

**COMPLEXITY AND SUSTAINABLE DEVELOPMENT  
IN THE CIRCUMPOLAR NORTH:  
POSITIONING CANADA IN THE ARCTIC COUNCIL**

by  
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## **Abstract**

In 1996, Canada assumed the initial two-year rotating chair of the Arctic Council; an unusual international regime of all eight Arctic states and three aboriginal organizations established to promote a broad cross-functional mandate of environmental protection and sustainable development.

Coincidentally, 1995 amendments to Canada's Auditor General's Act had required all major federal departments to prepare detailed sustainable development strategies. The Department of Indian Affairs and Northern Development had sponsored interdepartmental coordination in the development of a domestic Arctic strategy. Simultaneously, the Department of Foreign Affairs and International Trade had directed attention to a northern foreign policy. Canada was well-positioned, then, to bring leadership to the Arctic Council promoting international cooperation that was consistent with Canadian aspirations.

The first biennial Ministerial meeting held in Iqaluit, however, fell short of expectations. No sustainable development program framework was considered and only a few joint projects were conditionally adopted. Reasons for Canada's failure to facilitate more substantial progress included a lack of consistency and conceptual coherence in Canada's domestic and foreign policies, and a lack of political diplomacy and leadership in leveraging membership support for progress.

An analysis of Canada's policy highlights conflicts between neoclassical and ecological economic biases within key federal departments. More importantly, an analysis based on far-

from-equilibrium complex systems reveals that Canada had made no effort to understand the systemic relationships between environmental, ecological, and social dimensions of sustainable development upon which to plan robust and resilient solutions. Finally, Canada had not analyzed its position in the global economic system or questioned the sustainability of this context.

The thesis suggests that systemic transformation is inevitable and recommends that evolution of the global system requires internalization of dominant systemic relationships and the integration of the functionalist production of social meaning at regional scales. The circumpolar Arctic, given its key role in the regulation of biophysical planetary systems and its relatively untapped fuel and non-fuel resource reserves for economic expansion, has the potential to provide leadership in demonstrating revolutionary approaches to sustainable development and a regulatory function in the transition to global sustainability.

**Key Words:** Arctic Council, autopoiesis, cognition (and meaning), complex dynamic systems, dissipative structures, ecological economics, emergence, evolution, globalization, growth, international regime, language, planning, resilience, sustainable development, transformation, world system.

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## Abbreviations

|       |   |
|-------|---|
| AC    | Arctic Council  |
| AEPS  | Arctic Environmental Protection Strategy                              |
| AMAP  | Arctic Monitoring and Assessment Program                              |
| APEC  | Asia-Pacific Economic Community                                       |
| CAFF  | Conservation of Arctic Flora and Fauna                                |
| CEPA  | Canadian Environmental Protection Act                                 |
| CMHC  | Canada Mortgage and Housing Corporation                               |
| CPAN  | Circumpolar Protected Areas Network Strategy Action Plan (under CAFF) |
| DFAIT | Department of Foreign Affairs and International Trade (Canada)        |
| DIAND | Department of Indian Affairs and Northern Development (Canada)        |
| EC    | Environment Canada  |
| EIA   | Environmental Impact Assessment                                       |
| EPPR  | Emergency Prevention and Preparedness Response                        |
| GATT  | General Agreement on Trade and Tariffs                                |
| GNWT  | Government of the Northwest Territories                               |
| ICC   | Inuit Circumpolar Conference  |
| IMF   | International Monetary Fund   |
| LEK   | Local Ecological Knowledge  |
| LRTAP | Long-Range Transboundary Air Pollution                                |
| MSY   | Maximum Sustainable Yield   |
| NAFTA | North America Free Trade Agreement                                    |
| NGO   | Non-Governmental Organization   |
| NWT   | Northwest Territories (Canada)  |
| PAME  | Protection of Arctic Marine Environment                               |
| POP   | Persistent Organic Pollutant  |
| SAO   | Senior Arctic Official  |
| SD    | Sustainable Development   |
| TEK   | Traditional Ecological Knowledge                                      |
| TNC   | Trans-National Corporation  |
| WTO   | World Trade Organization  |

## Acknowledgments

The four assumptions for policy relevant research are that you, the analyst, have *access* to a decision maker, that she treats your research *seriously*, that she *uses* the research for making a decision, and that the decision is actually *implemented* in light of your research findings. There are, to repeat, no guarantees any of this holds. You have to work at meeting these assumptions and, as with all policy analysts, you not only have to be *persistent*, you must also be able to *compress* analysis into minutes of advice. As Kingdon underscores, your world of analysis will have only a few *policy windows*, i.e., a limited number of opportunities when these four assumptions are all met, in whole or in part. If policy makers have to fight to get heard and to be taken seriously, where, if they win, they frequently do so only at the last minute with one vote to spare, and then only after a great deal of effort, why ever should the lot of the analyst be any different? (Roe 1998:14-15, emphasis in original)

Thanks to the friendship and confidence of many northerners, the knowledge and experience underpinning this thesis came through hands-on experience with the evolution of political, constitutional, economic and community development policy in a number of venues in the Circumpolar North. The pragmatic research agendas and policy emphases were based on the tightly constrained, down-in-the trenches local view of what would advance a more humane world and at the same time be politically do-able. Of the many who have opened doors to my participating in a wide gamut of real-life Northern problems that form the context for this paper, I would like to acknowledge those whose support has been the broadest and most persistent:

- Walter Slipchenko, as the Director of Circumpolar Affairs in the GNWT, threw his weight behind several technical exchange programs with the USSR and Russia sponsored by Indian and Northern Affairs Canada (DIAND), Canada's Department of Foreign Affairs and International Trade (DFAIT), and the Canadian International Development Agency (CIDA), affording me the opportunity to design and deliver programs to build private- and public-sector project management and construction capacity to assist in Russia's economic (from socialism to capitalism) and political (from communist to democratic) transitions. Walter also provided regular guidance in political negotiation with Russian bureaucrats. As Executive Director of the Arctic

Council, he provided access to the files and leveraged expenses from DIAND to facilitate my direct participation in Canadian preparations for the Sustainable Development Task Force and Senior Arctic Officials meetings of the Arctic Council in London (16-19 August 1998)

- Larry Elkin, as the Deputy Minister of Public Works in the Northwest Territories (NWT) and then as a consultant to the Nunavut Implementation Committee, helped me understand the relationships between democratic constitutional development and economic self-reliance, providing many hours of unpaid coaching in my work on the Government of the NWT's (GNWT) Business Incentive Policy, the Community Empowerment Framework, and Self-Government negotiations
- Bob Doherty, as a Deputy Minister for the NWT's Public Works and Services and Transportation Departments, supported my interdepartmental co-chair responsibilities in creating on-the-job training programs for northerners, in developing policy targeting specific communities and business sectors for economic development, and in negotiating balanced policies for implementing the GNWT's contractual responsibilities within aboriginal land claim agreements. Bob also gave me a venue to speak about ecological footprints, eco-efficiency and policy to achieve sustainable development through industrial transformation at several occasions during the Circumpolar Housing Forum '98 in Yellowknife, NWT (7-10 September 1998) under "Theme A - Creating Economic Development and Trade Opportunities in the Circumpolar World."
- Berni Funston, who as senior advisor to the Arctic Council Secretariat, promoted my participation as the housing workshop facilitator at the *Circumpolar Conference on Sustainable Development in the Arctic: Lessons Learned and the Way Ahead* in Whitehorse, Yukon (11-14 May 1998) under "Theme 1: Living in Communities in the Circumpolar North", and more importantly enthusiastically promoted my research on contemporary debates regarding sustainable

development to the Arctic Council Sustainable Development Task force to advance a higher quality of life in the North he loves so dearly.

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- Bill Rees, who as my research supervisor, introduced me to ecological economics and theories of complex dynamic systems, and opened doors to a part-time career in public speaking on these issues at the Langara College Eco-City Program, the 1997 Southeast False Creek Spring Fest, and the 1998 Earth Day.
- Tom Hutton, who as my first reader, lent his full assistance to my understanding of the global dynamics of development in the Guangdong Delta of South China as a contextual counterpoint to the circumpolar north.

Although the issues and insights of this thesis arose through the support of these and many other people, only I am responsible for the substance. Finally, my partner and help-mate Carole is responsible for convincing me to work for more than a decade in the North, and then to redirect two years of time and savings from our two bemused yet supportive children in order to complete this degree. It is to her that this thesis is dedicated.

# CHAPTER 1: The Arctic Council's Sustainable Development Mandate

Sequinersuup qimaatilereerpaa ukiorsuup kaperlassua  
(The sun has put to flight winter's long gloom)

Greenlandic song celebrating the return of the sun after winter's endless night. (AMAP 1997:5)

## 1.1 Introduction

The Circumpolar North is a reflection of the underdeveloped South in the backyard of the richest countries of the industrially developed world. Around the pole, the region is characterized by very high population growth due to natural increases (in Canada, the birth rate is three times as high as the country average and life expectancy is rising, even if still five years lower than the country's average), lower life expectancy (at 54 years for men and 65 for women in Russia, this is 10-20 years lower than national averages), high proportions of aboriginal populations (as high as 85% in representative regions), a continuing dependence on subsistence hunting for food (as much as 300 kg./capita/year), low levels of education, rates of unemployment exceeding national levels by four times and more, and high rates of suicide, substance abuse and the related crimes of spousal and family violence.

"Among some groups of native people in Alaska," for instance,

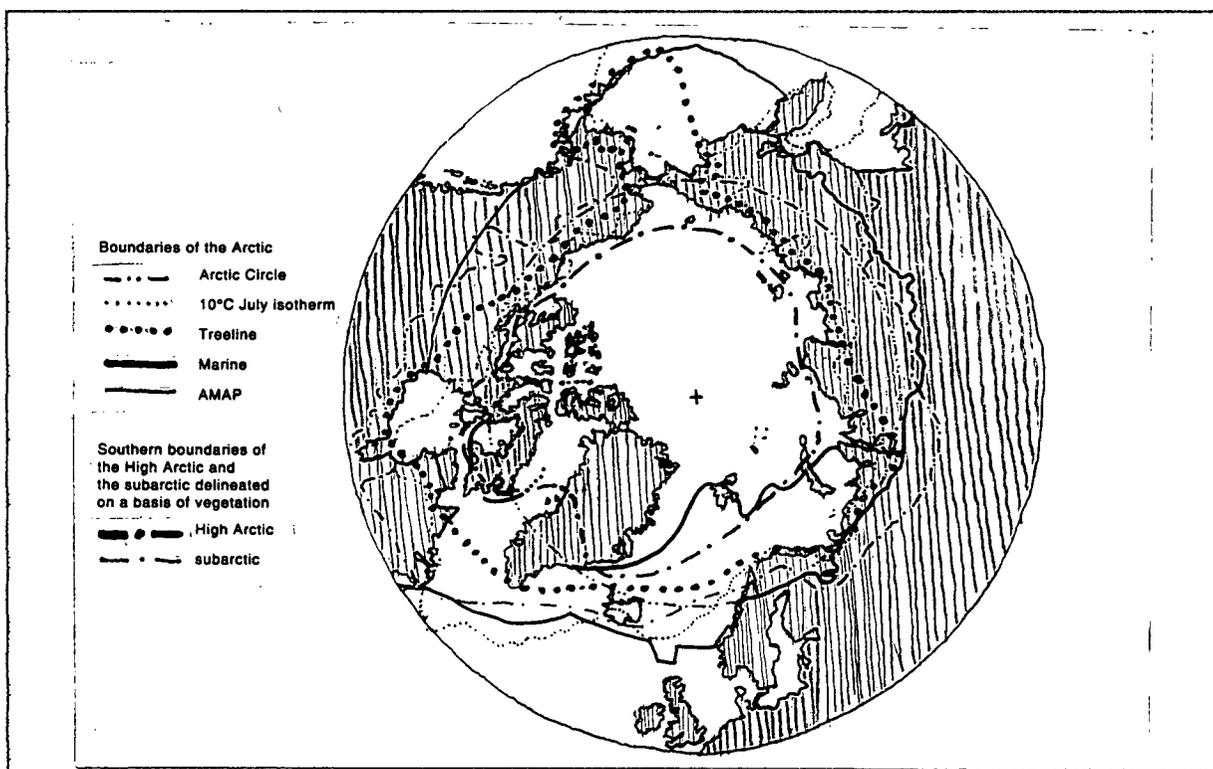
"pneumonia is nearly 60 times more common than for the United States population as a whole. In certain areas, botulism reaches its highest incidence worldwide. The age-adjusted mortality for some types of cancer is higher than for the United States population as a whole....The overall leading cause of death in Alaska is cancer followed by heart disease, unintentional injury, and suicide. Diabetes, breast cancer, suicide, chronic obstructive pulmonary disease, lung cancer, and neoplasms are increasing among native people" (AMAP 1997: 55-6).

The Circumpolar North<sup>1</sup> is variously defined as the area north of a) the Arctic circle, b) the 10°C July isotherm, c) the treeline, d) the juncture of the cool dilute waters of the Arctic Ocean with the warmer, saltier waters of southern oceans, or e) the southern border of the subarctic vegetation regimes (see

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<sup>1</sup> Besides temperature, there is little similarity between the two circumpolar regions: the arctic and Antarctic. In the North, the ice cap floats on an ocean where in the south it rests on a continent. The inhabited regions of the north are on land where the complimentary zone in the south is primarily ocean. During the Cold War, Antarctica was an international scientific research zone of a coherent epistemic community while the North was populated by a highly diverse and scientifically untrained aboriginal population, and as a zone of military security, was relatively inaccessible to the scientific community. In this thesis, 'circumpolar' always refers to the Arctic.

Figure 1.1). These various definitions define a zone appended to the North polar ice cap and crossing eight national jurisdictions: United States of America, Canada, Greenland/Denmark, Iceland, Norway, Sweden, Finland, and Russia. Although the region includes 6 major physical-geographical landscapes<sup>2</sup>, they are all characterized by relatively wide annual swings in temperature and daylight, low precipitation, short growing seasons, functionally unspecialized but resilient ecosystems, and small remote human settlements. Its simple cold desert ecology and the socio-economic profile of its peoples makes its developmental challenge more akin to the marginal areas of Asia and sub-Saharan Africa than to that of the advanced globalized national economies in which these regions reside. Because of their isolation and their minimal contribution to industrialization and economic growth, the plight of the northern regions has been mostly ignored --- until recently.



**Figure 1.1: Boundaries of the Circumpolar North, redrawn from AMAP 1997:6**

<sup>2</sup> These include a) Canadian and Baltic shield, b) Hudson and West Siberian Lowlands, c) Interior (Canada) and East European Plains, d) Central Siberian Plateau, e) North American Cordillera and East Siberian Highlands, and f) the Arctic Islands (AMAP 1997:7).

## **1.2 Problem Statement and Methodology**

In April 1986, the world's worst nuclear power plant accident occurred at Chernobyl. During the ten days of fire and core collapse, "9000 kilograms of radioactive material and 700,000 kilograms of radioactive graphite escaped" (AMAP 1997:111). Much of the lighter material was deposited in terrestrial arctic environments by winds traveling to the arctic sink where it accumulated in the food chain contributing to arctic contamination levels between 5 and 100 times higher than exposures for people living in temperate climates (Ibid.:126). Although global releases of strontium-90 and cesium-137 had actually peaked with atmospheric testing of nuclear weapons during the last half of the 1960's, the Chernobyl catastrophe, coinciding with investigations of global warming dynamics and the 1992 Agenda 21 agreements to produce national sustainable development action plans, highlighted the vulnerability of the arctic and northern peoples to all forms of industrial fallout from economic expansion in the remainder of the developed and developing world. The following processes illustrate the growing concern:

- The frozen ice cap pulls both atmospheric and oceanic currents; on the one hand this helps cool the planet and simultaneously expand the domain of temperate climates, but on the other hand transports industrial pollutants to the arctic where it accumulates 'free of charge' in a global pollution dump. The preservation of the ice cap has global significance, but results from non-arctic activities which are largely beyond its direct control.
- Major river systems<sup>3</sup> flow north; some carry industrial wastes (non-arctic sources), while others are primarily contaminated with the tailings of regional resource extraction processes (arctic sources).
- Levels of persistent organic pollutants and heavy metals in human breast milk and the umbilical cord blood of northern newborns are two- to ten-fold higher than in than their southern

---

<sup>3</sup> Annually, Arctic rivers carry 4200 cubic kilometers of water with 221 million tonnes of sediment into Arctic Seas. Rivers include the Nelson, Mackenzie and Yukon in North America and the Northern Dvina, Pechora, Ob, Yenisey, Lena and Kolyma in Eurasia (AMAP 1997: 28).

counterparts with impacts on child neurological development, reproductive capacity and the immune system (AMAP1997:180, 186) of mainly aboriginal victims.

- Global warming is proceeding faster than expected; the major effects will be the acceleration of storm-related damage in tropical and temperate climates (see Weizsacker et al. 1997: 223-227), with the bulk of average temperature increases (as much as 4-5°C by the mid-21st century) and the associated slow-cycle impacts on permafrost, biomes, life-styles and cultural-symbolic relationships with the land concentrated in the polar regions (Cohen 1997:1).

The Agenda 21 prescriptions advocated expansion of material wealth in the South coupled with decreased population growth, and in the North, advocated decreased resource consumption. Common to both North and South was the need to decrease cumulative impacts on the ecosphere, improve the equitable distribution of material wealth, and increase the efficiency of technology and markets in the allocation of scarce resources toward human well-being. Chernobyl emphasized that the Circumpolar Arctic was a bit of the 'South' within the sovereign jurisdictions of the developed world and as such, provided a pilot project for north-south sustainable development initiatives.

Through a series of steps beginning with scientific cooperation, the Arctic Council emerged in 1996 as a high-level political forum of the eight arctic states for coordinated action on sustainable development in the circumpolar north. The Arctic Council's first Ministerial meeting of 18-19 September 1998 in Iqaluit, Canada<sup>4</sup> concluded Canada's role as the host country and chair. It convened primarily to "adopt terms of reference for, and oversee and coordinate a sustainable development program" (Arctic Council 1996: clause 1c) and continue with the environmental protection work that remained central to the Nordic states. Canada had promoted the sustainable development agenda in the negotiation of

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<sup>4</sup> Iqaluit, formerly Frobisher Bay, located on Baffin Island in the Northwest Territories (NWT), will become the capital of Nunavut on April 1, 1999 through a division of the current NWT. Canada's third territory, Nunavut, will have a public government, but be territorially congruent with the Nunavut Final Land Claim negotiated with Inuit beneficiaries regardless of their place of residence.

the founding Declaration and authored the mandating clause<sup>5</sup>. This put particular pressure on Canada to ensure that sustainable development in the Circumpolar North achieved both momentum and direction. The purpose of this thesis is to present a critical analysis of Canada's position regarding sustainable development, especially regarding the Arctic, as an aid to positioning Canada for a) the Ministerial meeting and b) for the interjurisdictional brokering required during the next two year period. It was completed in stages both before and after the Ministerial.

The thesis is structured into four chapters. The first, and longest, provides a short history of the Arctic Council followed by a critical analysis of documentation underpinning Canada's position regarding sustainable development, especially in the Arctic, and asks the following questions:

- How does Canada define sustainable development (SD)?
- What is Canada's domestic policy regarding the Arctic, and is it consistent with SD?
- What is Canada's foreign policy regarding the Arctic, and is it consistent with SD?
- What joint sustainable development projects are being proposed to the Council and how should Canada respond to them?

The second chapter provides an overview of the "new sciences" of complexity for insights on the nature of systems to provide some guidance on how to balance the environmental, social and economic domains. The nature of this triple imperative has been the inscrutable 'black box' of sustainable development. The third chapter provides a preliminary scan of the global context for the circumpolar north, focusing on the two phenomena of economic globalization and political liberalization to test the resilience of Canada's policy stance. The final chapter reviews the output of the 1998 Ministerial meeting and provides recommendations on adjustments to Canada's policy stance. Overall the thesis is research in the service of policy development (see opening quotation of "Acknowledgments").

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<sup>5</sup> From an interview with Bernie Funston

The methodology can be characterized as participatory action research. Supplemented by research in the theories and policies of sustainable development, my understanding of circumpolar issues has developed mainly through responsible positions in political projects to facilitate institutional reform attendant to sustainable development in the Arctic including:

- Circumpolar Conference on Sustainable Development: Lessons Learned and the Way Ahead, 11-14 May 1998:
  - facilitator for the 'housing' workshop under the "Living in communities in the Circumpolar North" theme
- Community Empowerment Strategy - Infrastructure Transfer (approved 13 August 1997):
  - chaired interdepartmental committees and drafted Cabinet submissions,
  - facilitated pilot workshops for communities of the Keewatin Region 8-12 September 1997
- Arctic Council Secretariat:
  - provided research assistance and advice to the Senior Advisor
- Circumpolar Housing Forum '98 in Yellowknife, NWT, 7-10 September 1998
  - Plenary speaker on export housing and industrial transformation
  - Workshop Moderator: "Identifying the needs and opportunities for housing for aboriginal peoples in northern remote and urban areas"
  - Workshop Presenter: Housing in Poligus, Evenki Autonomous District, Siberian Russia: A Case Study
  - Rapporteur: Theme A: Creating Economic Development and Trade Opportunities in the Circumpolar World
- Northern Management Program between the Government of the Northwest Territories (GNWT) and the Republic of Sakha in Siberian Russia (1993-1996) sponsored by CIDA and the GNWT
  - technical coordinator on project management and contract administration capacity building in the State government

Participatory Action Research sacrifices dispassionate objectivity (which is now suspect anyway) for a chance to strive for relevance, a necessarily value-based pursuit. Acknowledging the attempt to change the historical development of my subject forces me to reveal my biases as the thesis unfolds and take responsibility for the outcomes that engaged research may produce.

### **1.3 Short History of the Arctic Council**

The fallout of Chernobyl and the collapse of the USSR provided the window of opportunity to develop a network of circumpolar nations to take scientific stock of the environmental consequences of all manner of pollution in the North. In the short term, Norway, Finland, Greenland/Denmark and Canada needed to ascertain the immediate environmental impact of existing chronic or persistent sources of radioactivity, organic pollutants, and heavy metals in terrestrial, marine and aerial biota and its potential consequences for humans, non-humans and their habitats. In the medium term all Arctic countries welcomed the opportunity to assess the potential risk of additional pollution sources (principally in Russia), their scope, and spatial distribution. Finally, in the long term, the Arctic Countries were interested in the cumulative impact of current or projected industrial development on climate, biodiversity, and ecological resilience in their own backyards. The common ground of the Arctic provided the opportunity for international cooperation. Chernobyl had been the surprise event that galvanized action around a simmering environmental issue. Thus the Arctic Environmental Protection Strategy (AEPS) was born, endorsed by all Arctic countries through the Rovemeni Declaration (Appendix 1) of 1991, signed in Finland. Four science-based working groups were established to monitor and recommend actions to protect the environment, principally under the auspices of Departments of Environment in each jurisdiction:

- Arctic Monitoring and Assessment Program (AMAP)<sup>6</sup>  
Monitors key pollutants in the Arctic (especially persistent organic pollutants, radionuclides, heavy metals and acidifying agents, but also petroleum hydrocarbons, climate change, ozone depletion and UV radiation), identifies their sources and transport linkages, levels, trends, cumulative impacts and effects on Arctic ecosystems and human populations
- Protection of Arctic Marine Environment (PAME)  
Addresses policy and non-emergency response related to marine protection from both sea and land based activity including offshore hydrocarbon exploration, shipping, and industrial activity

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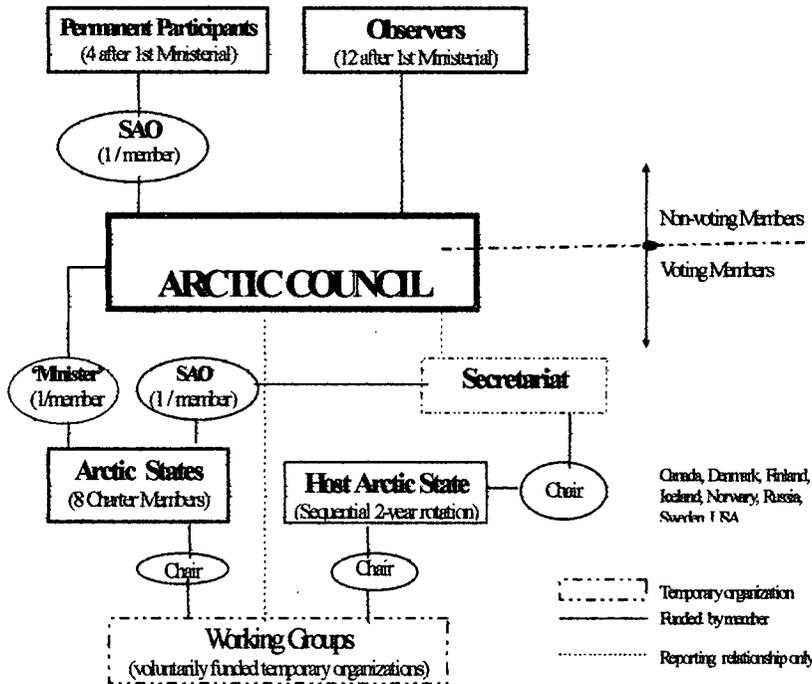
<sup>6</sup> DIAND partnered with EC on this initiative in Canada

- Conservation of Arctic Flora and Fauna (CAFF)  
Researches shared species and habits and develops mechanisms for conservation and sustainable resource utilization, including the coordinated and comprehensive designation of a protected area network
- Emergency Prevention and Preparedness Response (EPPR)  
Identifies means for improving emergency prevention, preparedness and response, especially with regard to oil spills and the accidental pollution from other high risk activities and includes reviews and recommendations on relevant international agreements.

Soon it became evident, however, that recommendations emerging from these studies, to the extent that they involved human welfare (health, education) or economic and industrial policy, etc., were outside the mandates of the responsible Senior bureaucrats. Canada had also foreseen this dilemma. Prime Minister Mulroney had promoted an Arctic organization with a more political mandate in the late 1980's. Jean Cretien's early positive experiences as a Minister of Indian and Northern Affairs under the Trudeau Government, had afforded him the opportunity to travel Arctic countries including the USSR and had endeared him to the North. One of his Liberal promises in the early '90s was to press for an expansion of the mandate of the AEPS. US President Clinton conceded to Canadian Prime Minister Cretien in 1994 opening negotiations to define the mandate of the Arctic Council, which by the time the declaration was signed in 1996 had expanded to include 'sustainable development' (SD).

Structurally, the Arctic Council has three types of participants. The eight Arctic Nation states are voting Members. Both the Permanent Participants of aboriginal groups (either inter- or intra-state) and the Observers are non-voting. The Permanent Participants, however, are at the table with the same rights as states to intervene in the dialogue. They are represented at the regular meetings of senior bureaucrats and through that have a greater level of involvement in setting the Council's agenda. The Arctic Council, during its first two years, has been served by a Secretariat which reports to the Arctic Council Chair. The Chair rotates every two years amongst the Arctic States and the chairing Member also provides the Secretariat. During the first two years of its mandate, Canada was the chair,

assigning Mary Simon, the Ambassador of the Arctic in the Department of Foreign Affairs and International Trade<sup>7</sup>, as the chairperson (see figure 1.2), and initially the Senior Arctic Official (SAO) as well.



**Figure 1.2: Arctic Council Organizational Chart**

focus on specific tasks. In addition to the working groups inherited from the AEPS program (AMAP, CAFF, PAME, EPPR), for instance, a temporary Sustainable Development Task Force was established in May 1998 to ensure that SD proposals submitted by Members and Permanent Participants were complete. In Canada, the Ministerial role is under the Minister of Foreign Affairs and International Trade, with lead department responsibilities divided between the Department of Environment (EC) and the Department of Indian Affairs and Northern Development<sup>8</sup> (DIAND). At the time of the first Ministerial the SAO was an Assistant Deputy Minister from DIAND. Canada

There are also three tiers within the Members and Permanent Participants. Senior elected officials are the decision-makers at the biennial Ministerial meetings. Their key policy advice comes from the Senior Arctic Officials (SAOs) who meet more frequently. Finally, the SAOs are served by working groups and their chairs who

<sup>7</sup> Simon was formerly the President of the Inuit Circumpolar Conference (ICC) from 1986-1992

<sup>8</sup> Since Canada's north of 60°N jurisdictions are territories, they are ultimately under Federal constitutional control and administered by DIAND under separate acts. Most responsibilities afforded other provincial

provides an unofficial 'interim chair' and a senior EC technical representative to the Sustainable Development Task Force, and provides chairs to two of the AEPS working groups (PAME & CAFF, see Appendix 6).

The 1996 *Declaration on the Establishment of the Arctic Council* (Appendix 2) divided environmental protection from sustainable development (AC 1996: recitals, emphasis added):

“...commitment to sustainable development in the Arctic region, including economic and social development, improved health conditions and cultural well-being”

“...concurrently...commitment to protection of the Arctic environment including the health of Arctic ecosystems, maintenance of biodiversity in the Arctic region and conservation and sustainable use of natural resources”

Although never articulated by Canada as such, the split 'twin pillar' approach was necessary to maintain support of those Arctic States more concerned about environmental protection than development of any kind, sustainable or otherwise. This was especially necessary given the ambiguity of the term 'sustainable development' amongst major governments and institutions like the World Bank where sustainable development remained synonymous with 'economic growth', and therefore necessarily had a predominantly negative impact on the environment. The twin pillar approach postulated implicitly that development necessarily created the need for environmental protection. Autonomy of the two mandates was required to establish a balance of power between conflicting agendas. In this context, however, the Arctic Council agreed to “adopt terms of reference for, and oversee and coordinate a sustainable development program” (Ibid.: clause 1(c)). The AEPS programs were not operationally absorbed into the Arctic Council until the final AEPS ministerial meeting in Alta, Norway in June, 1997. At this conference, the AEPS Ministers issued a surprising statement about the relationship between environmental protection and sustainable development (AC 1997; see Appendix 3):

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governments under the Constitution have been devolved to the territorial governments with the notable exception of energy and mineral resources.

“...sustainable development is an *overriding objective* for all activities in order to secure ecological safety and integration of environmental concerns in management, planning and development...” (emphasis added)

“...commitment...to protect the environment as one of the priority elements of sustainable development, as elaborated under the AEPS, and agree to continue joint efforts to implement, develop and improve AEPS programmes under the auspices of the Arctic Council.”

In these statements, the concept of sustainable development was nested within the priority element of “ecological safety”. The subsequent *Ad Referendum Terms of Reference on Sustainable Development* (Appendix 5) adopted on February 5, 1998 provided a more ambiguous framework, putting the improvement of environmental, economic, cultural, social conditions on an equal footing, again reinforcing the ‘twin pillar’ approach of the Arctic Council *Declaration*:

“The goal of the sustainable development program of the Arctic Council is to propose and adopt steps to be taken by the Arctic States to advance sustainable development in the Arctic, including opportunities to protect and enhance the environment, and the economies, cultures and health of indigenous communities and of other inhabitants of the Arctic as well as to improve the environmental, economic and social conditions of Arctic communities as a whole.”

The authority of the Arctic Council is limited by the following<sup>9</sup>:

- Consensus Decision-making: Decisions require the ascent of all voting members (the 8 Arctic states) or at least the agreement of more than one and no dissension from the remaining members. Dramatic change and innovation should not to be expected in this forum.
- Non-binding: Decisions made in the Arctic Council do not force any reciprocal action on the part of national governments. Decisions, therefore, will promote the sharing of information and joint-venturing on projects and policies consistent with current domestic legislation, policies, programs and projects.
- No “Court of Appeal”: This is not a forum for citizens to ‘press charges’ for the failure of national governments to adhere to their domestic policy or international agreements. Although

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<sup>9</sup> The outline of the following points is taken from discussions with Bernard Funston, Senior Advisor to the Arctic Council Secretariat and Walter Slipchenko, Executive Director of the Secretariat in August 1998.

officials can bring international non-compliance issues to the table, provisions for this are normally provided within these binding agreements; and not taken up at the Arctic Council.

- No Operational Capacity: The Council does not deliver programs or services. Representatives are accountable to national governments or regional organizations and are not elected or appointed with a specific mandate to serve on the Council, and therefore the Council, at least so far, does not promote a shared vision for the Arctic.
- No Significant Funding Capacity: There are no compulsory dues nor does the Council administer program funding. All programs, and the operation of the Secretariat, are voluntarily funded.
- No Bureaucratic Superstructure: There is no permanent bureaucracy at any level, including the Secretariat and the Working Groups. Even Ministerial representatives are prone to regular change. Corporate memory is quite short, alliances are vulnerable. On the positive side, duplication of effort at the national and international levels is less likely to occur.

Despite its lack of mandate to direct the significant changes generally recited in discussions about sustainable development, the Arctic Council still has considerable utility.

- It provides an opportunity for the west to quickly elevate new scientific knowledge and information about serious environmental risks in Russia to the attention of senior political decision-makers. Reciprocally, it allows Russia access at a senior political level to risk mediation technologies currently available in the west, as well as some financial assistance where the west deems it appropriate.
- It provides high level political access between governments to speed response time in case of emergencies. For instance, during the exceptionally damaging 1998 spring floods in the Sakha Republic of Russia along the Lena River, Arctic Council channels were used to muster international aid.

- It opens channels of communication and sharing, so that nations -- without the force of law -- can share information and experience with other members who might find it helpful. This in turn could lead to legally binding bi-lateral or multi-lateral agreements -- engaged without coercion -- to proceed on an area of common concern without having to wait for all or even a majority of Arctic Council members to agree.
- It builds the basis of trust and shared goals that could eventually lead to a legally-binding decision-making forum with the flexibility to implement decisions based on democratic principles of majority voting.

Officials to the Arctic Council, however, tend to carry expectations normally imposed on a legally binding institution and judge its output on the basis of formal agreements reached. In an environment shaped by terse news clips, Canadian politicians demand easily digested deliverables, and this expectation drives the bureaucratic machine. This is unfortunate. The real value of institutions like this is that they permit serious and informed debate on issues where the members may be widely divided. The Arctic Council will be valued by its membership to the extent that it provides a critical perspective on 'business as usual' and gives members new ideas to consider in the formulation of their own domestic policy, without having to implement instructions from a supra-national body. Whereas agreements in legally binding organizations must accommodate larger geopolitical agendas, the ideas accepted in a legally non-binding organization are carried on their merits, as well as the skill with which persuasion is wielded. The necessary debates need to happen at the SAO level or they will never get Ministerial attention. SAOs, therefore, should be filled with credible and respected leading edge thinkers from each Arctic State and Permanent Participant. Unfortunately, the SAO meetings appear to protect the bureaucratic position of the Ministerial level, rather than engage constructive debate on strategic issues and alternatives that challenge the status quo.

## 1.4 The First Circumpolar Sustainable Development Proposals

### Compliance Checklist

1. Outline issues to be addressed
2. Outline anticipated financial needs and implications
3. Suggest ways of dealing with financial needs
4. Show need for participation of more than one state
5. Identify body to oversee implementation
6. Project benefit to be realized
7. Describe relationship to experience/needs of residents
8. Identify related work of other international fora

**Figure 1.3: Arctic Council SD Proposal Criteria**

Between 7-29 July 1998, 4 of the 11 Arctic States and Permanent Participants of the Arctic Council submitted 10 sustainable development proposals for consideration at the Ministerial meetings in September. None of them met the simple information requirements specified in Item 2 of the *Ad*

*Referendum* Arctic Council Terms of Reference for a Sustainable Development Program (see figure 1.3)<sup>10</sup>. In particular, most were weak in realistic cost projections, and failed to reference national and international organizations engaged in similar or related projects.

The priority substantive areas from the Arctic Council Declaration included:

- Sustainable development (Inhabitants Well-being)
  - economic development
  - social development
  - improved health conditions
  - cultural well-being
- Environmental protection
  - health of Arctic ecosystems
  - maintenance of biodiversity
  - conservation and sustainable use of natural resources
- Traditional and Scientific knowledge
- Cooperative activities and circumpolar cooperation
- Full consultation and involvement of indigenous people and other arctic inhabitants
- Regular intergovernmental consideration and consultation on issues
- Oversee and coordinate programs
- Disseminate information, encourage education and promote interest in Arctic issues

<sup>10</sup> Although all charter states and Permanent Participants were asked to review the submissions for compliance, only Norway completed the task. Iceland provided an overall assessment of disappointment and CAFF commented on three which were of interest to them. The short time for input and the summer season were likely the significant factors explaining the delinquency. The late submissions were due to the delayed approval of Rules of Procedure (see Appendix 4) and the Terms of Reference for a Sustainable Development Program (see Appendix 5), both approved in February 1998. This delay was related to the weakness of the Secretariat's first Executive Director, who favoured political issues to the detriment of administrative process.

A brief outline of the submissions follows (see Table 1.1 and Figure 1.4). A more detailed summary and analysis of each appears in Appendix 7. All of this information was available to the SAOs at their London meeting.

**Table 1.1: Arctic Council Sustainable Development Proposals Summary**

|   | <b>Proposal (Proponent)</b>   | <b>Summary</b>  | <b>Type</b> | <b>Information Deficiency</b>   | <b>Preliminary \$ Estimate</b> |
|---|---|---|-------------|---|--------------------------------|
| 1 | The Future of Children & Youth of the Arctic: (Canada)                  | Effects of contaminants and social conditions on health & well being; enhancing scientific and TEK knowledge, targeted at youth   | SD          | Links to similar AC activities; feasibility of common approach to health                  | 378,000 (5.8%)                 |
| 2 | Strategic Approach to Managing Sustainable Development (Canada)         | Review recommendations of multi-stakeholder SD conference: develop plan for systematic implementation of circumpolar projects   | SD          | Cost sharing and in-kind contributions; relative to other intl. fora                      | 45,000 (0.7%)                  |
| 3 | Technology Transfer to Improve Arctic Sanitation & Energy Systems (USA) | Exchange information on planning & implementing telemedicine to support remote sensing, decision making & collaboration for distance treatment                              | SD          | Work plan, links to similar AC activities, relative to other intl. fora                   | 80,000 (1.2%)                  |
| 4 | Arctic Telemedicine (USA)   | Improve sanitation infrastructure: demonstration community & follow-up conference on training local fiscal mgmt; technical & governance capacity; planning, design and ops. | SD          | Source of resources; exec. body; workplan   | 367,000 (5.7%)                 |
| 5 | Cultural and Eco-Tourism (USA)  | Identify viable cultural/eco-tourism opportunities and develop for economic returns   | SD          | Source of resources; rel. to needs of Arctic residents; workplan, rel. to intl. fora; EIA | 630,000 (9.7%)                 |
| 6 | Arctic in National Sustainable Development Strategies (ICC)             | Comparative analysis of national SD strategies of Arctic States applied to Arctic regions   | SD          | Costs; Source of resources; Exec. body; workplan; rel. to intl. fora & AC; EIA            | 75,000 (1.2%)                  |
| 7 | Economic Rent from Natural Resource Development (ICC)                   | Effectiveness of legislative & policy tools to generate economic rent from arctic resources; consequent value of revenues and their distribution                            | SD          | Costs; Exec body; workplan; rel to intl. fora & AC; EIA                                   | ?                              |
| 8 | Indigenous Peoples' Natural Resource Use and Mgmt. (ICC)                | Impact of hunter support programs to promote indigenous culture & economics; inventory of eco/climate change and traditional land use & occupation in Russia                | SD          | Source of resources; exec. body; workplan; rel to intl. fora & AC; EIA                    | 135,000 (2.1%)                 |

|    | <b>Proposal<br/>(Proponent)</b>   | <b>Summary</b>   | <b>Type</b> | <b>Information<br/>Deficiency</b>   | <b>Preliminary<br/>\$ Estimate</b> |
|----|---|--|-------------|---|------------------------------------|
| 9  | Freshwater Fishery<br>Mgmt: Barents Region<br>(Sami)                                  | Current practices & comparative<br>analysis of fresh-water fisheries<br>co-mgmt. policy in Norway,<br>Finland, Sweden, Russia  | SD          | Source of<br>resources;<br>workplan; EIA                                  | 357,000<br>(5.5%)                  |
| 10 | Coastal Fishery Co-<br>mgmt. & TEK Systems<br>in Norway, Greenland<br>& Canada (Sami) | Current practices and comparative<br>analysis of co-mgmt.<br>arrangements in Canada,<br>Greenland, Alaska & Russia as<br>basis for institutional reform  | SD          | Source of funding;<br>work-plan; relation<br>to intl. fora and<br>AC; EIA | 220,100<br>(3.4%)                  |
| A  | Arctic Monitoring and<br>Assessment Program   | Provide data continuity, add new<br>stations for POPs and heavy<br>metals, add monitoring of human<br>health and food webs, climate<br>change, radioactivity and UV-B,<br>model multiple stressors in marine<br>environ't          | EP          | N/A   | 620,000<br>(9.6%)                  |
| B  | Protection of Arctic<br>Marine Environment  | Implement Phase I (POPs and<br>heavy metals) of Regional<br>Programme of Action, promote<br>Arctic Offshore Oil and Gas<br>Guidelines, review int'l<br>agreements, assess current<br>shipping hazards and safety code<br>revisions | EP          | N/A   | 3,108,000<br>(48%)                 |
| C  | Conservation of Arctic<br>Flora and Fauna   | Monitor biological diversity<br>changes, prepare Arctic<br>Vegetation Map, research and<br>implement CPAN, provide info.<br>on integrating biodiversity<br>conservation into economic<br>sectors                                   | EP          | N/A   | 210,000<br>(3.2%)                  |
| D  | Emergency Prevention<br>Preparedness and<br>Response                                  | Evaluate int'l agreements<br>adequacy, develop framework and<br>guidelines for high risk activity<br>source controls, Map resources at<br>risk from Arctic oil spills  | EP          | N/A   | 167,500<br>(2.6%)                  |
| E  | Environmental Impact<br>Assessment  | Electronic dissemination of<br>experience with Arctic EIA  | EP          | N/A   | 10,000<br>(0.15%)                  |

Proposals Cost Summary:

- Total of all SD Proposals: \$2,352,000 (36.4%)
- Total of all EP Projects: \$4,115,500 (63.6%)

SD Task Force Mandate:

- Receive & Review Proposals,
- Identify issues re: Management, coordination, and organizational structures
- Prepare presentation to SAOs

SD Task Force 98.08.17 meeting, London, England: Goals

- Advance sustainable development in the Arctic
- Protect and enhance the environment, and the economies, cultures & health of indigenous communities and other inhabitants of the Arctic
- Improve the environmental, economic and social conditions of Arctic communities as a whole

Challenges evident from proposals:

- Different assumptions and methods of costing, very preliminary descriptions
- Various (and inadequate) understanding of current international activity in each area
- No method for establishing priorities and the appropriate level of funding allocations
- No framework to integrate and balance effects of EP and SD elements
- No method of judging merits and making choices to achieve most effective synergies and achieve common goal; i.e. there a need for a focusing framework to develop and prioritize substantive issues in addition to procedural compliance.

**Figure 1.4: Notes supporting Table 1 - Arctic Council Sustainable Development Proposals**

Even though there were only 10 projects, it was clear that there were no criteria for deciding between them, a problem that would become more apparent if there was insufficient funding, or if there were considerably more projects. During the meeting, SAOs were reminded of the assessment of the World Bank regarding the need to have a conceptual framework to make decisions and to evaluate results and outcomes:

The major lesson learned from the sustainable development strategy and NEAP [National Environmental Action Plans] processes is the fundamental importance of setting priorities, developing national ownership, and involving the public. *Setting priorities* either on an economic or an ecological basis is essential since financial and human resources are limited, and governments can only respond to a few needs at a time. In the Costa Rican NEAP for example five priority areas were identified out of more than a dozen areas initially targeted for action. *National ownership* is also central to creating the political climate for effective action and policy change. It often takes longer to develop ownership and *involve the public and relevant ministries*, but it has been found that without ownership and the associated participation, an action plan or strategy usually becomes a paper document that goes on the shelf and is ignored. (World Bank 1997:7, emphasis in original)

These particular observations were chosen, to show the delegates that even the most conservative of international institutions, the World Bank, was aware of the key conceptual gulfs that created contradiction or inaction in the development of a sustainable development program.

### **1.5 Theoretical Spectrum for Sustainable Development**

The 1995 amendments to Canada's Auditor General's Act legislated a definition for sustainable development lifted directly from the Brundtland Report and probably intended as deference to Canada's public endorsement of the non-binding 1972 *Stockholm Declaration on the Human Environment* and the 1992 *Rio Declaration on Environment and Development*, reading of course: sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". By 1989 (Daly and Cobb 1994:71, 75-6), however, it was already recognized that the definition was a political compromise aimed to achieve consensus on a vague concept that in the future would need to clearly demarcate the difference between 'development' and 'growth', and to undertake a position on the substitutability of natural and human-made capital.

To bring some clarity to what is being sustained and the relationship between the environment, society and the economy, a number of operational definitions and criteria have emerged. For instance Rees provides a criterion for sustainability based on the premise that the sustainability of a system is contingent on the limiting factor (which is the rationale for the application of specific agricultural fertilizers) and that the current economic system is limited most critically by the scale of available ecological services:

Each generation should inherit an adequate per capita stock of both manufactured assets and self-producing natural assets no less than the stock of such assets inherited by the previous generation...humankind must learn to live on the annual income ('the interest') generated by remaining stocks of essential natural capital. (Rees 1995a: 350)

Synthesizing work by Herman Daly and Donella Meadows, Capra<sup>11</sup> has provided operational criteria for sustainable development:

1. Renewable resources shall not be used faster than they can regenerate.
2. Pollution and wastes shall not be put into the environment faster than the environment can recycle them or render them harmless.
3. Nonrenewable resources shall not be used faster than renewable substitutes (used sustainably) can be developed. —Daly
4. The human population... [has] to be kept at levels low enough to allow the first three conditions to be met.
5. The previous four conditions have to be met through processes that are democratic and equitable enough so that people will stand for them. —Meadows

Operational criteria like these, though, emerge from specific world views. For heuristic purposes, Daly has provided 'pre-analytic visions' within which alternative definitions fall.

There are, I believe, three alternative strategies for integrating the economy and the ecosystem that have been discussed in the public forum. First the strategy of "economic imperialism," in which the subsystem, the economy, expands until everything is included. The subsystem becomes identical to the total system, everything is economy<sup>12</sup> and everything has a price. Internalization of externalities has been carried to the limit and nothing remains external to the economy. This seems to be the implicit strategy of neoclassical economics.

The second strategy is to shrink the economy boundary to nothing so that everything is ecosystem. This I call ecological reductionism. All human valuations and choices are held to be explicable by the same evolutionary forces of chance and necessity that presumably control the natural world. Relative values correspond to embodied energy content, and economics, like ecosystems, are governed by the dictates of survival. Some follow this position to its logical conclusion, and view---or at least affect to view---human extinction as no more significant than the extinction of any other species. This seems to be the implicit strategy of those many biologists and ecologists who operate on a philosophy of scientific materialism.

The third strategy is the one adopted here---to view the economy as a subsystem of the ecosystem and to recognize that while it is not exempt from natural laws, neither is it fully reducible to explanation by them. The human economy cannot be reduced to a natural system. There is more to the idea of value than embodied energy or

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<sup>11</sup> Notes from the course entitled the "Web of Life" delivered at Schumacher College, 30 May - 26 June 1998

<sup>12</sup> B.Funston quips that in the Arctic Council, "everything is politics". The moral and ethical choices raised by the sciences of sustainable development are political choices. Ecological Economists would concur. The criteria for identifying and sorting decisions, however, derive from a common path of discursive and liberal thought which constrains the creative breadth of the options considered. This is the subject of chapter 2.

survival advantage. But neither can the economy subsume the entire natural system under its managerial dominion of efficient allocation. (Daly 1996a: 11)

Contemporary discussions on the key policy controversies over sustainable development issues such

| Daly (1996)             | Vos (1997)            |
|-------------------------|-----------------------|
| economic imperialism    | free-market advocates |
| ecological reductionism | deep ecologists       |
| ecological economics    | ecological-science    |

**Figure 1.5: Sustainable Dev't Typologies**

as risk assessment, regulatory approaches, environmental equity and environmental justice, private versus public control over Federal lands, trade, and environmental and national security

have used this tripartite topology to locate clusters of policy approaches. Vos (1997:5), for instance, uses a similar typology (see figure 1.5) to discuss the attitudes towards people and nature, limits to the rate and scale of ecological appropriation, the role of technology, the approach to equity and the distribution of wealth, the leading causal factor in environmental degradation, the means of accounting to future generations, and the appropriate environmental and economic management strategies.

At the same time Canada's *Guide to Green Government* was being published, eleven prominent economists and ecologists published their consensus in *Science* that "(1) the [environmental] resource base is finite, (2) there are limits to the carrying capacity of the planet, and (3) economic growth is not a panacea for [diminishing] environmental quality" (Daly 1996a: 10). The *Guide*, on the other hand, takes an "economic imperialism" approach to sustainable development. For instance, to improve the quality of life and well-being it supports innovation towards sustainable development and states:

"The ultimate aim of development is to improve the quality of human life. People depend on their environment and on economic *development* to meet their basic needs and to improve their quality of life. Economic *growth* is an important component of *development*, and reviving *growth* through improved productivity is the primary focus of economic policy. Economic *growth* also provides the wealth to make investments in protecting the environment, supporting education, science and technology, and in maintaining the health and well-being of Canadians. (Environment Canada 1995:9, emphasis added)

Here, 'growth' and 'development' are confounded and the document provides no recognition that alternative 'pre-analytic visions' exist, or why the prescriptions for growth have been selected over the

competing views. Canada's departmental sustainable development strategies assume this 'vision' without question. Domestic policy development must at the very least bring this fundamental issue to public debate so that coordinated policy and public support can be based on a shared vision. Unfortunately, "in Canada,, sustainable development is not about philosophy; its about political correctness."<sup>13</sup>

### **1.6 Domestic Policy Context**

It is reasonable to assume that participation in an international forum on sustainable development would supplement Canada's domestic policy-making, program design and service delivery, rather than provide a substitute for a domestic strategy. Accordingly, one logical procedure for the development of Canadian sustainable development proposals to the Arctic Council would have entailed the following:

1. Enumerate specific Canadian domestic action plans;
2. Identify those domestic activities which require international cooperation either because
  - a) significant obstacles to Canada's success exist and are under the control of foreign jurisdictions, or
  - b) opportunities for win-win outcomes are available through joint efforts; for example cross-boundary jurisdiction over common pool resources such as watersheds, economies of scale in the development or deployment of similar pollution control methods, or the existence of offsetting institutional capacities and expertise, or
  - c) another jurisdiction may have experience in solving problems or implementing solutions relevant to Canada;
3. Identify those activities and strategies representing best domestic practice, which if implemented throughout the polar region would be helpful to the success of other jurisdictions in achieving sustainability or even create an international context of mutually reinforcing feedbacks; and
4. Make proposals to the AC that further domestic interests with some measure of benefit to other Members or Permanent Participants.

In April 1997, several internal discussion papers<sup>14</sup> distributed to the three federal departments active in the Arctic Council (DFAIT, DIAND, EC), asked very direct questions regarding Canada's

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<sup>13</sup> Interview with B. Funston

<sup>14</sup> Interview with B. Funston.

expectations about a) the key issues the Arctic Council should discuss, b) the institutional role it should assume, and c) and the products it should produce. They stressed that clarity at home was a precondition for determining what Canada needed from the Council. An internal memo from DIAND distributed to DFAIT, DIAND, EC and the Arctic Council SAOs on 21 July 1998 included (amidst several hundred pages of background papers) a follow-up paper on the main messages that Canada wanted to bring to the Arctic Council and made it clear that Canada wished to avoid discussions of domestic policy, recognizing that coherent attempts to influence other jurisdictions on the basis of an explicit national agenda might invite reciprocal pressures on Canada from the Council membership to alter those same domestic policies. But any discussion would have required a foundation in domestic objectives whether or not they were made transparent and explicit to the membership.

| <b><u>Departments Required by Legislation to Table a SD Strategy</u></b> |                               |
|--|-------------------------------|
| Agriculture and Agri-Food Canada   | Canadian Heritage             |
| Atlantic Canada Opportunities Agency                                     | Industry Canada               |
| Indian and Northern Affairs Canada                                       | Department of Justice         |
| Canadian International Development Agency                                | National Defense              |
| Citizenship and Immigration Canada                                       | Revenue Canada                |
| Public Works and Government Services Canada                              | Natural Resources Canada      |
| Federal Office of Regional Development (PQ)                              | Environment Canada            |
| Solicitor General Canada   | Department of Finance         |
| Fisheries and Oceans Canada  | Transport Canada              |
| Foreign Affairs and International Trade Canada                           | Treasury Board Secretariat    |
| Western Economic Diversification   | Health Canada                 |
| Human Resources Development Canada                                       | Veterans Affairs Canada       |
| <b><u>Departments that voluntarily tabled a SD Strategy</u></b>          |                               |
| Canadian Environmental Assessment Agency                                 | Office of the Auditor General |
| Correctional Service Canada  | RCMP                          |

**Figure 1.6: Departments with Sustainable Dev't Strategies**  
(Commissioner of the Environment and Sustainable Development 1998:1-7)

Canada should have been in a position to provide a relatively thorough analysis of its strategies and on that basis, submit projects that advanced its national agenda. Amendments to the Auditor Generals Act passed as Bill C-83 in December 1995 required<sup>15</sup> that 24 key federal departments (see Figure

1.6) develop detailed sustainable development strategies for their own activities and table them before Parliament by December 15, 1997. The contents of the strategies were specified in the *Guide to Green Government* produced under authority of the Minister of the Environment. The components included:

- Departmental Systems and Procedures: for compliance with statutory reporting requirements
- Departmental Profile: identifying the departmental purpose and implementation instruments
- Issue Scan: assessing impact of activities relative to sustainable development objectives
- Consultations: seeking stakeholder priorities and valuations of sustainable development strategies
- Goals, Objectives and Targets: providing benchmarks, strategic goals and measurable targets
- Action Plan: including policy, program, legislative, regulatory, operational changes and the formation of inter/intra-governmental and public-private partnerships
- Measurement, Analysis and Reporting of Performance: identifying an organizational structure and processes to provide accountability documentation.

Despite a team of 21 auditors and 13 special advisors over a span of five months, the Commissioner's 1998 Green Report commented only on procedural compliance, that is whether departmental plans provided the requisite information. Little qualitative analysis of substantive content was undertaken. On the basis of compliance checks alone, however, the report identified two fundamental weaknesses in the strategies (OAG-BVG 1998:1-5, 1-14, 1-26).

- Almost all departments failed to set clear targets that they, parliamentarians and the public could use to judge whether or not the strategy was being successfully implemented.
- Many of the strategies appeared to be more a restatement of the status quo than a commitment to change to better protect the Canadian environment and promote sustainable development.

The bulk of the four volume report restated the importance of following the specifications for the development of the plan and provided additional clarification and case studies on each item; information that should have been supplementary to the 1995 specification guide, rather than the substance of the critique made three years later.

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<sup>15</sup> Refer to all of clause 24 of the Auditor Generals Act

The Commissioner's report insisted that "sustainable development is not a destination but rather a journey," marked by new understandings and the deployment of new skills and innovations and leading to reduced environmental impact and enhanced social responsibility. Having tracked the process of acknowledged private and public trend setters<sup>16</sup> in sustainable development, the report provided a map of changing attitudes as organizations embraced the changes in thinking and acting required to achieve sustainable development (see Table 1.2). The intention was to encourage federal departments to stop promoting past achievements, question the status quo, and to move beyond mitigation of environmental, social and economic damage to becoming a positive influence in the well-being of the various systems.

**Table 1.2: Attitude Changes as organizations embrace sustainable development**  
(OAG-BVG 1998:5-8)

| CHARACTERISTIC        | COPING                | COMPLIANCE               | COMPREHENSIVE ENVIRONMENTAL MANAGEMENT | PURSUIT OF SUSTAINABLE DEVELOPMENT      |
|-----------------------|-----------------------|--------------------------|--|---|
| Values/<br>Motivation | Short-term Profit     | Legal                    | Business Ecological                    | Sustainability                          |
| Objectives            | Survival              | Minimize Liabilities     | Build Competitive Advantage            | Economic, Social and Ecological Success |
| Strategic Approach    | Defend the Status quo | Minimize Change          | Significant Change                     | Redefine Purpose of the Organization    |
| Management Focus      | Crisis Management     | Regulatory Due Diligence | Build Business Strategy                | Knowledge/ Relationship Development     |
| Stakeholder Mode      | Avoidance             | Minimize Contact         | Engagement                             | Learn from and Innovate                 |
| Communication Focus   | None or Defensive     | Regulatory filings       | Lifecycle impacts                      | Comprehensive and Transparent           |

In identifying the lessons learned from trend-setting organizations, the report spotlights the need for vision (ibid:5-13ff): a common context for action within broader contexts of time and space that begins with the discovery of values and principles that lead to resilient strategies. Resilient strategies are based on scenarios or 'credible stories' about ways of acting that will remain robust under a wide

<sup>16</sup> The sample included SJ Rail (Sweden), TransAlta Corporation (Canada), Volvo (Sweden), The Netherlands National Environmental Policy Plan, The Center of Technology Assessment (Germany), Nortel (Canada) and

range of plausible yet unpredictable futures. None-the-less (and I repeat), the Commissioner's report makes no attempt to see if the visions in the strategic plans converge or diverge either in relation to one another, or in relation to the principles provided in the foundational *Guide to Green Government*. Despite the Commissioner's Report, whether Canada has a coherent framework to stimulate progress towards sustainable development remains unknown.

•Since DFAIT, DIAND, and EC are the core Canadian departments serving the Minister and SAO to the Arctic Council, a substantive analysis of their sustainable development strategies follows. This should help in understanding the context of domestic vision(s) that currently inform Canada's key domestic policy makers in the Arctic. It is also the kind of work that should be expected from the Commissioner for Environment and Sustainable Development in the near future.

### ***1.7 Analysis of Domestic Policy for Sustainable Development in the Arctic***

#### Environment Canada (EC)

Having written the *Guide to Green Government*, EC was among the first to complete their Sustainable Development Strategy in April, 1997. Minister Sergio Marchi introduced the document by underscoring the fundamental premise that human activity was dependent on the capacity of the living environment to sustain us, and that therefore, the fundamental challenge was to reduce the "growing gap between the demands that people place on the environment and the environment's ability to meet those demands" (EC 1997:i). EC was explicit in identifying the "deeply-rooted social and economic causes of the growing gap" (Ibid:3): "Growing consumerism in the developed world and rapid industrialization and urbanization in the developing world are testing the global limits of the earth's capacity to absorb waste and provide food, water and energy" (op cit.). The report is emphatic that sustainable development is the "*only* acceptable and workable way -- of bridging the gap" (Ibid.: i).

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Sony (international).

The document has a clear and logical structure. Based on an assessment of a) the contextual issues affecting the department's ability to effect progress in sustainable development through its mandate, b) an analysis of its core capacities, and c) its values (figure 1.7), EC identifies key challenges which it will address through four strategies (also called goals). Each strategy includes a set of initiatives or actions including EC's expectations about both the short-term results and the long-term outcomes of those actions, the key partners whose support is required, and the means by which progress will be measured. As one of five federal departments that consulted with Northerners as a group, the document also includes a special section on sustainable development as it relates to the Arctic.

EC's issue scan can be set apart from the other departments' in that it identifies exogenous influences on the performance of its mandate and expected outcomes, where others identify impediments to the effectiveness of their policy and program instruments. As such EC identifies a deeper matrix of issues, and expects itself to wield a broader social and political influence. The challenges identified can be summarized:

|               |  |
|---------------|--|
| Equity        | Costs & benefits of development should be shared globally between/within generations                             |
| Cooperation   | International cooperation required that recognizes differentiated capabilities, responsibilities and authorities |
| Integration   | Environmental, social and economic policy should be working toward the same end                                  |
| Eco-model     | Systems are nested and differentiated, leading to qualitative different interdependencies between/within levels  |
| Precautionary | Act to sustain life in the face of uncertainty   |
| Polluter pays | internalize the cost of externalities  |
| Prevention    | Pollution impacts should be avoided rather than remediated   |
| EIA           | Decisions on policy, programs, projects must anticipate impacts (env., socio-econ.)                              |
| Science       | Knowledge should stimulate technology  |
| Leadership    | Government should set the example  |
| Learning      | Continuous improvement must be built-in  |

**Figure 1.7: EC's Values and Principles**  
(EC 1997: 5)

- Consumerism exacerbated by population growth, industrialization and urbanization are the causes of global unsustainability (Ibid.: 3).
- The causes and impacts of the degradation of the global commons requires global responses. The degradation of the Canadian environment is due to pollution and habitat destruction caused by actions taken by other nations (Ibid.: 3-4, 50-51).
- Supranational bodies often dominate national policy-making, with an emphasis on economic growth and trade, shifting responsibility for social and

environmental well-being to communities and citizens (Ibid.: 4).

- Progress in reversing environmental damage will slow as we move from remediation to prevention and as global demands for resources increase exponentially (Ibid.: 51-2).
- As complexity increases, the uncertainty of outcomes for any specific action increases, creating a need for a form of knowledge that builds consensus for action decisions despite uncertainty (Ibid.: 52-3).
- Sustainable development is seen as a detriment to business competitiveness, rather than a stimulus to differentiating innovation and an environment that attracts durable investments (Ibid.: 53-4). The later perception should be encouraged.
- Individual and community-based action is critical to the adaptive behaviour required, but “environmental literacy of Canadians in general and key stakeholders in particular remains low, and will be an obstacle to progress on complex long-term issues” (Ibid.:54). Building a constituency for change requires information, including the ability to anticipate the consequences of action (Ibid.: 54-5).

#### **‘SD’ STRATEGIES**

- Strengthen EC’s ability to achieve its sustainable development goals
- Advocate for sustainable development in community, national and international fora
- Provide Canadians with the tools to make sound decisions in a changing environment  
Set a good example

#### **‘SD’ OUTCOMES**

- Healthy Environment: less degradation, restoration + enhancement of ecosystems and biodiversity
- Safety from Environmental Hazards, reduction of hazards and better anticipation and response to those that remain
- Greener Society, environmentally responsible citizenship, business, and international institutions

#### **Figure 1.8: EC’s ‘SD’ Strategies & Outcomes**

(EC 1997 9, 29-30)

Given such daunting challenges, EC cannot be criticized too much for the modesty of their strategies (Figure 1.8) and proposed actions. But their initial response to the challenge of consumerism, industrialization and urbanization to pursue “a strategy in which environmental goals are accomplished in a cost-effective manner that creates jobs and improves national productivity over the long-term” (Ibid.: 3) would be very disappointing if the reader didn’t study the detailed text and action plans that follow to

condition an interpretation of what changes to the status quo, if any, that strategy might entail. In fact EC accepts the responsibility to sponsor many new initiatives and changes in the way their own business, as well as the business of key public and private sector partners, is done.

EC's vision of a sustainable world is one where human and ecosystem well-being are improved while:

- renewable resources are replaced faster than they are consumed
- the productivity of non-renewable resources is radically increased, and
- human poverty is reduced

The thrust of their strategy is that economic production must innovate to become eco-efficient, and that Canadian business should take the lead in developing export technologies that reduce waste/pollution and increase the productivity of resource inputs. The role of EC is to provide information on the carrying capacity of distinct ecosystems to the impacts of human activities, the physical mechanisms by which human activities negatively impact environmental carrying capacity, and the policy framework which might reduce that impact and stimulate business innovation and creativity in social institutions.

The Sustainable Development Strategy did not, however, reference any of the substantial literature that could have dimensioned the problem and the necessary response. To be brief:

- It has been estimated (Wackernagel and Rees 1996) that human economic activity currently appropriates the equivalent of 135% of the net ecological productivity of the planet's biologically productive land.<sup>17</sup> This means that human activity is already consuming the natural capital endowment that produces the sustainable net income that we alone are currently overconsuming, not only at our future peril, but at the current price of significant rates of extinction.<sup>18</sup> If everyone on earth today were to enjoy North American standards of consumption, an additional two planets would be required to provide the requisite ecological carrying capacity.

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<sup>17</sup> At the present time, the actual amount of net biological productivity or 'sustainable yield' appropriated by human activity is at least 40% (Vituosek 1986). During a lecture on Regenerative Design for Sustainable Development in Vancouver, 1998, John Tillman Lyle stated that the net ecological appropriation had now reach 50%. The difference between these figures and the 135% suggested by Wackernagel and Rees is the direct extraction of the natural capital base.

<sup>18</sup> The extinction rate of non-domesticated flora and fauna approximates 75,000 species / year, or over 1% of all known species. This era has been dubbed the sixth planetary extinction, with rates of demise at least equal to the time of dinosaur extinctions.

- In anticipation of a global population of 11 billion by the year 2050, with a universal standard of living equivalent to North America today, resource productivity must increase by a factor of 10 (Weiszacker 1997, Costanza 1997, Robinson 1996: 11-13). Said the other way, the standard of living can be maintained only if resource (material and energy) throughputs<sup>19</sup> decrease by 90% and total per capita resource consumption does not increase at all.
- 85% of world resources are currently consumed by the richest 20% of world population. From an ecological perspective, the average per capita consumption of resources varies by as much as 1300% between nations<sup>20</sup>. Since the natural distribution of resources is inherently unequal, trade is one key mechanism that exacerbates that inequality. Through trade, ecological carrying capacity is exported or imported, with most wealthy nations importing carrying capacity from developing countries. Canada, as an exception, is an exporter of environmental carrying capacity.

Had the EC *Strategy* included just these few pieces of data, it might have proposed much more specific actions, which although consistent with the thrust of its prescriptions, would have been more urgent and more dramatic and measureable. For instance, it might have established policy targets to:

- Ensure that no renewable resources were used beyond the sustainable yield dictated by ecosystems with undiminishing ecological productivity
- Create cross-departmental agreements with Industry Canada, Agriculture and Agri-Food Canada, Transport Canada, and Canada Mortgage and Housing Corporation, etc. to develop technologies and taxation strategies for a phased reduction of per-capita ecological service consumption to a fair-earth share within a one generation
- Create cross departmental agreements with DFAIT to impose ecological tariffs to protect ecologically efficient Canadian industries

It is in this quantitatively dimensioned context that eco-efficiency and improved national productivity can lead to more Canadian jobs (p.3), increased “competitiveness of Canadian businesses in the global market” (p.10, 14), and an increased capacity for industry to “enter foreign markets” and “accelerate

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<sup>19</sup> MIPS (Material Input Per Service) unit is the industry term which describes the resource input required to satisfy a specific need to a certain level of satisfaction.

<sup>20</sup> The average per capita consumption of ecological productivity (expressed as an ‘ecological footprint’ of the average biophysical productivity of land with 1991 and (1997) data) varies between 0.4ha (0.5ha) for India and 5.1ha (10.3) in the US (Wackernagel and Rees, 1996: 85, 97-8; Wackernagel 1997).

the commercialization of Canadian environmental technologies” (p.14). Given the tone of the report, EC would agree. But given their lack of data on the scale of the problem, they are unable to do any more than recognize the need to demand that “trade and environmental policies should be mutually supportive” (p.5), that natural capital values should be incorporated into sustainability indicators (p.11), and that ecological tax reform (p.13) and the elimination of public tax, grants and subsidy disincentives to ecologically responsible behavior should be developed in concert with other departments (p.11). And they do assign themselves, as their very first task, the acquisition of “techniques and tools for socio-economic analysis in the design of EC’s policies” (p.21).

Regarding the Arctic, strategies for the preservation and enhancement of the productivity and vitality of northern ecosystems hinged on several cautious components (Ibid.: 12, 58-9).

1. Reduce contaminants, especially those in subsistence foods
2. Remediate waste from abandoned military (Dew line) and mining (e.g. Rankin nickel) sites
3. Monitor water quantity and quality
4. Co-manage resources and environmental protection (CEPA) in partnership with Aboriginal governance structures, and through the terms of mutually agreeable land claim provisions
5. Develop projects that provide long-term environmental and economic benefits (e.g. eco-tourism, sustainable commercial fisheries)
6. Coordinate scientific research in concert with the Arctic Environmental Protection Strategy and in support of the Arctic Council, and coordinate technological investment that support environmental, economic and social needs in consultation with Northerners through a Federal Strategy for Northern Science and Technology.

In consideration of previous discussions, the strategies could have been far more bold. Because the ice cap attracts the flow of atmospheric and oceanic currents carrying the waste of mid-latitude industrial activity and economic consumption, the Arctic is a bellwether of the attendant ecological impacts. The Arctic is the primary non-biological governor of the Earth’s temperature. The circumpolar north is also one of the primary sources of non-renewable resources, especially oil, gas,

industrial metals and gems. Mirroring the polar geophysical function, circumpolar nations have considerable power to govern or 'cool down' the economy by:

- pricing non-renewables to account for all externalities and to fund the R&D required for their gradual replacement by renewable substitutes, and
- acting as a Trust for those depletion and pollution appropriations, taking responsibility for their redistribution to community-based sustainable development projects and promising industrial technologies throughout the world

The thrust of the ICC sustainable development proposals to the Arctic Council concerns the appropriation of 'economic rent' from non-renewable resources as a way of underwriting the income of northerners. This is akin to the negative income tax funded by ecological taxes on resources proposed by proponents of Ecological Economics (Rees 1995b: 27-8; Daly 1996a: 89-91; Costanza 1997: 215-17). But by going further and including R&D funding in the pricing mechanism, the North assumes a value-added responsibility to invest that rent in technological change. This demands the development of an expertise which would demonstrate the value of the North's economic contribution, rather than focus on its economic entitlement to a "rent" which can be easily mistaken for an unearned income.

#### Department of Foreign Affairs and International Trade (DFAIT)

DFAIT's *Agenda 2000* is primarily a report on progress toward completing, ratifying, or implementing international agreements already 'in the pipe'. Agreements or negotiations are selected for reporting based on their potential for impact on economic growth, social equity or environmental protection. Canada can boast a lead role or substantial contribution to many international agreements - -- such as its sponsorship of the 1987 Montreal Protocol on CFCs, being the first to ratify the 1992 Biodiversity convention, having six gender equity proposals ratified at the 1996 UN Social Development Program, or having Canadian Louise Frechette coordinate international sustainable development initiatives in her capacity as the UN Deputy Secretary-General---and the report provides

an impressive listing of current activity. On the other hand, the report does not indicate whether Canada's commitments have been met, an issue which the Commissioner's Report highlights in an audit of various commitments on greenhouse gas emissions and in particular Canada's failure to meet its target for stabilizing CO<sub>2</sub> emissions by the year 2000 (OAG-BVG 1998:3-17 - 3-19)<sup>21</sup>. In addition, *Agenda 2000* provides no analytical criteria, benchmarks or measurable targets to determine whether or to what extent the various initiatives are contributing to sustainable development.

In contrast with the Commissioner's Report that conceives sustainable development as economic *development*, social *development* and environmental *quality*, DFAIT proposes a formula of "economic *growth* + social *development* + environmental *protection*" (emphasis added). The literature on sustainable development carefully distinguishes *growth* (quantitative increase by assimilation or accretion of material) from *development* (qualitative improvement, realization of potential) (Daly 1996a: 13). The implications for sustainable development, then, are that "quantitative increase of the scale of the economy...from the finite environment is not sustainable. Qualitative improvement and realization of potential may well continue forever....Sustainable development therefore is development without growth---that is without throughput growth beyond the regeneration and absorption capacities of the environment" (op cit.). Whether or not the choice in DFAIT's terminology was intentional, the usage is consistent, especially as it impacts trade.

40% of Canada's GNP results from trade. 25% of gross trade revenues result from trade in renewable resources. DFAIT sees its international trade role as promoting mechanisms that increase trade by leveling the playing field and reducing barriers to the flows of goods, services and finance by working

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<sup>21</sup> With only 1% of the world's population, Canada is responsible for 2% of global greenhouse emissions. In 1992, Canada signed the United Nations Framework Convention on Climate Change at the Earth Summit with the aim of stabilizing emissions at 1990 levels by the year 2000, and then further reducing them to prevent ecosystem damage resulting from human induced climate change. Domestic commitment endorsed this intention in the 1995 National Action Program on Climate Change. By that time emissions had increased 9% over 1990

in tandem with the Bretton Woods institutions (World Bank and IMF), APEC (to liberalize trade in the Pacific Rim nations), and with South and Central America to achieve harmonization of free trade throughout the Americas. To summarize the massive literature on the relation of trade and sustainable development (see for example Allison 1997; Goodman and Howarth 1997; Hines and Lang 1996; Daly 1996a, 1996b; Daly and Goodman 1992, Goldsmith 1996; Lang and Collins 1993; LeQuesne and Clarke 1997; Morris 1996; Nader and Wallach 1996; Richardson 1994; Robins 1995; Runnals 1994, Sewenarchuk 1994; Wackernagel and Rees 1996, Whalley and Uimonen 1994) there are two basic arguments.

The first argument is that a) trade based on 'comparative' advantage expands markets b) facilitating economic growth c) creating additional wealth which in turn d) provides the resources required to protect the environment and alleviate social inequities. Sustainability can be assured despite increased throughputs of material and resources if pollution and environmental impacts that reduce ecological resilience are constrained. Everyone wins!

The countering argument is first that liberalized trade that precedes successful containment of negative environmental impacts will only accelerate resource throughput and the contingent ecological degradation, and second that trade liberalization based on the unrestricted flow of finance results in 'absolute' --- not 'comparative' --- advantage. Comparative advantage assumes that where capital is constrained within political jurisdictions and will be invested in the development of national businesses that are the most efficient (profitable) in the transformation of available resources and keep people employed. But when capital is free to move across borders, it will pursue absolute advantage wherever it can be found, which will often be where environmental and social exploitation are the least restrained. The later situation drains the tax revenues of those who steward their environment and

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levels, with an increase to over 13% projected for the year 2000. The 1997 Kyoto Protocol would commit

citizens while failing to increase the wealth of those countries selling labour and resources without costing environmental and social externalities. Everyone loses (except for the transnational companies that have increased their profits through the pursuit of absolute advantage)!

DFAIT's sustainable development strategy subscribes to the first argument. The Commissioner's Report on the international (including Canadian) failure to abate the destruction of habitat, the reduction of biodiversity, the emission of greenhouse gases, etc. could have logically led DFAIT to link trade to the equivalent performance of trading partners on all aspects of environmental and social stewardship through the mechanism of some form of trade equalization, such as an ecological tariff. Since equal environmental performance among trade partners does not exist, DFAIT should not have completely endorsed free trade. Since this did not occur, it appears unquestionable that DFAIT's trade strategy is unsustainable.

This analysis could just have likely appeared in the following section on foreign policy<sup>22</sup> were it not for the huge impact of Canada's trade stance on domestic business and employment. Canada's stance puts its resource prices in direct competition with developing countries who are flooding the market with unsustainably harvested resources as their only short term means of retiring economic development debt obligations (Weiszacker 1997:232), resulting in depressed prices for resources. This forces Canada to compete in the knowledge-based which are globally accompanied by increased income inequities. Not only does this create the need for labour transition programs that must be borne by the tertiary and quaternary industries, but it can lead either to under-utilization or over-exploitation of resources, depending on whether the industrial restructuring is or is not successful. Rather than devising an "end of the pipe" palliative for this form of industrial inefficiency, it might have been appropriate for DFAIT to question the fundamentals of its trade policy.

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Canada to a level 6% below 1990 levels between 2008-2012, but Canada has not yet ratified this agreement.

One trade issue in the Arctic is the elimination of discriminatory trade restrictions on arctic fur harvests contained in the Marine Mammal Protection Act (MMPA) and reinforced by the European ban on fur imports. Given mechanisms to guarantee harvests well within sustainable yields<sup>23</sup> the harvest and export of this unique Canadian resource fosters the use of renewable, low-embodied energy inputs in the high energy clothing and food sectors. Simultaneously it provides relatively reliable long-term wage increments to the aboriginal subsistence life-style. Although Canada has consistently argued for the removal of restrictions under MMPA, the initiative does not appear in DFAIT's strategic plan. The failure to have a full understanding of the linkages between trade, environment, and employment means that sustainable and unsustainable initiatives are indistinguishable.

DFAIT's position on trade is all the more remarkable given that *Agenda 2000* is signed by the Minister of International Trade, Sergio Marchi, who assumed the portfolio after signing off on EC's *Sustainable Development Strategy*. Yet the two documents could hardly be more contradictory.

#### Indian Affairs and Northern Development (DIAND)

“Koqajotmnej tan koqoey mimajunuksi't -- keeping it the right way that which gives us life”  
(Mi'kmaq expression which describes the concept of sustainable development)

“Beneficial socio-economic change that does not undermine ecological and social systems upon which communities and societies are dependent” (Council of Yukon First Nations)

Under the Yukon Act and the Northwest Territories Acts, DIAND has a more comprehensive responsibility for environmental and social well-being in Canada's north than other federal departments have in the other 10 provinces. Where federal responsibilities in the provinces follow

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<sup>22</sup> Issues of environmental and national security will be considered with in the foreign policy Section 1.8.

functional divisions, DIAND's mandate for the development of the North and Aboriginal peoples, invites greater integration of functional responsibilities. This affords them a greater opportunity to make substantive progress in defining the relationship between environmental protection and sustainable development (DIAND 1997:39). Constrained by the legislated definition of "sustainable development", DIAND provided a set of principles (Figure 1.9) which for the most part are

**DIAND's Sustainable Development Principles**

- open, inclusive and accountable decision-making
- honouring of its treaty and fiduciary obligations, and international agreements,
- consideration of economic viability, culture and environmental values, as policies and programs are developed
- provision of fair and equitable opportunities for First Nations and northern peoples
- consideration of sharing the risks and benefits from development
- respect for diverse cultures and traditional values
- respect for the land and its diversity as the foundation for healthy communities
- consideration of transboundary and cumulative impacts in decision-making
- efficient use of natural resources and minimization of pollution in DIAND's operations, and
- fiscal responsibility

**Figure 1.9: DIAND's SD Principles**

procedural. In addition, they are self-bounded by "aboriginal people" and the "North". For instance neither the principle of equity between northern aboriginal and non-aboriginal people nor the issue of equity between generations is addressed. The scale of efficient resource use is restricted to Northern populations, so that global differentials in resource endowments (which in the non-renewable sectors dramatically favour the north) are not resolved. It is easy

to avoid issues of equity in sparsely populated regions that are richly endowed materially. The issue of democratic decision-making is skirted through discussions of aboriginal self-determination, and as a result, the implications of self-determination as a model of development within Quebec or Canada as a whole are avoided. The opportunity to explore issues of Canadian unity and ethnic or cultural distinctness and their impact on sustainable development are untouched.

DIAND primarily sees itself as an advocate for the political and constitutional development of aboriginal people. The underlying themes of their Northern strategy are:

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<sup>23</sup> Recent co-management agreements negotiated with comprehensive land claim settlements and employing the

- Continued political development of the North through the devolution of government responsibilities to territories and First Nations
- Continued constitutional development of the North through the completion of land claims, the operational establishment of Nunavut (April 1, 1999) and negotiations of self-government under the Inherent Right Policy (1995)
- Social and economic improvement in northern communities of aboriginal and non-aboriginal people.

Through continual devolution of its responsibilities, DIAND anticipates that its “role in sustainable development processes and programs will continually diminish” (Ibid:38). The relatively short-time horizon for its activities is the direct result. Simultaneously, DIAND is concerned that the transfer of responsibility for decision-making and regulation will be incomplete due to the fiscal retrenchment and staff cutbacks the Department is currently experiencing. In this environment of changing power relationships, organizational issues tend to dominate. The issues concerning the establishment of co-management boards and other instruments of resource management within land claims revolve around scope of authority for the new partnerships and delimiting the nexus of federal and territorial legislation that will have jurisdiction in the north. Little attention is given to redefining the federal and territorial interest in environment and development within the new paradigm of “sustainable development,” or in redefining the context in which devolution and self-government can unfold. DIAND appears content to accede to the laudable empowerment<sup>24</sup>, partnership<sup>25</sup> and participation<sup>26</sup> aspirations of Chapter 26 of Agenda 21 and the preservation of traditional lifestyles and Traditional

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precautionary principle are now coming into effect

<sup>24</sup> “the establishment of a process to empower Indigenous people” (Ch.26 of *Agenda 21* quoted in DIAND 1997: 13)

<sup>25</sup> “arrangements to strengthen the active participation of Indigenous people” (op cit.)

<sup>26</sup> “participate at the national and local levels in resource management and conservation strategies and other relevant programs established to support and review sustainable development strategies” (*The Convention on Biological Diversity* quoted in op cit.).

Knowledge expected in the Convention on Biological Diversity<sup>27</sup>, by seldom mentioning non-aboriginal stakeholders living in or owning interests in the North.

The report itemizes the contextual issues facing sustainable development in the north (Ibid: 39-43, 102-105). To summarize:

- Environmental threats: Threats are from three source types. The first is from the legacy of abandoned mines and military sites which are being cleaned up under the Arctic Green Plan with contributions from the Americans in the form of credits against future military purchases. The more troublesome wastes include PCBs, petroleum products and metals. The second is that ongoing or prospective pollution from operating or new mines poses a threat that requires pollution regulation and proactive impact assessments regarding environmental carrying capacity and risk. The third is from pollutants transported from non-arctic anthropogenic sources, especially persistent organic pollutants, heavy metals and radioactivity that accumulate in the upper reaches of the arctic food chain.
- Resource Development and the Economy: After government, mining is the single largest employer in the north, with a potential for increased employment in the oil and gas industry in the Beaufort Sea and Mackenzie watersheds (not to mention the vast reserves in Alaska, Russia, and the North Atlantic), and now gem-quality diamonds with the opening of the BHP facility, the first of its kind in North America. Increased non-renewable extractions represent a boon for the economy, but could threaten the harvest of renewable resources as evidenced by the ongoing tension between conflicting uses of North Slope Alaskan oil and the Porcupine calving grounds. The tension between the two economies might be resolved through the resolution of protected wilderness areas, but given the variability of migration paths in response to actual and anticipated climate change, a fixed boundary approach may have little practical utility.
- Emerging Institutions of 'Public' Government: Innovative governance institutions are being established as a result of three initiatives: a) devolution of public government responsibilities to territorial governments and the further devolution of powers under various community

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<sup>27</sup> "to respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity, and promote their wider application with the approval and involvement of the holders of such knowledge..." (op cit.)

empowerment initiatives; b) the establishment of collective property rights institutions under aboriginal land claim settlements and self-government arrangements, and; c) the creation of the eastern arctic territory of Nunavut, which is roughly congruous with the Nunuvut land claim for Inuit beneficiaries under the Tungavut Federation of Nunavut (TFN) registry. Resource responsibilities are the last to be transferred from the federal government to the territorial and aboriginal institutions. One recognized opportunity is that innovative approaches to sustainable development policies are possible in the context of such upheaval. While increased certainty regarding resource development rules would be welcome to potential developers, the increased number and variation of management structures and procedures, the conflicting or duplicated procedures for development initiatives that straddle jurisdictions, and the untested decision-making processes may challenge the certainty of outcomes in the short run but create opportunities for genuine innovation as well as real conflict. Although not mentioned in the report, attention will need to be directed at clarifying the conceptual and operational differences between individual property rights emanating from Canadian constitutional liberalism, and the common property rights that may emerge from traditional aboriginal perspectives regarding the 'land'. In addition, structural conflicts where common and private property rights overlap and conflict (such as the case where aboriginal self-governments are nested in public governments) needs particular articulation.

- Capacity: Relative to Canada, the north has a high natural increase in population with a very high proportion of younger people. 45% of northerners and 60% of the NWT's aboriginal population are under 25 years of age. For many reasons<sup>28</sup>, housing is generally in short supply in all communities which restricts mobility between communities, creating overcrowding pressures on available family homes. In addition, educational achievement averages, although improving, are relatively low in the North discouraging mobility to employment opportunities in Canada's south. Training programs and preferential local and northern employment programs have slowed the emigration of skilled people from Canada's south toward management positions and some

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<sup>28</sup> Except in the largest government centers and resource extraction communities in the NWT, housing has been a public good since forced resettlement programs were initiated in the late '50s and early 60's. Only in the last few years has a private housing market begun to develop as the GNWT has sold its public housing. None-the-less, with relatively little growth in the wage economy and unemployment approaching 40% in most smaller communities, there is no incentive for private developers to build, except in response to increased mortgage money. With the demise of CMHC funding for social housing in the mid-1990's, the NWT established a program of housing loans and mortgages for higher risk communities beyond the normal reach of the conventional banking institutions to stimulate private housing ownership and a quasi market-driven housing sector. But this has not stimulated mobility within the North.

technical trades in the north. Together these are correlative with decreased social wellness including high rates of teenage suicide, substance abuse and family violence, and economic comparative disadvantage.

- Scientific and Traditional Knowledge: Modern science and especially medicine is currently capitalizing on the pragmatic knowledge of indigenous peoples, passed down through generations of oral tradition over hundreds and thousands of years. This approach to knowledge may be a critical component for assessing the cumulative biophysical impact of arctic and non-arctic development and needs to be available to new co-management resource management institutions. Capturing the artifacts of traditional methods (the descriptions of the features of healthy ecosystems) without retaining the methodology itself, however, may be of little use should the northern environment undergo permanent change.
- Consultation and Partnership: The large number of complex issues, the isolation of small communities, and the relatively few people available to seriously move the issues toward acceptable actions means that decisions and especially change are a slow process. In a world of high-speed informational technologies, the North remains the 'tail' of a faster moving global economic 'dog'. Decisions are obsolete by the time they are made, and the north remains economically marginalized except as a primary material producer for highly capitalized and usually foreign operations.

DIAND's consultations regarding sustainable development in the North were conducted with the Federal Departments of Environment, Heritage, Fisheries and Oceans, and Natural Resources, and were preceded by the joint preparation of *Towards a Sustainable Development Strategy for North of 60°N: Discussion Paper*, which outlined each department's assessment of the challenges it faced in the Canadian North. Common themes from workshop participants included a) promoting consultation, b) enhancing partnerships, c) inter-departmental cooperation/coordination of information, d) promoting community empowerment, e) developing an integrated Northern sustainable development strategy, f) incorporating traditional knowledge, g) improving health by addressing contaminants from arctic and non-arctic sources, h) continuing devolution, i) addressing sustainable land use and 'free entry' resource access, j) recognizing land claims in sustainable development, and k) ensuring gender equity.

Given these on-going issues, but without explicit clarification of the relationships between environmental protection and human well-being, or the substantive dimensions of sustainable development, the report identifies six sustainable development goals for the North with itemized objectives, specific actions to achieve those objectives and measurable targets to verify progress towards those objectives (DIAND 1997:43-53). An overview follows (Table 1.3):

**Table 1.3: DIAND's Sustainable Development Strategy for the North**

| GOALS  | OBJECTIVES   | ACTIONS  |
|--|--|--|
| 1. Strengthen communities: facilitate capacity building                                      | <ul style="list-style-type: none"> <li>• Promote northern political development</li> <li>• Empower communities to manage resources</li> <li>• Increase economic development benefits retained by (Aboriginal) communities</li> <li>• Increase aboriginal mgmt., admin., business and technical capacities</li> </ul> | <ol style="list-style-type: none"> <li>1. Support creation of Nunavut</li> <li>2. Participate in Western NWT constitutional development</li> <li>3. Continue devolution of prov. Powers to NWT and Yukon</li> <li>4. Prepare DIAND for changes</li> <li>1. Settle and implement land claims and self-government</li> <li>2. Include SD in aboriginal agreements</li> <li>3. Share best practices SD info. On capital facilities, mining, oil development, esp. through electronic networks</li> <li>4. Consult and inform communities of new governance institutions</li> <li>1. Promote SD through all funding programs</li> <li>2. Require oil and gas developers to hire and train northern/aboriginal people and businesses</li> <li>1. Increase utilization of procurement and training programs</li> </ol> |
| 2. Facilitate and maintain effective partnerships  | <ul style="list-style-type: none"> <li>• Strengthen interjurisdictional partnerships to promote sustainable development</li> </ul>   | <ol style="list-style-type: none"> <li>1. Promote a comprehensive fed. SD strategy with key stakeholders</li> <li>2. Develop new co-management resource boards and facilitate info. exchange on research and experience</li> </ol>   |
| 3. Integrate sustainable development into departmental and interdepartmental decision-making | <ul style="list-style-type: none"> <li>• Empower northerners to influence their future</li> </ul>  | <ol style="list-style-type: none"> <li>1. Consult on ongoing revisions to SD Strategy</li> <li>2. Complete Northern Science and Technology Strategy</li> <li>3. Develop/use SD info.systems for consultation &amp; mgmt.</li> </ol>  |

|  |   |   |
|--|---|---|
|  | <ul style="list-style-type: none"> <li>• Incorporate TK into science-based decision-making</li> <li>• Promote TK into resource mgmt throughout Canada</li> <li>• Implement SD consistently through resource mgmt. boards</li> <li>• Measure SD Strategy effectiveness</li> </ul>      | <ol style="list-style-type: none"> <li>1. Improve access to TK info developed in current research</li> <li>1. Develop TK use in resource mgmt. policy through stakeholder consultation</li> <li>1. Incorporate SD principles into co-mgmt. board procedures and hearings</li> <li>1. Develop baseline data and appropriate indicators</li> </ol>  |
| 4. Maintain and support healthy environments                                   | <ul style="list-style-type: none"> <li>• Coordinate Federal and aboriginal resource mgmt. regulations</li> <li>• Eliminate health risks of fed.'s contaminated sites</li> <li>• Eliminate country food contamination; provide local info. for informed decisions</li> </ul>           | <ol style="list-style-type: none"> <li>1. Enforce regulatory compliance in resource use</li> <li>2. Admin. and develop regs. for water, mineral, and granular resources</li> <li>1. Manage or remediate hazardous waste sites</li> <li>1. Assess &amp; inform on contaminants, support int'l controls negotiations</li> </ol>   |
| 5. Develop and maintain sound natural resource management regimes              | <ul style="list-style-type: none"> <li>• Integrate environmental protection and SD</li> <li>• Promote SD among industry and resource users</li> <li>• Promote SD (renewable) resource planning and management</li> <li>• Promote economic activity through SD of resources</li> </ul> | <ol style="list-style-type: none"> <li>1. Develop resource mgmt. laws consistent with claims and SD principles, esp. SD impact of royalty regimes</li> <li>1. Prepare mapping and policies to reduce environmental impacts of resource activities</li> <li>1. Advance protected areas strategy</li> <li>2. Implement and assess success of development impact (env., soc., econ.) of development</li> <li>1. Support humane traps/trapping</li> </ol> |
| 6. Meet DIANDs international obligations in support of sustainable development | <ul style="list-style-type: none"> <li>• Participate in Arctic Council</li> <li>• Provide SD forum to circumpolar nations</li> <li>• Control int'l POPs.</li> </ul>   | <ol style="list-style-type: none"> <li>1. Support AC secretariat and participate in AEPS</li> <li>1. Organize Conference in Whitehorse (May, 1998)</li> <li>1. Lead in POP negotiations</li> <li>2. Help develop PAME national program of action to reduce land-based pollution sources</li> </ol>  |

The strategy reinforces obligations to complete development or ensure consistent implementation of planned or existing programs and legislation. Sustainable development, it infers, does not depart from

established means and ends<sup>29</sup>. The strategy focuses then on the continued elaboration of the status quo with no long-term plans to implement additional fundamental changes. The emphasis is primarily procedural --- the empowerment of aboriginal governance institutions to manage sustainable development --- or defensive --- the minimization of negative impacts on the environment and the maximum retention of resource development economic benefits for aboriginal peoples. By implication, sustainable development means the exploitation of maximum sustainable yields (MSY) without environmental impacts that degrade natural ecosystems or social well-being.

DIANDs emphasis is consistent with the recent ICUN report on *Aboriginal Peoples and Sustainable Development*. This report makes two main points: 1) traditional aboriginal life-styles have been sustainable over many generations and 2) aboriginal peoples should assume the right to development through self-government arrangements ensuring ethnic jurisdiction over all aspects of development:

Above all, sustainability strategies involving Indigenous Peoples, their knowledge and resources must respect human rights. For Indigenous Peoples, human rights encompass *self-determination, territorial rights, collective rights, and the right to development*. For this reason and the fact that Indigenous People live close to the Earth and possess an environmental ethic, a broad-based approach to sustainability incorporating both human and environmental rights is both appropriate and necessary. Traditional Resource Rights (TRR) is a concept around which a system can be developed based upon 'bundles' of human and environmental rights which already exist in international law and national laws. Indigenous Peoples are calling for a new system of protection based on such 'integrated rights' approach because they do not believe that existing legal regimes can provide sufficient protection for their knowledge and resources. (ICUN 1997:80, emphasis in original)

Recognizing

- that Inuit are a distinct indigenous people, with a unique ancestry, culture, and circumpolar homeland that transcends political boundaries;
- that Inuit have the right to self-determination, including the right to safeguard the integrity of the Arctic environment for present and future generations, and to control their social, economic, cultural and political development;

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<sup>29</sup> The mandate of the Northern Affairs Program is fourfold: to support northern political development; to protect and rehabilitate the northern environment; to establish legislation and institutions of public government for the management of natural resources and environment pursuant to northern land claims agreements; and to manage the sustainable development of the North's natural resources in a manner that will generate jobs, and foster social and economic well being (DIAND 1997: 81).

- that Inuit are an integral part of Arctic ecosystems and have a profound relationship with the lands, waters, sea ice, and other resources of the Arctic environment, upon which Inuit survival and continued growth depends;
- that the protection of the Arctic, and the sound conservation, management and use of its resources are fundamental to the maintenance of global ecological health and stability;
- that Arctic policy and decision-making must always be based on principles that recognize and respect the inherent collective and individual rights of Inuit, and that are consistent with their right to exercise approval and control over Arctic matters;
- that Arctic development must be environmentally sustainable and equitable from an Inuit viewpoint;
- that Arctic states and Inuit have a duty and responsibility to cooperate at all levels, so as to devise and implement comprehensive, coherent, and coordinated Arctic policies;
- that the direct and meaningful participation of Inuit is a necessary prerequisite to democratic and effective international, national, and regional action by Arctic states and others;
- that Inuit are committed to contributing their traditional and other forms of knowledge, skills, efforts, and expertise for the betterment of humanity, the common security of all peoples and states, and world peace;

Therefore:

....Arctic states and others are invited to join with Inuit in the ongoing challenge of building and carrying out a common Arctic vision that is clearly supportive of the Arctic environment and beneficial to humankind. (Inuit Circumpolar Conference, 1992; during the Presidency of Mary Simon prior to her appointment as Circumpolar Ambassador, quoted in ICUN 1997:110-111)

The ICUN Report identifies several strategies to reinforce this right of development including 1) empowerment of communities, indigenous elders, women and youth, 2) collective and common property rights, 3) the right to development, 4) territorial and land rights, 5) self-determination, 6) deriving just benefits, 7) respect for Indigenous Peoples, their knowledge and their environmental ethic, 8) the provision of prior informed consent to research, and 9) strengthening indigenous economic systems of self-reliance and related institutions (Ibid.:81-115).

The Report's 'Preface' was written by Mary Simon during her tenure as Canada's Ambassador to the Circumpolar Arctic, clearly revealing her own agenda during her Chair of the Arctic Council. The US concern that Canada's position in the Arctic Council was a thinly veiled platform for promoting the aboriginal agenda onto the international stage is not without cause.

DIAND may have ignored its responsibility to the relationship between the north and a national sustainable development policy through an almost exclusive concern for the aboriginal cause.

Historically, aboriginal peoples have not always led sustainable livelihoods. Although there are many examples of sustainable aboriginal societies, there are also examples<sup>30</sup>, such as the Midland Mayans, or the James Bay Cree (Berkes et al. 1998) where aboriginal peoples have decimated either part or all of their resource base. DIAND may have provided a more practical and less ideological service to sustainable development had it researched and advised both northern, national, and international governance institutions about the principles gleaned from successful aboriginal practices that could inform current development challenges recognizing that these challenges arise in unprecedented circumstances. For instance, population growth can now exceed local environmental carrying capacity due to health practices and resource exploitation technologies that were not possible in traditional societies and are now imported from and maintained by resources foreign to the northern environment. There is no guarantee that traditional practices will apply to new circumstances, although the methodologies might.

Missing from the DIAND Strategy is the acknowledgment that research work has been done on the principles of sustainable development which inform successful indigenous and local knowledge practices. Firstly, these practices all (unconsciously) assume that the environment is a complex, dynamically interdependent network of human/non-human relationships (see Chapter 2). Secondly, traditional sustainable development practices are supported by social institutions which are distinguishable from the governance institutions built on Newtonian science and which pose unique solutions to the exclusion problem (how to control access to resources), and the subtractability problem (how to devise and impose rules to solve potential divergence between individual and collective rationality through the definitions of property rights over the use, exclusion, management and sale of resources).

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<sup>30</sup> See also Tainter 1995 and Ponting 1991 for further examples of ecological degradation (including aboriginal) from human activity which has led to the collapse of human habitat.

A key distinction between modern scientific methods and the adaptive management techniques that successfully employ local ecological knowledge methods is the kind of environmental feedbacks that are monitored for adaptive response. The western approach tries to reduce the variability and maximize the production of a target resource (such as fish or timber) by freezing the ecosystem at a certain stage of natural change through strategies that block out the environmental feedback's that govern natural system change. Effective in the short term, the approach obstructs small scale, short term quantitative disturbances until they accumulate in large scale events "at a scale that threaten the functional performance of the whole ecosystem, and thereby also the flow of resources and services that it generates" (Berkes & Folke 1998: 12) qualitatively changing the environment. For instance, the negation of cleansing fires in Yellowstone Park eventually led to a huge fire that destroyed half the Park forest in 1988 (Holling, et.al. 1998: 349). Traditional systems, on the other hand, build a cultural memory reservoir that aids perception of and adaptations to environmental variability and that actively husbands the cyclical successions required to maintain robust and evolving ecosystems. The traditional focus is on adaptation to, rather than the control of, environmental variability. Traditional social institutions support this difference. Berkes and Folke (1998:22-3) suggest three hypotheses that distinguish successful local ecological knowledge institutions:

- maintenance of ecological and social system *resilience* is the key criteria for the design of human/environment interactions
- management mechanisms are maintained that monitor and interpret environmental feedbacks that permit variability and system disturbances which do not disrupt the structure and functional performance of ecosystems and their services
- social institutions support management and co-evolve with the evolution of the ecosystem.

This approach may be consistent with the newest developments in contemporary non-Newtonian science, and will be discussed further in Chapter 2. Folke, Berkes and Colding (1998)<sup>31</sup> have

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<sup>31</sup> See also Berkes and Fast 1996.

### Local Ecological Knowledge Sustainability Practices

#### 1. Management Practices

- Monitoring change in ecosystems and in resource abundance
- Total protection of keystone species that regulate system functional and the speed of succession
- Protection of specific habitats for biodiversity
- Protection of vulnerable stages in species life-history
- Temporal restrictions of harvest to allow recovery
- Multiple species management for maintenance of all ecosystem functions
- Resource rotation
- Management of succession
- Management of landscape variety (patchiness)
- Watershed management
- Ecological process management across time and spatial scales
- Responding to and managing pulses and surprises
- Nurturing sources of system renewal

#### 2. Social mechanisms

- Generation, accumulation and transmission of knowledge
- Self-organizing institutions that develop, evolve, and impose a full range of property rights through time
- Mechanisms of internalization of behaviour
- Ethics and values built on sharing, generosity, reciprocity and redistribution of resources

### Figure 1.10: Traditional resource management practices

and institutional learning

- Re-discover adaptive management
- Develop values consistent with resilient and sustainable socio-ecological systems

The management practices promoted by DIAND are mostly resource specific strategies for maximizing sustainable yield for target economic resources, inadvertently undercutting traditional ecological resource management systems. A viable co-management regime needs to be preceded on a clear understanding of traditional management systems that have succeeded and been interpreted through the most credible of current scientific thought. This research should also form the basis of DIAND's strategy and its contributions to (a) negotiations with territorial governments regarding devolution, (b) negotiations with federal departments regarding a national sustainable development

identified a number of management practices and supporting social mechanisms that are generic to local ecological resource management systems (Figure 1.10). From this they suggest a number of principles that should be applied to sustainable development regimes that build eco-social system resilience (Ibid.: 430-1):

- use management practices based on local ecological knowledge (LEK)
- Design management systems that flow with 'nature'
- Develop LEK for understanding cycles of natural and unpredictable events
- Enhance social mechanisms for building resilience
- Promote conditions for self-organization

strategy, and (c) discussions through the Arctic Council on a coordinated program for sustainable development and the construction of criteria for the selection of sustainable development proposals submitted by the Arctic States and Permanent Members. Finally, DIAND could propose that the Arctic Council pattern itself on the social institutions typical of truly resilient traditional societies. In this case, the Arctic Council would direct its work on the identification of management mechanisms at its own circumpolar scale that impede small scale disturbances and accumulate these into large scale catastrophes. A good example of where this has already been done is the AEPS program identification of land-based sources of pollutants that accumulate in the Arctic food chain. But the work would need to go beyond regulation of sources and proceed to identify the mechanisms that promote industrial externalization of production costs --- such as the lack of full-cost pricing of social and environmental costs --- and then ensure that corrective mechanisms are correctly identified. Additional mechanisms that elevate small scale disturbances to system-wide problems include the liberalization of trade, finance, and immigration in advance of national policies that fully internalize ecological and social costs (see Chapter 3).

In addition, DIAND, through the Arctic Council, could promote local variation in the means to accomplish social and ecological well-being, but focus on identifying and adopting scale constraints based on the regions ecological limits for human activity (ecological footprint), and the per capita fair share of ecological consumption based on an explicit position on global equity.

### ***1.8 International Policy Context***

Although the Treaty Section of DFAIT annually publishes a list of all bilateral and multilateral legally binding agreements to which it is a party, and maintains a separate list of non-binding Memoranda of Understanding, these lists contain no information on specific commitments made, the actions required to meet those commitments, the actions taken, or the results achieved. The Commissioner of the

Environment and Sustainable Environment reports that Canada “does not systematically track its performance in implementing its international environmental commitments....Canada does not have an overall picture of how good a job it is doing at meeting the obligations it has undertaken” where it has been successful; what gaps remain; what lessons have been learned” (OAG-BVG 1998:2-5). Not only is accountability regarding performance deficient, but there is also little opportunity to determine whether various commitments share common visions and purposes (effective) and employ an economic means (efficiency) through coordinated implementation. One explanation for poor accountability is that although DFAIT has the mandate to manage international negotiations and to sign the final agreements on Canada’s behalf, the lead responsibility is assigned to the department with the functional expertise and legislated mandate to implement the anticipated domestic follow-up actions.

Currently the Commissioner’s office is developing a data base of international agreements including the specific commitments, and actions taken. Presumably reporting on results achieved will be recorded in the Commissioner’s annual reports, but not accessible directly through the data base. Currently the data base is limited to legally binding agreements that fall into a narrow definition of the environment (OAG-BVG 1998:2,32-33). The Arctic Council, as a non-binding agreement, and all agreements on sustainable development are currently missing. Eventually non-binding agreements and those related to sustainable development will be added with information on commitments and actions taken on them. Once completed, the data base maintenance will be assumed by DFAIT. Neither the design of the system, or the institutional structure for its maintenance anticipate substantive analysis of the conceptual convergence, practical effectiveness and coordination and economic efficiency of the complete suite of agreements. Clearly, this is a significant flaw.<sup>32</sup>

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<sup>32</sup> Curiously, there is also duplication in effort. During the Second Conference of Parliamentarians of the Arctic Region held in Yellowknife, NWT (13-14 March 1996), it was agreed that the third meeting scheduled for April 1998 in Salekard, Russia would examine three themes across the Arctic to answer a single key concern: “is the

However, the first recommendation of the Standing Committee on Foreign Affairs and International Trade's Report on "Canada and the Circumpolar World" called on the federal government to "...elaborate an explicit policy framework in which Canada's objectives in pursuing circumpolar cooperation and the proposed means for their achievement are systematically set out" (Government of Canada 1998: 4). A draft report was completed by DFAIT on 13 July 1998<sup>33</sup>, for quick consideration by the Canadian delegation to the Arctic Council. It purports to have identified 30 core Canadian values underpinning Canadian political identity. Unlike policy goals that are susceptible to change, core values are defined as those "not subject to being overtaken by events or rendered irrelevant by external developments" (DFAIT 1998a: 1). The report's success is suspect. To begin with, the report identifies "maintaining the Armed Forces' capability to aid civil authorities in the Arctic" in the event

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progress we have made since 1993 taking the right direction; what has worked; what did not work; and why?" (Meaken and Curran 1998:xii). The three themes are:

1. the progress made at the Arctic Council
2. economic co-operation and sustainable development
3. social and cultural issues

In support of that work, delegate Brigitta Dahl (Sweden) proposed "...that an inventory of relevant Arctic work be carried out on our behalf and as a presentation for our next Conference (1998). This will mean that we will get comprehensive knowledge of what is going on, what can be set in motion, and what is still missing and has thus to be initiated" (op cit.). The first survey was completed (416pp) which included a listing of international and national government and non-government initiatives and included their starting and targeted/mandated completion dates, goals and objectives, strategy, actions, the background and a key contact. But again, analysis of common purpose or a methodology for tracking results has not yet been done or contemplated.

<sup>33</sup> The report was based on several key consultative reports: Department of Foreign Affairs and International Trade (1998), *The Arctic National Forum: Summary of Proceedings*. Canadian Council for Foreign Policy Development; Government of Canada (1998), *Government of Canada Response to the Report of the Standing Committee on Foreign Affairs and International Trade, "Canada and the Circumpolar World: Meeting the Challenges of Cooperation into the Twenty-first Century"*; Calgary Working Group of the Canadian Arctic Resources Committee (1998), *"A Report and Recommendations for Canadian Foreign Policy in the Circumpolar Arctic: An Assessment of the Report of the Standing Committee on Foreign Affairs and International Trade, "Canada and the Circumpolar World: Meeting the Challenges of Cooperation into the Twenty-first Century"*; Department of Indian Affairs and Northern Development (1997), *"Gathering Strength: Canada's Aboriginal Action Plan"*; Royal Commission on Aboriginal Peoples (1997), *Report of the Royal Commission on Aboriginal Peoples*. House of Commons Standing Committee on Foreign Affairs and International Trade (1997), *Canada and the Circumpolar North: Meeting the Challenges of Cooperation into the Twenty-first Century"*; Special Joint Committee Reviewing Canadian Foreign Policy (1994), *"Canada's Foreign Policy: Principles and Priorities for the Future"*; Canadian Centre for Global Security and the Canadian Polar Commission (1994), *"Proceedings of a Conference on 'A Northern Foreign Policy for Canada'"*. Inuit Circumpolar Conference (1992), *"Principles and Elements for a Comprehensive Arctic Policy"*.

of environmental emergency situations (oil spills, long-duration power failures related to weather) and non-environmental accidents (related to civilian development, tourism, or scientific research) as a core value. Obviously this simple confusion of ends and means replaces the unstated core value of personal and property security with a rationale for the preservation of the military institution. The "common sense principles" provided for "determining priorities and harmonizing competing goals" (DFAIT 1998a: 5) include a) do those things where you have some control over the variables that determine success or b) do those things with the highest benefit in the near term where the only suggested means to measure benefit is money. Neither of these provides much insight into core Canadian values.

More pertinent to the issue of sustainable development, but more politically volatile, is the report's identification of "enhanced human rights and self-determination for northern aboriginal peoples" as a core Canadian value. Certainly self-determination of aboriginal people is entrenched in the Canadian constitution. But the distinction between cultural distinctiveness and political autonomy, especially with the recent Supreme Court ruling on Canada's responsibility to negotiate Quebec's separation should there be a 'clear majority on a clear question' has become fuzzy indeed. The relationship between the values of (a) the national central tenet of sustainability (Ibid.: 6), (b) Canadian unity and national identity and (c) the self-determination of northern aboriginal peoples, is unstated --- and given the reports silence on democratic public government --- confusing.

The report is especially naive about the evolving role of the nation state in issues of national security and the potential impacts on sustainable development. It begins by stating that the end of the Cold War has reduced external pressures on northern foreign policy and that the a) emergence of an articulate and forceful Aboriginal leadership and b) the importance of the Arctic environment to global

survival, allow domestic agendas to “play a larger, normally dominant role in determining Canada’s northern foreign policy” (Ibid.: 1).

In *The Edmonton Journal* (98.05.11: A14), journalist Paul Koring presented his main concerns in preparation for the 1998 National Forum on Canada’s International Relations:

- National geopolitical security remains an issue despite the end of the Cold War:
  - “(A)fter a decade filled with genocide, ethnic cleansing, the violent disintegration of formerly proud federations, and the proliferation of chemical and biological weapons among rogue states, it may be too soon to dismiss the old threats.”
- Human rights abuses toward northern aboriginals, both at home and especially in Russia, should not be pursued in the light of the economic importance of the repressor (compare vigorous condemnation of South Africa to constructive engagement of China). But the issue of collective identities (aboriginal and French) need to be treated with some equity:
  - “(A)ny foreign policy position on the whole vexed question of collective minority rights, both with respect to aboriginal peoples and ethnic or linguistic minority, will reverberate in the domestic political agenda. To be blunt: how will it play in Quebec if Ottawa is supporting the right of self-determination of minorities elsewhere. It is, in short, a minefield, in the shaping of a circumpolar foreign policy.”
- The Arctic environment will concern the world only when the world sees consequences for themselves:
  - “(E)nvironmental degradation in the Arctic is unlikely to prompt broad international action unless, and until, it can be demonstrated that the consequences are both sufficiently dire and will affect populations far outside the Arctic. It wasn’t worry about Antarctic penguins that made repairing the hole in the Ozone possible. It was the fear of skin cancer; shared by hundreds of millions of sun lovers across the United States and the rest of the industrialized world, that provided the international political impetus to tackle the causes.”
- Sustainable Development still lacks concrete definition (how can non-renewable resources be used sustainably and why is it an appropriate priority for aboriginals as suggested in House of Commons Standing Committee on DFAIT report?).
- Canadian values (DFAIT) of prosperity, security (geopolitical, environmental and cultural) and the universalization of democratic institutions need to be achieved at home too.

Canada's northern foreign policy statements reflect a primarily inside-out perspective, that is Canada expects to promote its internal objectives in the remainder of the circumpolar world. There is no analysis of how the rest of the world works, and a lack of appreciation that there is significant impact from the outside-in. The lack of analysis of the impact of the global economy on both global and national sustainability is especially disturbing. No amount of traditional knowledge concerning change in the local environment will address the causes behind globalization or its impact on the economy, or the change this is bringing about in key institutions like the nation state, social welfare, the division of labour, the structure of business, or the context for collective identity (see chapter 3).

### **1.8 A 'Credible Story'?**

To summarize the world views of the three core Departments in the Arctic Council, DFAIT is concerned about prosperity driven by economic growth increased through international trade. The North is a source of resources which need to be exploited without detrimental effects on the environment. A key strategy is the liberalization of trade.

For EC, the environment is the basis of social well-being and is the fundamental criteria for sustainability. Economic prosperity needs to be built on business innovations and exports that increase the productivity of resources (minimize waste) and remediate the environment. The focus is on improvements to technology. The role and purposes of civil society and culture are largely absent in their view of a sustainable world.

Finally, DIAND is concerned about the processes for ensuring a fully representative decision-making structure for economic and political development with a predominant emphasis on the role of aboriginal peoples. Sustainability will emerge from the shared responsibility for making decisions. The methods for collecting and interpreting information on ecosystem health will be informed by

TEK, but there is a lack of discrimination about what constitutes viable TEK given the trans-arctic pressures of population, industrialization, and economic globalization with their impact on the global commons. As a result, DIAND reverts to a maximum sustainable yields criteria for the exploitation of resources given sufficient pollution control to avoid environmental degradation associated with resource depletion/harvest. There is no fundamental concern for the environmental consequences of resource use.

None of them address economic globalization or urbanization as a context for understanding the impact of national sustainable development policy. None of them acknowledge the problems of inequity generated from over-consumption in developed countries vis-à-vis undeveloped countries despite the fact that this was the central argument of the 1992 Rio Conference. None of them acknowledge any change in overall development objectives so that Canada's platform for participation in the Arctic Council is primarily to ensure that it can exploit all of its resources in its continued participation in the world economic system, given the caveat that the necessary tinkering to ensure environmental protection is assured. Despite the fact that all of them acknowledge that the environment, society and the economy must be considered in an integrated way, none of them address how systems of this kind might work and how to manage these interrelationships through clear interpretative epistemologies and discrete criteria for action.

Although Canada could showcase the procedural structures developed through land claims as inclusive mechanisms for development decision-making, it has not been able to show how they augment sustainability and wellness of the human environment, and are open to criticism from the US that the Canadian platform simply advocates aboriginal rights. Canada has no idea whether it could sustain itself both within the carrying capacity of the nation, or within its equitable per capita share of global ecological services, and therefore does not know where it needs help from or is obliged to help other

Arctic States. Finally, it has done no analysis of national or international institutional mechanisms of trade, risk analysis, national security, etc. which might have a negative impact on the resilience of local or regional ecosystems, regardless of whether the activities are local or cross national boundaries. They are not in a position therefore to look at fundamental changes in Canadian domestic policy, or to discuss international policy which might be deleterious to or augment Canadian ecological and social well-being.

Canada's sustainable development strategies, individually or as a group, fail to tell a comprehensive, consistent or credible story.

## CHAPTER 2: Complexity, Evolutionary Systems and Planning For Change and Sustainability

"The next great awakening of human intellect may well produce a method of understanding the qualitative content of equations. Today we cannot. Today we cannot see that the water-flow equations contain such things as the barber pole structure of turbulence that one sees between rotating cylinders. Today we cannot see whether Schrodinger's equation contains frogs, musical composers, or morality—or whether it does not." Richard P. Feynman (quoted in Cohen and Stewart 1994: frontispiece)

The goal of the sustainable development program of the Arctic Council is to propose and adopt steps to be taken by the Arctic States to advance sustainable development in the Arctic, including opportunities to protect and enhance the environment, and the economies, cultures and health of indigenous communities and of other inhabitants of the Arctic, as well as to improve the environmental, economic and social conditions of arctic communities as a whole. (Arctic Council. 1998b:1)

Sustainable development --- integrating economic with environmental goals --- fits in the Liberal tradition of social investment as sound economic policy. Preventive environmental care is the foundation of the Liberal approach to sustainable development. ---*Creating Opportunity* (quoted in EC 1995)

Sustainable development...recognizes that development is essential to satisfy human needs and improve the quality of human life. But development must be based on the efficient and environmentally responsible use of all of society's scarce resources --- our natural, human, and economic resources. (EC 1995:3)

Progress towards implementing sustainable development practices can be made if all three interdependent and mutually reinforcing elements --- social, economic and environmental --- are considered...The deeply-rooted social and economic causes of the growing gap between economic demands and the earth's carrying capacity require cooperation among governments internationally and new and innovative approaches...EC must, therefore, pursue a strategy in which environmental goals are accomplished in a cost-effective manner that creates jobs and improves national productivity over the long term. (EC 1997:2)

Reconciling economic development, social equity and environmental quality is at the core of sustainable development. The challenge in defining sustainable development is that it means different things to different people; it is a reflection of a community's values. (DIAND 1997:8)

The sustainability concept is especially meaningful to Arctic Aboriginal peoples because it implies passing the natural environment on unimpaired from one generation to the next, maintaining diversity in economic and cultural development, and integrating these goals with the region's carrying and assimilative capacities. (DFAIT 1998b: 5)

Given these quotes, it is reasonable to assume that sustainable development involves some relationship between environmental, economic, social and cultural dimensions of human reality that promotes improvement along each axis while maintaining both the health of the living environment and the viability of the human system into the distant future. The language of the interrelationships involves 'balance' and 'reconciliation'. The language describing the axis of change includes 'progress', 'growth' and 'development'. That is the relationships are to be kept in some kind of equilibrium, change is linear, the process is manageable and the outcomes predictable. This chapter, the core theoretical chapter of the thesis, disputes all of these assumptions, arguing that our expectations of systemic development are illegitimate. It proposes that the environment-and-social system is a global complex evolutionary system, operates far-from-equilibrium, behaves non-linearly, and has reached domains of instability where fundamental structural change is inevitable and unpredictable. What is not sustainable is the relationships underlying the functional partition of our world into environmental, economic, social and cultural components. A completely new conceptualization is required to promote exploration of the possibility space opening up to human social evolution as a basis for revising our notions of planning for sustainability.

## **2.1 INTRODUCTION**

Knowledge about the future is perhaps the most important fruit of knowledge about the past. The real predicament of the human race is that all experiences are of the past but all our decisions are about the future. Unless we at least think we know something about the future, decisions are impossible, for all decisions involve choices among images of alternative futures. This is why the study of the future is more than an intellectual curiosity; it is something that is essential to the survival of humankind itself. All our decisions are about imaginary futures and are made in the imagination, but if these imaginations are unrealistic and ill informed, decisions based on them are all too likely to be disastrous. What unites the past and the future is the study of dynamics, and dynamics is the study of the space-time continuum and the patterns it contains. (Kenneth Boulding 1995:1, emphasis added )

Today's most vexing planning issues concern systems. The environmental system is being assaulted by pollution and resource over-exploitation which has impacts on climate, the fertility of soil, and the immune systems of living organisms. The economic system has broken free of national boundaries to

become global, and this has impacts on the flows of trade, finance, technology, emigration and immigration, as well as the significance of cities and the identity of individuals and cultures. Key authors recognize that systems are central to their subjects. For instance, the International Society for Ecological Economics has adopted Daly's 'pre-analytic vision' of the economy as an open subsystem dependent on the finite, non-growing and materially closed global ecosystem (Costanza, et al. 1997: 62) or more specifically, "the economy is seen as a highly ordered and dynamic system maintained by available energy and matter (essergy) 'imported' from the ecosphere...(and) exists in a quasi-parasitic relationship with the ecosphere, ultimately dependent on material flows to and from nature and on life-support services" (Rees 1995a: 348). Castells uses the language of systems to explain the emergence of a new social organizational logic underpinning the dynamics of globalization. He argues that the globalization of capitalism, supported by the centralizing control capability of electronic computation and communication, has resulted in a network society, and a fundamental conflict between the logic of the network system and cultural identity within that system:

"Our exploration of emergent social structures across domains of human activity and experience leads to an overarching conclusion: as a historical trend, dominant functions and processes in the information age are increasingly organized around networks. Networks constitute the new social morphology of our societies, and the diffusion of networking logic substantially modifies the operation and outcomes in processes of production, experience, power, and culture...This networking logic induces a social determination of a higher level than that of the specific social interests expressed through the networks; the power of flows takes precedence over the flows of power. Presence or absence in the network and the dynamics of each network vis-à-vis others are critical sources of domination and change in our society: a society that therefore, we may properly call the network society, characterized by the pre-eminence of social morphology over social action." (Castells 1996: 469)

Finally, in their pessimistic diagnosis of the "world system's" continuing ability to contain the tensions resulting from the socio-economic inequities of an expanding and elaborating capitalist world economy, the Fernand Braudel Centre for the Study of Economies, Historical Systems, and Civilizations uses explicit systems principles:

"A historical system is both systemic and historical....a system has cyclical rhythms (resulting from its enduring structures as they pass through their normal fluctuations) and secular trends (vectors which have direction, resulting from a constant evolution of the structures). Because

the modern world-system (like any other historical system) has both cycles and trends—cycles that restore ‘equilibrium’ and trends that move ‘far from equilibrium’—there must come a point when the trends create a situation in which the cyclical rhythms are no longer capable of restoring long-term (relative) equilibrium. When this happens, we may talk of a crisis, a real ‘crisis’, meaning a turning point so decisive that the system comes to an end and is replaced by one or more alternative successor systems. Such a ‘crisis’ is not a repeated (cyclical) event. It happens only once in the life of any system, and signals its historical coming to an end.” (Hopkins and Wallerstein 1996: 8)

These dynamic human systems are not the systems modeled by Newtonian science, which:

- are either at equilibrium (such as planetary motion) or near equilibrium (as in the swing of a pendulum),
- can be returned to equilibrium through response to negative feedbacks that manipulate single control variables (reversible),
- can be explained as a manifestation of fundamental laws,
- can be understood through the isolated analysis and reconstruction of the parts,
- behaviours can be described through linear equations computing measurable quantities, and
- the scale of effects are proportional to the scale of causes.

The classic example of reversibility in a near-equilibrium system is the thermostatically controlled building space conditioning system where a positive response (turn on the heat) is triggered by a negative condition (the temperature is not at the predetermined set point). In contrast, dynamic systems are far-from-thermodynamic-equilibrium (3rd phase) systems that behave counter-intuitively relative to the well-known Newtonian systems. The study of these complex systems originated with general systems theory and cybernetics beginning with WWII, followed by nonequilibrium thermodynamics, cellular automata, catastrophe and chaos theories, and most recently new work in ecology and evolution<sup>34</sup>. The science is so new, however, that the implications for intervention in the development of global ecological, economic, and cultural systems are constrained by the limits of our

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<sup>1</sup> Laszlo (1996:21-2) identifies key pioneers in each area: general systems - Ludwig von Bertalanffy, Paul Weiss, Anatol Rapoport, and Kenneth Boulding; cybernetics - Norbert Wiener, W. Ross Ashby and Stafford Beer; non-equilibrium thermodynamics - Aharon Katchalsky and Ilya Prigogine; cellular automata - John von Neumann, autopoiesis - Humberto Maturana and Francisco Varela; catastrophe and chaos theory - Rene Thom, Christopher Zeeman, Robert Shaw, and Ralph Abraham (to which should be added Edward Lorenz and Benoit Mandelbrot). Key pioneers in systems ecology would include Ernst Haeckel, Alfred J Lotka, Erwin Shroedinger and the Odum brothers, and in philosophy would include Alfred North Whitehead. Several institutes for the study of complex systems have emerged recently including the Santa Fe Institute (Stuart Kaufmann, Murray Gell-Mann, W. Brian Arthur, Christopher Langton) and the University of Michigan’s Program for the Study of Complex Systems (Robert Axelrod). For a further review of contemporary contributors, see Appendix 8: Annotated Bibliography.

understanding, and by the partial or inappropriate use of metaphor and analogy in both diagnosis and prescription. While we are recognizing that “we are transgressing, perhaps irreversibly, critical thresholds” (Sadler 1996:25) of key human life support systems which are undergoing profound structural and functional change, our understanding of these systems is embryonic, leading to contradictory prescriptions for corrective, adaptive, or symbiotic action.

The purpose of this chapter is to outline the visible contours in the current state of knowledge about complex systems, and to review the implications for planning economic development, environmental management and globalization. The chapter begins with a description of the structural and behavioural features of complex systems, discusses the reductionistic and holistic explanations of these systems, proposes a typology of change, and then offers some preliminary observations about the diagnoses and prescriptions offered by leading analysts in planning. Finally, it speculates on the implications of dynamic systems for sustainable development in the Circumpolar North.

## **2.2 LIFE & COMPLEX DYNAMIC SYSTEMS**

The paradox of life emerging to ever greater levels of complexity in a universe governed by the law of increasing entropy and disorder stimulated the study of life and dynamic systems. How --- when Newton’s clock-work universe was running down and where usable energy and organized structure irreversibly dissipated into homogeneity and total heat death --- could life, consciousness and society emerge. In his 1943 lectures on *What is Life?*, Shroedinger proposed that the answer lay in resolving how natural processes caused order to arise from **both order and disorder**. Genetics provided insight into the replication and reproduction of order. The work of Gregor Mendel on ‘order from order’ achieved explanatory coherence in Watson and Crick’s discovery of DNA. Insight on ‘order from disorder’, however, was achieved much later. The classic demonstration is the Bernard cell experiments of P. Silveston that show that an open system subjected to critical infusions of energy

over time will spontaneously develop organized structures to increase the systems ability to dissipate that energy (see Figure 2.1). Similar phenomena is evident in hurricanes, tornadoes and other organized storm structures that form spontaneously to dissipate excess atmospheric heat. "No longer is the emergence of coherent self-organizing structures a surprise, but rather it is an expected response of a system as it attempts to resist and dissipate externally applied gradients which would move the system away from (thermodynamic) equilibrium" (Schneider and Kay 1994: 631)<sup>35</sup>.

**Figure 2.1: Order from Disorder**

When a working fluid medium is placed between a heat source plate and a heat sink plate, the heat transfer first occurs through molecule-to-molecule conduction. But as the gradient increases to a critical level (Rayleigh number 1760), the transition to highly organized vertical hexagonal convection cells occurs to dissipate the energy. At higher gradients, chaotic turbulence ensues. At each change in organization the more exergy is destroyed (or more entropy is produced), and more work is required to maintain the system in its stable non-equilibrium state. As the gradient increases, the fluid becomes vertically isothermal except for the boundaries of the cell which carry the gradient, that is do the work. These boundaries become thinner as they become more efficient, and become increasingly sensitive to change (exhibit structural adaptability). This experiment is discussed in detail in Schneider and Kay (1994:631), Capra (1996:87-88, 161), and Combs (1996:36), to name a few. Cohen and Stewart (1994: 263-266) provide a chemical example: the Belousov-Zhabotinski reaction, where a chemical mixture oscillates back and forth between two groups of compounds with a spontaneous formation of regular patterns of red-then-blue wave patterns.

Once the explanation of spontaneous organization in the construction of dynamic systems no longer called for an external 'vitalist' or 'non-material' cause, the fresh study of complex systems was released from spiritualist constraints and began in earnest. Their features are often seen to be consistent across chemical, biological, mental, and social domains, and are summarized in the following sections.

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<sup>35</sup> Schneider and Kay went on to restate the Hatsopoulos and Keenan law of stable equilibrium which had synthesized all energy conservation and increasing entropy laws of thermodynamics: "The thermodynamic principle which governs the behaviour of systems is that, as they are moved away from equilibrium, they will utilize all avenues available to counter the applied gradients. As the applied gradients increase, so does the system's ability to oppose further movement from equilibrium" (Schneider and Kay 1994: 630). The Hatsopoulos/ Keenan law had refined previous dictums that real (entropic) processes are irreversible with a law stating that there is both a direction and an end-state to all real processes: "When an isolated system performs a process after the removal of a series of internal constraints, it will reach a unique state of equilibrium: this state of equilibrium is independent of the order in which the constraints have been removed" (Ibid.).

### 2.2.1 Features of complex systems

Recently, Capra synthesized the features of complex systems presented in leading scientific research (1996: 157-76):

**Table 2.1: Capra's synthesis of living systems**

| Feature  | Key Researcher(s)                      | Discussion  |
|--|--|---|
| Autopoiesis: relational <u>pattern</u>               | Humberto Maturana and Francisco Varela | a self-producing and transforming network of self-referenced processes of production that are organizationally <u>closed</u> around a set of feedbacks distinguished by the system, yet <u>open</u> to the flow of energy and matter for self-renewal = Identity  |
| Dissipative <u>Structure</u> : embodiment of pattern | Ilya Prigigone                         | material manifestation of autopoiesis, far-from-equilibrium stable structures maintained by flows of essergy (the classic example is the bathtub vortex) which exist within a range of stability bounded by thresholds where they are prone to spontaneous structural change or dissolution (bifurcation) = behaviour, development, evolution |
| Cognition: dynamic <u>process</u>                    | Maturana and Varela                    | functional manifestation of autopoiesis = knowing or structural coupling or creation and response to significant difference and meaningfulness  |

Although Capra distinguishes structure, pattern and process for analytical clarity, he also contends that they are inseparable aspects of systems. The cell is the prototype living system, composed of networked components that maintain identity and structure despite continuous replacement using material and energy exchanged with the environment, and remain responsive to that environment to persist behaviourally and structurally.

#### 2.2.1.1 Autopoietic (organization/identity)

The classic definition of autopoietic systems “are systems that are defined as unities, as networks of production of components that recursively, through their interactions, generate and realize the network that produces them and constitute, in the space in which they exist, the boundaries of the network as

**Figure 2.2: Autopoietic Properties**

“Gail Fleischaker has summarized the properties of an autopoietic network in terms of three criteria: the system must be self-bounded, self-generating, and self-perpetuating. To be *self-bounded* means that the system’s extension is determined by a boundary that is an integral part of the network. To be *self-generating* means that all components, including those of the boundary, are produced by processes within the network. To be *self-perpetuating* means that the production processes continue over time, so that all components are continually replaced by the system’s processes of transformation.” (Capra 1996:208)

components that participate in the realization of the network” (Maturana<sup>36</sup>, quoted in Luhmann 1990:3) (see also Figure 2.2). What is critical here in overturning Newtonian thinking habits, is that the components (the elements with-IN the system) are undecomposable from the system. Autopoietic systems “are sovereign with respect to the constitution of identities and

differences...they cannot import identities and differences from the outer world; these are forms about which they have to decide themselves” (op.cit.).

Through self-bounding, autopoietic systems distinguish ‘system’ from ‘environment’. In that systems are open, interactions with the environment accelerate the production of entropy; maintaining the system at the expense of the environment which is necessarily changed through the relationship. To maintain its identity, however, the system must change its mode of interaction in response to environmental changes. The system produces, maintains and transforms itself in time and has a history which is unique to itself. Human interventions into systems, such as ecologies, are necessarily interventions into entities that are “produced by and capable of history” (Stengers 1997: 17). To the extent that instrumental domination and manipulation motivate the intervention, we canalize the potential development of Nature in this specific and limited self image. The implications for planning will be discussed later. At a fundamental level, however, ‘time’ is not a spatialized arrangement of the sequence of events, but is imminent in phenomena.

<sup>36</sup> Humberto R. Maturana. 1981. “Autopoiesis.” In *Autopoiesis: A Theory of Living Organization*, Milan Zeleny (ed.). New York: North Holland, p.21.

Components are unities created by and for the system. Self-reference implies circularity in their feedback loops, but in that each component is also a system to itself (arguably with infinite regress) each with its own rhythms and flows of time, the relations between components is more accurately a network. Interrelations in networks is non-linear, and though the trajectory of any set of non-linear equations is determinate, it is also infinite and unpredictable. Unpredictability is not the result of inadequate information, but a result of non-linear and irreversible histories.

It is typical in complexity modeling to use the autopoietic process in one system as a metaphor for understanding others. Self-organization in ant colonies, for instance is applied to the understanding of human society, or in comparing the globalization of the contemporary political-economy to a super-organism. These analogies (see especially Laszlo 1996, Stock and Campbell 1996) are deeply misleading because the self-production process is specific to a system and produces components unique to that system. Autopoiesis in organisms is the property of life producing cells and organs, in psychic systems it is consciousness producing subjects and objects, and in social organizations it is communication/languageing producing meaning and bringing forth a shared world of actions.

#### *2.2.1.2 Dissipative Structures (behaviour)*

The homeostatic capabilities of living and complex systems to maintain internal functional integrity despite environmental variability is well known. Their study satisfied mechanistic preconceptions about the utility of simple interventions in maintaining any system in a specific phase state, or to force it into a desirable state through the manipulation of control parameters. Manipulations of the money supply and effective demand are expressions of this theoretical stance in Keynesian economics. The maximization of sustainable yields of discrete resources such as timber and fin fish embedded in ecological systems is the application of homeostasis in the scientific management of renewable

resources. But the result in each instance is that small fluctuations accumulate until cataclysmic depressions, forest fires or the collapse of economic fisheries result.

As autopoietic systems develop, they increase their ability to dissipate essergy efficiently. The Amazon is a striking example. In the tropical rain forest, the tight cascading network of interconnected specialized organisms are able to process and degrade so much of the insolation and waste metabolic energy produced by the system that the energy re-radiated into the atmosphere is as low as that from the polar ice caps (Schneider and Kay 1994:637-39). But the dissipation of increasing amounts of high quality energy pushes the systems further from thermodynamic equilibrium. Instability increases establishing conditions for structural changes; some of which maintain the identity of the system (e.g. ontogenetic development, for instance) and some which do not (e.g. phylogenetic speciation). Where identity is retained, environmental control parameters remain within normal limits and the trajectory of system states is described by attractors (point, cyclical, chaotic). Succession in ecosystems (e.g. forests) are an example of a system that develops along a common cyclical multi-equilibrium path of resource exploitation, conservation, creative destruction and mobilization/retention (Holling 1994). The chaotic attractor of quickly diverging paths is common to weather systems, described by the Lorenz attractor (Capra 1996: 134-5, Cohen and Stewart 1994:207, Mainzer 1996: 57-9).

Systemic identity can be lost when the system depletes the environmental essergy required for its maintenance, i.e. overloads the environmental carrying-capacity. Overgrazed grass-lands, as a dramatic example, can be irreversibly transformed to deserts. Systemic identity is vulnerable when, for instance:

- articulation of internal complexity through the elaborations of network operations over time may create inefficiencies in flows of essergy or information jeopardizing system viability, or

- alternatively, increasing internal complexity creates positive feedback resonances that selectively amplify functions until fundamental internal network relations are transformed and the identity speciates
- attractors collapse due to environmental parameter changes that push the system beyond the zone of stability (the subject of catastrophe theory)

Cyclical development is the kind of variability that resource managers often try to constrain. Cycles frustrated at one spatial or temporal domain can be accumulated within the system until they become unwanted surprises at a much larger scale. The suppression of forest fires to maximize the timber yield can result in closure of the arboreal canopy or accumulation of deadfall on the forest floor until eventually a fire starts that is uncontrollable. As an example, half of Yellowstone Park burned in 1988, after years of fire suppression that were retarding the small scale forest successions that would have happened normally in the park (Holling, Berkes and Folke 1998: 349).

Structural evolution is a double-edged sword of destruction and creation. Speciation is nature's equivalent to innovation, invention and the exploration of the possibilities created through the processes of life and death at contingent levels of systems.

### *2.2.1.3 Cognitive Processes (knowing/language-meaning)*

Systems differentiate themselves from environments that are themselves constituted by other systems. An external relationship is implied by this original demarcation. Systems differentiate component unities to suit their own reproduction, implying another set of internal relationships. At all levels -- within systems, between systems and between systems and environments --- there are interrelations between unities that are distinguished by the autopoietic operation of each system. Systems propagate within the constraints of the environments to supply the material throughputs that constitute them, first in competition with other systems, but eventually through negotiations between them that optimize the utilization of available throughputs, and conserve and increase autopoiesis and adaptability of the

encompassing systems. Maturana and Varela named this behavioural negotiation that happens between unities at all levels 'structural coupling' (Maturana and Varela 1992). Structural coupling is the process of adapting through structural changes brought about by the autopoietic transformation of the system as it exchanges with its environment<sup>37</sup>. "(T)hrough mutual structural coupling, individual living systems are part of each other's worlds. They communicate with one another and coordinate their behaviours. There is an ecology of worlds brought forth by mutually coherent acts of cognition" (Capra 1996:269).

On the level of physical systems, structural coupling manifests as wave-form resonance and chemical valence. In biological systems structural coupling is related to perception and response, such as in the immune system which couples with any cell in the system (domestic or foreign) to maintain the molecular identity of the organism. In social systems, structural coupling is a function of the meanings produced and reproduced through languaging that distinguish relevance from nonsense relative to a particular culture.

Language was never invented by anyone only to take in an outside world. Therefore, it cannot be used as a tool to reveal that world. Rather, it is by languaging that the act of knowing, in the behavioural coordination which is language, brings forth a world. We work out our lives in a mutual linguistic coupling, not because language permits us to reveal ourselves but because we are constituted in language in a continuous becoming that we bring forth with others. We find ourselves in this co-ontogenic coupling, not as a preexisting reference nor in reference to an origin, but as an ongoing transformation in the becoming of the linguistic world that we build with other human beings. (Maturana and Varela 1992: 235)

Complexity increases the elements and potential relations within a system to the point of potential confusion. The effectiveness of the system is premised on its ability to select among potential relations both in its operations of the present and in its recursive self-observation of remembered

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<sup>37</sup> "An autopoietic system undergoes continual structural changes while preserving its weblike pattern of organization. It couples to its environment *structurally*...through recurrent interactions, each of which triggers structural changes in the system...The environment only triggers the structural changes; it does not specify or direct them...The structural changes in the system constitute acts of cognition. By specifying which perturbations from the environment trigger its changes, the system 'brings forth a world,' as Maturana and Varela put it. Cognition, then, is not a representation of an independently existing world, but rather a continual *bringing forth of a world* through the process of living." (Capra 1996: 267)

pasts. The pattern by which selections are made defines the organism's cognitive structure and results in the selection of possible actualizations from the field of possibilities. In social structures, this pattern is *meaning* which is "a *representation of complexity...a new and powerful form of coping with complexity under the unavoidable conditions of enforced selectivity*" (Luhmann 1990:84).

### 2.2.2 Operational characteristics

During the history of a complex system, initial conditions and the recurrence of perturbations or throughput fluctuations in the environment will trigger the reinforcement of certain internal relations and their structures through positive feedbacks and amplifications. Each unity so defined within the system will operate according to its own temporal character.<sup>38</sup> These favoured relations within the internal network will characterize the dominant features of the system, expressed in ecosystems, for instance, as a keystone species (Folke, Holling, Perrings 1996). The productivity of the system, that is its vigor, is related to the efficiency of these favoured relations in their structural coupling and exchange with their respective environments (Ulanowicz 1997).

Mature systems tend to favour these dominant relationships. Less useful components are marginalized and eventually excluded (e.g. extinction). The strongly ordered specialization of functional roles supports, on the one hand, maximization of thermodynamic power and entropy production, but simultaneously increases the 'brittleness' of the system, reducing its flexibility to respond to the structural changes resulting from either the systems own internal operations or changes in

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<sup>38</sup> "(Physics) recognizes the irreversible time of evolutions toward equilibrium, the rhythmic time of structures whose pulse is nourished by the world they are part of, the bifurcating time of evolutions generated by instability and amplification of fluctuations, and even microscopic time, which manifests the indetermination of microscopic physical evolutions. Every complex being is composed of a plurality of times, connected together by way of subtle and multiple articulations. The history, whether of a living being, or of a society, will never again be able to be reduced to the monotonous simplicity of a unique time, whether this time expresses an invariance or traces the paths of progress or decline. The opposition between Carnot and Darwin has given way to a complementarity that we need to appreciate in each of its singular productions." (Stengers 1997:41-2)

environmental parameters brought about through the operation of the system and/or through the operation of other systems within the environment. A 'brittle' system is not adaptable. When systems reach zones of instability through their own complexification, or encounter new environmental parameters, systems that carry functional redundancy or a reservoir of potential adaptations are more likely to evolve new adaptive strategies. Organisms with a long genetic history, ecosystems with a library of adaptive strategies residing in marginal species and societies with a living library of active alternative cultures (traditional or intentional) retain reservoirs of adaptive strategies to be drawn upon in changing circumstances. Ecosystems that retain diversity or 'natural insurance capital' (Folke, Holling and Perrings 1996), then, are more resilient, so long as that diversity is not completely 'slaved' to the dominant functions. Over-specialization, regardless of diversity, creates a brittle system. In these cases, simpler systems where functions are redundant and less interdependent will have greater resilience. For example, the arctic environment, where resident species are relatively self-sufficient despite a huge annual range in environmental parameters, are more resilient than a mature tropical rain forest (Rees 1988). Resilience is the capacity of a system to buffer disturbance and avoid being dislodged into a different equilibrium state or to collapse completely (Berkes and Folke 1998<sup>39</sup>, Folke, Holling and Perrings 1996, Berkes and Folke 1992).

The biases in the connectivity between components<sup>40</sup> in an autopoietic system leads to increased efficiency, power and productivity but at a cost. Materially, environmental entropy increases. Systemically, brittleness increases with a loss of resilience and natural insurance capital. One measure of these variables in a systems development is 'ascendency' (Ulanowicz 1996, 1997). From separate perspectives, Ulanowicz and Koestler have introduced the concept of paedomorphosis --- the retreat to

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<sup>39</sup> This definition is common in the literature: "*Resilience* is the buffer capacity or the ability of a system to absorb perturbations; the magnitude of disturbance that can be absorbed before a system changes its structure by changing the variables and processes that control behaviour (Holling et al. 1995). *Threshold* is the point where a system flips from one equilibrium state to another" (Berkes and Folke 1998: 6).

<sup>40</sup> In cybernetics, these biases define 'information' (Ulanowicz 1997)

or retention of precursor forms --- as a systemic restraint balancing the maximization of efficiency with organizational redundancy to retain resilience, adaptability, and flexibility; that is systemic health and evolutionary capability. In planning, this could be as simple as devoting some resources to maintaining a contingency plan in readiness, or intentionally supporting the development of radical alternatives to the status quo (local exchange trading systems/local currencies, intentional communities, bioregional stewardship, aboriginal self-government within national jurisdictions) to build a reservoir of adaptive strategies.

### **2.3 MODELS, METAPHORS, MYTHS**

A party of economists was climbing in the Alps. After several hours they became hopelessly lost. One of them studied the map for some time, turning it up and down, sighting on distant landmarks, consulting his compass and the sun. Finally he said, "Okay, see that big mountain over there?"

"Yes?" asked the others eagerly.

"Well, according to the map, we're standing on top of it." (Cohen and Stewart 1994: 308)

The critique of the Newtonian paradigm has come from within science itself, stimulated by four internal convulsions during the past century (Santos 1992: 9):

- Einstein's non-universality of space and time
- Heisenberg's non-reducibility of nature
- Godel's limits to the explanation of mathematical assumptions
- Prigogine's spontaneous evolution of order in far-from-equilibrium systems

Even the most enthusiastic contemporaries of each innovation have inadvertently reduced the impact of these breakthroughs in their attempts to assimilate the new understandings, not because of detraction or attempts to explain new ideas within the past paradigm, but through extrapolating the implications for human reality through the techniques of knowledge production inherited from the past paradigm. Since the 'discovery' of complexity, for instance, mainstream science has worked to model the behaviour of complex systems by mapping the iterations of non-linear equations through all possible parameters to reveal the visual pattern of 'meaningful' values. Langton's 'Ant', John von Neumann's cellular automata, John Horton Conway's 'Game of Life', Benoit Mandelbrot's composite

Julia sets are examples. Some of these equations are metaphors of some existing scientific theory, such as natural selection and competition applied to computer ecologies or economic models. The intent is to reduce the patterns of complex systems to the operation of simple deterministic equations. Based on the success of this approach, numerous physical scientists, economists, planners are searching for the variables and non-linear equations that explain the dynamics of their area of concern<sup>41</sup>. In the excitement over the deterministic creation of surprise and novelty, something important is often overlooked. It is forgotten that this particular explanation reveals only the potential--although not inevitable convergence---of the operation of non-linear equations (rules of behaviour between interrelated components) in the creation of 'features' (patterns) recognizable only from outside the system itself. Higher levels of organization are required (our perception) in order to collapse the complexity by recognizing patterns of meaning or 'features'. At that point the underlying rules of behaviour are no longer relevant. That is if another set of rules produced similar features, the response of the higher level system would remain unchanged, making the underlying rules irrelevant.

Each system reacts only to the features of the other. So what we need is a theory of features, an understanding of how the geographies of spaces of the possible conspire to create new patterns and combined dynamics. Such a theory would see weather as the motion of cyclones and rain clouds, not as the motion of billions of tiny, indistinguishable particles of fluid. But it would treat those features in a precise way, unlike old-fashioned qualitative meteorology. It might well use computers, but they would run programs that understood the meaning of the large-scale features, rather than allowing them to emerge as a by-product of billions of bits of information. It might not predict weather any better than we can now, because our current understanding is that weather is inherently unpredictable, thanks to the butterfly effect, and features collapse the chaos that they can collapse, not the chaos that we would like them to collapse. But it would remove the butterfly effect from the path whereby we understand weather....We must find a theory of mathematical complicity between the quantitative and the qualitative. (Cohen and Stewart: 1994:442)

As a result, the fundamentalism of traditional science is important but insufficient to an understanding of complex systems. A precise apprehension of quality as a real phenomena is required (see the box at the beginning of Chapter 2).

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<sup>41</sup> The work of the Santa Fe Institute and several other university based organizations for the study of computational complexity are representative. See Lewin 1992 and Waldrop 1992.

Complexity portends other implications for scientific epistemology. Complexity characterizes all systems at the macromolecular level of human experience<sup>42</sup> and probably all phenomena that are not isolated in experimental conditions<sup>43</sup>, making these implications non-trivial.

- Structural coupling, that is any interaction with another system or environment, is an insertion in the historical development of both, creating a symmetry break that reconfigures their paths of possible futures. Redefining how we must understand 'subject' and 'object' follows. Giving an objective reality to the quality of time has "taught us that nature cannot be described 'from the exterior,' as if one were an ideal, godlike spectator" (Stengers 1997:43).
- The notion of the trajectory of an individual buffeted by forces is replaced by the probability of collective behaviour as a fundamental, irreducible and indeterminate unit of scientific observation. In addition, fluctuations, which originate both from within systems and their environments, do not cause anything. The dynamic relations of the system select which fluctuation will be subject to "amplification, the opportunity that this amplification reveals, and which gives way to an intrinsically collective phenomenon" (Stengers 1997:71).
- Once it is recognized that the relevant description of a dynamic system cannot be revealed in an instantaneous state, "processes are irreducible to a physics of states" (Stengers 1997: 65). Manipulations based on these generalizations will lead, necessarily, to outcomes only partially anticipated by the description.
- Networks produce effects throughout the system, irrelevant of proximity. This "collapses the distinction between local events and global description" (Stengers 1997:71).
- Analysis can never circumscribe an entity in its entirety, but can reveal some of its potentialities through the lens of an observer's specific intention. Science is forced to carefully consider the relevance of its questioning on behalf of both society and the 'object' under scrutiny. The choice of questions is always a political choice and science can never be in a position to judge social actions on the basis of natural laws. Science can only reveal the potentials accessible to the

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<sup>42</sup> Prigogine suggests that the Avogadro number of  $10^{23}$  molecules creates conditions of thermodynamic instability (Prigogine 1997).

<sup>43</sup> The following themes reverberate throughout the work of Stengers (1997, 1992), and some of them in Santos 1992, Rosenau 1992, and Khalil (with Boulding) 1996 (see Appendix 8: Annotated Bibliography).

original choice of relevant questions (which should therefore be socially legitimized) in the context of specific systems and times (Stengers 1997: 74).

Facile attempts to extrapolate the significant features of biological systems to social systems is to have missed the point. Functions and elements are defined simultaneously with the emergence of a system; emergent behaviour is not the result of the complexification of pre-existent elements and is clearly not reducible to them.

“Conscious systems are not living systems, and social systems are not conscious systems; each of them requires the other, however, to be part of its environment. Each of them may be a dynamic and even autopoietic system able to combine closure and openness; but since they are based on different elements, they cannot be part of one encompassing autopoietic system.” (Luhmann 1990: 85)

## **2.4 THE EVOLUTION OF CHANGE & EMERGENCE**

Twenty-six attempts have preceded the present genesis, and all have been doomed to failure. The world of man has arisen out of the chaotic womb of the preceding debris, but it has no guarantee certificate: it too is exposed to the risk of failure and the return to nothing. “Let’s hope it works” (Halway Sheyaamod), exclaimed God as he created the world, and this hope accompanies the subsequent history of the world and humanity, emphasizing right from the start that this history is stamped with the mark of radical insecurity. (Analysis of Talmudic text from André Nehrer, “Vision du temps et de l’histoire dans la culture juive.” In *Les cultures et le temps*. Paris: Payot, 1975:179, quoted in Stengers 1997:58)

The management of change is at the heart of planning. Saint-Simon, the father of modern scientific planning, built on the pragmatic utilitarianism of Jeremy Bentham on the premises that:

- society is a complex machine that operates according to objective organic laws knowable through science, where human freedom is achieved through submission to these laws
- future outcomes of present actions are predictable
- a new industrial order, humanity’s liberation from feudalism, could be scientifically planned (Friedmann 1987: 51-85)

Comte, Saint-Simon’s protégé, outlined the consequences for technocratic planning. Planners would translate science into social guidance which public officials would administer. Politics, formerly grounded in the privilege of class, was therefore ill-equipped to provide normative guidance (op.cit.).

The scientific management of change assumes equilibrium or near-equilibrium systems. The purpose of management is to monitor and correct deviations. The goal is to reduce the variability in the maximization of some variable, whether it is the production of a commercial resource, the accumulation of profit, the growth in the GNP, or the elimination of production errors through increased rigor over work procedures (eg. ISO standards), or the mediation of class or ethnic conflict.

Simultaneously, there has been a tradition of anti-systemic movements and radical planning approaches which arise in protest to the contradictions of the dominant system. Taylor identifies the labour movement as the resistance to the labour stratification of the “industrial modernity, and

environmentalism as the resistance to the depletion of planetary ecological services resulting from the expiring ‘consumerist modernity’” (Taylor 1997:2). He observes, however, that anti-systemic movements both promote and

**Table 2.2: Friedmann's matrix of planning traditions**

| <b>Knowledge to Action (strategy)</b>        | <b>Conservative (preserve state)</b> | <b>Radical (replace or destroy state)</b> |
|--|--------------------------------------|---|
| <b>For societal guidance (top-down)</b>      | Policy Analysis (social engineer)    | Social Reform (technocracy)               |
| <b>For social transformation (bottom-up)</b> | Social Learning (pragmatist)         | Social Mobilization (revolutionary)       |

resist transitional potentials. From a complex systems perspective, anti-systemic movements are the imperiled components and withering relationships within the system, self-referentially produced or differentiated by the system itself, and ultimately dependent upon it. Friedmann’s matrix of planning traditions describe a spectrum that arises within the social system (see Table 2.2).

In contrast to change in mechanistic equilibrium systems, a number of perspectives shed light on change in complex systems. The first, and most well-known, is to trace the trajectory of a system in phase space, that is an abstract geometrical space whose *n*-dimensions represent the variables required to provide a complete description of its measurable behaviour. Among the simplest phase space

diagrams is that describing the motion of a pendulum whose phase space dimensions are ‘velocity’ and ‘angular momentum’, and whose trajectory under the parameter of gravity is a circle (when friction is ignored) or a spiral (when friction is included). The behaviour of trajectories in phase space either ‘gravitates’ toward a single point, cycles between two or more points, or traces a never-repeating and unpredictable ‘chaotic’ course among a set of points, some of which may appear or disappear over time. The behaviours, known as ‘attractors’, are often confused with gravitational ‘forces’ given our Newtonian biases. As abstract mappings, their significance is in the revelation of the “appearance of coherent collective behaviour” (Stengers 1997:13), but they shed little light on the “discoveries of possibilities of passage” (Ibid.:9) implicit in their historical unfolding in an environment. Table 2.3 shows that simple and complex computational schemes can “model” various simple and complex behaviours, showing that chaos and catastrophe theory are among several that are representative of the broader area of complexity.

**Table 2.3: Behaviours modeled by rules/laws of relations between components**

| RULES OF INTERACTION | FORM OF BEHAVIOUR   |   |
|----------------------|---|---|
|                      | Simple  | Complex   |
| Simple               | At & near equilibrium - point & cyclical attractors (planets) <sup>44</sup> | Strange Attractors - Chaos (plants)                       |
| Complex              | Catastrophe (plagues)   | Psychic & Social Systems - self-awareness/meaning (plays) |

Tracing the evolution of systems over time can reveal both convergent and divergent behaviours related to the dominant orientation of structural coupling. In the real world, the attractors are never just the simple iteration of a systemic dynamic, but always result from the feedback loops generated by the interaction of at least two spaces of the possible, that of the system (content), and that of the

<sup>44</sup> The bracketed terms come from the work of economist Kenneth Boulding, who had a poetic intuition about the dynamics of systems. He identified these four arenas (*planets*, *plants*, *plays* and *plagues*) as representing the dominant dynamics of the distinctly different environments that society encountered in the ‘world as a total system’, each of which had to be understood as unfolding in its own time. He also proposed that each system could be characterized by balances or imbalances in the various forms of interaction between the constituent

systemic nature of the environment (context). Cohen and Stewart's research suggests that lower-order systemic features change in stable contexts and higher order features change in unstable contexts, that is interactions with context become the dominant dynamic of change as the environment becomes increasingly unstable (see Table 2.4). As a result, any system's pattern of change can be characterized by any or all of these dynamics. Interest then shifts to the process by which innovations are introduced at the various system/environment levels that trigger qualitative change, the simplest of course, being the elaboration and growth of the system beyond the carrying capacity of the environment, and the complexifications of internal relations that jeopardize the thermodynamic efficiency of the system relative to competitors. Processes of self-observation (see next section) give innovation a place in the real geography of conceptual space.

**Table 2.4: Orders of change extrapolated from Cohen and Stewart (1994)**

| Character         | Behaviour  | Change Dynamic  |
|-------------------|------------|---|
| Simplicity        | Divergent  | Elaboration of isolated autopoietic system constrained within tightly constrained environmental parameters                                      |
| Complexity        | Convergent | Structural coupling between features within a system  |
| Simplexity        | Divergent  | Exploration of single possibility space: single system/environment  |
| Complicity        | Convergent | Expansion of possibility space through the interaction of high level features between systems or between a system and an environment of systems |
| Beyond complicity | ?          | ?   |

The characterizations of change normally described within the concepts of dynamic systems include:

- Metabolism/turnover is the production and maintenance of *complex systems* through environmental exchanges (essergy in biological systems, communications in social systems)
- Growth/replication is the accumulation of *components* created through positive environmental feedbacks in an autopoietic pattern across all relevant temporal domains. A system grows by retarding the flows of environmental throughputs through the system (transient accumulation), but it replicates itself through construction of accumulated patterns (genes, social norms) that can be transferred across temporal domains following the collapse of higher order structural features without the collapse of the underlying autopoietic pattern of organization

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elements, characterizing these relations as *coercion*, *exchange* and *integration*. The relevance to the ecosystem triad of parasitism, commensalism and symbiosis is obvious. See Boulding & Boulding 1995, and Boulding 1977.

- Development/succession is the succession of *dissipative structures* of a single system
- Evolution/transformation is the change in *autopoietic patterns of identity* through the interaction and structural coupling between high order features of parallel systems or systems and their environments

The focus in this section has been on the character of change, rather than the processes introduced in Section 2.2. Two concepts need to be emphasized here: environmental internalization and resonance. In his work on the morphological development of organisms as complex dynamic systems, Goodwin shows that the environment defines essential parameter values that constrain the natural dynamic of the living system, and also acts as a communication media for field activity (often electrical currents that must accompany biological growth and development) produced through the unfolding of the process itself, autopoietically. In complex species, the environment is successively internalized (Webster and Goodwin 1996:249) either as genetic structures or as intercellular media<sup>45</sup>. The attractor, produced by the dynamic system as the species life cycle, constitutes a “dialectical unity of organism and environment...(in which) the ‘external’ and the ‘internal’ are inexorably folded together” (op.cit.).<sup>46</sup> The process of internalization appears in the sustainable economics work of Clark Perez-Trejo and Allen (1995) which call for entrepreneurial innovation, endogenization of environmental constraints, and agent-based anticipation of structural change as key strategies in development, which in this context and other steady-state economic prescriptions (Daly 1996a, Wackernagel and Rees 1996, Weizsacker, Lovins and Lovins 1997) requires that ecological carrying capacity be explicitly included in the calculus of economic production.

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<sup>45</sup> The example given is the regeneration of the human fingertip, where the external sea water is replaced by body fluids providing extracellular ionic conduction, where the original environment has been replaced by an internalized medium that has a physiological origin.

<sup>46</sup> Goodwin has recently proposed a major research project to demonstrate that species morphologies are the result of robust morphogenetic trajectories, which at the individual level unfold in the contingencies of developmental history, but at the species level are the result of morphogenetic trajectories of classes of natural kinds produced by common generative mechanisms, i.e. their morphogenetic fields. Morphogenetic fields provide an exploratory strategy for each species within the spaces of the possible of either the *simplex* or *complicit* variety (referring to Cohen and Stewart). A question that is beyond this chapter is whether types of societal systems have morphogenetic natural classes parallel to biological species.

The second concept is resonance. Accepting that systems act as fields, resonance occurs in the superimposition of wave phenomena in self-reinforcing positive feedbacks that can either reinforce structures or eventually transform them through the creation of instability. Poincaré identified resonance between degrees of freedom as the reason that dynamic physical systems are nonintegrable and break time's symmetry (Prigogine 1997:39). Resonance, as demonstrated in harmonics, structurally couples systems, introduces novelty, and expands the possible development open to both of them. Given resonance and the spontaneous generation of orders of increased complexity, the challenge for Prigogine was not to explain change, but to formulate "sufficient conditions for stability, which we call the 'general evolution criteria'" (Ibid.: 65). This mechanism of irreversible process is the dynamic character of the field itself.

Returning to the characterization of Friedmann's planning stances toward change, each category can now be elaborated within the ideas of complexity:

**Table 2.5: Planning perspectives on Change**

| <b>Term (see Table 2.2)</b>                          | <b>Friedmann's definition</b>  | <b>Expansion based on Complexity</b>   |
|--|--|--|
| Social Reform -<br>Radical Social<br>Guidance        | application of scientific technocracy to achieve representative democracy, human rights and social justice where an apolitical state manages according to the single 'best method' | Rostow's development theories of economic take-off assume a linear and predictable sequence produced by the creation of repeatable conditions (such as investment, or the elimination of cultural biases towards work). This equilibrium approach eschews any evolutionary development of the system in either existing or new contexts. |
| Policy Analysis -<br>Conservative Social<br>Guidance | bounded rationality guides sequential and iterative decision-making methodology within a systems operations context striving to achieve material progress and social equilibrium   | This employs the notion of negative feedback in an oscillating system near equilibrium, where policy constrains variability.   |

| Term (see Table 2.2)                                 | Friedmann's definition  | Expansion based on Complexity  |
|--|---|--|
| Social Learning - Conservative Social Transformation | knowledge is derived from experience validated in practice in a dialectical process of change: social learning is the production of both social meaning and social goals  | This acknowledges the evolution of social structures, but fails to segregate the underlying <u>identity</u> from changing <u>structures</u> or behaviours. The level of change is not specified, so that the qualitative difference in interventions implied is not recognized.                              |
| Social Mobilization - Radical Social Transformation  | direct grass-roots political action provides the data for scientific analysis and understanding for further transformative action which either disengages community from the state or confronts existing power relations. | This suggests a fundamental change in social system identity through defensive isolation or direct confrontation. But the focus of change is directed at social structures, rather than at the means of production of social relations and will either reinforce or destroy the system --- not transform it. |

## **2.5 THE CONSEQUENCES FOR PLANNING: MANAGING CHANGE FOR SUSTAINABILITY AND CULTURAL CHANGE**

Simplifying Luhmann (1990:177-181), from a systemic point of view a society can be characterized not by its dominant part but by the way it differentiates itself internally, and the techniques it uses to interact with its environment. Modern social complexity, distinct from the hierarchical role segmentation of traditional societies, is the result of functional differentiation and specialization (Luhmann 1990:178) and a form of instrumental distinction which is common to both capitalist and socialist political economies. Until recently, modern society had distinguished itself so completely from its environment, that the gulf between them was seen as an objective separation making nature a resource whose sole purpose was the satisfaction of human purposes. Conceptually (though as we now realize not in fact) the contemporary modernity, based on the idea of the individual (read 'component') had a very strong sense of autonomous identity independent of its social and physical environments. Unfortunately, it continues to preserve this self-image as an historical artifact of inadequate self-observation. As the western social system has become increasingly articulated and complex, planners have had to resort to increasingly simplified descriptions which stimulate reactions

that intensify the favoured relations to the exclusion of others, creating positive feedback loops that create resonance, pushing the system further from equilibrium, and increasing its instability.

But a self-referential system that tries to absorb planning may speed up its own evolution, because it becomes hypercomplex and will force itself to react to the ways in which it copes with its own complexity. If this is true, world society will have to face conditions in which more intentional planning will lead to more (and more rapid) unintentional evolution. (Luhmann 1990:181)

To take this one step further, functional sovereignty has now become global. The WTO/GATT, and to a certain extent regional trading blocks such as the EC, NAFTA and APEC have functional sovereignty over the international flows of goods, services, technology (intellectual property rights) and financial capital (Daly and Goodland 1992). A growing international network of NGOs and UN organizations have increasing jurisdiction over the rights and welfare of residents in countries, regardless of the national government in power or the citizenship of the resident (Sassen 1996, Borja and Castells 1997)<sup>47</sup>. The growing independence of these functional subsystems increases their evolutionary autonomy, though they remain constrained within the discursive differentiating techniques of the encompassing societal system which itself has become global. This increasingly autonomous subsystem evolution focuses the amplification of specific autopoietic relations from plural sources, each of which are described and acted upon as simplified self-descriptions of internal systemic relationships, increasing the certainty of systemic bifurcations and the unpredictability of the outcomes.

Growing functional autonomy does, however, provide an opportunity. Self-observation on the level of functional subsystems that comprehends the ways we produce meaning through specific techniques

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<sup>47</sup> Sassen, like Daly, is concerned that the legitimate national governments are losing the ability to tend for the welfare of their own constituents given the globalization of welfare standards institutions that have no democratic sanction or accountability. "All residents, whether citizens or not, can claim their human rights. Human rights begin to impinge on the principle of nation-based citizenship and the boundaries of the nation...The European Convention on Human Rights has taken on considerable importance. As with other human rights instruments, it bestows rights on 'persons' rather than citizens." (1996:89, 92) Also aware that the legitimacy of nation states is under assault, and that nations have lost functional sovereignty and the ability to negotiate multi-cultural

of system/environment differentiation may help reveal relevant alternatives. These could arise through historical studies of traditional societies (Berkes and Folke (eds.) 1998, Harman and Sahtouris 1998, IUCN 1997). But more likely, alternatives will become apparent through small scale pilot projects experimenting with home-grown alternatives which are carefully recorded and analyzed. For instance, the disciplined use of sustainable community indicators designed to observe and communicate about changes in social techniques and technologies and the associated outcomes --- that is, to become attentive to the production of meaning and differentiation at functional and spatial subsystem levels --- could reveal new ways to create meaningful relations between ourselves and our environments.

Increasing systemic health and stability at the subsystem level would not prevent evolution at the societal level, but it may increase the local capacity for adaptation to that change and base the encompassing change on resonances between positive outcomes, rather than the amplification of negative outcomes like global warming, biodiversity destruction, productive land degradation, and overconsumption of ecological services. The prescriptions of bioregionalists towards decentralized and integrated decision-making and of ecological economists towards conceptual clarity about sustainability within functional subsystems<sup>48</sup> is in harmony with this prescription, but for different reasons. From this perspective, community development planners can postulate intuitively that “(i)f human systems follow the quantum model, they are dynamic, self-developing, self-healing and self-organising systems that have the capacity for continuous learning and even self-transcendence. Empowerment, then becomes the effort to stimulate the natural systemic energy for self-development... (P)ost development writers point to the local life spaces of civil society -- the vernacular, the grassroots, especially the low-income and marginalised --- as the major crucible for ultimately transforming societal values” (Wilson 1996: 625,628).

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identities at the local level, Borja and Castells argue for strengthening the responsibility and authority of the metropolitan government and for the rights of the urban resident as a citizen in a set of new power relationships.  
<sup>48</sup> “We seek to focus the definition of environmental sustainability (ES), partly by distinguishing ES from social sustainability, rather than load social desiderata on to the definition of ES. Similarly with economic sustainability, let economists define it or use previous definitions of economic sustainability. The three types of

**Figure 2.3: Social practices and mechanisms for resilience**

(Folke, Berkes, Colding 1998: 418)

**Management Practices based on ecological knowledge**

- Monitoring change in ecosystems and in resource abundance
- Total protection of keystone species
- Protection of vulnerable stages in the life-history of species
- Protection of specific habitats
- Temporal restrictions of harvests
- Integrated management of multiple species
- Resource rotation
- Management of succession
- Management of landscape patchiness
- Watershed management
- Managing ecological processes at multiple scales
- Responding to and managing pulses and surprises

**Social mechanisms behind management practices**

**a) Generation, accumulation and transmission of ecological knowledge**

- Reinterpreting signals for learning
- Revival of local knowledge
- Knowledge carriers/folklore
- Integration of knowledge
- Intergenerational transmission of knowledge
- Geographical transfer of knowledge

**b) Structure and dynamics of institutions**

- Role of stewards/wise people
- Community assessments
- Cross-scale institutions
- Taboos and regulations
- Social and cultural sanctions
- Coping mechanisms; short-term responses to surprises
- Ability to re-organize under changing circumstances

**c) Mechanisms for cultural internalization**

- Rituals, ceremonies and other traditions
- Coding or scripts as a cultural blueprint

**d) Worldview and cultural values**

- Sharing, generosity, reciprocity, redistribution, respect, patience, humility

Planning for subsystem resilience is the theme of current ecosystems management research on successful aboriginal and durable local ecological knowledge systems for resource management strategies and the social institutions that support them (see Figure 2.3). Since the environment has changed, however, replication of these strategies as normative rules of behaviour, in themselves, will not increase adaptive capacity unless a regime of critical self-observation is part of the discipline, and that the responsibility and authority for flexibility and radical realignment of actions are granted to communities at the same time. This is not to deny that certain issues of organization and scale must be asserted from outside the community by organizations to which the community is federated and participates with a voice equal to members at a similar level of the holonarchy (Costanza et al. 1997, Harman

& Sahtouris 1998, Henderson 1996, Norgaard 1994).

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sustainability -- social, environment, and economic -- are clearest when kept separate." (Goodland and Daly 1996: 1002)

## **2.6 Summary**

Increasing environmental gradients (broadly information) result in higher levels of organization to preserve a far-from-equilibrium stability in the living system through dissipation of the gradient. The world system has maintained a gradient of high quality energy, first through the discovery of high energy materials and energy resources in the colonization and exploitation of non-European regions, then through the increasing capability of industrialization and technology to extract the available energy in material and then fossil energies, then through the Bretton Woods institutions creating transnational corporations and finance (Lo and Yeung 1996:4), and now through the capability of information processing networks to extract further potential from the environment. Power relationships are now determined by decision-making control over the flow networks of trade, finance, citizens, technology and information. "What characterizes the current technological revolution is not the centrality of knowledge and information, but the application of such knowledge and information to knowledge generation and information processing/communication devices, in a cumulative feedback loop between innovation and the uses of innovation....For the first time in history, the human mind is a direct productive force, not just a decisive element of the production system" (Castells 1996:32). Through a series of discrete qualitative reorganizations in the western technological system, the world system has repeatedly risen out of periods of stagnation where the productive limits of the system had encountered points of diminishing returns in its relations with the biophysical environment. Wallerstein contends that each of these breakthroughs occurred at confluences of downward trends in two major social cycles --- the 45-60 year Kondratieff economic cycle and the 100 year or more nation-state hegemonic cycle --- which had destabilized the world system, creating conditions either for its transformation or for its systemic chaos and demise (Hopkins and Wallerstein 1996: 8-10). In each case since the 13<sup>th</sup> century beginning (Aub-Luhgod 1997: seminar) of the current world system based on nationalism and scientism/universalism/liberalism ((Hopkins and Wallerstein 1996:8) each

reorganization has opened up a pathway creating further opportunity for vitality and development.<sup>49</sup> If overall systemic viability had been compromised, then the new pathways would have been selected against. But these new developments, regardless of the type of system, are not arbitrary. The system's dynamic is constrained from within. The constraining factor in biology is genetics, in AL is computational rules, in ecologies is biodiversity. In traditional societies, myth and religion provided rules of behaviour that worked. Today, anti-systemic movements of resistance act as social 'genetic' brakes, while transformative movements seek to express the self-organizational impulse. The two must work together with the environment to find effective new forms of organization.

“(E)cosystems, as open systems, respond, whenever possible, with the spontaneous emergence of organized behaviour that consumes the high quality energy in building and maintaining the newly emerged structure. This dissipates the ability of the high quality energy to move the system further away from equilibrium. This self-organization process is characterized by abrupt changes that occur as a new set of interactions and activities by components and the whole system emerge. This emergence of organized behavior, the essence of life, is now understood to be expected by thermodynamics. As more high quality energy is pumped into an ecosystem, more organization emerges to dissipate the energy. Thus we have order emerging from disorder in the service of causing even more disorder (Schneider and Kay 1995: 170).....Living systems must function within the context of the system and environment

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<sup>49</sup>Castells' understanding of complexity is through the Sante Fe Institute, who have been reductionistic in their approach. He is very aware of the limitations of their approach as a model for understanding social transformation. His critique, however, calls for the systemic creativity that expanded approaches to complexity have demonstrated. Granted that his work recognizes the need to take control of the production of cultural codes, he is less aware of the systemic constraints imposed by the world system on the differentiation of meaning than either the Braudel Centre or Luhmann. Nevertheless, his prescriptions remain similar even though he sees current social action directed only at rectifying the contradictions of the organizational dominance of the current informational age, not overturning it. His hope is for the 'end of ideology' since "the most fundamental political liberation is for people to free themselves from uncritical adherence to theoretical or ideological schemes, to construct their practice on the basis of their experience while using whatever information or analysis is available to them." (1998: 359), and if truly successful, would be built on a pluralism intolerable to continuing dominance of the current world system. About complexity he writes: "They [the Sante Fe Institute] focus on understanding the emergence of self-organizing structures that create complexity out of simplicity and superior order out of chaos, through several orders of interactivity between the basic elements at the origin of the process.... (T)his approach seems to forbid any integrating, systemic framework. Complexity thinking should be considered as a method for understanding diversity, rather than a unified meta-theory. Its epistemological value could come from acknowledging the serendipitous nature of Nature and of society. Not that there are no rules, but that rules are created, and changed, in a relentless process of deliberate actions and unique interactions. The information technology paradigm does not evolve towards its closure as a system, but towards its openness as a multi-edged network. It is powerful and imposing in its materiality, but adaptive and open-ended in its historical development. Comprehensiveness, complexity, and networking are its decisive qualities" (Castells 1996:64-5).

they are part of. If a living systems does not respect the circumstances of the supersystem it is part of, it will be selected against. The supersystem imposes a set of constraints on the behavior of the system and living systems which are evolutionarily successful have learned to live within them. When a new living system is generated after the demise of an earlier one, it would make the self-organization process more efficient if it were constrained to variations which have a high probability of success. Genes play this role in constraining the self-organization process to those options which have a high probability of success. They are a record of successful self-organization. Genes are not the mechanism of development; the mechanism is self-organization. Genes bound and constrain the process of self-organization. At higher hierarchical levels other devices constrain the self-organization process. The ability of an ecosystem to regenerate is a function of the species available for the regeneration process. (Ibid.: 171)

Cohen and Stewart charge society to learn how to become context for the evolution of the Earth system, that is to not wait to be constrained by nature's limits, but to provide those constraints for itself and on its own autopoietic dynamic.<sup>50</sup>

Until recently we have been acting as if the global ecology were a context for humanity. We saw our task as a narrow one: to extract what was best for us, and to hell with everything else. We are now in the process of discovering painfully, that we are also a context for the global ecology. Everything we do affects it. If we can understand how to be a context we will understand how to coexist with the rest of our planet. (Cohen and Stewart 1994: 389)

Marshall McLuhan said the same in 1970<sup>51</sup>:

Whereas the planet had been the *ground* for the human population as *figure*, since Sputnik, the planet became *figure* and the satellite surround has become the new *ground*...Once it is contained within a human environment, Nature yields its primacy to art, and experience yields precedence to knowledge. The consequent upgrading of man's responsibilities for the planet as environment would seem rather obvious. (quoted in Timmerman 1987: 436, emphasis in original)

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<sup>50</sup> Castells invoked the same observing that social action can be understood as the changing pattern of relationships between Nature and Culture. The first stage of human experience was the domination of Nature over Culture, followed by the second, associated with the Industrial Revolution and the triumph of Reason and the domination of Nature by Culture. The contemporary stage is where 'Culture refers to Culture...(H)istory is just beginning, if by history we understand the moment when, after millennia of a prehistoric battle with Nature, first to survive, then to conquer it, our species has reached the level of knowledge and social organization that will allow us to live in a predominantly social world' (1996:477). However, where he see the information age "marked by the autonomy of culture vis-à-vis the material bases of our existence" (Ibid.:478) complexity thinking would suggest that instead, **Culture referring to Culture transforms its techniques of meaning production, becoming context for the co-evolution of functional social subsystems and Gaia together.**

<sup>51</sup> "Editorial Viewpoint." *International Journal of Environmental Studies*, 1(3).

The conceptualization of self-referencing autopoietic systems is as old as philosophy. In contrasting a machine, where the parts “exist for each other... within a functional whole,” with an organism where the “parts also exist by means of each other” (Capra 1996:22). Kant wrote in 1790 that “(w)e must think of each part as an organ that produces the other parts (so that each reciprocally produces the other)...Because of this, [the organism] will be both an organized and self-organizing being” (Kant 1790, 1987:253). A few years earlier he had summarized the problems of philosophy in three questions (Mainzer 1996:316)<sup>52</sup>: 1) What can I know? , 2) What must I do? 3) What may I hope? From the planners perspective the following answers are offered as hypothesis, the beginning of further research.

- 1) KNOW: Imbedded in time, we cannot precisely describe the emergent ‘phase state’ of the global social milieu in which we live, or for that matter that of our own consciousness, although we can experience it as a whole and then communicate that experience afterwards as a self-observation, a self-reflection in historical time. We can come to appreciate the dynamic qualities of a system and the techniques we use to differentiate relevance from nonsense. This allows us to project that dynamic into the short-term future as a set of divergent paths in an environment whose parameters are largely influenced by our own actions. Although we will not know which path will unfold, or how the larger environment will respond, we can decide whether any of them are worthy of our pursuit, or whether other techniques reveal more desirable futures.
- 2) DO: Rather than allow global functional hegemony to control systemic variability to maximize narrowly defined objectives (profitability of capital, for instance) which accumulates

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<sup>52</sup> Mainzer’s answer to these questions is that our knowledge is limited to the range of statistical possibilities of deterministic non-linear equations, that we need to act with sensitivity to the limits of stability of complex systems with both caution and courage avoiding the politics of mono-causality, and that we must hope for the Greatest Good or *summum bonum* of the dignity of personal life born primarily through the free acts of human self determination that must be protected as the bedrock of social evolution and complexification.

perturbation and instability until it manifests as large scale surprise, we can take action to increase our awareness of the variables (through relevant healthy community indicators, for instance) and down-scale the management for variability to the community level, participating in larger scale systems only to the extent that it promotes local systemic health without impinging on fairly allocated scale parameters set at higher levels of federated functional hierarchies. That is, large scale autonomous functional subsystems would be integrated at smaller scale, but relatively autonomous territorial subsystems.

- 3) HOPE: Individual dignity remains a key objective for systems of consciousness, protected by cultural institutions. But the dignity of communities, expressed at Habitat II as the 'right to city' (Borja and Castells, 1997: 245)<sup>53</sup> and by various aboriginal groups as 'collective rights' regarding common property and common-pool resources (ICUN 1997: 85)<sup>54</sup> is the fundamental unit of social systems that must be acknowledged, protected and empowered as the meaningful agency and subsystem recognized as a unity by the global societal system. Castells argued that societal transformation in the global informational age would require a form of social action that built its identity around neither legitimization of the dominant institutions or defensive resistance against the pervasive contradictions such as environmentalism, feminism, religious fundamentalism, nationalism, territorial or ethnic identity, but rather on project identities produced by "subjects that are not individuals, even if

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<sup>53</sup> This right was proposed by the authors in their report to the UNCHS (Habitat) as one of three. The other two were 2) recognition of the national and international legitimacy of governments of proximity (local governments) as partners in the international arena, and 3) a universal declaration of the rights and duties of citizens, regardless of their nationality. The right to city in an era of rapid urbanization includes "fit and non-precarious housing, socially valued districts provided with basic services, communication with the city as a whole and mobility to make central provision accessible, job possibilities and suitable training fro the social membership and political and legal equality of all inhabitants." (Borja and Castells 1997: 245-6)

<sup>54</sup> Collective human rights are recognized in two key international human rights documents: The International Covenant on Economic, Social and Cultural Rights and the International Covenant on Civil and Political Rights Article 1(2): "all peoples may, for their own ends, freely dispose of their natural wealth and resources without prejudice to any obligations arising out of international economic cooperation, based upon the principle of mutual benefit, and international law. In no case may a people be deprived of its own means of subsistence."

they are made by and in individual. They are the collective social actor through which individuals reach holistic meaning in their experience” (Castells 1997: 10)<sup>55</sup> and through the transformation of the overall societal structure. He proposed as well that “*subjects, if and when constructed, are not built any longer on the basis of civil societies, that are in the process of disintegration, but as prolongation of communal resistance*” (Castells 1997: 11, emphasis in original) encountering directly the key contradictions of the informational age: 1) the duality of those living globally in the instantaneous space of functional flows and those living in place, or alternatively the epistemic communities at the controls of the global networks and those individuated by the segmentation and global transience of the new international division of labour; 2) the end of patriarchy and its impact on household structure; 3) the invisibility of death; and 4) the multi-culturalism of global urbanization. Castells recommends that social movements counter the networking logic of domination in the informational society by networking communications among themselves with the primary purpose of becoming “*the actual producers, and distributors, of cultural codes*” (Ibid: 362, emphasis in original). The means of producing cultural code or social meaning, i.e. the ways we differentiate relevance, should be added to the recommendation so that the production and transformation of meaning structures might become a conscious enterprise.

Social transformation in times of great instability necessitates risk-taking where responsibility for the outcomes of plural experiments needs to be articulated and shared at the level of communities as ‘subjects’. The process begins with the internalization of the dynamics of the current environment, meaning that we must understand the dynamics of the living environment, and the means of differentiation which create our own systemic moving boundary with it. Adaptive evolution demands that planners live precariously perched at the edge of history.

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<sup>55</sup> Castells’ use of the term ‘subject’ follows Touraine. 1992. *Critique de la modernité*, Paris: Fayard.

## **2.7 Implications for the Arctic**

Complex systems exhibit positive feedbacks; the amplifying effects of autopoietic selections, and push themselves further from equilibrium. The Arctic's role in global climate change is a key illustration. Because of the axis of the earth's rotation, the poles receive almost no sunlight in the winter, and although daylight can be nearly continuous in the summer months, the angle of incidence is so low that even then, solar energy reaching the surface is greatly reduced. This is the basic dynamic behind the differential in temperature between the poles and more tropical latitudes. The differential, coupled with the fact that the north pole is an ocean nearly surrounded by land, causes the Arctic region to act as a pump drawing both oceanic and atmospheric currents northwards. This helps distribute the earth's heat to increase the temperature of north mid-latitude zones by as much as four degrees higher than they would be by solar insolation alone, but helps cool the earth overall. The North is one of the mechanisms that has allowed the earth to maintain a relatively constant temperature throughout its geological history despite the fact that the sun's energy has increased 25% over the same time. But global warming has the potential to trigger a number of amplifications in the North that, at least in the short term, could be significant.

The northward circulations would result in increased circumpolar temperatures as much as four times higher than the global average increase, that is between 5° and 8°C. Warming would thaw permafrost and promote microbial action in the soil that would release methane, a greenhouse gas much more powerful than CO<sub>2</sub>. Currently, the north is a net sink for carbon deposits. Dead vegetation decomposes very slowly in the cold and tends to accumulate in peat bogs. A warmer climate would speed aerobic decomposition with the potential of releasing more CO<sub>2</sub> into the atmosphere than all cumulative contributions of CO<sub>2</sub> from fossil fuels through 1995. And although some of this would be taken up through increased plant productivity, the carbon in storage far exceeds the potential increase in annual uptake. The snow would retreat and the polynyas (open water between by fractures in the

sea ice caused by wind and sea currents) would enlarge, decreasing the reflection of solar energy and increasing its absorption while releasing melt waters that would raise the oceans up to a meter (through increased volume and molecular expansion), causing damage to coastal communities and especially small island states. All of these processes would amplify global warming. On the other hand increase in the spatial scale and duration of open water would increase evaporation and cloud formation that could insulate the north and retard its warming. The warmer arctic waters, polluted with copious infusions of fresh melt-water, would lose their circulatory power tending toward a slowing in oceanic and atmospheric circulation and a collapse of global temperature regimes toward higher stratification and a new cycle of arctic cooling (AMAP 1997: 10-15,160).

Through a cycle of positive and then negative feedbacks, this scenario suggests, the planet will take care of itself and homeostatic processes will win the day restabilizing the planet despite the anthropogenic basis of global warming<sup>56</sup>. But this cycle of warming and cooling takes time during which systemic instability could lead to structural changes in complex systems. Northward shifts in habitat<sup>57</sup> would have dramatic effects on non-migratory species, potentially leading to speciation in short-period generation species; invasions of plants and animals from the south following warmth and nutrient availability might out-compete Arctic species to extinction; and surface waters would sink to ground water flows changing aquatic habitats. Regarding human impacts, permafrost subsidence could destroy building foundations; changes to surface water availability could force the relocation of communities. Aboriginal land claims that are geographically demarcated to enclose the ecosystems that support a subsistence life style would become irrelevant.

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<sup>56</sup> This is the central thesis of James Lovelock's work. See especially *Gaia*. New York: Oxford University Press, 1979 and *Healing Gaia*. New York: Harmony Books, 1991.

<sup>57</sup> A warming of 2°C would result in a 400-500 kilometer northward shift of vegetation types by 2020.

The four basic conclusions of the 6-year *McKenzie Basin Impact Study* on the effects of global warming on the Mckenzie/Athabasca watershed were (Cohen, S. 1997: 1-2):

- The negative impact of regional effects --- landslides from permafrost thaw, reduced water levels, increased forest fires and reduced yields --- would far outweigh the benefits of a lower growing season;
- The faster the change the less likely that ecosystems, including human communities, would adapt;
- The primary initial cause of regional warming would be exogenous, meaning that local actions would have no impact on global warming;
- Regional institutional change was occurring on several fronts in response to economic globalization, aboriginal land claims and political development (Nunavut). The impact of adding climate change in this context (depending on whether flexibility and adaptation had become a way of life, or whether the additional stress would collapse the resilience of the social systems to additional challenges) was unpredictable.

For a number of reasons, both the bio-physical and social systems of the circumpolar arctic, relative to other regions, are likely to witness high levels of systemic instability in the short run. Like the structural change that increases heat dissipation in the Bernard cell, the circumpolar world is at a structural seam in the increasingly chaotic behaviours of climate. It is at another structural seam in the cultural re-orientation of one of the largest concentrations of the world's aboriginal populations. The North provides one context for the exploration of fundamental innovation in response to systems, which for reasons not originating in the North, are likely at the verge of evolutionary bifurcation.

Before discussing how the North might position itself in the face of fundamental change, however, it is necessary to take a closer look at the process of economic globalization. From a systems perspective globalization is the dominant functional subsystem redefining the social landscape of the circumpolar north.

## CHAPTER 3: The Global Context

Charting a course toward sustainability requires a clear understanding of the international context in all its dimensions. The ozone protocol, for instance, is based on a sufficient agreement about the cumulative effect of ozone depleting substances and the circulation and chemistry of the global atmosphere. The UN Economic Commission for Europe's Long Range Transboundary Air Pollution (LRTAP) protocols on the elimination or reduction of discharges, emissions and losses of Persistent Organic Pollutants (POPs) and Heavy Metals are based on a sufficient agreement about oceanic circulation, the accumulation of toxins in the food chain and its impact on the health of higher species including humans, especially those living in the Arctic. The operation of a sustainable economy within the carrying capacity of the ecosphere, by analogy and common sense, requires an understanding of the operation of the global economy, its impact on human life and whether in its current form it is, or can be made to be, sustainable. The operation of the global economy and its impact on sustainability or Canadian domestic policy choices are questions that are not recognized in Canada's strategic plans for sustainable development, or for that matter, in its northern foreign policy.

Lamb's draft "Policy Framework for Canada's Northern Foreign Policy", for instance, states that "relative to external pressures, domestic pressures will from now on play a larger, normally dominant, role in determining Canada's northern foreign policy" (DFAIT 1998a: 4, emphasis added). In the final version tabled in Iqaluit, the wording signaled a shift in balance toward a more "inside-out" orientation saying that "Canadian domestic northern interest will play a more decisive role in determining Canada's northern foreign policy" (DFAIT 1998b: 4, emphasis added). But even then, the response to international influences was to maintain the status quo --- expansion of circumpolar

trade, exercising Canada's full sovereignty in the North, preservation of regional<sup>58</sup> security, and developing strong bi-lateral relations with the US, Russia and the Nordic States. The *Guide to Green Government*, provided as a framework for the preparation of Federal SD strategies, identified "meeting our international obligations" (EC 1995:7) as one of five<sup>59</sup> sustainable development objectives. The *Guide* stated explicitly that "sustainable development is inherently an international concept...a complex challenge in an increasingly interdependent world" (op.cit.). Strategic planning typically requires an environmental scan that looks at the context in which a vision is to be realized in hopes of understanding whether the environment will support, ignore or resist the organization's initiatives. But the *Guide's* chapter on how to prepare a sustainable development strategy required only an "issue scan" that looked at the impact of a department's strategy on sustainable development (an inside-out analysis), and an "action plan" that identified organizational changes and partnerships with stakeholders needed to achieve departmental goals, objectives and targets. An environmental scan was not required, and a consideration of the international context was not mentioned. Although this explains why the strategies ignored contextual issues, the strategies remain fundamentally deficient. Any domestic strategy which must contribute to global equity and sustainability in an "interdependent world" must contend with the reciprocal effects between domestic policy, exogenous international economic and political 'forces' and the global biophysical environment.

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<sup>58</sup> In Lamb's draft, this section referred to 'military' security, noting that demilitarization of the Arctic area was not possible because "Murmansk on the Kola Peninsula is Russia's only year-round seaport giving its naval forces egress into the Atlantic Ocean" (DFAIT 1998a: 28). Acknowledging that the US and Russia were now security partners in the Organization for Security and Cooperation in Europe (OSCE), it cautioned that "this does not mean that Washington has or ever will acknowledge the Arctic as a Russian military preserve. A degree of mutual military watchfulness by the United States and Russia is therefore likely to be a more or less permanent feature of circumpolar reality" (op.cit.). Specifics of this kind were dropped from the final document, but the conclusion remained unchanged: "the Government does not support the demilitarization of the Arctic" (DFAIT 1998b: 13).

<sup>59</sup> They were: (1) Sustaining our natural resources--sustainable jobs, communities and industries, (2) Protecting the health of Canadians and of ecosystems, (3) Meeting our international obligations, (4) Promoting equity (this area recognized the North-South divide and the need for aid and for global prosperity without increasing pressure on global ecosystems), (5) Improving our quality of life and well-being (EC 1995: 5-10).

This chapter, similar to the preceding chapter, presents the context of economic globalization to address this fundamental deficiency in the Federal strategies, and to put Canada's policy toward sustainable development for the Arctic in context.

### **3.1 Globalization**

Since at least the close of the 16<sup>th</sup> century, the relentless expansion of capital accumulation to the limits of technology in space and time has been the driving force of economic activity; that is the Age of Reason has witnessed the expansion of a 'world' economy. Recently, however, the economy has changed qualitatively and become 'global'. This is not to say that the production systems of capital accumulation have permeated every corner of human society, but that the economy has "the capacity to work as a unit in real time on a planetary scale." (Castells 1996:92) Communication and computational technology have advanced to the point that decisions regarding the flow of goods, services, finance, investment, and technology, and the shifting location and decentralized articulation of a segmented production process (research and design, manufacturing, marketing, distribution, sales, service), can be orchestrated continuously and instantaneously across the globe from a hierarchical network of 'world cities'.

Globalization is the source of major on-going research as business strives to achieve and maintain competitive advantage in a volatile domain, as cultures struggle to retain some identity, and as nation-states defend their legitimacy while functional sovereignty expands to supranational organizations like the WTO, regional trading blocks, and international 'rights and obligations' organizations. The incentive for this research is to promote participation in or resistance to the context of a universal and functionally partitioned world. Despite the 'hybridizations' that occur as the global logic inserts itself into new social territories, the underlying dynamic --- often characterized as the experience of

individual liberalism and its extension through the business corporation, and the universalistic, mechanistic science of Cartesian 'man'/nature dualism (Gonzales 1997, Heilbroner 1995, Khor 1997, Ophuls and Boyan 1992, Sklair 1991) --- remains the same. Globalization brings forth a shared world of social meaning through the application of a common suite of epistemological 'scientific' techniques, reproduced through languaging that is socially constructed and globally convergent, subsuming both capitalist and socialist forms of economic accumulation.

Modern society is, therefore a world society in a double sense. It provides one world for one system; and it integrates all world horizons as horizons of one communicative system. The phenomenological and the structural meanings converge. A plurality of possible worlds has become inconceivable. The worldwide communicative system constitutes one world that includes all possibilities. (Luhmann 1990: 178)

The purpose of this chapter will not be to review the extensive literature on globalization.<sup>60</sup> Rather, the phenomena of globalization will be briefly recast through the understanding of complex systems presented in Chapter 2 so that implications for the Arctic can be presented at the conclusion of this chapter. A summary of the less superficial observations in the literature is provided here by way of introduction (see Abu-Lughod 1995, Beaugregard 1995, Castells 1996-98, Friedmann 1995, Friedman and Goetz 1982, Sassen 1994, Taylor 1995).

- The technologies of communication and computation and their unrestricted availability are at the core of the reproduction, innovation and evolution of the contemporary global economy. Dominance in information-based decision making affords centralized control over a dispersed, trans-national economic system. Superficially, this manifests in the elaboration of service and information sectors (tertiary and quaternary) as profit centres while the resource and manufacturing sectors (primary and secondary) lose their leading edge dominance.

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<sup>60</sup> The literature is both positive and negative toward globalization, analyzing the phenomena in order to augment participation or criticize its advance. Representative of the most positive is Porter, Michael. 1990. *The Competitive Advantage of Nations*. New York Free Press. Representative of the opposite is Mander, Jerry and Edward Goldsmith (eds.). 1996. *The Case Against the Global Economy and for a Turn Toward the Local*. San Francisco: Sierra Club Books. Among the most detailed empirical analyses is the three volume work by Castells, Manuel. 1996-8. *The Information Age: Economy, Society and Culture*. Oxford: Blackwell Publishers.

- The center/periphery geometry of the world economic system centered on nation-states has been reconfigured by the global economy into a new network of world cities. A flexible geometry of functional centrality and power is laid over a fixed architecture of urban places. The result is a volatile arrangement of urban hubs and nodes whose dominance and wealth can rise and fall like the twinkling of neuronal activity in the brain; each hub/node's vitality dependent on the spatial access and temporal instantaneity provided to the global system through it. A hierarchical structure has been replaced by multiple functional networks with nested and often overlapping domains of dominance. Cities, to the extent that they are the physical production site for a functional node, are more interconnected with other cities of similar functional scope than with their own nation-state. A nested hierarchy of functional world cities encompasses the planet.
- A new international division of labour is no longer polarized between management and labour, but between the interlocked epistemic (knowledge-producing) communities that live within the virtual world of 'flows', and the pools of individuated labour who rely on their skill base, flexibility and adaptability to changing employment circumstances in decentralized production facilities. Centralized economic control exists within a virtual and instantaneous world of telecommunications and transportation-based corporate centres, while decentralized labour exists in the physical places of contingent and sequential events. Social polarization now exists in geographically contingent social spaces within each life place. The income divides are increasingly a phenomena within cities rather than between countries.
- Participation in the global economic network is ephemeral. The network's flexible geometry defines inclusion and exclusion. The struggles between the exploiter and the exploited have been replaced by the gulf between those that are connected to the global networks and those who are irrelevant or marginalized.
- Social identities based on economic class have collapsed (the drastically reduced impact of the trade labour union is testament) creating a new instability. Old identities based on social memories reconstructing more stable times are being recalled (religious fundamentalisms, ethnic or territorial identities, etc.) and new identities built on the collapse of previous identities (feminism arising out of the collapse of the patriarchal family, eco-feminism arising out of the collapse of a dominating instrumental science, etc.) or on the contradictions of globalization (social justice, environmentalism, metropolitan-regional governance arising out of the loss of

nation-state powers to provide for the economic, social, cultural and environmental security of citizens, etc.) are competing for control over alternative constructions of meaning, either in a retrogressive or transformative sense.

- Planning strategies either legitimize the status quo, take a defensive stance against the dominant logic of the current ‘modernity’, or attempt to transform the social relations of experience, power and production through direct engagement with the dominant social techniques/technologies (see table 3.1).

**Table 3.1: Strategic Community Planning Types per Castells’ “identity projects”**  
(Castells 1997)

| <b>Strategy</b>   | <b>Legitimizing</b>  | <b>Resistance</b>  | <b>Project</b>   |
|-------------------|--|--|--|
| 1. Approach       | Accommodating  | Defensive  | Creates social subjects  |
| 2. Goals          | Builds civil society   | Creates isolated communities or communes   | Redefines subjects position in society and transforms social organization  |
| 3. Values         | structural functionalism, modernism, scientific innovation will overcome problems  | reactive, advocates the “rights” of an object defined and threatened by the dominant system, ex: “poverty”, “heritage”, “biosphere”, “labour”      | proactive, reconstructs social reality through concepts of gender equality, the projective space of social meaning, the glacial time of enduring patterns of spiritual & ecological values |
| 4. Urban policies | Creates “milieus of innovation” to attract the high value-added end of informational capitalism and promote competitiveness (venture capital, university R&D, ‘leading’ industries, cultural and recreational amenities, communication/information infrastructure) | Preserves heritage precincts and ethnic places, contains or rejects growth, transportation demand mgmt, political decentralization to city-regions | Work-live complete communities, political devolution (city-states).  |
| 5. Example sites  | Tokyo, Boston, Silicon Valley, Los Angeles   | inner city ghettos, Tehran, Sheffield, Liverpool   | Catalunya (Barcelona),   |

The typical discussions of globalization are concerned with the increasing exploitation of the world’s resources through the expansion of the global economic system and the problem of equitable redistribution of wealth on a global scale. The fact that human activity alone has already appropriated more ecological resources than the planet can sustainably reproduce is anything but trivial, but it needs

to be understood within the current and completely new social context described in the points above. Otherwise, the solution to resource exploitation is inevitably a technological fix; reduce exploitation of resources by increasing their productivity through eco-efficient industry, industrial ecologies, bio-compatible technologies and the like. Increasing resource productivity increases the range and volume of goods and services available to global consumers (regardless of how equity concerns are addressed) while imposing no pressure to reduce or even stop the expanding demand for environmental resources. Increasing resource productivity decreases the 'ecological rucksack' of individual goods and services, but the savings are redirected towards growth in total consumption. Unfortunately, it is the partially understood promise of this technological fix that allows Canada's *Guide to Green Government* to pronounce that "(e)conomic growth is an important component of development, and reviving growth through improved productivity is the primary focus of economic policy. Economic growth also provides the wealth to make investments in protecting the environment, supporting education, science and technology and in maintaining the health and well-being of Canadians" (EC 1995:9). Taken out of the new social context of globalization, these strategies, though well-intentioned, would be inadequate.

### **3.2 An Autopoietic World System**

Depending on the 'attractor', dynamic systems develop along recognizable trajectories (see Chapter 2). Ecological succession following the Holling (Ulanowicz) model of exploitation-conservation-creative destruction-renewal (growth-development-maturation-senescence) is the trajectory of a periodic attractor (Holling 1994, Ulanowicz 1997). The speciation trajectory of (1) exploration and variation, (2) selection based on contingency, (3) consolidation, convergence and canalization, and (4) emergence of a new level of dissipative organization (Cohen & Stewart 1994) illustrates a chaotic attractor. Systems evolve through feedback loops or relations among component unities defined,

produced, maintained and transformed by the system for the system. Relations exist between unities or features that are distinguished at a specific level of organization. Nested within systems are subsystems where different features are the cognitive basis of relations. The unities perceived at any particular level of emergence transcend the particulars of the underlying subsystem, that is the higher order system is independent of the rules of interaction that maintain the lower order features. On the other hand, the lower order features are continually being transformed by the underlying rules of interaction, pushing the evolution of higher levels of organization. All systems co-evolve through interdependent but relatively autonomous bottom-up and top-down processes: the divergence/convergence resulting from iteration pressing from the inside-out and structural coupling attracting from the outside-in. The emergence of new systemic forms signals new organizational relations, as in a new species. The emergence of higher order dissipative structures can occur without loss of relational identity of the system.

The key descriptive elements of a complex system are the constituted components and the network patterned organization of feedback relations between them, the dissipative structures which manifest the system in space-time and express the throughput of essergy and information with the environment, and a process of distinction/differentiation that selects internally (component) and externally (structurally coupling with features of other systems/environments) to compete effectively for resources, efficiently metabolize throughputs, adapt to changing internal and environmental features, and to explore the possibility space available to it. Contemporary social theory is increasingly cast in this language of complex systems. As noted before, the overarching conclusion of Castells' analysis is that "as a historical trend, dominant functions and processes in the information age are increasingly organized around networks. Networks constitute the new social morphology of our societies and the diffusion of networking logic substantially modifies the operation and outcomes in processes of production, experience, power, and culture." (1996:469).

World systems theory beginning with the Fernand Braudel's *Annales* School expanded through the work of Wallerstein and his colleagues, has become a significant approach to the analysis of the last 500 years of Western history understood as the evolution of a single set of organizational relations, codified by six deep institutional features, or durable manifestations of social structure.

We call these evolving institutional domains 'vectors' of the world system, meaning complexes of processes that provide the continually evolving structured frameworks within which social action has occurred. Over its historical existence the modern world-system, in our view, has developed six such distinguishable but not separable vectors: the interstate system, the structure of world production, the structure of the world labour force, the patterns of world human welfare, the social cohesion of the states, and the structures of knowledge.

None of the six has (or, in our view, could have) developed in isolation from the others. The vectors are not at all to be thought of as loci of autonomous forces. They form, rather, the minimum array of interrelated facets of a single, imperfect, organic whole, each vector quite dependent on the others. Any shock, or blockage, or transformation within any one of them or among them affects all the others, and usually soon, visibly and consequently. (Hopkins and Wallerstein 1997:3)

Many theorists observe that the western system has on several occasions reached the limits of its ability to increase the utility it could extract from its environmental resources. At this limit, the system stagnated; the expansion of material wealth gave way to concerns over its distribution --- the institutions of production waned and those of power waxed. In the past, innovations in the techniques/ technologies of navigation, mechanization, the use of fossil fuels, and now the informational revolution have successively revived a stagnating system. The latest, informational / computational revolution beginning in 1968-73 provided a new level of organization for an exhausted industrial paradigm.<sup>61</sup> The reason for the collapse of the Soviet system in 1989, Castells proposes, "was the

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<sup>61</sup> It is important to understand technological change as more than a set of tools or hardware (see Jacques Ellul, 1964. *The Technological Society*. New York: Vintage Books. Technological change must be understood as a fundamental change in the techniques of interacting with the world, whether that world is physical, psychical or social. "By industrialism, I mean a mode of development in which the main sources of productivity are the quantitative increase of factors of production (labor, capital, and natural resources), together with the use of new sources of energy. By informationalism, I mean a mode of development in which the main source of productivity

incapacity of the Soviet system actually to integrate the much-vaunted ‘scientific technical revolution’” (1998:28) into its industrial organization.<sup>62</sup> Based on Lo and Yeung’s typology of world system phases, a brief summary of these technological reorganizations is provided above in Table 3.2.

**Table 3.2: Characteristics of the developmental phases of the Modern World System**

|                                 | 1st Phase  | 2nd Phase  | 3rd Phase  | 4th Phase                                 |
|---------------------------------|--|--|--|---|
| Prototypical City               | Mercantile ports   | Industrial within nation state                                   | Export/Consumerist and mega-cities   | Informational functional core             |
| Period                          | 1250-1700  | 1773-1900  | 1945-1973  | 1990-?                                    |
| Leading technology              | Shipping and navigation  | Machines, metallurgy   | Energy   | Information and communications management |
| Modernity                       | Man replaces “God”   | Faith in Social Progress   | Progress is development  | Knowledge is power                        |
| Material basis of surplus value | long-distance trade augmented hinterland agricultural tributes | Colonial exploitation of raw materials based on unequal exchange | international division of labour, mobility of capital, technology, finance | Intellectual property                     |
| Hegemons                        | Ottomans, China, Dutch Hanseatic League                        | Great Britain  | USA  | Triadic (European Community, Japan, USA)  |
| Key Cities                      | Hangzhou, Constantinople                                       | London   | New York, London, Paris  | Los Angeles, Tokyo,                       |
| Antisystem Movement             | mobilized diasporas (Jews)                                     | Luddites, utopians, Labour movement                              | Environmentalists  | Eco-feminism                              |

Accordingly, technological innovation and the creation of informational complexes (universities, research and development grants and tax relief) to support competitiveness in a global market are at the centre of many national and urban strategies (Castells and Hall 1994). Yet there is no guarantee

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is the qualitative capacity to optimize the combination and use of factors of production on the basis of knowledge and information” (Castells 1998:7).

<sup>62</sup> The reasons he proposes also fit into the systems paradigm: “Thus, at the core of the technological crisis of the Soviet Union lies the fundamental logic of the statist system: overwhelming priority given to military power; political-ideological control of information by the state; the bureaucratic principles of the centrally planned economy; isolation from the rest of the world; and an inability to modernize some segments of the economy and society technologically without modifying the whole system in which such elements interact with each other” (Castells 1998: 36). That is the dominance of a single function reduces adaptive strategies and increases systemic brittleness, central planning standardizes responses reducing the flexibility in local ‘structural coupling’, and isolation allowed ‘ascendance’ of an efficient organization in one environment, leaving no ‘overhead or insurance capital’ to provide innovation and flexibility when the environment changed (internally through industrial pollution and externally through the increased ability of the capitalist world to extract international and common pool resources through informationalism).

that the fundamental identity of a system can forever elaborate new levels of organization through the continual iteration of its internal logic. There are at least two reasons. First the particular environmental resources upon which the systems reproduction is based are eventually exploited beyond sustainable limits through the processes of growth. Secondly, the operation of the system inevitably changes the features of both the system and its environmental system forcing new adaptive strategies, new structural coupling. The change, for instance, from an open system ('unlimited' resources) to a closed system (a finite environment) always entails the change from competitive strategies to negotiated cooperation and symbiotic behaviours, or the system will collapse. The previous reference to the collapse of the Soviet Union is a socio-political example.

A historical system is both systemic and historical. That is to say, it has enduring structures that define it as a system---enduring, but not of course eternal. At the same time, the system is evolving second by second such that it is never the same at two successive points in time. That is to say, the system, has a history, and it is what it is at an given moment not only because of its enduring structure but because of its particular (indeed unique) historical trajectory.

Another way to describe this is to say that a system has cyclical rhythms (resulting from its enduring structures as they pass through their normal fluctuations) and secular trends (vectors which have direction, resulting from the constant evolution of the structures). Because the modern world-system (like any other historical system) has both cycles and trends -- cycles that restore 'equilibrium' and trends that move 'far from equilibrium' there must come a point when the trends create a situation in which the cyclical rhythms are no longer capable of restoring long-term (relative) equilibrium. When this happens, we may talk of a crisis, a real 'crisis', meaning a turning point so decisive that the system comes to an end and is replaced by one or more alternative successor systems. Such a crisis' is not a repeated (cyclical) event. It happens only once in the life of any system, and signals its historical coming to an end. (Hopkins and Wallerstein 1997:9)

Positive feedbacks within the global system tend to lead toward the dominance of the component that most efficiently satisfies a specific functional requirement of the system. As the system's efficiency increases, it becomes less redundant (the degrees of freedom or flexibility collapse) and more brittle. The replacement of components becomes increasingly less likely. In economic systems where this

tendency is not constrained by social regulation, monopolies will inevitably arise, a tendency which is now unfettered with the instantaneous and global mobility of finance. Currently, global monopolies<sup>63</sup> have already developed in aerospace and airlines, automobiles, consumer durables, electricity and electronics and steel, with near monopolies<sup>64</sup> in oil, personal computers and the media. Over 3/4 of world trade in cereal grain, bananas, cocoa, tea and tobacco are controlled by 5 or fewer transnational corporations (Clarke 1996:298, Lang and Hines 1992: 35).<sup>65</sup> Entry of new firms into a mature system is increasingly unlikely.

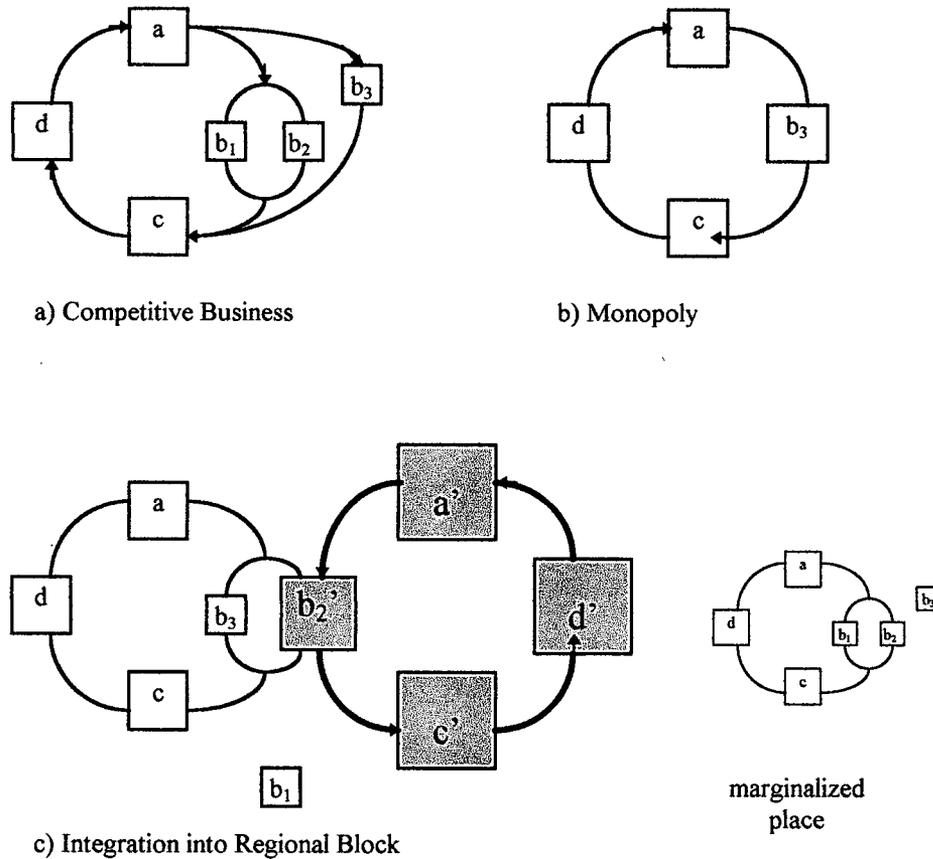
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<sup>63</sup> A monopoly is any industry where five or fewer firms control more than 50% of the world market.

<sup>64</sup> A near monopoly is any industry where 5 or few firms control more than 40% of the world market.

<sup>65</sup> The statistics are numerous and overwhelming and the subject of study on the transnational corporation (see Korten, David C. 1995. *When Corporations Rule the World*. New York: Kumarian Press). 35 TNCs control 40% of goods trade, where the 37,000 TNCs control 70% of world trade and earn 33% of the Gross World Product but employ only 1% of the world's population and decreased their labour force by nearly 10% between 1980-1993. 15 TNCs have gross income larger than the GDP of the poorest 120 nations. 47 of the 100 largest world economies are TNCs.

A diagrammatic representation of the 'ascendance' of complex systems is shown in figure 3.1, based on the autocatalytic hypercycle diagrams<sup>66</sup> of Manfred Eigen and Peter Schuster (Laszlo 1996:33-35, Capra 1996: 92-5).



**Figure 3.1: Monopolies and marginalization in competitive complex systems**

<sup>66</sup> Hypercycles are simple autopoietic systems. Catalytic reactions in far-from-equilibrium biochemical systems exposed to energy flow display the autopoietic behaviour of complex systems and form closed loop feedback networks that maintain stability of the system, self-replicate and correct replication errors, and "evolve by passing through instabilities and creating successively higher levels of organizations that are characterized by increasing diversity and richness of components and structure" (Capra 1996: 94).

The diagram illustrates a simplified economic subsystem of the world system where 'b' is the productive capacity of the business sector maintained in a self-referencing feedback loop that includes environmental resources, the knowledge production centres of universities and research centers, the social capital of trained labour and the social welfare institutions that support them, and the production of regulatory regimes that reinforce sanctioned power relations, etc. In 3.1(a), businesses compete with each other at some scale --- say the national --- to fulfill the productive function of the economic subsystem. Complex systems will tend to select the component that fulfills that function most efficiently so that the system captures, retains and uses the maximum free-energy flux available in its environment, which includes both ecological resources and social meaning. Eventually a competitor is likely to eliminate the competition, to be replaced only if the dominant component fails to evolve structurally with the changes caused by the operation of the system -- see 3.1(b).

Larger scale systems, say global systems, may articulate a smaller scale into the larger network as shown in 3.1(c), changing the role of the sub-component in the national network as well. Once a functional role in the global network is satisfied by a component, competing components and other national systems can be simply ignored by the network --- they are not required and become irrelevant and marginalized, eventually withering because they are unable to access the flows of resources that are now fully utilized by the dominant system. "The ascent of informational, global capitalism is indeed characterized by simultaneous economic development and underdevelopment, social inclusion and social exclusion" (Castells 1998: 82). In the global economy, the business sector in entire locales as large as sub-Saharan Africa can be completely marginalized. They are disarticulated from the global economic system, but very much a part of the global ecology. Local ecological source and sink resources, as well as any capable human resources are simply absorbed by the global system, leaving nothing behind for a viable local economy and sapping the material basis for the maintenance and re-

invention of an institutional capacity to manage the crises of unemployment, starvation, and the inter-tribal warfare that arises from deprivation.

Systems that become overconnected through efficiency gains become more brittle or less resilient for two reasons. First, they lack alternative functional strategies or 'insurance capital' to deal with internal development and external environmental change because subunits have been effectively 'slaved' to the larger system through the loss of degrees of operational freedom. This can be overcome to the extent that innovation of technique (rather than just in technology) continues and does so at fairly low levels within the system, but this is rare. Secondly, and more importantly, highly-connected far-from-equilibrium systems that are at or near the edges of their stability domains (relative to their environments) push structural change from lower to higher levels. This means that low-level variability is constrained, but changes in high-level features are prone to dramatic change in unpredictable directions at unpredictable times. The management of the evolution of low-order features is exchanged for the riskier but inevitable changes in high level features. The evidence: globalization has led to climate change, which entails not only global warming in a the linear sense that would spawn local catastrophes<sup>67</sup>, but the risk of structural change in whole ecosystems, bioregions, and GAIA. Change in high level features --- like climate and ecospheric structure --- changes the fundamental parameters that constrain the possibility space of evolution. To speculate on whether this might result in even higher rates of extinction<sup>68</sup> or the emergence of new life forms is unnecessary. It would certainly change the nature of the environment and increase the potential hardship for the increasing number of those (including humans) without the resources to adapt. Additional evidence: the increasing volume and speed of financial flows and investments has led to

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<sup>67</sup> Flooding of small island nations, higher incidence of property-damaging storms, northern shifts of ecosystems.

<sup>68</sup> The rate of extinction is now as high as the previous five major extinctions. One of these accompanied the end of the dinosaurs where 95% of all species disappeared. Another was the poisoning of the atmosphere by oxygen-producing bacteria that also decimated 95% of all life forms. The current extinction rate (17,000 species per

the increasing instability of the financial markets, changing overnight the economic viability not only of individuals or companies, but of whole nations. The contagion of radical economic 'structural adjustments' required to maintain the system has come at a cost. The citizens of developing countries have retrenched into a subsistence or coping life-style imbedded in an informal economy, maintained largely by women yet still articulated into the global economy.

Globalization in a networked world, to repeat, increases the instability of features or functional unities at the highest levels of the system. Work at the Braudel Centre at SUNY in Birmingham has identified five arenas of high-level instability in the world system (Wallerstein 1996: 239-243) which have been largely confirmed through Castells empirical work, and are summarized in Table 3.3.

**Table 3.3: World System Arenas of Instability and the paths of bifurcation**

| <b>Arena</b>   | <b>Old Features</b>                | <b>New Polarization</b>  |
|----------------|------------------------------------|--|
| groups         | state patriotism                   | Urban multi-cultural citizenship vs. ethnic purity   |
| internal order | police law and order               | Local justice vs. organized int'l crime  |
| external order | territorial military security      | Multilateral security over territory, economics, environment and human rights vs. global terrorism |
| social welfare | basis needs: health, food, housing | Equity vs. marginalization   |
| religion       | Patriarchy and universalistic      | Eco-feminism vs. Fundamentalism  |

The polarizations identified represent chaotic behaviours and not the features of a new organizational level or structural entity. The point here is not to discuss each of these arenas and the connections between the global economy and each bifurcation pathway. The point is only that there are critical and significant contextual changes being brought about by globalization. Canadian sustainability strategies that ignore these and have no explicit strategy for interfacing with them or capacity to respond and adapt to them are vulnerable to being buffeted about by exogenous upsets. This is no way to plan for sustainability.

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year, or between 1-2% of all species annually) is just as large, but quicker than preceding extinctions.

We have argued that the world revolution of 1968, completed in 1989, involved a process of irreversible shift in collective social psychology. It marked the end of the dream of modernity --- not the end of the search for its goals of human liberation and equality, but the end of the faith that the state within the capitalist world-economy could serve as the facilitator and guarantor of steady progress towards achieving these goals (Wallerstein 1997: 236)...To be sure, after systemic chaos will come some new order or orders. But here we must stop. It is not possible to discern what such a new order would be. It is only possible to assert what we would like it to be, and to struggle to make it so. (Wallerstein 1997: 243)

### **3.3 Glocalization**

In the last two decades numerous theorists have addressed the relation between the global and the local... Dominance is conceded to actors and forces operating internationally, and local actors resist, adapt, or acquiesce but not fundamentally alter global intrusions. The thrust of this diverse literature is to nest national and subnational scales of activity within an overarching global framework. (Beauregard 1995:232)

(T)he current death dance between identities, nations, and states, leaves, on the one hand, historically emptied nation-states, drifting on the high seas of global flows of power; on the other hand, fundamental identities, retrenched in their communities or mobilized toward the uncompromising capture of an embattled nation state; in between, the local state strives to rebuild legitimacy and instrumentality by navigating transnational networks and integrating local civil societies. (Castells 1997: 276)

In a global world the role of the state changes. It negotiates with transnational organizations to describe the generic global contours of functional interfaces for the conduct of business and human rights, resulting in a universalization of the rules of economic and social conduct, increasingly less responsive to national circumstances (Kirby and Marston 1995). And it establishes policy to redistribute wealth within the country without jeopardizing the competitiveness of the stronger regions, resulting in downward pressures on the minimal protections of the social safety net. As such, the powers of the state to negotiate on behalf of its citizens well-being are eroded in support of the global system and transferred both out and in: transnational organizations increasingly manage the globalized functional subsystems and cities are expected to harmonize social relations.

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Accordingly Dr. Leaky calls our era the 'Sixth Extinction'.

The local level is expected to fulfill one of two roles. Where the local has been articulated into the global economy, the local is called upon to provide the telecommunication network and informational production sites to advance and maintain competitiveness, to market the place as a site for business and as a destination for business and personal travel, and to address the social issues of globalization including multiculturalism, the demise of the patriarchal family and the rise of women's urban work, the pressures of labour mobility on housing, social services (especially education and public health), and the toll of urbanization on the local environment, especially the quality and health of air, water and land. "The strategic importance of the local as a managerial centre for the global in the new techno-economic system can be seen in three main fields: economic productivity and competitiveness, sociocultural integration and political representation and management" (Borja and Castells 1997: 3)

On the other hand, where the local has been excluded from the global, as in the case of sub-Saharan Africa and to a lesser extent the aboriginal cultures of the planet including the Arctic, the local level is expected to reconstruct society on the basis of self-reliance and a partial delinking of local or regional economies from the global accumulation networks in response to the asymmetry of the linkages. The challenges to this are several: previous linkages to the global system may have supported overpopulation relative to local carrying capacity, local elites may exact wealth and power through their connections to the legal or illegal global networks, local natural resources are often devalued through short-term excess supply to satisfy pressures to repay the interest on development loans, and human capital is devalued by the growing gap in knowledge and the collapse of supporting socio-cultural institutions following the deprivation of a material basis. In short, the local can rarely rise to this calling without political revolution, extreme instability, social bifurcation and experimentation, with the "collective experience of rage, conflict, struggle, hope, failure and compromise" (Castells 1998: 129). The Arctic may be an exception, however, since the safety net of relative political

stability afforded by the wealth of the Arctic eight and the growing consolidation of significant aboriginal populations provides the context for conscientious negotiation of a development alternative based in self-sufficiency.

The legacy of globalization is strewn with the debris of crushed and discarded cultures (Norberg-Hodge 1996). But there are also notable examples of places, cultures and nations that have filtered their articulation into the global society through their own structural characteristics. The economic reform of China is a dramatic case in point, where the nationalist agenda and the power of the Communist Party cadres in attracting and managing foreign direct investment through *guanxi* relationships with the off-shore Chinese community has coalesced into a network of municipal based bureaucratic capitalist enterprises (Lin 1997, Castells 1998: 287-307); a form of capitalism with socialist Chinese characters. But for the most part, these are local mediations of global influences, neither the resistance to nor the transformation of the global.

In terms of complexity it is important to understand that the local mega-urban place in a world which has become predominantly urbanized for the first time in history is not a resurgence of the city of the industrial or colonial past. The new 'local' is a new creation of the network of functional relations in the global system. The relation between the city and its hinterland, although still relevant as a secondary phenomena, does not help understand the city as a functional node within the network of global subsystem (primarily economic) connections. The transformative opportunity of the local is not related to its ability to resist globalization through entrenchment in old urban symbols of territorial integration whether of the bioregional or industrial revival form. Rather the transformative opportunity results from evolving new forms of social relations whose point of departure is the contradictions within globalization. Where new models of social life arise based on new techniques of science and distinction resulting from a direct encounter with the local, these become the unities

influencing the evolution of the encompassing world system, and a tenable force of transformation and evolution.

Cultural differences embody --- for better or for worse, this is relevant to the politics of research and intervention --- possibilities for transforming the politics of representation, that is, for transforming social life itself. Out of hybrid or minority cultural situations might emerge other ways of building economies, of dealing with basic needs, of coming together into social groups. The greatest political promise of minority cultures is their potential for resisting and subverting the axiomatics of capitalism and modernity in their hegemonic form. This is why cultural difference is one of the key political facts of our times....The defense of the local as a prerequisite to engaging with the global; the critique of the group's own situation, values, and practices as a way of clarifying and strengthening identity; the opposition to modernizing development; and the formulation of visions and concrete proposals in context of existing constraints, these seem to be the principal elements for the collective construction of alternatives. (Escobar 1995: 225-6)

For the most part, however, cultural minorities and local ecological knowledge are subsumed by the global with the acquiescence of local elites trading 'glocal' knowledge for personal power and wealth. Local leadership in directions other than global integration necessarily involves conscious risk-taking. Integration with the global is made on the assumption that the status quo can be expanded linearly and infinitely, and managed mechanically given sufficient knowledge and the compliance of all subsystems, that is it presumably entails less risk. From the standpoint of complex systems the opposite and counter intuitive is more likely to be true: radical experimentation in self-sufficiency at a lower organizational level is inherently less risky for the system as a whole, and simultaneously provides a context of greater stability and a capacity of greater resilience for the local.

### **3.4 Implications for the Arctic**

Government should abandon, once and for all, the idea that society's problems can be separated, categorized and ordered. The overall health and well-being of our people is intrinsically tied to the social, political and economic development of our communities. We can no longer afford to pay the price of dividing issues into manageable portfolios, programs and services. A holistic, integrated approach is necessary at every level and in relation to every issue or problem. (Pauktuutit, brief to the Royal Commission on Aboriginal Peoples, quoted in GNWT 1995:1)

The informational age has ushered in a global economy. Resource development is at the center of the Arctic's articulation into that economy. Oil from Alaska's North Shore, Norway's North Atlantic, Canada's Beaufort Sea, and the Russian north are the primary revenue earners. Tremendous non-fuel non-renewable resource reserves are available as well, but largely undeveloped due to the remoteness from markets, their relative inaccessibility and the inclement conditions surrounding their extraction. Yet in October 1998, BHP opened the first commercial North American diamond mine in the Northwest Territories (NWT), Canada, signaling that technology, resource scarcity and market demands are now making the development of these non-fuel resources viable. The extent to which these developments are global is well illustrated by BHP, an Australian transnational corporation, operating a fly-in resource camp with crews marshaled from Edmonton, Alberta, managed from Vancouver, B.C., and profits largely repatriated. Opportunities for northerners are related to expediting, and for northern aboriginals are limited to minimal training and on-site jobs.

To date, development is relatively insignificant in most Arctic circumstances. For instance, total exports from the NWT in 1996-97 were roughly equivalent to the Territorial government budget (approximately \$1billion) which itself represented the tax on roughly 40 times that export volume. The share of international markets relative to extra-Territorial markets in Canada is growing.<sup>69</sup> The

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<sup>69</sup> Interview with Garry Singer, GNWT/RWED. The leakage of profits from the NWT was a concern with the Berger Commission over the development of the McKenzie Valley Pipeline and the development of oil reserves in the Beaufort Sea. A 10-year moratorium on development was put in place to allow northerners to

same situation exists in the Russian Siberian Republic of Sakha, where international revenues from a favourable balance of trade in diamonds, gold, coal and oil (Lishenyuk 1994:40-1), and those projected from a natural gas pipeline to South Korea,<sup>70</sup> are the basis for its relative political and economic autonomy from Moscow.

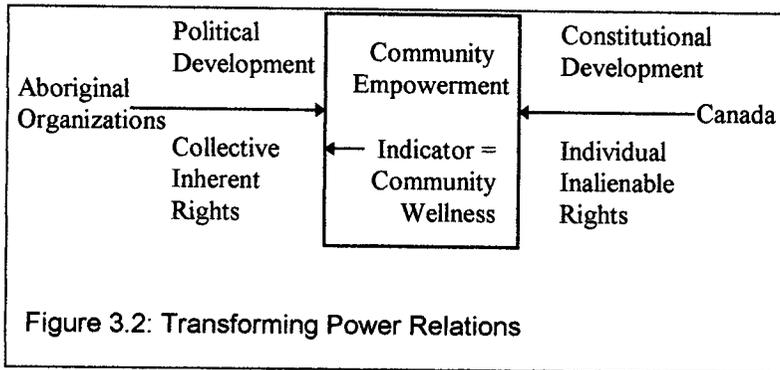
The growing Arctic concern about resource sustainability, however has not been generated so much by the international dialogue on sustainability, but by attempts to secure a material base for the traditional subsistence life-style of the aboriginal populations. Co-management resource boards have become entrenched in aboriginal land claims in the Canadian Arctic (ex. Nunavut Act 1993), forcing a consideration of local ecological knowledge about the impact of environmental changes on renewable resource harvesting (ex. Nunavut Wildlife Management Board, Tungavik and DIAND 1993, Article 5), and about the environmental impact of non-renewable resource development (ex. Nunavut Impact Review Board, Tungavik and DIAND, Article 12), without prejudice, however, to the Federal Government's primary responsibility for and control over revenues from renewable resources, minerals and energy. The challenge is for these co-management organizations to become instruments that increase systemic resilience. This will require that resource depletion is defined not only within limits determined by a local ecosystem health approach to resource yields, but within a global ecosystem health approach that recognizes the total contribution to global ecological instability caused by the resource end use. Otherwise, there is the real danger that these boards might simply develop resources to promote the personal wealth and power of the leadership as happened in the Inuvialuit Regional Corporation in the early 1990's.

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build an indigenous capacity to control development and benefit from it. The benefits from the new BHP mine probably show little change from those of Gulf and Shell nearly two-decades ago. But the trends in the articulation of the NWT into the global economy is the subject for another research project.

<sup>70</sup> Personal discussions with Yuri Busalae, Director General of Sakhavneshtroy, the State Organization for international construction purchases and project management.

An even more promising avenue for social transformation is the confluence of the NWT community



empowerment initiatives and the  
 Canadian aboriginal self-  
 government negotiations.  
 Community empowerment  
 promotes constitutional  
development through the

delegation of public government authorities and responsibilities, where aboriginal self-government promotes political development through the devolution of decision-making powers (Dacks 1990). Together the two provide an opportunity for the invention of new power relations negotiated between a government based on the liberal tradition of *inalienable rights of the individual* and the aboriginal tradition of *inherent rights of collectivities* (see Figure 3.2). This unusual opportunity to renegotiate relations of power comes through the direct encounter with a growing awareness of contemporary antinomies. But unless it is done in the larger context of globalization it will lead to the tragic animation of cultural cartoons, parodies of living, evolving cultures.

## **CHAPTER 4: The Outcomes, Next Steps and Policy Implications**

### ***4.1 The London Senior Arctic Officials (SAOs) Meetings***

During the week of August 17, 1998 the SAOs met in London to finalize the report to the Arctic Council Ministers. One item on the agenda was selecting which of the ten sustainable development proposals would be recommended to the Ministers for funding and completion.

Consistently, the Americans had insisted that conceptual discussions of 'sustainable development' were not legitimate since a procedural framework was specified by the "Declaration" and the "Terms of Reference for Sustainable Development". Beyond that, what sustainable development meant would be evidenced by the proposals advanced by each delegation (even if the picture was fragmented and unintelligible). The advantage of the approach, they argued, was that people would vote for projects with fiscal contributions where there was sufficient overlap between national agendas and definitions of sustainable development to support joint initiatives. Overall agreement on a conceptual framework for sustainable development was therefore unnecessary, avoiding the likely huge investments of time and energy required to achieve an eight-nation consensus on an integrated vision. The pragmatic American approach would allow action on something, reinforcing the legitimacy of the Arctic Council, without requiring any modifications of national agendas or policy on sustainable development. As such, the U.S. SAO, Ray Arnaudo, rejected any proposals which included the need to define sustainable development. The Canadian proposal on Children and Youth included educational materials on sustainable development, and was therefore unacceptable. The Canadian proposal on the Whitehorse Conference was explicitly related to the determination of a conceptual framework, and therefore unacceptable. The ICC proposal asking for a comparative analysis of member nation domestic policies invited discussion of the similarities, differences and relative merits of different approaches, and again was unacceptable. On the other hand, the three US proposals (eco-

tourism, tele-medicine and sanitation) did not require a philosophical discussion, clearly benefited northerners and therefore should not raise any objections except from those who could demonstrate to their own constituents that they had no need for any of these. Canada, Iceland, Finland, and the ICC were frustrated in that the lack of a framework allowed projects to be supported which may have had short-term social benefits, yet divergent outcomes relative to different frameworks concerning sustainability.

The second long-term agenda for the Americans had been the desire to subject each of the former AEPS working groups (AMAP, PAME, CAFF, EPPR) to biennial review to ensure that their mandates were consciously extended, rather than structurally assured. It appeared that they objected to an international bureaucratic and scientific organization developing operational legitimacy that might influence American policy; that is, they didn't want to consciously create an organization which they might have to argue with. Since the Nordic membership had seen this as a way of killing the working groups and the environmental protection thrust of the AEPS, this move had been blocked. But the provision within the "Rules of Procedure" to renegotiate the funding for each working group provided a mechanism for the US to cripple the operation of a working group(s) while retaining an empty shell on paper. When the US showed up at the London meeting with an unexpected proposal to create a working group of SAOs to complete acceptable proposals for final Ministerial approval, there was concern about possible ulterior US motives:

- This new SAO working group might demonstrate an alternative political management structure to the bureaucratic working group structures which in turn could be used to question the cost of the AEPS working groups. For the remaining members this might lead to the loss of this scientific contribution to knowledge about developmental impacts on the circumpolar north and undermine continuity in the tangible work of the Arctic Council.
- The creation of the SAO working group would mean that no sustainable development projects would be adopted by the Ministers in Iqaluit leaving environmental protection and the work of the

AEPS working groups as the only work on the table for the next two years. Since policy implications of the AEPS work was reactive, this strategy would push any policy regarding new northern development off the table.

One suggestion was that Canada support the American proposal for a SAO management team but impose a 6-month time frame for the SAO's to return to the Ministers. On the positive side this would elevate political accountability to the SAOs for bringing about outcomes in the sustainable development program, but on the other hand it would simultaneously force Canada to develop a clear national strategy about sustainable development which its SAO could argue on behalf of Canada.

The bottom line for Canada was to at least retain the Arctic Council structure. Should Canada eventually come to understand the international context it needed to implement its own sustainable development agenda, it would then have a forum for presenting that vision and the supporting rationale. Preserving the structure was more important than achieving results in the short run. That meant that Canada took a conciliatory approach.

#### ***4.2 Last minute changes?***

Canada learned in London that without revisions to its proposals it would probably not get support from the US Arctic Council Minister. But that still left Canada with several options to advance its proposals based on the rule that a project could go forward if more than one member supported it and no-one objected:

- Withdraw its proposals and forego a face-off with the US  
Revise the proposals only enough to remove US objections and then persuade other countries to support the new proposals, hopefully with endorsement from representative permanent participants and observers
- Revise the proposals enough to achieve full consensus including US endorsement

Unfortunately, the key Canadian actors appeared to have little time for lobbying support for existing or revised proposals in advance of the Ministerial. In this situation, the safest move would probably be to drop Canadian concerns about a unifying framework and ensure that momentum was built up behind the process of trust-building and shared action. But there was also a nagging concern that the US would repeat its pattern for meeting appearances: the US regularly showed up with an unexpected proposal for consideration by the group at hand, the proposal regarding an SAO working group on sustainable development being the most recent. Canada might consider raising the ante, having a clearer sense of the desires of the group for a pragmatic proposal with short-term outcomes for northerners that simultaneously clarified a vision about 'sustainable development' without having to debate its meaning. Even if it didn't get approved, a clear and well-presented new project would demonstrate Canada's honest determination to advance the substantive agenda in front of the others at the table, and might help frame the dimensions of the needed debate.

A new project was proposed within the Canadian delegation to engage communities across the Arctic in defining sustainability indicators that would allow local governments to assess changes in the biophysical and socio-economic health of their own communities, interpret the meaning of those changes, identify actions within their power and sphere of influence that would improve those indicators or augment innovative adaptability, and provide a constituency with the basis for negotiating with superior jurisdictions for assistance in implementing actions beyond the capability and capacity of local governments (see Appendix 9).<sup>71</sup> Similar exercises, done under titles using 'sustainable/healthy cities/communities' had already been done across the US, southern Canada, and Europe,<sup>72</sup> but seldom in Arctic Communities. Similar to the US tele-medicine, eco-tourism and sanitation projects, it was a continuation of what was already being done within national governments.

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<sup>71</sup>The proposal was prepared by the author, provided to Canada's SAO, and advanced to EC and DIAND for review.

<sup>72</sup>Hart 1997, Puget Sound Sustainable Community Round Table 1997, Sustainable Seattle 1995, are examples.

In sympathy with both Canadian proposals, it could actively accommodate youth in all phases of indicator selection and constructive policy design and implementation, and allow communities to prioritize the Whitehorse recommendations within a coherent political agenda. In sympathy with the ICC framework proposal and the Finnish non-paper, it would facilitate comparisons on governance and provide practical working evidence of sustainability philosophies and criteria, without a high-level discussion in advance. Finally, in sympathy with the Sami proposals, it would identify specific resource management and community economic development priorities for each community. Most importantly, it would engage all northern communities in capacity building for self-reliance and the assumption of individual and collective responsibility for action. It would require a technical support and facilitation team representative of all participating members to facilitate shared experience and rapid learning and feedback to the SAO working group for guidance and marshaling national support including research, administration, material resources, or legislative response. It would promote the functional self-awareness and transformation of a functional subsystem increasing evolutionary resilience of the global economic system. Canada, however, did not advance the synthetic proposal.

### **4.3 *The Iqaluit Ministerial, September 17-18, 1998***

For the three days preceding the Ministerial meetings, the SAOs met in Iqaluit to finalize the SAOs' report and the draft declaration. The spirit of the meetings was extremely conservative. Regarding the sustainable development program, there was consensus around only the following:

- few specific projects would be endorsed by the Ministers, conditional on SAO resolution of details regarding cost and coordination,
- SAOs would form a working committee to develop priorities, garner funds from their own jurisdictions, and proceed with the most 'fundable' projects,
- there would be no concrete measurable goals for the upcoming Ministerial to be held by the USA (probably in Alaska) in the year 2000.

The structure of the Ministerial meetings themselves were not conducive to discussion. The afternoon of Thursday, September 17 was open to the public and held in the Iqaluit high school gym. The session was comprised of prepared statements from the delegates. The following morning closed session was held in the parish hall, but this again was comprised of formal statements. Discussion of current issues did not take place on either outstanding procedural or substantive issues, although there were several that deserved attention:

- Financing for participation of permanent (aboriginal) participants continues to be uncertain. Their participation in both SAO and Ministerial meetings is subject to ad hoc strictly voluntary contributions by member states when individual participants have not generated sufficient funds from other sources. This lack of funding has dampened participants enthusiasm for the unprecedented opportunity to influence an international regime. The U.S. has not yielded to pressure to address this issue.
- The utility of a permanent secretariat needed further discussion. Although the bureaucracy associated with many international regimes has been non-existent due to the fact that the contractual obligations have been conducive to self-policing or monitoring by third parties, the secretariat could provide more than clerical and logistical services to the SAOs and Ministers by:
  - providing a clearinghouse of information on the Arctic;
  - retaining a current database on the status of arctic initiatives engaged by all organizations;
  - providing a reliable web-site.
- The financial Asian Flu had already spread to Russia with expectations of a serious financial meltdown pending in Brazil. Through the IMF, developed countries could expect requests for major additional capital infusions to stabilize the situation. The continued reliance on the neo-classical economic strategies for prosperity through economic growth and the free flow of goods, services and finance should have been questioned. Ultimately, the solution for an intricately networked and instantaneously responsive global economy lies in sustainable economic development. Given the mandate of the Arctic Council, there was a timely opportunity to explore options and alternatives for sustainable development, increased economic stability and sufficiency in a circumpolar regional context in preparation, at least, for the upcoming meetings of the G7 nations and Bretton Woods institutions. This did not happen.

In an apparently unexpected move, the Minister of Foreign Affairs tabled "Toward a Northern Foreign Policy for Canada" (DFAIT 1998b) which was a shortened, but substantively unaltered version of John M. Lamb's "Policy Framework for Canada's Northern Foreign Policy". In the foreword the Minister indicated that "by articulating well-defined national interests in a northern foreign policy, Canada will be in a stronger position in working with its Arctic neighbours. Canada's new northern foreign policy will be recognized as emanating from an agreed set of national objectives that are there for all to see." The document identified no national objectives that required any new initiatives within the context of the Arctic Council (if all the sustainable development projects proposed had been accepted). As discussed in Chapters 1 and 3, the document has no explicit theoretical base, and provides no critical analysis of the exogenous forces of economic globalization and identity construction which fundamentally constrain the possibility landscape of national agendas. Recognizing that the northern renewable resource sectors, for instance, "face significant challenges relating to distance from markets, vulnerability to environmental threats, and exposure to extra-regional market and political forces" (Ibid.: 5) the document only observes that "(t)hese are forcing northern communities...to get better organized politically, and to become more business-oriented, better educated and more connected with the outside world" (op.cit.). National foreign policy objectives were directed towards buffering these forces or assisting in improving northerners capacity to participate --- primarily in the area of environmental impact mitigation, strengthening the northern capacity to participate in circumpolar trade (training, transportation, communication, access to finance, social welfare equity), and the enhancement of democratic institutions and community identity. All of them assume a linear development of the global systems where the replication of key variables such as institutions and access to global networks will be sufficient to bestow similar advantages to new participants without any structural change to the system. The utility of tabling this document was questionable regardless of how comprehensive or insightful it might have been. At best, the document could only strengthen articulation of differences between nations, where what was clearly needed was the development of a

shared problem or a shared vision to stimulate resolve and guide action, providing a basis for integrative negotiations. This may have been a case where transparency could have become divisive, save for the fact that there was no discussion of it and it was completely innocuous and unprovocative at any rate. At best, its distribution was a waste of time, at worst it demoted expectations about the relevance of future Canadian contributions.

The Ministerial was scheduled over a 24-hour visit, so logistical effectiveness was important to the facilitation of any discussion. As it happened, Friday's closed sessions were cut short due to rescheduling the charter for delegates back to Montreal to suit Minister Axworthy's travel plans. There were confusions over the guest list which, for instance, omitted the presentation by the UNEP delegate from Nairobi who was also not granted admission to the Thursday night formal banquet for delegates due to Canada's inability to correct the error. For such a short meeting, confusions like this can be inordinately distracting.

On the other hand, delegates may have understood that there was little short-term political utility in increasing their efforts. The *Globe and Mail*, Canada's national newspaper, carried a one-line announcement that the meetings were being hosted on the day preceding the event and then carried no further coverage. The CBC television news carried a similar announcement. The local *Nunatsiaq News* carried a number of articles including an editorial on September 17, all of which expressed disappointment in the Council's slow start in defining the implications of transboundary pollution for human health and the consumption of country food, in its inability to agree on an operable definition for 'sustainable development', in its failure to assure the Permanent Participants that aboriginal participation really means anything, or in their failure to agree to any new action plans regarding the AMAP analysis of global pollution and climate change which had already shown that the Arctic is following a "detailed map of the road to hell" (Lars-Otto Reiersen, AMAP secretary quoted in the

*Nunatsiaq News*, Nunavut Edition, 98.09.24). But the articles recognized as well that those who “criticize the fledgling international organization for being slow to achieve anything concrete should be mindful that it’s very existence is something of a miracle [given its impossibility during the Cold War]” (*Nunatsiaq News*, Nunavut Edition, 98.09.17).

It is worth asking why the Arctic Council failed to make more progress, however, and whether it is likely to make any progress in the future. Oran R. Young, an analyst of international organizations with a long-term interest in polar politics has, with a number of colleagues, made some observations about the elements of successful international regimes which have arisen in response to the governance of the international commons. There are three options to governance<sup>73</sup> in areas of globalizing functions and their impacts at the planetary scale of the ecosystem:

1. enclosure through the extension of national jurisdiction;
2. creation of supranational or world government; or
3. introduction of codes of conduct analogous to common property arrangements in small-scale stateless societies or “governance without government”,

His specific interest is in the latter, called regimes, defined as “social institutions that consist of agreed-upon principles, norms, rules, decision-making procedures, and programs that govern the interactions of actors in specific issue areas” (1997c: 5-6) where the institution and its members are mutually constitutive: “participation in social institutions can affect how members frame their interests and understand their identities, even though their distinct identities were established prior to participation” (1997b: 276). Although generally formed for mixed purposes, regimes are primarily interested in specific problems, rather than means to “provide systems of public order for geographically or socially defined areas” (op.cit.: 279) and can be characterized as (Ibid.: 278):

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<sup>73</sup> Young, after Douglass C. North defines governance as “the establishment and operation of social institutions--in other words, sets of rules, decision-making procedures, and programmatic activities that serve to define social practices and to guide the interactions of those participating in these practices” (1997c:4).

1. regulative; focused on behavioural prescriptions;
2. procedural; focused on how to arrive at collective choices;
3. programmatic; focused on collaborative projects; or
4. generative; focused on new ways of thinking about issues and problems.

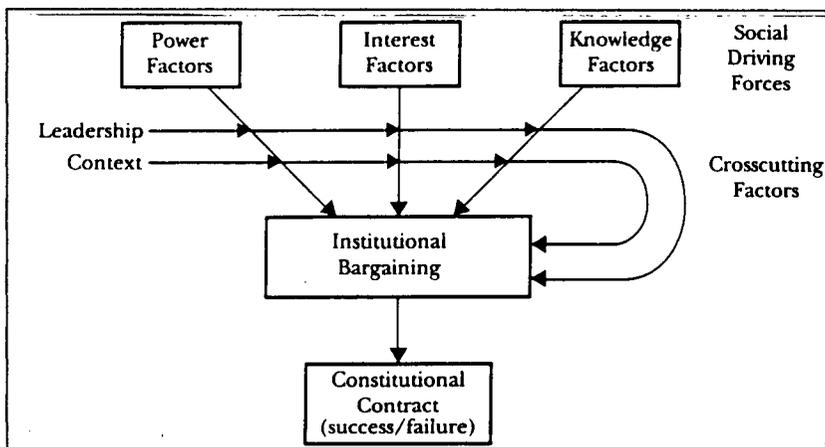
Functionally, regimes are “1) utility modifiers, 2) enhancers of cooperation, 3) bestowers of authority, 4) learning facilitators, 5) role definers, and 6) agents of internal realignments,” (1997c:15) the balance determined by the nature of the issues that bind them together and the differences in the actors interests. The actors may be principally states (as in the GATT and WTO, the Antarctic Treaty System and the ozone regime consisting of the 1985 Vienna Convention, the 1987 Montreal Protocol, the 1990 London amendment and the 1992 Copenhagen amendment), or non-state actors (as in the International Air Transport Association), but increasingly a combination of the two, as in the Arctic Council. Regimes can arise spontaneously to codify customary relations, be imposed by a dominant hegemon, or negotiated through distributional and integrational tactics depending on the benefits and costs of the issue (Ibid.:10-11), where the Arctic Council clearly falls into the later formation category. Regimes are particularly useful in demonstrating solutions which can be applied in other similar circumstances or to other issues, in defining new cognitive approaches to thinking about problems, and in establishing social practices that alter the distribution of power (op.cit.).

Regimes are horizontal networks which provide order in the relationships developed through the global articulation of functional subsystems, which although having no direct impact on the evolution of the societal superstructure, do potentially accelerate the evolution of the subsystem. Although the systemic ramifications are of no concern to Young, the regime’s amplification of a simplified and narrowly defined self-image of a functional subsystem creates positive feedbacks which, as discussed in Chapter 2, further destabilize the subsystem, accelerate its evolution as a unity, and provide feedbacks to the encompassing system which lead to an increasingly certain evolution of the

superstructure toward unpredictable futures. Young's thesis is, in fact, that the success of international regimes depends on the context or "the presence of a vibrant international society or some sort of global civil society" (Ibid.:22).<sup>74</sup> 'Global civil society' is an overly simple concept; an abstraction conjured by influential elites far removed from the concrete experience of social identities such as aboriginal or special interest groups whose understanding of the meaning of the specific events of interdependence, although converging, is still not overlapping. He admits that regime success may "depend on embedding specific arrangements in larger institutional structures rather than treating those arrangements as stand-alone institutions" (op.cit.) but then is preoccupied with defining the conditions for effectiveness at the regime level, with no further concern for the plausible ramifications at the contextual level. Nonetheless, his observations are useful in understanding the current inertia of the Arctic Council.

Regime success resolves around both output and process criteria: first, the economic efficiency,

political equity and ecological sustainability of the problem resolutions, and second, the management of the process of issue definition and exploration toward coherent common action. Recognizing that the more intractable global problems



**Figure 4.1: Multivariate model of regime formation**

(Source: Young & Osherenko 1993:247)

<sup>74</sup> Young, along with Wapner and Lipschutz, intends *global civil society* to be understood as a parallel social system to the state-centric perspective that includes interest groups, professional associations, and corporations that "operate above the level of the individual but below or apart from the level of the state" (1997b:281). Recognizing that the term is ambiguous, the causes of legitimacy and the assumptions of power associated with it are not analyzed. Whether global civil society is nested within state centric society or apart from it are significant, but both included in the definition. Factors influencing the success of regimes are investigated without further elaboration of this issue, and must be understood within this limitation.

require changes of social institutions and property rights within state jurisdictions, the effectiveness of regimes is in the introduction of institutional innovation at the level of specific problems that are diffused through international society (Young 1997b: 294). This is consistent with our analysis of complex systems, with the distinction that the functional identity of subsystems in global society is not recognized in Young's analysis. Based on an analysis of the North Pacific Fur Seal Regime, the jurisdiction over the Svalbard Archipelago, the Polar Bear regime, the stratospheric Ozone regime, and the failure of the Arctic Haze regime in contrast to the success of the recent Long Range Transboundary Air Pollution regime (passed June 1998), a study by Young and Gail Osherenko (1993) revealed the following tendencies in the political formation of broadly successful consensually negotiated regimes, organized around the three social driving forces of power, interest and knowledge, and the cross-cutting factors of context and leadership (see Figure 4.1):

- A faulty understanding of the problem will not be corrected through the process of institutional operation. On the other hand, regimes are formed around issues that are incompletely understood, and often framed in conventional terms. The process of negotiation and bargaining then is critical to issue entrepreneurship and the selection of members.
- The exercise of hegemonic power is ambiguous in regime formation, serving equally to forge unions and to polarize positions. The distribution of power around interests, however, are important in the progress of negotiations, evidenced by the change of US position toward ozone-depleting CFCs after Du Pont broke ranks with industry in 1986 prior to the Montreal Protocol. A 'middle power', however, can broker power exchanges as it did in the creation of the polar bear regime and in the creation of the Arctic Council. Timing is critical and must recognize the life cycle of issue incubation (P. Alain Martin, President, Professional Development Inst., interview).
- A preponderance of integrative (a search for common behaviours) over distributional (apportioning the costs of remediation or prevention) negotiating objectives is required. Expanding the contract zone (the geographic area of impact) and thickening the veil of uncertainty (the interconnection and distribution of causes and effects) will accentuate integrative over distributive solutions. Thinning the veil of uncertainty may make the benefits clearer, but in

solidifying the cost will simultaneously limit or delay participation. Therefore, it is best to cement integration around issues of integrative principle, allowing the distributional divisiveness of implementation to follow through the operational phases of a functioning regime. The fact that negotiations seldom engage a fully specified and mutually understood description of the issues, their contract domains, or their durations, and the fact that the actors expect it will take some time to learn of the costs and benefits flowing from the welfare implications of altered social behaviours and institutions, each of these in initial conditions automatically softens the divisiveness of distributive positions at the outset of regimes.

- Cognitive reconceptions of the problem that overcome impasses<sup>75</sup> signal that existing institutions based on previous cognitive frameworks may not be adequate and that the regime is capable of producing plausible alternatives.
- Individual leadership is critical and takes several forms that often overlap within key people: structural (related to the power of the organization they represent to promote or impede action), entrepreneurial (conceptual and organizational innovation, diplomacy, value conflict resolutions) and intellectual (substantive knowledge of the facts). Only entrepreneurial leadership appears essential. Intellectual leadership is more significant in raising or supporting awareness of issues that become grist for advocacy groups and the media in developing a critical mass of support. Intellectual leadership has little role during institutional bargaining.
- Equitable solutions take priority over efficiency. Salient solutions to problems (simple uncomplicated behavioural rules that are easily convertible to media sound bites and policy), the availability of minimally intrusive compliance mechanisms/technologies) improve the chances of agreements.
- Changes in context open windows of opportunity to promote regimes around new problems, solutions and cognitions. Typically these take the form of surprise events signaling crisis. The discovery of the ozone hole jump-started the stalled 1985 Vienna Convention resulting in rapid resolution of the 1987 Montreal Protocol. Being prepared to take advantage of them is critical to leadership. The reason is that the event, disseminated through the media, can create the critical

mass of interest-based support required to enforce expectations for the creation of an accountable institution.

- The shared conception of the common good must at least accommodate, if not enhance partisan interests. The issues of the regime need not be high on the agendas of all key actors. In fact the give and take of negotiations are substantially facilitated when the issue has not risen to the top of all members' agenda. The phased inclusion of additional members to create regimes that carry the endorsement of universally recognized proponents of specific issues can be very expeditious.
- Negotiated regime formation, due to the cross-cutting relationships forged by leadership and context, are non-linear processes that follow chaotic trajectories. This requires flexibility and adaptiveness or an impasse will quickly stall progress.
- Interpreting this in Luhmann's language (see Chapter 2) critical self-observation is required to discern the changing relations between power, interest and knowledge.

Clearly, the Arctic Council is not typical of international regimes. Its focus, although beginning with the narrow mandate of the AEPS to determine the state of the arctic environment as a result of anthropogenic influences, has moved to capture sustainable development which invariably impacts much broader concerns of social behaviour and values. It is worth examining the formation of the Arctic Council in light of the above observations, however, to see where its base may be shaky, and where further work needs to be done should it have a durable and effective future.

Structural leadership was critical in the development of precursors to the Arctic Council. Soviet General Secretary Mikhail Gorbachev's October 1987 speech in Murmansk proposed regional cooperation on an Arctic "zone of peace" which included cooperation on resource development, science coordination and a comprehensive environmental protection plan. This provided a climate of

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<sup>75</sup> The CFC protocols progressed in part through relating ozone integrity to global climate change. Previous requests to reduce CFC production (the status quo) because there was a hole in the ozone had been an inadequate conceptualization.

East-West reconciliation following the Reagan years of the 'evil empire' creating conditions conducive to the consummation of the International Arctic Science Committee and the Rovaniemi process leading to the AEPS. Similarly the 1979 LRTAP framework treaty grew out of Soviet General Secretary Leonid Brezhnev's follow-up proposal to the 1975 Helsinki Accord of the Conference on Security and Cooperation in Europe (CSCE). Although the Soviet intervention in Afghanistan began only 6-weeks later, the LRTAP convention continued to evolve through negotiated reductions on sulfur emissions because it left at least one venue for continuing East-West discussions to ease tensions in an area that had a relatively small political charge. These events demonstrated the importance of the structural leadership that underpinned these regimes (Soroos 1993:218-20). The Arctic Council, initiated by Brian Mulroney in 1989 gained momentum following the February 1995 meeting between Prime Minister Jean Chretien and US President Bill Clinton (Young 1997a: 54). For Mulroney as structural head of Canada, and for Chretien with a long-term personal interest in the Arctic, the initiative combined Canada's long-term brokerage role between the two super-powers with the new opportunity resulting from the collapse of the USSR. Had Canada failed to claim the initiative early, it would have been occluded by the need for the US to engage Russia in the G7 to deal with its economic reconstruction. If the relation between the Arctic states had been built on this kind of US initiative, it would have resulted in a more narrowly defined 'structural adjustment' forum (rather than a sustainable development mandate) with completely different actors. In this case, Canada's initiative was the 'butterfly effect' in the emergence of a particular form of regime.

Cited as "the cutting edge of the general reawakening of interest in regionalism --- in contrast to globalism --- in world affairs" (op.cit.), the evolution of this soft-law agreement has lacked the entrepreneurial leadership to articulate clear issues or visions for a regime that potentially transcends the normal functional issues and problems. Although it was formed in the first instance to provide a forum to discuss and coordinate political action on the scientific insights that would eventually

congeal around the work of the AEPS, the new regime came into existence without distinguishing regulative, procedural, programmatic or generative mandates. Infighting between the secretariat and the Canadian Chair stifled any progress on this until a new Executive Director, Walter Slipchenko, was installed half-way into Canada's mandate. Only then, nearly 16 months after the Arctic Council was established, were procedural rules put in place for the conduct of the Council and its sustainable development program. Elevating the sustainable development 'pillar' from its original equality with the environmental protection 'pillar' to the position of 'overriding objective' was declared as an entrepreneurial initiative of the outgoing Ministers of the old AEPS agreement at Alta in 1997 and has been acknowledged only grudgingly by the Arctic Council regime. Mary Simon played the roles of both Chairperson of the Council while Canada hosted the Secretariat and Senior Arctic Official for Canada during the initial year of the Council. She was seen to represent partisan objectives that had been imported from her previous roles as President of the Inuit Circumpolar Conference (1986-92), Commissioner of the Nunavut Implementation Commission (1992-94) and author of a 1997 book entitled "Inuit -- One Arctic -- One Future". This display of dominance over the Council's agenda had to be downplayed to retain commitment from the other participants and especially the state Members. Canada provided another SAO, Jim Moore, ADM of DIAND, allowing Simon an opportunity to relax from parlaying positions to one of encouraging participation. This was probably a mistake. As an SAO, Simon's intensity around legitimate Inuit concerns about environmental poisoning and economic exclusion could have provided the emotional 'harpoon-head' to lead a well-orchestrated suite of supportable problems and cognitive reconceptualizations. But relinquishing the position of structural power in the Chair to a more facilitative person did not happen and Simon's entrepreneurial talents were squandered.

The sustainable development projects were of two types, those looking for reconceptualizations of key issues (ex. the ICC proposal to look at economic rents from non-renewable resources as a means to

promote long-term sustainability) and off-the shelf solutions and current initiatives emanating from status quo conceptualizations that could achieve efficiency gains through joint-ventures (e.g. tele-medicine, eco-tourism). The Americans have been steadfast in supporting only those pragmatic initiatives that make immediate improvements to northern lives, and have resisted any attempts to provide conceptual coherence or reconceptualization of SD. They have reinforced this stance by 1) maintaining a separation between the sustainable development and environmental protection pillars, 2) supporting the Nordic countries leadership in environmental protection AEPS initiatives to isolate the Canadian promotion of sustainable development<sup>76</sup> and 3) selecting projects on the simple basis of which can attract adequate financial support (from Members, Permanent Participants, Official Observers or the private sector) without encountering opposition from the Members (“US officials promise pragmatic approach to Arctic Council”, *Nunatsiaq News*, Nunavut Edition, 98.09.17). This apparently popular stance that “makes the Arctic Council more visible and relevant in the eyes of the public” (“Editorial: The Arctic Council”, *Nunatsiaq News* Nunavut Edition, 98.09.17), coupled with the official US exclusion of military issues<sup>77</sup>, and the tacit US exclusion of trade issues makes the institution quite conservative. Although the US suggests that further debate on substantive issues will not be nearly as productive as on-the-ground demonstrations, it is also hard to imagine that the thinking that produced the problem will also overcome it.

The Arctic Council, so far, can only promote the legitimacy of the status quo<sup>78</sup>, even though a forum that identifies opportunities for bi- and multi-lateral agreements on projects is useful, and probably worth preserving just to maintain easy access to information throughout the Arctic, and a quickened response to emergencies. On the other hand, the Arctic holds many opportunities for bold

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<sup>76</sup> from discussions with Secretariat officials

<sup>77</sup> This is specific in a footnote of the Declaration on the Establishment of the Arctic Council.

<sup>78</sup> On October 7, 1998, Canada was selected as a non-permanent member to the UN Security Council, a triumph for Minister Axworthy. The reason for Canada's selection, according to a CBC news item, was that Foreign Affairs had supported the need to liberalize trade instead of pushing concerns over human rights in its

experimentation: the continuity of climatic features, the preponderance of aboriginal peoples, the small number of nations involved, the broad cross sections of political ideologies of the membership, the strong and unparalleled political, economic and ecological interdependencies between the Arctic's relative poor and the developed mid-latitude countries. Despite this, the Arctic Council will not take a leadership role in regionalism or sustainable development without the emergence of a champion that can bring clarity to the Arctic problems, the nexus of causes, and their possible trajectories, and exercise the level of diplomacy to build a critical mass among delegates and advocacy groups to attract political attention and the demand for accountable action. The alternative trigger to an effective Council is another surprise event --- like Chernobyl --- whose consequences would be felt as dramatically in the south as in the Arctic. On the other hand this kind of trigger may not provide much time for innovation.

The lack of functional specificity is both the strength and weakness of the Council, and the reason leadership is so critical. The issue of sustainable development itself may "ultimately prove to be a *cul de sac* in the sense that it fails to provide workable criteria for making decisions about human/environment relations" (Young 1997a: 58) when what is needed is a generative vision "that serves to integrate its components into a coherent package and to structure the discourse in terms of which participants discuss its operation" (Ibid:57). In most international regimes built around a single problem or issue (polar bears, atmospheric pollution, Porcupine caribou, ozone, greenhouse gases), the form of the organization and its membership are tailored to the specifics of the function at hand. One obvious function of the Arctic Council is the coordination of existing and new efforts to overcome duplication and gaps in research or action, but this function is inadequate because it requires neither political guidance or political action to implement new institutions of social behaviour.

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organization of the APEC conference. This form of conservatism seems to reverberate throughout Canada's participation in international fora.

Despite its broad functional scope, and probably because of it, the Arctic Council still needs some clear straight-forward, supportable tasks that capture the public's attention and around which to structure its organization (Young 1998: 59-61). Over the years, organizations with an Arctic interest have been notoriously ignorant of northern residents, with the conservationist policies of the International Whaling Commission and the EC's ban on furs being just two examples of where non-consumption preservationist approaches to renewable resources have literally become matters of life and death for northern peoples. Young suggests that if the focus really is "to foster the development of sustainable communities in high northern latitudes" (Ibid.:61), a two-tier system similar to the Barents Euro-Arctic arrangement may help. The Barents Council comprised of states is complemented by a subsidiary Regional Council made up of county and oblast governments, each level having formal responsibilities. The determination of organizational form would be possible, however, only after issues of subsidiarity were resolved by defining the responsibilities and degrees of freedom of lesser jurisdictions, and the encompassing constraints on development. This would be a leadership task for the Council. In this regard, following the recommendation of the Finnish 'non-paper' to establish a Commission on Arctic Governance would reveal the different structures of authority, administration and delegation in Arctic States, and the degree to which these structural evolutions were convergent or divergent. An understanding of the limits of national governments to orchestrate adaptive behaviour to ecosystem changes would require an understanding of dynamic systems, and agreements between nations about the allowable regional scale of ecosystem appropriation relative to the global economic system. Canada's co-management schemes for renewable resources, entrenched in its northern land-claim agreements, have taken steps in this direction; steps which are not welcome in Nordic nations. A simple plotting of the ecological footprint of Northerners in each state and region relative to their nations and the global fair-share might go a long way to clarifying a sustainability task (reducing community footprints to the global fair share while improving indicators

of individual and community 'wellness') that could shape the organization and its membership. Without some vision that takes the Arctic forward, the Council will flounder or be sustained as a token enterprise, and discussions about more responsible roles for aboriginal participants or a permanent secretariat will be unfounded.

#### **4.4 The next two years**

If we fail to dare, if we do not try, the next generation will harvest the fruits of our indifference, a world we did not want --- a world we did not choose --- but a world we could have made better, by caring more for the results of our labors. Senator Robert Kennedy (quoted in UNED and Dodds 1997: xiv)

Five years after Rio, poverty had increased, environmental degradation persisted and northern government had failed to honour their financial commitments to developing countries<sup>79</sup> (Speth 1997:xii). For some, the greatest frustration has been that the implicit equality between environmental sustainability (the developed countries' agenda) and social justice (the undeveloped countries' agenda) underpinning the practice of sustainable development has been reduced to 'environmental protection' signaling a "*cumulative* loss of momentum" on their integration. (Porritt 1997: xvii-xviii). In support of this frustration, the 'ecological footprint' (Wackernagel & Rees 1996) graphically demonstrates that the 'environmental protection' stance is increasing the appropriation of the planet's natural capital by the world's developed countries at the expense of the underdeveloped (Töpfer 1997: 239-40). In this sense, the circumpolar world is subsidizing the continued expansion in the material wealth of the mid-latitudes and is the sacrificial lamb even of their own nation-states. The insistence (principally by the US and Norway) on a primarily environmental protection agenda for the Arctic Council allows the continued appropriation of arctic environmental source and sink resources for mid-latitude consumption while containing local environmental impact in the short term at the expense of the

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<sup>79</sup> Between 1992 and 1997, aid dropped from \$65 billion to \$55 billion. In 1960, the wealthiest 20% of the world's population were 30- times better off than the poorest 20%, but 61-times wealthier in 1997. The world's 358 billionaires had a net wealth equal to the combined incomes of the poorest 2.2 billion people (from the 1996 UNDP Report, quoted in Porritt 1997: xviii).

global commons in the long-term. The containment of contamination at northern mine sites allows the use of resources in production that accelerate the infusion of pollution into global atmospheric and oceanic sinks at a larger spatial and temporal scale. Small perturbations accumulate to impose surprise and structural change at larger scales of the ecological system. Although it can be argued that the signing of the LRTAP conventions on persistent organic pollutants in June 1998 will force eco-efficient production in mid-latitude Europe and North America, experience with the Climate Change Conventions demonstrates that action following intention can be significantly delayed, increasing the opportunity for problems. Even within the Arctic Council, for instance, the workplan for measuring impacts of pollution on human health in the North will not be considered for approval until 2000.

Nevertheless, the Arctic Council, as a regional international body that transcends a single functional focus, represents an opportunity “to launch an experiment in problem-solving at the international level that will not only prove effective in the Arctic, but also loom large in the thinking of those seeking to deal with similar issues in other parts of international society.” (Young 1997a: 66-7). This avant garde role is not without precedent. Rothwell contends that a “variety of legal responses (ecosystems approach, increasing emphasis on precautionary principles, restricting the exercise of sovereignty by individual states on property rights over common-pool resources) have been adopted in the polar regions which in many instances were outside existing norms at the time, but have since become accepted as the standard” (quoted in Young 1998:66).<sup>80</sup> The larger opportunity, is in the demonstration of a soft-law role for regionalism in the guidance of sustainable development. At this point, however, only Finland, Russia and Canada are motivated to see this potential exploited. They recognize that if Russia’s northern regions are not able to develop some sustainable local productivity. The needs of ordinary survival and exploitation by organized crime will not only continue to erode the environmental base, but erode as well the social capacity and political stability to

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<sup>80</sup> 1996. *The Polar Regions and the Development of International Law*. Cambridge: Cambridge University Press.

develop benign technologies and any hope in the prospects to resist further erosion in the health of individuals and communities. Should the situation in Russia continue to worsen, the northern reaches of Finland and Canada will continue to suffer first and most from the 'fallout'.

A change in role gives an actor opportunity to change their behaviour. With the passing of the Arctic Council chair to the US, Canada needs no longer concern itself with maintaining the commitment of member states to the organization, but can now champion the Council's broadest potentials. But it will need to act quickly in this change of identity, lest inertia set in and Canada waits for the US to lead. To take leadership, Canada needs first to engage in a substantive analysis of the convergences and divergences of its federal departmental sustainable development strategies in comparison to plausible alternatives. Once it is clear to what extent Canada can live within or be self-sufficient within its own richly endowed carrying capacity, it can then look beyond its borders for opportunities to exploit trade to improve its quality of life by trading equivalent units of carrying capacity with other jurisdictions. Then it might go a step further, and determine how its citizens could enjoy the same standard of living using only its per-capita fair share of ecological services (about 1/3 of current consumption) and trade the sustainable remainder to build a heritage fund for its own future generations, and to donate in sponsorship of other projects around the world that show promise in increasing the sustainability of other communities, cities, and countries. Canada has the resources to become a global patron of sustainable development research and implementation.

But first, Canada needs to get its own house in order. At the very least, and if all else fails, it can implement its own proposal regarding sustainability indicators in Arctic communities to demonstrate the viability of the project, and clarify its national, or at least its Arctic policy agenda. Additional preliminary policy suggestions follow.

## Investing in Natural Capital

Regardless of the accomplishment of social equity, economic globalization will certainly increase the demands on all types of ecological resources. Urbanization is a necessary correlate to the logic of agglomeration and accumulation driven by economic expansion in an informational age. It is recognized that urbanization may abet human misery and ecological degradation just through the fresh water diversion required to support it, or alternatively expand the opportunities for economies of scale and ecological efficiency, industrial eco-efficiency, expanding resource productivity (Rees), social identity and individual freedom and development (Borja & Castells 1997), and cultural evolution (Töpfer 1997:242). Urbanization can be either the centre of the problem or of the solution. The potential of networked cities as political forces in taming transnational corporations, establishing a new order of rules for the flows of goods, services, financial capital, human migrations and rights, and information, and demanding north-south and urban-rural reconciliation was recognized in their formal participation in the 1996 Habitat II Conference in Istanbul. Although on a greatly reduced scale, urbanization has also taken place in the Arctic through forced settlement of all northern migratory subsistence groups throughout the last century, with Canada's beginning in the early 1960s and Russia's consolidating only now with the collapse of the specialized quota production centres of the formerly planned economy.<sup>81</sup>

Economic expansion and urbanization in the short run will increase pressure on the Arctic's vast reserves of hydrocarbons as well as its non-fuel resources. This presents two opportunities:

- Full-cost pricing of all externalities could be imposed on those resources. Externalities include the costs of pollution mitigation plus the cost to develop renewable replacements in advance of the exhaustion of non-renewables.<sup>82</sup> The collected revenues would be consolidated as a trust fund for

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<sup>81</sup> Timothy Heleniak, Economist, World Bank, personal interview

<sup>82</sup> Since non-renewables are concentrations of high-grade solar energy, their exhaustion means that they can only be replaced by renewables, which are the storage of the current flows of solar energy. See especially Daly 1993:340-48.

two purposes. The first would be the mitigation of short-term --- and the financing of bonds against long-term --- ecological degradation. The second would be the creation of a research and development fund for the promotion of innovations in sustainable development. This 'Arctic Resources Trust (ART)' could be distributed in response to applications for projects to develop eco-efficient technologies and/or resilient social equity institutions that operated within global limits.

- 'ART' provides a tremendous political opportunity to amplify urban-rural and north-south reconciliations. 'ART' could be administered by regional bodies comprised of community federations and funded by regional resources. 'ART' trust monies could be made available only to applications from cities and metropolitan governance bodies whose proposals included not only the development of some industrial technology or institutional technique, but included its implementation at the level of the city or community. The Arctic would exercise its resource trusteeship by sponsoring sustainable urban development, becoming an information clearing house of best-practices, provide international recognition to outstanding achievements and assist in networking communities with similar problems or approaches. This function would support the development of a sophisticated telecommunications infrastructure with the world, and give the Arctic a sense of purpose and identity within the whole world, rather than remain identified as an icy and barely inhabited outpost.

Full-cost pricing, of course, represents a retrogressive tax on resource holders, so part of the operation of the Trust would need to deal with social equity in the North, where resource prices would, in the short term, decrease the demand for northern resources. Northern non-renewable resource revenues now constitute its largest economic sector, so this will not happen without some pain, but the overall cost of subsidizing the North is relatively small because of its small population. To fund financial transfers, eco-taxation on developing countries similar to that proposed to reduce the pressure on the Amazon forest (Pearce 1991) could be negotiated in the short-term. Since most Arctic countries are already financing the development of northern communities through financial transfers of some kind, this would not necessarily cost any more. It would allow these countries to negotiate the transfers with other developed countries to legitimize the concept and, in time, to distribute the financial burden. On the down side, it would legitimize the concept of international transfers "to compensate the developing

world for foregoing legitimate development projects” (Ibid.:49) and this would open up the door to similar expectations from the southern hemisphere. The Arctic eight could either resist this inevitability, or pilot it in Arctic regions where the administration of the program would be most controllable and provide a benchmark for efficiency and effectiveness once it became available to the South. Coupled with tariffs on imported products and resources that did not include full cost pricing, the initiative would soon put upward pressure on resource prices universally, promoting resource productivity enhancements world-wide, and the efficient development of global resources, revitalizing northern resource development. This would not address the complimentary issue of equitable consumption, a distributional issue requiring separate institutional attention.

### Rewarding sustainable investment

Northern housing is tested under the toughest environmental conditions on the planet. The long distance for material transport, building in cold conditions, the importation of labour given generally low construction trade skills all increase the price of housing and increase the pressure to find inexpensive and durable solutions. At the recent Circumpolar Housing Forum '98, conference participants adopted the idea of certifying the environmental sustainability of housing solutions<sup>83</sup>. “This house meets the sustainability standards of the Arctic” would become an internationally recognized symbol that the resource throughputs over the life of the facility were a significant percentage less than comparable units on the market and that the goal would be for housing solutions that consumed no more than 30% of the fair ecological earth share of each person on the planet. Certification would also be contingent on the product having a positive impact on the Index of Sustainable Economic Welfare or its derivatives. The intention was to give the Arctic a role in

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<sup>83</sup> Proposed by the author in a keynote speech on September 8, 1998 in Yellowknife, Northwest Territories (proceedings forthcoming). The idea was continually promoted by conference speakers as a tangible accomplishment which could bolster a measurable definition of sustainability, and augment the salability of northern housing products and services.

housing products and services equivalent to the Pennsylvania Agriculture Administration's inspection seal which over a century ago earned a reputation as the paramount guarantee of safe food.

The idea of certification of sustainable products could be expanded into clothing (providing a way of measuring the sustainability of furs and skins) or into animal food products (providing a way of measuring the sustainability of wildlife products over industrial animals like farm fish, battery chickens and feedlot livestock). On the one hand, northern products would receive a higher profile in line with sustainable development, but more importantly, the north could develop a certification industry that would far exceed the economic value of further resource development.

As another precursor strategy, the Arctic could provide provincial tax discounts (and negotiate federal discounts) for investments in certifiable products and services. Not only would these encourage the development of these products, but compensate for the lack of full-price resource costing and eco-tariffs until these instruments were imposed.

#### Empowering jurisdictional subsidiarity

With its land claim settlements and their resource co-management institutions, with its constitutional entrenchment of self-government, and with its political devolution of provincial authorities to the municipal level in the Northwest Territories, Canada has initiated major pioneering steps in jurisdictional subsidiarity. The significance of sustainability among aboriginal societies and common property social institutions that support their resilience has attracted increasing attention throughout the world, but especially in the North through the work of world-recognized biologists like Berkes, Folke and Holling. Southern Canadian sentiment is vulnerable to a political back-lash against these

initiatives,<sup>84</sup> which are endangered as well by their proponents where the lessons of the past are concretized in rigid institutional rules that lose their adaptiveness to change. Canada could do much more than it has to promote debate on the development of adaptive forms of resilient subsidiarity to ensure that the emerging governance forms benefit from constructive opportunities for public exposure. Canada could do a lot more as well to support local research on the failures and successes of these approaches on the ground, and to distribute the results internationally. This would both inform subsequent developments and increase the recursive redevelopment of local structures. Most importantly, however, Canada needs to more clearly define its role at the inward boundaries between the nation-state and the community, and at the outward boundaries between nation-state and other countries or the Arctic region.

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Canada could promote these initiatives within its own north, and with its Arctic Council colleagues. Most of those listed above could be done without any international cooperation. But full-cost pricing and ecological tariffs are boundary issues and quickly demand regional integration or risking the potential of conflict. The issues of trade in all its dimensions and developmental financial transfers, therefore, present the greatest opportunity for a truly regional sustainable development initiative. With Canada's track record on trade liberalization, however, this will take a significant change in philosophy in the Department of Foreign Affairs and External Trade. It may become necessary for the three northern Territories and the Permanent Participants to take up the initiative. Not only would they need to engage negotiations with the Arctic eight, where sympathies might be found in the Nordic states, but with the Arctic Council Observers who might be able to apply external pressure on the Arctic eight to empower the Arctic Council to take a lead role in Sustainable Development as a precursor of global applications.

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<sup>84</sup> The recent refusal by Canadian newspaper magnate David Black to publish editorials supporting aboriginal land claim settlements is just one example of this conservative position.

Since the theoretical core of this thesis engaged the evolution of complex autopoietic systems, it is imperative that a final word be written about the Arctic Council in the light of complexity. Almost all international regimes are focused around single functional concerns. As such they will magnify the techniques of meaning production within that functional subsystem. There will be increased 'ascendance' or efficiency in the replication of power relations explicit in that function. The positive feedback loops in trade liberalization, for instance, work to promote the advantage of the first few in, bolster the structural advantage of the transnational corporations that can trade with its subsidiaries to transfer profits without local taxation and those that control the 'flow' technologies of international decision-making. The results are increased profitability, but also increased inequity and increased instability as clearly evidence in contemporary financial markets. The amplification of the production of meaning will also reinforce the ways in which what is significant is partitioned from the insignificant. The centrality of informational technology in production and decision-making about production, for instance, will throw a net of inclusion over remote parts of the planet that are segmentally organized around integrated production processes at the same time that it will marginalize other places and whole regions (Africa is the paramount example). As contemporary functional society reaches a new level of organization through informationalism, global epistemic communities will dominate the restricted membership of a new social reality while the remainder of the world will be thrown back on their own individuality, surviving by their adaptability to multiple careers. Castells and others argue that this contradiction will be resolved in the creation of urban identities in cities and metropolises whose leadership allow them to negotiate with and eventually transform these forces.

Pertinent arguments of complexity are:

- Resilient environmental systems can best be created through reducing the spatial and temporal scale of succession events, supporting small scale ecosystem management schemes based on local ecological knowledge such as those promoted by bioregionalism and aboriginal land claims.

Similarly, the destabilization resulting from the growing autonomy of socially-defined social subsystems can best be offset through allowing amplifications to manifest at the smallest possible scale, and to allow local authority to adjust to the outcomes of functionally based policy prescriptions. The exercise of controls on socially-responsible business practice through local business permits is an example.

- Social relations within all functional subsystems are produced by techniques of knowledge production where positive feedbacks amplify both the zones of significance and 'ignore-ance'. The promotion of new techniques of knowledge production is most likely to occur through local control of and dependence on bio-compatible technologies (see Lyle 1994, *Domus* January 1997) where new understandings of the boundary conditions between the environment and the societal system will feed back into new means of differentiating meaning, focusing on the once neglected relationships in the Culture/Nature relationship.

The evolution of meaning at the sub-system level requires a discipline of self-observation that improves the accuracy of descriptions from a more inclusive level, and the conscious identification of anomalous distinctions between systems as a source of revelation.

- Internalization of environmental contexts (meaning exogenous constraining parameters) is a key means for increasing the degrees of freedom that a system has for exploring its own possibility space.

In this context, the Arctic Council provides a mechanism for stabilizing the evolution of the global social system to the extent that it can differentiate its viability, validity, value-adding and visioning capability (Swilling, personal conversations)<sup>85</sup> while retaining relevance in direct interaction with the global system. The Arctic Council needs to internalize the global parameters of Gaia's own evolution.

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<sup>85</sup> Professor Mark Swilling, former head of the School of Public and Development Management, University of the Witwatersrand, Co-director of the Spier Leadership Institute, and Chair of the Trustees for the Local Governance Learning Network Trust, all in South Africa, proposed a model of organizational development for the new Masters in Public Administration program at the Warwick Business School in London based on four design dimensions: *validity* with respect to global and local contexts; operational *viability* regarding revenue production, economic efficiency and accountability; management capability to formulate and implement policies that create public *value*; and *visionary* ethical and socially responsible leadership.

Through its bellwether location, the Arctic can provide an ecological state of the globe report, and use the latest in graphic communication media to illustrate the network of global causes behind the effects. Through its ability to express self-observations of its own process of meaning production, policy formation and implementation in the context of a functional global society, it again internalizes its environment. In these ways the Arctic Council make the ground of global behaviour the figure of conscious variation and transformation.

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### Internet Sites

[www.ec.gc.ca](http://www.ec.gc.ca). This is Environment Canada's web-site. The "Green Lane" provides access to the *Sustainable Development Strategy and Summary Document*, as well as the *Guide to Green Government*.

[www.nrc.ca/arctic](http://www.nrc.ca/arctic). Site of the Arctic Council as maintained by the Arctic Council Secretariat currently under the auspices of Canada. The site includes public reports and documents, linkages to other relevant sites. Its future is unknown following the transfer of host and Secretariat responsibilities to the USA following the 1998 September 17-18 Ministerial meetings in Iqaluit.

[www/dfait-maeci.gc.ca/](http://www/dfait-maeci.gc.ca/) This is the homepage of the Department of Foreign Affairs and International trade. It provides access to several relevant northern sites including the final "Toward a Northern Foreign Policy for Canada: A Consultation paper (September 1998)" the Department's sustainable development strategy, and a direct link to the Arctic Council site.

[www.oag-bvg.gc.ca](http://www.oag-bvg.gc.ca) (click on Commissioner of the Environment and Sustainable Development; click on Sustainable Development Strategies) This provides, under the Auditor General of Canada, access to the Act as well as all Departmental sustainable development strategies and national Green Plans.

## **Appendix 1: The Rovaniemi Declaration**

signed by the Eight Arctic Nations (June 14, 1991) [This appendix is provided given the difficulty of accessing the document and the uncertain future of the Arctic Council Website]

### **DECLARATION ON THE PROTECTION OF THE ARCTIC ENVIRONMENT**

We, the Representatives of the Governments of Canada, Denmark, Finland, Iceland, Norway, Sweden, the Union of Soviet Socialist Republics and the United States of America;

Meeting at Rovaniemi, Finland for the First Ministerial conference on the Protection of the Arctic Environment;

Deeply concerned with threats to the Arctic environment and the impact of pollution on fragile Arctic ecosystems;

Acknowledging the growing national and international appreciation of the importance of Arctic ecosystems and an increasing knowledge of global pollution and resulting environmental threats;

Resolving to pursue together in other international environmental fora those issues affecting the Arctic environment which require broad international cooperation;

Emphasizing our responsibility to protect and preserve the Arctic environment and recognizing the special relationship of the indigenous peoples and local populations to the Arctic and their unique contribution to the protection of the Arctic Environment;

Hereby Adopt the Arctic Environmental Protection Strategy and commit ourselves to take steps towards its implementation and consider its further elaboration.

We commit ourselves to a joint Action Plan of the Arctic Environmental Protection Strategy which includes:

Cooperation in scientific research to specify sources, indigenous peoples and to invite their organizations to future pathways, sinks and effects of pollution, in particular, oil, acidification, persistent organic contaminants, radioactivity, noise and heavy metals as well as sharing of these data;

Assessment of potential environmental impacts of development activities;

Full implementation and consideration of further measures to control pollutants and reduce their adverse effects to the Arctic environment.

We intend to assess on a continuing basis the threats to the Arctic environment through the preparation and updating of reports on the state of the Arctic environment, in order to propose further cooperative action

We also commit ourselves to implement the following measures of the Strategy:

Arctic Monitoring and Assessment Programme (AMAP) to monitor the levels of, and assess the effects of, anthropogenic pollutants in all components of the Arctic environment. To this end, an Arctic Monitoring and Assessment Task Force will be established. Norway will provide for an AMAP secretariat;

Protection of the Marine Environment in the Arctic, to take preventive and other measures directly or through competent international organizations regarding marine pollution in the Arctic irrespective of origin;

Emergency Prevention, Preparedness and Response in the Arctic, to provide a framework for future cooperation in responding to the threat of environmental emergencies;

Conservation of Arctic Flora and Fauna, to facilitate the exchange of information and coordination of research on species and habitats of flora and fauna.

We agree to hold regular meetings to assess the progress made and to coordinate actions which will implement and further develop the Arctic Environmental Protection Strategy.

We agree to continue to promote cooperation with the Arctic indigenous peoples and to invite their organizations to future meetings as observers.

We agree to meet in 1993 and accept the kind invitation of the Government of Denmark and the Home Rule Government of Greenland to hold the next meeting in Greenland.

Wherefore, we, the undersigned Representatives of our respective Governments, recognizing its political significance and environmental importance, and intending to promote its results, have signed this Declaration.

## **Appendix 2: Declaration on the Establishment of the Arctic Council, and Joint Communiqué of the Governments of the Arctic Countries on the Establishment of the Arctic Council**

[This appendix is provided given the difficulty of accessing the document and the uncertain future of the Arctic Council Website]

### **DECLARATION ON THE ESTABLISHMENT OF THE ARCTIC COUNCIL**

**THE REPRESENTATIVES** of the Governments of Canada, Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden and the United States of America (hereinafter referred as the Arctic States) meeting in Ottawa;

**AFFIRMING** our commitment to the well-being of the inhabitants of the Arctic, including recognition of the special relationship and unique contributions to the Arctic of indigenous people and their communities;

**AFFIRMING** our commitment to sustainable development in the Arctic region, including economic and social development, improved health conditions and cultural well-being;

**AFFIRMING** concurrently our commitment to the protection of the Arctic environment, including the health of Arctic ecosystems, maintenance of biodiversity in the Arctic region and conservation and sustainable use of natural resources;

**RECOGNIZING** the contributions of the Arctic Environmental Protection Strategy to these commitments;

**RECOGNIZING** the traditional knowledge of the indigenous people of the Arctic and their communities and taking note of its importance and that of Arctic science and research to the collective understanding of the circumpolar Arctic;

**DESIRING** further to provide a means for promoting cooperative activities to address Arctic issues requiring circumpolar cooperation, and to ensure full consultation with and the involvement of indigenous people and their communities and other inhabitants of the Arctic in such activities;

**RECOGNIZING** the valuable contribution and support of the Inuit Circumpolar Conference, Saami Council, and the Association of Indigenous Minorities of the North, Siberia, and the Far East of the Russian Federation in the development of the Arctic Council;

**DESIRING** to provide for regular intergovernmental consideration of and consultation on Arctic issues.

#### **HEREBY DECLARE:**

1. The Arctic Council is established as a high level forum to:
  - (a) provide a means for promoting cooperation, coordination and interaction among the Arctic States, with the involvement of the Arctic indigenous communities and other Arctic inhabitants on common Arctic issues<sup>86</sup>, in particular issues of sustainable development and environmental protection in the Arctic.
  - (b) oversee and coordinate the programs established under the AEPS on the Arctic Monitoring and Assessment Program (AMAP); Conservation of Arctic Flora and Fauna (CAFF); Protection of the Arctic Marine Environment (PAME); and Emergency Preparedness and Response (EPPR).

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<sup>86</sup> The Arctic Council should not deal with matters related to military security.

- (c) adopt terms of reference for and oversee and coordinate a sustainable development program.
  - (d) disseminate information, encourage education and promote interest in Arctic-related issues.
2. Members of the Arctic Council are: Canada, Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden and the United States of America (the Arctic States).

The Inuit Circumpolar Conference, the Saami Council and the Association of Indigenous Minorities in the North, Siberia, and the Far East of the Russian Federation are Permanent Participants in the Arctic Council. Permanent participation is equally open to other Arctic organizations of indigenous peoples<sup>87</sup> with majority Arctic indigenous constituency, representing:

- (a) a single indigenous people resident in more than one Arctic State; or
- (b) more than one Arctic indigenous people resident in a single Arctic State.

The determination that such an organization has met this criterion is to be made by decision of the Council. The number of Permanent Participants should at any time be less than the number of members.

The category of Permanent Participation is created to provide for active participation and full consultation with the Arctic indigenous representatives within the Arctic Council.

3. Observer status in the Arctic Council is open to:
- (a) Non-arctic states
  - (b) inter-governmental and inter-parliamentary organizations, global and regional; and
  - (c) non-governmental organizations
- that the Council determines can contribute to its work.
4. The Council should normally meet on a biennial basis, with meetings of senior officials taking place more frequently, to provide for liaison and coordination. Each Arctic State should designate a focal point on matters related to the Arctic Council.
5. Responsibility for hosting meetings of the Arctic Council, including provision of secretariat functions, should rotate sequentially among the Arctic States.
6. The Arctic Council, as its first order of business, should adopt rules of procedure for its meetings and those of its working groups.
7. Decisions of the Arctic Council are to be by consensus of the Members
8. The Indigenous Peoples' Secretariat established under AEPS is to continue under the framework of the Arctic Council.
9. The Arctic Council should regularly review the priorities and financing of its programs and associated structures.

**THEREFORE**, we the undersigned representatives of our respective Governments, recognizing the Arctic Council's political significance and intending to promote its results, have signed this Declaration.

**SIGNED** by the representatives of the Arctic States in Ottawa, this 19th day of September, 1996.<sup>88</sup>

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<sup>87</sup> The use of the term "peoples" in this declaration shall not be construed as having any implications as regard the rights which may attach to the term under international law.

<sup>88</sup> Signatories included Lloyd Axworthy for Canada

## **JOINT COMMUNIQUÉ OF THE GOVERNMENTS OF THE ARCTIC COUNTRIES ON THE ESTABLISHMENT OF THE ARCTIC COUNCIL**

Ministers and senior Representatives of the Governments of Canada, Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden, and the United States of America met in Ottawa, Canada, on September 19, 1996, and signed the Declaration on the Establishment of the Arctic Council.

This inaugural meeting was attended by the leaders and senior representatives of three international Arctic indigenous organizations- the Inuit Circumpolar Conference, the Saami Council, and the Association of Indigenous Minorities of the North, Siberia, and the Far East of the Russian Federation, as Permanent Participants in the Council.

Also present at the signing ceremony were the Standing Committee of Parliamentarians of the Arctic Region; the Nordic Council Finnish Secretariat; the non-Arctic States of Great Britain, Germany, Japan, Poland and the Netherlands; the International Union for Circumpolar Health; the International Arctic Science Committee; the United Nations Environment Programme; the International Union for the Conservation of Nature; the Advisory Committee on Protection of the Sea; and the World Wildlife Fund.

Ministers viewed the establishment of this new intergovernmental forum as an important milestone in their commitment to enhance cooperation in the circumpolar North. The Council will provide a mechanism for addressing the common concerns and the challenges faced by their governments and the people of the Arctic. To this end, Ministers referred particularly to the protection of the Arctic Environment and sustainable development as a means of improving the economic, social and cultural well-being in the North.

Ministers noted that the indigenous people of the Arctic have played an important role in the negotiations to create the Arctic Council. To this end the Inuit Circumpolar Conference, the Saami Council, and the Association of Indigenous Minorities of the North, Siberia and the Far East of the Russian Federation, are named as Permanent Participants in the Arctic Council. Provision is also made for additional organizations representing the Arctic indigenous people to become Permanent Participants.

Ministers acknowledged the significant work accomplished under the Arctic Environmental Protection Strategy (AEPS), whose existing programs will be integrated within the Council. They agreed to complete the integration process by the time of the final AEPS Ministerial meeting being held in Norway in 1997.

The Ministers recognized the contribution of international science to the knowledge and understanding of the Arctic region and noted the role that scientific cooperation, through the International Arctic Science Committee and other organizations, is playing in developing a truly circumpolar cooperation.

Ministers welcomed the attendance of the Standing Committee of the Parliamentarians of the Arctic Region and looked forward to its future participation in the meetings of the Council. They also recognized the need for providing the opportunity to non-Arctic countries, governmental and non-governmental organizations with Arctic interests to participate actively, as observers, in the work of the Council, and to draw on their experience.

Ministers set the initial priority tasks for the start-up of the Council as follows:

- developing, for adoption by the Council, rules of procedure;
- developing, for adoption by the Council, terms of reference for a sustainable development program as a basis for collaborative projects; and
- ensuring an effective transition of the AEPS into the Arctic Council, to be completed at the time of the 1997 AEPS Ministerial meeting in Norway.

Ministers expressed their appreciation to Canada for hosting the inauguration of the Arctic Council, and welcomed Canada's offer to host the first meeting of the Council in 1998.

## Appendix 3: The Alta Declaration

[This appendix is provided given the difficulty of accessing the document and the uncertain future of the Arctic Council Website]

### ALTA DECLARATION ON THE ARCTIC ENVIRONMENTAL PROTECTION STRATEGY

We, the Ministers of the Arctic countries:

**Recalling** that the Ministers of the eight Arctic governments met in Rovaniemi, Finland in June 1991 to establish the Arctic Environmental Protection Strategy (AEPS), and have met since then in Nuuk, Greenland in September 1993 and Inuvik, Canada in March 1996 to review and determine further measures to collectively implement the AEPS;

**Noting** the progress made by the AEPS and its programmes since its inauguration;

**Recognising** the importance of the Arctic to our respective countries, to present and future generations of all Arctic residents, especially indigenous peoples<sup>89</sup>, and to the rest of the world;

**Acknowledging** that the Arctic environment consists of ecosystems with unique features which are particularly vulnerable to impacts resulting from human activities, and as such require special precautionary and protective measures;

**Recognising** that while the Arctic, in comparison with most other areas of the world, remains a clean environment with large areas of unspoiled nature, it faces serious environmental risks and problems from contaminants transported from sources outside the Arctic which require effective international action. Also, in some parts of the Arctic, severe pollution from local sources requires both national and international remedial action;

**Recognising** that sustainable development is an overriding objective for all activities in order to secure ecological safety and the integration of environmental concerns in management, planning and development;

**Acknowledging** the importance of sustainable development in the Arctic to the health, social and cultural well-being, and economic circumstances of Arctic peoples;

**Recognising** the importance of biological diversity in the Arctic region and **reaffirming** the special role and responsibilities of the Arctic countries with respect to protection, restoration and conservation of the Arctic environment;

**Reaffirming** the support of our countries for the principles of the Rio Declaration, Agenda 21 of the UN Conference on Environment and Development, and regional and global conventions and other arrangements or instruments relevant to the Arctic;

**Acknowledging** with appreciation the substantive and comprehensive work of the Arctic Monitoring and Assessment Programme (AMAP) in preparing "The AMAP Assessment Report: Arctic Pollution Issues" and "Arctic Pollution Issues: A State of the Arctic Environment Report" and in holding the international scientific symposium in Tromsø, Norway;

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<sup>89</sup> The use of the term "peoples" in this Declaration shall not be construed as having any implications as regard the rights which may attach to the term under international law.

**Acknowledging** with gratitude the work and reports of the programmes on Conservation of Arctic Flora and Fauna (CAFF), Protection of the Arctic Marine Environment (PAME), Emergency Prevention, Preparedness and Response (EPPR) and Sustainable Development and Utilisation (SDU);

**Recognising** the special role and important contributions of indigenous peoples in each of the AEPS programmes;

**Recognising** also the support and the contributions from non-Arctic countries, global and regional inter-governmental and non-governmental organizations in the AEPS and **encouraging** their continued participation and contributions to activities and objectives of the AEPS programmes;

**Welcoming** the establishment of the Arctic Council in September 1996 and **looking forward to** the work of the Arctic Council to promote co-operation, co-ordination and interaction among Arctic countries and to build on the achievements and objectives of the AEPS;

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Hereby make the following Declaration:

**We reaffirm** our commitment to protect the Arctic environment as one of the priority elements of sustainable development, as elaborated under the AEPS, and **agree** to continue joint efforts to implement, develop and improve AEPS programmes under the auspices of the Arctic Council;

**We welcome** with appreciation the AMAP reports and commit to take their findings and recommendations into consideration in our policies and programmes. **We agree** to increase our efforts to limit and reduce emissions of contaminants into the environment and to promote international co-operation in order to address the serious pollution risks reported by AMAP. **We will** draw the attention of the global community to the content of the AMAP reports in all relevant international fora, particularly at the forthcoming Special Session of the General Assembly, and **we will** make a determined effort to secure support for international action which will reduce Arctic contamination;

**We receive** with appreciation the "Guidelines for Environmental Impact Assessment (EIA) in the Arctic" and the "Arctic Offshore Oil and Gas Guidelines" developed under the AEPS, and **agree** that these Guidelines be applied;

**We receive** with appreciation the "Arctic Guide for Emergency Prevention, Preparedness and Response" and **encourage** the Arctic countries to make use of the Guide as appropriate;

**We note** the discussion on ethical principles for research in the Arctic and **underline** the principle that Arctic research is based upon commonly accepted scientific guidelines. **We also note** the "Reference Document on Ethical Principles" and **recommend** that this be used as appropriate;

**We encourage** continued input and participation of the Permanent Participants in the AEPS programmes, including indigenous peoples' traditional knowledge, as essential to sustainable development, including the use of natural resources and effective environmental protection of the Arctic;

**We encourage** international scientific research as necessary to expand the knowledge and understanding of the Arctic region;

**We support** the efforts of the Russian Federation in addressing its environmental problems, and in particular its recent efforts towards developing a Russian Programme of Action for protecting the marine environment from land-based sources of pollution, and its efforts to protect the environment from the effects of accidents.

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**We welcome** with appreciation the report from the Senior Arctic Affairs Officials (SAAOs) to the Fourth Ministerial Conference on the AEPS, adopt the SAAOs recommendations, and instruct the senior officials to assign and direct future work of the programmes based on the following priorities:

**We endorse** continuation of activities for monitoring, data collection, exchange of data on the impacts, and assessment of the effects of contaminants and their pathways, increased Ultraviolet-B (UV-B) radiation due to stratospheric ozone depletion, and climate change on Arctic ecosystems. Special emphasis is required on human health impacts and the effects of multiple stressors, as detailed in the SAAO report on the future work of AMAP and its implementation. The overall objective is to provide reliable and sufficient information on the status of, and threats to, the Arctic environment, and to provide scientific advice on actions to be taken.

**We endorse** continuation of activities for conservation, monitoring and assessment of threats to Arctic flora, fauna and their habitats. **We welcome** the co-operative Strategy for the Conservation of Biological Diversity in the Arctic Region, and note the intention to develop a long-term plan to give effect to the Strategy. **We also endorse** the further development and implementation of the "Circumpolar Protected Areas Network (CPAN) Strategy and Action Plan", the implementation of the "International Murre Conservation Strategy and Action Plan", and the "Circumpolar Eider Conservation Strategy and Action Plan".

**We endorse** continuation of activities to identify means of preventing or reducing pollution of the Arctic environment through co-ordinated action programmes and guidelines complementing existing legal arrangements. Focus should be on the completion and implementation of the "Regional Programme of Action for the Protection of the Arctic Marine Environment from Land-based Activities", follow-up on the application of "Arctic Offshore Oil and Gas Guidelines", and development of a co-ordinated system for data collection and sharing of information on current and potential shipping activities to facilitate analysis of their associated environmental effects.

**We endorse** continuation of activities to identify means of improving emergency prevention, preparedness and response, in particular the development of an action plan for source control to meet risks identified, the development of a "Field Guide for Arctic Oil Spill Response" and a strategic plan of action for this programme area.

**We endorse** the continued analysis and maintenance of a comprehensive overview regarding the adequacy and effectiveness of international agreements, measures and guidelines, and the analysis of accident notification systems to identify gaps and improve existing arrangements.

**We recognize** the importance of waste management issues, and **instruct** the senior officials to continue work in this area.

**We look forward** to progress reports at future Arctic Council meetings on the priority activities defined above.

**We extend** the mandates for the existing Working Groups and their Secretariats on an interim basis until the first meeting of the Arctic Council decides how it will organize its work, taking into account the need to integrate, consolidate and co-ordinate the work in the most efficient and effective way;

**We take note** of the report on Financing Strategy and Mechanisms, and **recommend** that the next Arctic Council meeting take into consideration the range of options contained in the SAAO Report when exploring funding mechanisms for the Arctic Council, including participation of indigenous peoples, in particular the Russian indigenous inhabitants;

**We recommend** that sustainable development, including environmental protection strategies, scientific advice and traditional knowledge, be an overriding objective for all activities under the Arctic Council. **We also stress** the need for relevant activities supporting sustainable use of renewable resources by Arctic residents, in particular indigenous peoples;

**We call for** the completion, as a matter of urgency, of the Terms of Reference for sustainable development programmes and Rules of Procedure necessary for the operation of the Arctic Council, and **direct** the senior officials to continue to identify and promote development of co-operative activities in other programme areas;

**We recommend** that the Arctic Council co-operate and take appropriate action with other relevant fora which are pursuing complementary objectives, such as the Barents Council, in order to ensure co-ordination of work and increase efficiency;

**We agree** that the Arctic countries should take joint action to promote the early completion of the on-going work on an "International Code of Safety for Ships Operating in Polar Waters" (Polar Code) under the auspices of the International Maritime Organisation (IMO);

**We are committed** to deal with the threat of radioactive pollution of the Arctic to avoid irreparable damage. **We therefore fully support** regional cooperation between two or more Arctic States, as well as multilateral efforts, to enhance nuclear reactor safety and to increase and promote the safe management, storage and disposal of spent nuclear fuel and radioactive waste. **We call for** full implementation of the International Atomic Energy Agency (IAEA) Convention on Nuclear Safety; the rapid finalisation of the IAEA Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, and the application of the current IMO Irradiated Nuclear Fuel Code. In addition, we recognize the importance of the on-going co-operation to provide for the early completion of the facilities needed for the implementation of the ban on dumping of radioactive waste at sea adopted by the London Convention of 1972;

**We agree** to work vigorously for the early completion and implementation of a protocol on the elimination or reduction of persistent organic pollutants (POPs) under the framework of the UN Economic Commission for Europe (ECE) Convention on Long-Range Transboundary Air Pollution. **We also fully support** the negotiations to conclude similar protocols on heavy metals and nitrogen oxides. **We strongly welcome** the establishment of an Intergovernmental Negotiating Committee under the auspices of United Nations Environmental Programme (UNEP) to initiate work on a global instrument on POPs by early 1998;

**We therefore proclaim** our intention to continue co-operation, co-ordination and interaction among the Arctic States, with the involvement of the indigenous peoples and other Arctic residents, on common Arctic issues for the benefit of present and future generations.

**In witness hereof, we sign this Declaration.**

**For the Government of Canada**

.....  
**Mary Simon**  
Ambassador

**For the Government of Denmark/Greenland**

.....  
**Marianne Jensen**  
Minister of Health, Environment & Scientific Research

**For the Government of Finland**

.....  
**Markku Nurmi**  
Director General

**For the Government of Iceland**

.....  
**Guðmundur Bjarnason**  
Minister of Environment

**For the Government of Norway**

.....  
**Thorbjørn Berntsen**  
Minister of Environment

**For the Government of the Russian Federation**

.....  
**Alexander A. Solovyanov**  
Deputy Chairman of the State Committee for  
Environmental Protection

**For the Government of Sweden**

.....  
**Bo Kjellen**  
Ambassador

**For the Government of the United States of America**

.....  
**R. Tucker Scully**  
Director

Alta, June 13, 1997

## **Appendix 4: Arctic Council *Ad Referendum* Rules of Procedure**

(February 4, 1998, 1:30pm) [This appendix is provided given the difficulty of accessing the document and the uncertain future of the Arctic Council Website]

In accordance with Article 6 of the Declaration on the Establishment of the Arctic Council of September 19, 1996 (the "Declaration"), the Arctic Council adopts the following Rules of Procedure for its meetings and those of its subsidiary bodies.

### **PART I: INTRODUCTION**

#### **Definitions**

1. In these Rules of Procedure, hereinafter the "Rules":

"Arctic States" means the Members of the Arctic Council, namely Canada, Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden and the United States of America;

"Permanent Participants" means the organizations referred to in Article 2 of the Declaration as well as any other organization granted Permanent Participant status in accordance with these Rules;

"Observer" means an entity described in Article 3 of the Declaration which has been granted observer status in accordance with these Rules;

"Host Country" means the Arctic State which chairs the Arctic Council during the particular period in question.

#### **Application**

2. Subject to the Declaration, meetings and other activities under the Arctic Council shall be governed by these Rules.

## **PART II: ARCTIC COUNCIL MEETINGS**

### **General Provisions**

3. Six of the Arctic States shall constitute a quorum for purposes of holding a Ministerial or Senior Arctic Official (SAO) meeting.
4. Arctic States and Permanent Participants may participate in all meetings and activities of the Arctic Council, and may be represented by a head of delegation and such other representatives as each Arctic State and Permanent Participant deems necessary.
5. In accordance with the Declaration, the category of Permanent Participation is created to provide for active participation and full consultation with the Arctic indigenous representatives within the Arctic Council. This principle applies to all meetings and activities of the Arctic Council.
6. The Heads of Delegation of the Arctic States may meet privately at their discretion.
7. In accordance with the Declaration, all decisions of the Arctic Council and its subsidiary bodies, including with respect to decisions to be taken by SAOs, shall be by a consensus of all eight Arctic States. In the event that a Ministerial or SAO meeting is held without the attendance of all eight Arctic States, consistent with Rule 3, decisions may be taken by a consensus of all Arctic States present, subject to confirmation in writing by the absent Arctic States within 45 days after receiving notice of the decision.
8. Decisions of working groups, task forces or other subsidiary bodies may be adopted by a consensus of all Arctic States present, subject to any objection in writing by an absent Arctic State within 30 days after receiving a report containing the decision.
9. At meetings, unless decided otherwise, discussions or decisions shall not occur on any matter which has not been included as an item in an agenda adopted in accordance with these Rules.
10. The Host Country shall act as chair of the Arctic Council from the conclusion of a biennial Ministerial meeting to the conclusion of the next biennial Ministerial meeting, and shall coordinate arrangements for Ministerial meetings.
11. The Host Country, an Arctic State, or other subsidiary bodies may undertake communications on Arctic Council matters with other international fora as may be agreed to in advance by the Arctic States.
12. During the discussion of any matter, a representative of an Arctic State or Permanent Participant may rise to a point of order and the point of order shall be decided immediately by the chairperson in accordance with these Rules.
13. After consultation with Arctic States and Permanent Participants, the Host Country may place reasonable limits on the size of all delegations for a meeting and shall notify all delegations accordingly.
14. Decisions other than those which must be taken at a Ministerial meeting may be taken by written communications, including telefax communications.

### **Ministerial Meetings**

15. Ministerial meetings shall be held biennially, or at such other times and locations as may be agreed upon by the Arctic States in consultation with the Permanent Participants.
16. Subject to the concurrence of the Arctic States, the Host Country shall be entitled to designate the chairperson for Ministerial meetings. At the initial session of the Ministerial meeting, the Arctic States may

also designate one or more vice-chairpersons of the meeting who shall preside in the absence of the chairperson.

17. In accordance with Article 5 of the Declaration, the chair of the Arctic Council shall rotate among the Arctic States. Prior to the conclusion of each Ministerial meeting, the Arctic States shall confirm the host of the next meeting.
18. The Host Country shall propose a date and the location for a biennial Ministerial meeting at least 6 months in advance of the proposed date.
19. After consultation with Arctic States and Permanent Participants, the Host Country shall circulate a draft agenda at least 90 days prior to the date of a Ministerial meeting. Arctic States and Permanent Participants may propose supplementary agenda items by notifying the Host Country 60 days prior to the Ministerial meeting. No later than 30 days prior to a Ministerial meeting, the Host Country shall circulate the revised draft agenda to Arctic States and Permanent Participants along with any explanatory or other documents. A final agenda shall be adopted by a decision of the Arctic States at the opening session of each Ministerial meeting.
20. At least 7 days prior to a Ministerial meeting, Arctic States, Permanent Participants and Observers should provide in writing to the Host Country the names of individuals in their respective delegations.

#### **Meetings of Senior Arctic Officials**

21. Each Arctic State shall designate a SAO, and each Permanent Participant shall designate a representative, to act as focal point for Arctic Council activities, and shall inform the other Arctic States and Permanent Participants of the designation through the Host Country.
22. The Host Country shall provide the chairperson for the SAO meetings, subject to the concurrence of the Arctic States represented at the SAO meetings.
23. The SAOs shall receive and discuss reports from working groups, task forces and other subsidiary bodies and shall coordinate, guide and monitor Arctic Council activities in accordance with the decisions and instructions of the Arctic Council.
24. SAOs shall review and make recommendations to the Arctic Council on proposals by Arctic States and Permanent Participants to be submitted to a Ministerial meeting with respect to proposed cooperative activities.
25. Meetings of Senior Arctic Officials should take place at least twice yearly at the call of the Host Country, after consultation with the representatives of the Permanent Participants. The date, location and agenda of SAO meetings shall be decided by the SAOs. A draft agenda shall be circulated no less than 30 days in advance of such as a meeting, and shall be approved at the initial session of the meeting.

#### **PART III: PROGRAMS AND PROJECTS**

26. An Arctic State or Permanent Participant may make proposals for cooperative activities. All proposed programs and projects for which there is no existing Ministerial mandate shall be subject to a decision of the Council at an Arctic Council meeting. Proposals on programs and projects should address the elements outlined in ANNEX 1. For a proposal to be submitted to the Council, it must be placed on the agenda in accordance with these Rules.
27. Proposals for cooperative activities should be received 90 days prior to any SAO meeting or meeting of a subsidiary body at which they are to be considered.

## **PART IV: IMPLEMENTATION OF COOPERATIVE ACTIVITIES**

### **Working Groups, Task Forces and other bodies**

28. The Arctic Council may establish working groups, task forces or other subsidiary bodies to prepare and carry out programs and projects under the guidance and direction of SAOs. The composition and mandates of such bodies shall be agreed to by the Arctic States in a Ministerial meeting. The activities of these bodies shall be subject to these Rules.
29. In consultation with SAOs, a working group, task force or other subsidiary body shall select a chairperson and a vice chairperson. An Arctic State may volunteer to provide secretariat support functions. The period for which a chairperson or vice-chairperson may serve shall be specified.
30. The date, location, and agenda for meetings of working groups, task forces and other subsidiary bodies shall be decided by a consensus of the participating Arctic States.
31. Working Groups, task forces and other subsidiary bodies may establish operating guidelines which are consistent with these Rules. Such operating guidelines shall be submitted to SAOs for approval.

### **Secretariat Support Functions**

32. The Host Country shall be responsible for facilitating preparations for forthcoming Ministerial and SAO meetings, liaison and coordination, providing secretariat support functions, and carrying out such other tasks as the Arctic Council may require or direct.

### **Indigenous Peoples' Secretariat**

33. In accordance with Article 8 of the Declaration, the Indigenous Peoples' Secretariat established under the AEPS shall continue under the framework of the Arctic Council.

## **PART V: OTHER MATTERS**

### **Additional Permanent Participants**

34. Arctic organizations meeting the criteria set out in Article 2 of the Declaration are eligible to be considered by the Arctic States for Permanent Participant status.
35. An application by a potential Permanent Participant shall be circulated to Arctic States and Permanent Participants by the Host Country at least 90 days prior to the Ministerial meeting at which the matter is to be decided. Unless any Arctic State objects at least 30 days prior to the Ministerial meeting, the agenda for that meeting shall include an item to decide whether the organization should be granted Permanent Participant status.

### **Observers**

36. Observer status in the Arctic Council is open to:
  - (a) non-Arctic States;
  - (b) inter-governmental and inter-parliamentary organizations, global and regional;
  - (c) non-governmental organizations that the Council determines can contribute to its work.

Accreditation of Observers shall be in accordance with the provisions of Annex 2.

37. Observers shall be invited to the Ministerial meetings and/or to other meetings and activities of the Arctic Council. Observer status shall continue for such time as consensus exists at the Ministerial meeting. Any Observer that engages in activities which are at odds with the Council's Declaration shall have its status as an Observer suspended.

Ad hoc Observer status for specific meetings may be granted.

38. Observers may make statements at the discretion of the Chair and submit relevant documents to the meetings.

The Host Country shall provide for timely access of any interested party to appropriate records, documents and reports.

#### **Experts**

39. Where the Arctic Council, or the Arctic States participating on a working group, task force or other subsidiary body agree, the chair of the body may invite any person or organization that can contribute expertise and is able to contribute to the work of that body to participate in specific meetings. These persons or organizations do not have Observer status unless so decided in accordance with Rule 36.
40. Costs associated with the attendance of experts at meetings shall not be borne by the Arctic Council or its subsidiary bodies unless authorized in advance by a decision of the Arctic States.

#### **Languages**

41. English shall be the working language of the Arctic Council.
42. The Host Country of a Ministerial or SAO meeting shall make reasonable efforts to provide for Russian interpretation.
43. Any individual may speak in a language other than English and in such cases that individual shall arrange for interpretation into English.
44. An Arctic State or Permanent Participant may volunteer to provide interpretation into languages other than English and vice versa.

#### **Public communications and documents of meetings**

45. The Host Country may release minutes, if any, communications and documents of the meeting after obtaining approval from the relevant officials of each Arctic State. The Host Country is responsible for preparing a report of the meeting which will be formally released after it has been approved by the relevant officials of each Arctic State.

#### **Communications with the Arctic Council**

46. The Host Country shall designate a point of contact for communications and shall inform all Arctic States, Permanent Participants and Observers accordingly. All communications with the Arctic Council or Host Country required by these Rules shall be directed to the designated point of contact.

#### **Amendment**

47. These Rules may be amended by a decision of all the Arctic State

**ANNEX 1**

As a guide to preparation of such proposals for programs and proposals, the following elements should be included, as appropriate:

- a. the issues or matters to be addressed;
- b. the reasons that the Arctic States should consider and approve the proposal;
- c. any relevant recommendations in relation to the proposal, including recommendations as to an appropriate body or bodies for carrying out, coordinating, or facilitating an activity;
- d. information in relation to costs and methods of financing an activity;
- e. a work plan, including initiation and completion dates;
- f. relationships to other Arctic Council programs or activities and to activities in other relevant regional or international fora;
- g. an environmental impact assessment; and
- h. any other information relevant to the proposal

## ANNEX 2

1. Accredited Observers to the Arctic Environmental Protection Strategy (AEPS) which are granted Observer status under the Arctic Council are:  
  
Federal Republic of Germany  
The Netherlands  
Poland  
United Kingdom of Great Britain and Northern Ireland  
Nordic Council  
Northern Forum  
United Nations Economic Commission for Europe (UN-ECE)  
United Nations Environment Program (UNEP)  
International Arctic Science Committee (IASC)
2. Not later than 120 days before a Ministerial meeting, the Host Country shall circulate, to all Arctic States and Permanent Participants, a list of entities, additional to those referred to in paragraph 1, that have applied or been nominated for Observer status.
3. Nominations or applications for observer status shall be directed to the Host Country and shall be accompanied by a memorandum setting out relevant information including:
  - (a) a written description of the proposed Observer's ability to contribute to the work of the Arctic Council;
  - (b) in the case of organizations:
    - the purpose of the organization, including a copy of its annual report;
    - a description of the organization's activities and information on the organization's governance and the total number of members.
4. Observers shall submit to the Arctic Council up to date information about relevant activities.

## **Appendix 5: Ad Referendum Arctic Council Terms of Reference for a Sustainable Development Program**

(February 5, 1998) [This appendix is provided given the difficulty of accessing the document and the uncertain future of the Arctic Council Website]

Noting that the Declaration on the Establishment of the Arctic Council provides that the Council will adopt terms of reference for, and oversee and coordinate a sustainable development program;

Further noting that the Declaration affirms the commitment of the Arctic States to sustainable development in the Arctic region, including economic and social development, improved health conditions and cultural well-being;

Affirming the commitment of the Arctic Council to the protection of the Arctic Environment, including the health of Arctic ecosystems, maintenance of biodiversity in the Arctic region and conservation and sustainable use of natural resources;

Desiring to facilitate the consideration of proposals for cooperative activities which will form part of the sustainable development program;

The Arctic Council hereby adopts the following terms of reference for the Council's sustainable development program:

1. The goal of the sustainable development program of the Arctic Council is to propose and adopt steps to be taken by the Arctic States to advance sustainable development in the Arctic, including opportunities to protect and enhance the environment, and the economies, cultures and health of indigenous communities and of other inhabitants of the Arctic, as well as to improve the environmental, economic and social conditions of Arctic communities as a whole.

2. Consistent with the Arctic Council Rules of Procedure, proposals for cooperative activities which will form part of the sustainable development program should also conform to the following requirements:

a. Proposals shall clearly outline the issues to be addressed and any anticipated financial needs and implications, and suggest ways of dealing with those needs and implications.

b. A proposal should provide for participation by more than one Arctic State and should identify if a working group or other subsidiary body would be needed to oversee its implementation.

c. Proposals for such activities should include a description of the nature of the issue to be addressed and identify the benefit to be realized, including projected relationship to the experience and needs of the indigenous and other residents of the Arctic.

d. Proposals should include a description of the relationship of the proposed work to activities currently underway within the Arctic Council (e.g. AMAP, CAFF, PAME, EPPR), or in any other relevant fora (e.g., Barents Council, Commission on Sustainable Development, IASC).

3. A proposal, including any comments received, should be taken up at a Senior Arctic Official (SAO) meeting. The SAOs should consider the merit of the proposal, including the degree to which it is consistent with the Declaration and with the decisions taken at Ministerial meetings, regional applicability, level of sponsorship and sufficiency of any financial support required. The SAOs may call for further revision of the proposal or forward it to a Ministerial meeting for consideration and decision.

\*\*\*\*\*

ARCTIC COUNCIL  
SENIOR ARCTIC OFFICIALS MEETING  
Whitehorse, Yukon, Canada  
10 May 1998

**TASK FORCE ON SUSTAINABLE DEVELOPMENT**

An *ad hoc* Task Force based on the following is hereby established to assist Senior Arctic Officials (SAOs):

**TASKS:**

1. The Task Force will **receive** proposals for sustainable development projects.

[Note: The party making a proposal should circulate it directly to SAOs and Permanent Participants with a copy to the Task Force. The SAOs would set the final date for receipt of proposals to be considered for this year's Ministerial.]

2. The Task Force will **review** proposals for sustainable development projects.

[Note: This review is to ensure compliance with the Rules of Procedure and the Terms of Reference for Sustainable Development. The Task Force may advise the party making the proposal of any matters which the Task Force believes need to be clarified or supported with additional information in preparation for consideration by SAOs.]

3. The Task Force will **identify issues related to management, coordination and/or possible organizational structures** arising from project proposals.

[Note: There may be linkages among projects, Working Group activities, and the work of other fora which SAOs will want to consider when they make decisions on proposals. The Task Force will point out these linkages through its graphical presentation at the next SAO meeting.]

4. The Task Force will **prepare a graphical representation** of proposals to assist the SAOs.

[Note: This presentation is to assist the SAOs in obtaining an overview of the proposals in the context of the overall Arctic Council work plan and activities. The purpose of this presentation would not be to speak to the merits of any of the proposals. That would be up to the party making the proposal.]

5. The Task Force will not decide on proposals, make recommendations on the merits of proposals, nor submit its own proposals.
6. The party making a proposal should provide a copy to the Arctic Council Secretariat for circulation to all Arctic States, Permanent Participants and to the Task Force. The Task Force will not circulate proposals.

**PARTICIPATION ON THE TASK FORCE:**

7. The Task Force would be open to all Arctic States, Permanent Participants and Working Groups Chairs (or another member of a Working Group).
8. Consideration may be given to seeking advice from Observers, as appropriate.

**TARGET DATES:**

9. SAOs will decide on a date prior to the SAOs meeting for receipt of all proposals.

**TASK FORCE MEETINGS:**

10. Most work could be conducted by phone and fax providing there were timely responses.
11. At least one meeting could occur prior to the next SAO meeting to review and finalize the materials to be presented to SAOs.

**TERM OF OPERATION OF TASK FORCE:**

12. The Task Force will operate to assist SAOs up to the Ministerial Meeting in September, 1998. SAOs agree that the utility and mandate of the Task Force will be assessed at the next SAOs meeting.
13. The need for a body to coordinate or manage activities under the Sustainable Development Program would be an issue for SAOs and Ministers unrelated to the Task Force and its activities.

## Appendix 6: Arctic Council Officials

(Ministers as of September 18, 1998; all others as of 27 July 1998)

### Member States and Permanent Participants

Chair: Arctic Ambassador Mary Simon (Canada)

| State or P.P.       | Minister  | SAO                    | SD Task Force          |
|---------------------|---|------------------------|------------------------|
| CANADA              | Lloyd Axworthy,<br>Min. Foreign Affairs         | Jim Moore, DIAND       | Ricki Hurst            |
| DENMARK             | Niels Helveg Petersen,<br>Min. Foreign Affairs  | Mogens Holm Pedersen   | Kuupik Kleist          |
| GREENLAND           | see Denmark                                     | Marianne Lykke Thomsen | "                      |
| FINLAND             | Pekka Haavisto, Min.<br>Environment/Devel.Co-op | Amb.Heikki Puurunen    | Sauli Rouhinen         |
| ICELAND             | Gudmunður Bjarnason,<br>Min. Environment        | Amb.Gunnar Gunnarsson  | Hugi Olafsson          |
| NORWAY              | Knut Vollebæk,<br>Min. Foreign Affairs          | Amb.Dagfinn Stenseth   | Fredrik J. Theisen     |
| RUSSIA              | Vladimir Goman, Chair.<br>Devel't of the North  | P.Dzubenko/S.Nikiforov | Pavel H. Zaifudim      |
| SWEDEN              | Anders Bjurner,<br>Dep.Sec. of State            | Amb.Wanja Tornberg     | Amb. Wanja Tornbert    |
| USA                 | Wendy Sherman,<br>Ambassador to Canada          | Ray Arnaudo            | Tracy Hall             |
| Perm't Participants | Note: No voting rights                          |                        |                        |
| ICC                 |   | Aqqaluk Lyngø          | Terry Fenge            |
| SAAMI COUNCIL       |   | Leena Aikio            | Leif Halonen           |
| RAIPON              |   | Sergei N.Haruchi       | Pavel Sulyandziga      |
| IPS                 |   | Tove Sovndahl Petersen | Tove Sovndahl Petersen |

### Working Groups

|      |  |
|------|--|
| AMAP | Lars-Erik Liljelund, Norway secretariat (100% of cost) |
| CAFF | Kevin McCormick, Iceland secretariat (50% of cost)     |
| EPPR | Ollie Pakhalla, Finland secretariat (100% cost)        |
| PAME | John Karau, Iceland secretariat (50% of cost)          |
| EIA  | Eeva Furman, Finland leads (jointly funded)            |

### Observers

|                    |                      |
|--------------------|----------------------|
| Germany            | Ms. Ursula Mompro    |
| Netherlands        | Mr. M.I. van der Zee |
| Poland             | Mr. Jacek Ochocinski |
| United Kingdom     | Mr. M. Richardson    |
| Nordic Council     | Mr. Guy Lindstrom    |
| Northern Forum     | Mr. Fredrik Bjorkan  |
| UN-ECE             | Mr. Lars Nordberg    |
| UNEP               | Mr. Jorge Illueca    |
| IACS               | Dr. Robert W. Corell |
| WWF                | Dr. Peter Prokosch   |
| Standing Committee | Mr. Guy Lindstrom    |

## **Appendix 7: Sustainable Development Project Summaries**

(A draft of this analysis was submitted to the Arctic Council Secretariat, August 10, 1998, for use at the SAO meeting in London on August 16-17 in its review of Sustainable Development Proposals from the members and in the preparation of recommendation to the Ministers at the Iqaluit Ministerial)

### **Sustainable Development Project Proposals considered by the Arctic Council Sustainable Development Task Force**

**Project Title:** **Follow-up to Recommendations from the Circumpolar Conference and Workshop on Sustainable Development in the Arctic: Lessons Learned and the Way Ahead (SDA)**  
(Canada)

**Source:** A proposal signed by James R. Moore (SAO-Canada) on July 23, 1998 and accompanied by the InfoLink Consultants July 14, 1998 "Summary Report - Circumpolar Conference on Sustainable Development" which included a full list of recommendations from the Conference workshops. The proposal simply forwarded the recommendations of this international workshop for prioritization by the Arctic Council through the articulation of a "strategic approach".

**Summary:** The purpose of the project is to set priorities based on multi-stakeholder recommendations from the SDA conference and to develop a strategic approach to the systematic implementation of circumpolar sustainable development projects. An Ad Referendum approval of the strategy would allow detailed work plans for key projects to be developed and implemented under SAO direction.

**Analysis:** From my perspective as a facilitator and a conference participant, the selection of the 7 themes appear biased toward process issues rather than substantive concerns. For instance, the theme of capacity building was identified as a means to local self-reliance. The need to mark progress against explicit indicators reflecting community-generated visions of healthy, thriving communities was common in all workshops, but the vision setting exercise is not mentioned in the overarching themes. In this context capacity-building and behaviour change was often discussed as institutional reform, especially as it related to the financial and educational sectors. It would be useful to reconvene the three theme coordinators and possibly facilitators/experts to sharpen the focus of thematic issues that emerged at the conference.

More importantly, a comprehensive strategy would need to grapple with both national and international inconsistencies in fundamental assumptions about the interconnections of causality in human and environmental systems, the assessment of risk, the responsibilities of the public and private sector in management of common pool resources (oceans, atmosphere), the valuation of inter- and intra-generational equity, etc. This will likely be non-trivial and needs to return to the Ministers for political leadership prior to the implementation of projects.

Project (cont'd.):

**Follow-up to Recommendations from the Circumpolar Conference and Workshop on Sustainable Development in the Arctic: Lessons Learned and the Way Ahead (SDA)**  
(Canada)

Again, this project, in that it explicitly calls for the development of a conceptual framework for decision-making, will meet resistance from the US delegation. There are several other members, specifically Finland (the Finnish "Non-paper on the immediate tasks of the Arctic Council" stated that "the greatest immediate challenge of the Arctic Council is defining operatively the concept of sustainable development and implementing it programmatically by cooperative and joint action" and proposed a Commission) and the ICC (see their project below), that have already explicitly supported similar ventures. Entrepreneurial negotiations on the part of Canada's Minister of Foreign Affairs is needed to advance this project. Another tactic is to charge the SAOs themselves with the responsibility for determining a criteria for project development and selection.

## **Sustainable Development Project Proposals considered by the Arctic Council Sustainable Development Task Force**

- Project Title:** **The Future of Children and Youth of the Arctic (Canada)**
- Source:** Proposal signed by James Moore (nd) and distributed by Arctic Council Secretariat on July 22, 1998. This was first made public in a paper presented by Ambassador for Circumpolar Affairs, Mary Simon, in a speech called "Children and Youth of the Arctic: A Critical Challenge of Sustainable Development" given to the "Circumpolar Conference on Sustainable Development in the Arctic: Lessons Learned and the Way Ahead (Whitehorse, Yukon, Canada, May 12-14, 1998)".
- Summary:** The proposal focuses on Arctic children and youth, specifically: 1) the impact of environmental contaminants and social conditions on their health and well-being, and 2) enhancing comprehensive scientific and TEK sustainable development learning. The project completes base-line information. With youth participation in discussions about social and environmental circumstances, will recommend action strategies. The second objective would also include international internships in sustainable development and the development of a multi-media information network.
- Analysis:** This proposal identifies objective impacts, but does not develop a criteria for determining their interrelationships or the impact of the change on a specific community. What is blatantly missing here is the local vision of a healthy community; a vision which frames the interpretation, prioritization, and selection of a desirable state of key community health indicators. Developing healthy community indicators has been central to socio-economic development and educational policy in both urban and rural settings across North America and Europe for the last decade. The exercise not only clarifies local identities but helps place tradeoffs and linkages within a local political agenda. The addition of an 'indicators' project would give this local significance and deconstruct the universalist bias in this proposal (an action plan developed by one youth and one elder from each AC member), allowing more meaningful comparisons of strategies relative to goals, and focus the leadership and institutional capacity building.
- Regarding the second objective, there are organizations with conflicting agendas that support 'sustainable development'. It would be useful, therefore, for the AC to develop a typology of sustainable development assumptions so that both youth and communities can make informed choices about relevant internship experiences.
- Since the proposal focuses on the preparation of learning materials on 'sustainable development' (SD) for youth, it will require a coherent conceptual framework for understanding it. The exercise would meet with resistance from the US delegation. An indicators exercise would require preparation of the various arguments without any endorsement from Arctic States. The bottom-up exercise would solicit non-binding public opinion from citizens of all arctic states, sharpen the awareness of SD issues, and potentially clarify common and disparate measures required by the members of the Arctic Council.

## **Sustainable Development Project Proposals considered by the Arctic Council Sustainable Development Task Force**

**Project Title:**       **Technology Transfer Project to Improve Arctic Sanitation and Energy Systems**  
(USA)

**Source:**             Proposal forwarded under letter signed by Raymond V. Arnaudo, US SAO, dated July 29, 1998, and forwarded to the Arctic Council secretariat on July 31, 1998 by Jutta Paczulla of DIAND. The proposals had been prepared for the Whitehorse SAO meeting (May 1998) by the State of Alaska.

**Summary:**         The purpose of the project is to improve remote rural cold climate sanitation infrastructure, reducing negative impacts of sewage disposal on human health and the environment. Through a demonstration community, capacity building (local fiscal management, and technical and governance capacity in planning, design, operation) projects would be implemented in each country. A follow-up conference would focus on a comparative analysis of results.

**Analysis:**         Despite its title, the project focuses only on sewage treatment in northern environments. Opportunities for reduced pollution impacts of integrated water supply, sewage, and energy systems is not explored, but provides potential keys for ecological recycling and sustainable use of water, energy and nutrients. The lack of attention to design innovations focused on regenerative systems means the proposal reinforces obsolete technologies through new institutional arrangements. The work of John Tilmann Lyle (*Regenerative Design for Sustainable Development*) and Amory Lovins (*Soft Energy Paths*) and Lovins, Lovins and Weiszacker (1997, see References) would provide useful insight and inspiration for innovative solutions.

The northern challenges of domestic water, sewage, solid waste and energy are also related to housing form, design and density. The terms of reference for the project, therefore, needs to expand to include all infrastructure issues related to settlement. Otherwise, the technical fixes will not be integrated with each other or the local environment and will tend to be universalistic and mechanistic, resulting in economies of production scale at the cost of increased dependence on imported knowledge and equipment.

**Sustainable Development Project Proposals considered by the Arctic Council  
Sustainable Development Task Force**

**Project Title:**        **Arctic Telemedicine Project  
(USA)**

**Source:**                Proposal forwarded under letter signed by Raymond V. Arnaudo, US SAO, dated July 29, 1998, and forwarded to the Arctic Council secretariat on July 31, 1998 by Jutta Paczulla of DIAND. The proposals had been prepared for the Whitehorse SAO meeting (May 1998) by the State of Alaska.

**Summary:**              The purpose of the project is to exchange information on the planning and implementation of telemedicine supporting remote sensing, decision-making and collaboration on treating patients at a distance. Project activities include 1) an inventory and analysis of current practices and programs, 2) a bi-annual conference to exchange best-practices co-ordinate planning, and 3) an Internet referral system education and training program.

**Analysis:**              The focus is on cure, rather than prevention. But if the potential to improve the quality of life without increasing environmental resource throughputs is the goal, then telemedicine may contribute to sustainable development. If, on the other hand, it accelerates the process of diagnosis and the perceived need for access to remote curative treatments, then it will increase the environmental cost of healthcare as patients are transported to regional treatment centres. The criteria for success, then, must include the reduction of resource throughputs and an increase in health. This will force a focus on prevention, rather than curative interventions.

## **Sustainable Development Project Proposals considered by the Arctic Council Sustainable Development Task Force**

**Project Title:**        **Arctic Cultural and Eco-Tourism Project**  
                                  **(USA)**

**Source:**                Proposal forwarded under letter signed by Raymond V. Arnaudo, US SAO, dated July 29, 1998, and forwarded to the Arctic Council secretariat on July 31, 1998 by Jutta Paczulla of DIAND. The proposals had been prepared for the Whitehorse SAO meeting (May 1998) by the State of Alaska.

**Summary:**            The purpose of the project is to 'explore viable cultural and eco-tourism opportunities ... (and) develop Arctic cultural resources into a viable economic sector' . The focus is on information sharing regarding market opportunities and tourism service inventories, maximization of local benefit and minimization of local disruption and environmental degradation. In addition analysis and planning would be provided to improve transportation and local physical infrastructure, to strengthen service provider capacity, and to focus marketing especially through a conference and professional networks. The work would be coordinated by a representative cultural resources steering committee to respect local desires.

**Analysis:**            This is a good example of the potentially contradictory activities that can be pursued under 'sustainable development' when it is poorly defined and the operational criteria are determined by vested interest. Although demonstrations of environmentally benign tourism are required as 'best practice' examples, one must question whether the increased energy /environmental costs of tourism is the best investment in a sustainable economic sector for the North. For instance, retraining outfitters to maintain local ecosystems and monitor them for environmental impacts from remote industrial pollutants, or producing high quality educational film on the arctic environment and the dynamics of the global ecosystem (GAIA) might be a better use of investment dollars with an equal impact on the northern economy over the long-haul with greater environmental sustainability. See chapter 4 for other suggestions on northern economic roles.

The development of transportation and accommodation infrastructure associated with tourism does make the north more accessible to the global economy. But as shown in Chapter 3, it does not guarantee that northern people will not be marginalized as northern resources are exploited for the world market-place. The development of infrastructure for environmental and cultural tourism must be examined simultaneously with the development of infrastructure for resource development if the northern economy is to be sustainable and take a responsible position in ensuring global sustainability.

## **Sustainable Development Project Proposals considered by the Arctic Council Sustainable Development Task Force**

- Project Title:**       **The Arctic in National Sustainable Development Strategies (ICC)**
- Source:**            “Sustainable Development and the Arctic Council: Initial Proposals from the Inuit Circumpolar Conference, August 1998” distributed under a letter from the SD Task Force Acting Chair Bernard W. Funston dated July 20, 1998.
- Summary:**         The purpose of the project is to inventory the individual national sustainable development strategies of circumpolar countries as applied to their arctic regions for comparative analysis of strengths, weaknesses, and successes, especially as it relates to north-south tensions and compromises. This proposal specifically co-relates the problems of the Arctic regions when compared to the southern regions of these jurisdictions with the problems between developing countries of the South(ern) hemisphere and developed industrial countries of the North(ern) hemisphere.
- Analysis:**         By insistence on using common criteria and format for comparison and evaluation, the proposal potentially teases out national definitions of sustainable development as well as policy goals, objectives and priorities. The development of a common vision on sustainable development for the Arctic States requires clarity on what is being sustained, for whom, at who’s cost and by what means. Synergies can then be identified and magnified. Conflicts can be identified and eventually resolved through on-going dialogue and principle-based negotiation.
- Being substantive and theoretical in nature, this project will meet with resistance from the US delegation. But it is a project that would certainly capture the interest of the University of the Arctic, proposed by the Circumpolar Universities Association, and with an interim secretariat funded by Finland. This project, along with Finland’s non-paper proposal to “mandate a task force of governmental experts to study the governance of Arctic issues within the Arctic region and in the relationships of the Council with sub-regional, regional and wider cooperative institutions and arrangements” (Finland 1998:4), could be sponsored in part by the ICC and brought to future meetings of the SAOs through the ICC, with specific motions supporting specific recommendations of the reports. Acceptance or rejection of the recommendations would require, at least within nations, a consideration of and alignment with specific philosophies underpinning sustainable development and the structures of governance these decisions would require. At this young stage in the evolution of the Arctic Council, entrepreneurial leadership is required to give it an inspirational and relevant focus, and an operational purpose. These projects might identify relevant and important work, and uncover entrepreneurial leaders.
- The ICC, given its meager resources for the development of SD proposals and the completion of SD projects, would benefit by creating liaisons with the professional, academic and business community who might help them in the development of their proposals.

## **Sustainable Development Project Proposals considered by the Arctic Council Sustainable Development Task Force**

**Project Title:**           **Economic Rent from Natural Resource Development (ICC)**

**Source:**                 “Sustainable Development and the Arctic Council: Initial Proposals from the Inuit Circumpolar Conference, August 1998” distributed under a letter from the SD Task Force Acting Chair Bernard W. Funston dated July 20, 1998.

**Summary:**             The purpose of the project is to analyze the effectiveness of various arctic government legislative and policy tools to generate economic rent from arctic natural resource development including the value of revenues and their distribution, and impacts on economic production scale and rate. The information would assist circumpolar aboriginals in resource development corporations.

**Analysis:**             Although the proposal is undeveloped, it appears to be concerned with means to maximize economic benefits from resource development within a competitive international context and to consolidate a negotiating front for circumpolar aboriginal peoples vis-à-vis transnational corporations. An unstated potential of the study, however, is cradle-to-grave tracking of resources for purposes of determining full-cost pricing. This goes far-beyond current concerns which price resources to include the environmental clean-up required to remediate the bio-physical impacts of the extraction process only. This would allow a better assessment of human and environmental impacts throughout the extraction and use cycle. In addition, resource utilization studies would help identify needed R&D projects and the priority for and magnitude of shadow pricing needed to raise R&D funds directed at eventual substitution of renewable for non-renewable resources.

## **Sustainable Development Project Proposals considered by the Arctic Council Sustainable Development Task Force**

- Project Title:** **Indigenous Peoples and Natural Resource Use and Management (ICC)**
- Source:** "Sustainable Development and the Arctic Council: Initial Proposals from the Inuit Circumpolar Conference, August 1998" distributed under a letter from the SD Task Force Acting Chair Bernard W. Funston dated July 20, 1998.
- Summary:** Two case studies are proposed to broaden knowledge of the impact of natural resource use and management on indigenous peoples. The first will inventory and analyze the impact of hunter income support programs as vehicles to promote indigenous culture and economy. The second expands existing studies on traditional land use and occupancy into Russia and extends research on indigenous perceptions of ecological/climate change.
- Analysis:** The proposals are made to expand the AEPS into the sustainable development arena, but no explicit linkages are made. The first case, however, is consistent with a number of studies looking at the total ecological cost-benefit of negative income tax regimes which reduce total resource utilization (through subsistence rather than import) while increasing wellness and the quality of life. Similar work has been done in Kerala India where per capita incomes at 1/60 of the US seem to result in equivalent UNHD indicators.
- The second provides a TEK component to climate change work, similar to the work done on the McKenzie Basin Impact Study and is useful in providing early warning signals to ecosystem succession and ecosystem resilience decay, as well as locally appropriate adaptation strategies to ecological stress. The recent study edited by Berkes and Folke (1998), which includes a relevant study of the James Bay Cree, would have been a useful reference and provided some intellectual rigour to the study.
- The Berkes/Folke volume not only explores TK practices and perceptions, but the social institutions required to perpetuate adaptable and viable societies. This would have allowed a combination of this and the ICC's preceding project, illuminating the linkages between environmental sustainability, social institutions and political choice. A much stronger proposal would have resulted. The proposal is weakened by the implication that past TK practices may have relevance to the contemporary change/challenges of global climate change. Behind 'traditional knowledge' is traditional science. The techniques of knowing, rather than the artifacts of knowledge, may have more greater relevance in the recognition and evaluation of change and need explicit recognition in the proposal.

## **Sustainable Development Project Proposals considered by the Arctic Council Sustainable Development Task Force**

**Project Title:**       **Freshwater Fishery Management in the Barents Region (Sami)**

**Source:**               Sami Council proposal #1 (nd.) received by DIAND on July 6, 1998 and forwarded to the Arctic Council SD task force members on July 13, 1998

**Summary:**            The purpose of the project is to develop a comprehensive region-wide (Norway, Finland, Sweden, Russia) fresh-water fisheries co-management policy with the Sami incorporating TEK, which secures Sami access to both the fishery resource and the commercial revenues. The project would include: 1) inventory and analyze current fishery practices and impacts on Sami socio-economics and fishery sustainability and 2) a comparison of co-management policies in other Arctic regions.

**Analysis:**            The cumulative impact of the sustainable use of global renewable resources is global sustainability. The proposal also addresses social equity issues. Both make it valuable both locally and internationally. The global importance is not highlighted however, and this makes the proposal appear to be of local, rather than international significance.

An underlying issue here is that Nordic States have been less amenable to aboriginal co-management than has Canada with its precedent setting co-management boards established under comprehensive land claims. The Nordic states, therefore, will see that this proposal is directed at securing international pressure to change domestic policy. This proposal is a case study of the ICC and Finish non-paper proposals on the structure of governance needed for resilience, adaptability and sustainability. The Sami would be more successful if they rallied behind these proposals.

**Sustainable Development Project Proposals considered by the Arctic Council Sustainable Development Task Force**

- Project Title:** **Comparative Analysis of Coastal Fishery Management systems in Norway, Greenland and Canada with Reference to Sea Sami, Co-management and Traditional Ecological Knowledge (Sami)**
- Source:** Sami Council proposal #2 (nd.) received by DIAND on July 6, 1998 and forwarded o the Arctic Council SD task force members on July 13, 1998
- Summary:** The purpose of the project is to review co-management arrangements in Canada, Greenland, Alaska, (and Russia) to reform Norwegian/Sami co-management of the Cod fishery. The project includes an analysis of current practices, and a collection of Sami TEK as the basis for institutional reform. Recommendations on reform, however, are not explicitly part of the proposal.
- Analysis:** Sustainable development objectives are not explicitly referenced, but implied in the subsistence functions, as well as issues concerning culture, lifestyle and identity. The emphasis on export revenues, by itself, could de-emphasize sustainable harvest. The main issue seems to be the sharing of power over the distribution of wealth, and little about environmental sustainability.

## Appendix 8: Complexity and the New Sciences: Annotated Bibliography

A thorough annotated bibliography of the new sciences of complexity can be found in Lee, Richard. 1992. *Review*, 15(1) winter: 113-171 arranged according to an array of categories (see below) demonstrating the pervasive influence of the sciences of "organized complexity" (Weaver, Warren. 1948. "Science and Complexity." *American Scientist*, 26(4):536-44). The review begins with the publication of Godel's theorem in 1931, but recognizes the precedent events of Henri Poincare's differential equations as the basis of bifurcation theory, Georg Cantor's transfinite sets, Einstein's relativity theory, Heisenberg's quantum theory, and the theoretical and technological basis of computing machines, all products of the late nineteenth and early twentieth centuries.

- I. UNDECIDABILITY, UNCERTAINTY, AND COMPLEXITY
- II. MACROSTRUCTURES: SYSTEMS AND THE HUMAN SCALE
  - A. Entropy
  - B. Dynamical Systems
    - 1. Game theory
    - 2. Cellular automata
    - 3. Catastrophe theory
    - 4. Chaos
      - a) Historical accounts
      - b) Order in chaos, strange attractors, universality
      - c) Order out of chaos
    - 5. Fractal geometry
    - 6. Anticipatory systems
    - 7. Living systems
      - a) Evolution
      - b) Self-organization, morphogenesis, and pattern formation
  - C. Computation
    - 1. Information theory
    - 2. Cognitive science and artificial intelligence
- III. THE VERY BIG AND THE VERY SMALL: PHYSICS, ASTROPHYSICS AND COSMOLOGY
- IV. TIME
- V. CULTURE AND EPISTEMOLOGY

Lee's bibliography is compiled for the "working historical scientist", but is representative of the topography of research issues, and includes reviews of the interpretations of both hard technical researchers and soft popularizers. Lee's graduate work was done in conjunction with the Fernand Braudel Centre at SUNY and went on to write with I. Wallerstein about changes in western epistemology in the current critical phase of the "world system", showing that complexity theory is now foundational to theories of history and social change.

For other reading lists, Cohen and Stewart (1994. *The Collapse of Chaos: Discovering Simplicity in a Complex World*. N.Y.: Viking) provide an interesting annotated bibliography of substantially different references by briefly itemizing the subject matter of each document, occasionally seasoned with cryptic personal assessment. Several texts provide unannotated reference lists key to specific authors and organized under complexity-related subject headings. Ervin Laszlo's (1996. *Evolution: The General Theory*. Cresskill, N.J.: Hampton Press) headings are "Nonequilibrium thermodynamics and dynamic systems theory," "General and Evolutionary Systems Theory," "Biological Evolution," and "Cosmic Evolution". Another Laszlo text (1994. *Vision 2020: Reordering Chaos for Global Survival*. Yverdon, Switzerland: Gordon & Breach Science Publishers) provides a list of further reading on Evolution and Society (by Alexander Laszlo) and an appendix summarizing evolutionary systems theory. L.D. Kiel and E. Elliott (1996. *Chaos Theory in the Social Sciences: Foundations & Applications*. Ann Arbor: University of Michigan Press) include a thorough list of references on chaos and computational dynamics in the social sciences, but this theoretical foundation is a limited domain of

complexity science. The bibliography that follows, will focus primarily on material published since Lee's work, and try to summarize the key arguments of each text, but dispense with any taxonomy of the subject matter. Unannotated sources reviewed as background reading are noted. The "top half-dozen (or so)" that left the greatest impression on me are marked (■).

**Allen, Peter M. 1994. "Coherence, chaos and evolution in the social context." *Futures*, 26(6), July/August: 583-597. HB3730.F8(ubc-koerner)** Concerned that models based on a taxonomy of components and the laws of interaction between them based on equilibrium are valid only as long as the structure is unchanged and no new behaviour results, he proposes to incorporate innovation and evolution in models of economic systems. These models incorporate the interactions of both external and internal factors that change each other in non-linear ways, exhibit multiple potential behaviours/trajectories and unpredictable outcomes. His search for a "deterministic description of non-linear dynamics" (p.590) is based on endogenous innovation. The exploratory behaviour reinforced by catalytic loops, genetics and cognitive process, explores possibility space, creating performance hills and valleys that sponsor competition around a hill, deviant escape from these 'positive feedback traps' to create a landscape of synergetic complementarities, which if allowed to become too rigid/stable will suddenly collapse (for reasons not explained). The freedom and microdiversity of individual agents acting at local scales within a coherent system, for him, promotes on-going learning/evolution, raising the value of individual differences and diversity. Unfortunately, he pays little attention to the exogenous structural change of the environment, and how this meta-landscape affects the socio-economic human possibility space.

----- 1990. "Why the Future is not what it was: New models of evolution." *Futures*, 22(6): 555-70. HB3730.F8 (ubc-koerner)

Bascompte, J. and R.V.Sole. 1995. "Rethinking complexity: modeling spatio-temporal dynamics in ecology." *Trends in Ecology and Evolution*, 10(9): 361-366. QH540.T7451(ubc-woodward)

**Berkes, Fikret and Carl Folke. 1998. "Linking social and ecological systems for resilience and sustainability." In *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*, Fikret Berkes and Carl Folke (eds.). Cambridge: Cambridge University Press (pp.1-25). GF21.L55 1998 (National Library of Canada)** With roots in utilitarian exploitation of discrete resources, contemporary scientific resource management has focused on maximum sustainable yields, but often resulted in the collapse of entire populations and ecosystems. The authors propose an integrated systems approach which reshapes property rights within social institutions of adaptive management informed by traditional resource management systems for the purpose of ecological resilience, where resilience is defined as "the buffer capacity or the ability of a system to absorb perturbations; the magnitude of disturbance that can be absorbed before a system changes its structure by changing the variables and processes that control behaviour. (6)" The emphasis shifts from constraining the variability of a target resource and the feedbacks that regulate change to an emphasis on adapting to cyclical variability "on a scale which does not disrupt the structural and functional performance of the ecosystem and the services it provides. (21)" This requires a small scale practice of locally based ecological knowledge and social institutions that accept environmental co-evolution. A study of successful traditional and local resource management systems "provide a reservoir of active adaptations which may be of universal importance in designing for sustainability. (15)"

**Berkes, F. and C. Folke. 1992. "A systems perspective on the interrelations between natural, human-made and cultural capital." *Ecological Economics*, 5: 1-8. HC79.E5E264 (ubc-koerner)** Arguing that technology (means of production/human-made capital) results from the interaction of natural capital (integrated functional ecosystems) and cultural/adaptive capital (human values, morals, institutions), the authors argue that it is the synergetic co-evolution of the human/natural systems' self-organizing ability which is fundamental to sustainability. They argue that co-evolution must be local and that the resulting cultural diversity provides the resource of adaptive strategies [cultural equivalent to Folke's natural insurance capital], and that institutions capable of adaptively managing common-property must be decentralized and hierarchical.

- **Capra, Fritjof. 1996. *The Web of Life: A New Scientific Understanding of Living Systems*. New York: Doubleday (Anchor Books). QH501.C375 1996 (ubc-woodward)** Following an introductory section on the history of scientific explanations of life, Capra explores three key attributes of complex dynamical systems: 1) autopoietic organization (the configuration of relationships that determines a system's identity), 2) dissipative structures (the physical embodiment of the systems organization, the basis of its behaviour), and 3) cognitive process (the activity of life involved in the development and evolution of the systems organization). This model is used to bring insight to systems ranging from cells, to organisms, to ecologies, to consciousness and finally human language. The recent work of Maturana and Varela is key to the book which argues for an ontological unity between mind and nature that surpasses the work of Bateson. It argues that complex systems evolve through symbiotic interaction which in humans is made operative through language which "brings forth a world", and which in naming new relationships, "brings forth" a transformed world. Language, a social construction, is the invention of human cooperation which in real terms, propels the evolution of the ecosphere.

Cartwright, T.J. 1991. "Planning and Chaos Theory." *American Planning Association Journal*, 57(1) Winter: 44-56.

- **Clark, Norman, Francisco Perez-Trejo and Peter Allen. 1995. *Evolutionary Dynamics and Sustainable Development*. Aldershot, U.K. and Brookfield Vt.: Elgar. HC79.E5C56 1995 (ubc-koerner)** The book is one of a limited set that explicitly attempt to employ the principles of complex systems to develop a conceptual model from empirical observation linking process to pattern as a tool for research, decision making and policy analysis in economic development for third world countries where development is defined as an "*integrated process of structural change* rather than ... economic growth *per se*. (p.16)". It promotes stakeholder identification of hierarchical spatial and temporal system scales, the intra-disciplinary search for processes that might sustain observed system behaviours/patterns, and to model the impact of structural change on the evolution of both the economy, its values and the physical environment. Using mathematics inaccessible to the technically illiterate, it demonstrates the model as a heuristic for expansion of tourism in Crete, and the relation between urbanization and ex-rural migration in Senegal. Contrasted with the Forrester/Meadows Systems Dynamics approach which tries to reproduce observed changes from a dynamic description, this approaches systemic structural changes on the basis of processes within a nested level of the hierarchy. The processes of central concern is the neo-Shumpeterian focus on entrepreneurial innovation, endogenizing environmental constraints, and agent-based (firms and households) anticipation of structural change. Key characterizations of complex systems include: organizational identity and resilience, indeterminate emergence of higher order, evolution as a function of learning or curiosity in possibility space, information as a manifestation of complexity, and non-determinism. Despite the attempt to be non-mechanistic, Allen's earlier collaboration with Prigogine focuses on the computational rules behind perceived structures, and less on the human dynamics that value/select patterns in the first place, but the limitation is acknowledged.

- **Cohen, Jack and Ian Stewart 1994. *The Collapse of Chaos: Discovering Simplicity in a Complex World*. N.Y.: Viking. 495pp. Q175.C613 1994 (ubc-koerner)** This carefully reasoned book by a mathematician and a biologist begins with an openness to the complexity of Nature, noting that both simple and complex behaviours emerge from both simple and complex dynamics. Two approaches are taken toward a thoroughly illustrated explanation of phenomena drawn from physics, chemistry, developmental and evolutionary biology, ecology, cognition and consciousness: 1) looking inside (content) phenomena for the simple rules/laws of nature (resulting in simplicity and complexity), and 2) looking outside (context) for the interrelationships between systems (resulting in simplicity and complicity). Their position is that real understanding requires both. Emergence at every level of dynamic system development is the collapse of chaos/complexity around simple "features" (the manifestations of higher-order organization) or patterns that collapse the underlying complexity. Systems change by the interaction of the "features" of different systems (not the underlying laws), so that what is required is "an understanding of how the geographies of spaces of the possible conspire to create new patterns and combined dynamics...(based on) the *meaning* [information in context]of the large-scale features (p.442)." They propose a hierarchy of transcendence, beginning with reductionism (where the dynamics of laws create emergence), followed by *simplicity* (where emergence results from exploration of a single space of the possible, a context created by the original emergence), and then complicity (emergence resulting from the expansion of the possible through the interaction of high-level

features from more than one system, that is the impact of context), and suspect that there are more possible, with the higher kinds of flexibility concentrating on changing the processes (expanding the context/ rules of the game) rather than the structures. Many alternative routes to innovation at each level are presented: 1) changed development timing (progenesis, neotony), 2) discontinuities (attractor catastrophe in possibility space), 3) collateral necessity (contingency and positive feedback) 4) complexification before simplification. There are universal patterns of emergence that transcend the particulars of the underlying subsystem which include: 1) higher-order features change in unstable contexts 2) lower-order features change in stable contexts 3) predation, parasitism, symbiosis, cooperation emerge at all levels 4) emergent phenomena begin with exploration and variation, selection based on contingency, followed by consolidation, convergence and canalization. To help overcome the difficulty of the subject, a dialogue between earthling space-travelers downed by fuel exhaustion and a sophisticated alien 'Zarathustran', as well as analogue jokes, tell the story on two other levels.

Combs, Alan and Herbert Guenther (eds.) 1995. *Radiance of Being: complexity, chaos and the evolution of consciousness*. Edinburgh: Floris Books. I1052.1433 (ubc-koerner)

Costanza, Robert, John Cumberland, Herman Daly, Robert Goodland, Richard Norgaard. 1997. *An Introduction to Ecological Economics*. Boca Raton, Florida: St. Lucie Press. As a summary volume of the main themes of the International Society for Ecological Economics, the volume describes the basic thermodynamic model of an open economic subsystem within a closed and finite global ecosphere, and discusses the key economic problems of sustainability including sustainable scale, equitable distribution (inter and intra-generational) and efficient allocation. Special emphasis is given to the natural capital criteria of strong sustainability, and measures of social/economic welfare. The purpose of the book is to provide an argument for three key policy instruments: 1) natural capital depletion tax, 2) ecological tariffs, and 3) precautionary polluter pays principle (4P). The latter is an outcome of a "complex adaptive systems (p.93)" approach to the environment which includes the following concerns: system stability and productivity/vigor result from exploitation and conservation functions (working diversity of keystone species) but system resilience results from creative destruction and reorganization functions (latent diversity of insurance species); over-connectedness (brittle-ness) and over-specialization can destroy system integrity and peak thermodynamic dissipation capability. Healthy systems have a balance of vigor and resilience, and the closer systems come to the edge of the domain of this stability, the more inherently unpredictable their behavior. High risks coupled with high inherent uncertainty calls for a precautionary policy response, where responsibility for potential consequences are born fully and up-front by the beneficiaries of these actions.

Costanza, R. 1996. "Ecological economics: reintegrating the study of humans and nature." *Ecological Applications*, 6(4): 978-990. QH540.E273 (ubc-mcmillan,woodward) Three models are proposed as a basis for policy that addresses the issues of sustainable scale, inter/intra-species/generation equity and economic efficiency: 1) realistic; simulating qualitative system behaviour 2) precise; high resolution (in space or time) quantitative analysis and 3) general; allowing more universal application/comparison. A balanced model gives a sense of the magnitude and direction of system change (effective mix of predictability and accuracy), pluralism builds consensus at "the intersection of lies (quoting Levins (1966))". The models are based on complex systems, which are 1) non-linear 2) networks with 3) time/space lags, discontinuities, thresholds and limits making 4) aggregation of small to large scales misleading since each level experiences higher levels as constraints and lower levels as noise (synchronous noise creates trends which affect slower processes at higher levels). Change is accomplished through adaptation/learning processes of 1) information storage and transmission (culture), 2) generation of alternatives (innovation), and 3) selection of superior performance (learning and value reinforcement). Different from optimization, this is 1) path dependent (historical contingent) 2) achieves multiple equilibria, 3) may never reach optimality and 4) may lead to survival of the first through positive feedback (lock-in). Cultural adaptation tends to focus on the short run and must be balanced by foresight where self-organization and environmental disorganization are balanced "at the edge of chaos (p.986, quoting Bak and Chen 1991)". Models need to build consensus and support adaptiveness.

Costanza, Robert and Bernard C. Patten. 1995. "Defining and predicting sustainability." *Ecological Economics*, 15:193-196. Asserts that the critical problem with "sustainability" is not definitional, but a) the problem of predicting the inherent uncertainty in the behaviour of complex systems, b) a lack of social

consensus about which level of the nested hierarchy of planetary systems we wish to preserve, and c) unrealistic expectations about how long each level of the system should persist. They propose that there is a positive asymptotic relationship between the expected longevity of a subsystem and its extent across space, and that components of larger systems must have shorter life spans to impart the capability of evolutionary change to higher levels. When parts last too long relative to the system, the system is "brittle". When parts disintegrate too quickly, the system is "unsustainable". Predicting part-whole relationships that will persist must be tempered with precautionary policies that acknowledge the remaining irreducible uncertainty.

**Csanyi, Vilmos. 1996. "Organization, Function, and Creativity in Biological and Social Systems." In *Evolution, Order and Complexity* (Routledge Frontiers of Political Economy series), E.L. Khalil and K.E. Boulding (eds.). London and New York: Routledge (pp. 146-180).**

**De Greene, Kenyon B. 1996. "Field-Theoretic Framework for the Interpretation of the Evolution, Instability, Structural Change, and Management of Complex Systems." In *Chaos Theory in the Social Sciences: Foundations & Applications*, L. Douglas Kiel and Euel Elliott (eds.). Ann Arbor, University of Michigan Press. H61.25.C48 1996 (ubc-koerner)** Beginning with a review of several key principles of complex systems theory, the article develops the linkages between the *world societal field* and the *world ecosystem*, creating the *world system field*. Evolutionary structural change at the world system level, order parameter fluctuation at the collective cognitive level, and the cyclical variation of the Kondratiev level, provides the hierarchical field context for his explanations of change in the modern world system. Key concepts include innovation as endogenous at the micro-level, constraint as exogenous at the macro-level, positive feedback driving systems to thresholds of stability and the saturation of possibility space which constrains differentiation and information, order parameters as the emergent behaviour of collectivities (language, technological paradigms, mind) which slave subsystems reaching thresholds. Kondratiev cycles are explained using attractors, with depression and recovery associated with strange attractors, prosperity with point attractors contained within a longer hegemonic cycle and bounded by environmental logistic curves. Mature systems diffuse information gradients as stability of structural identity is increasingly reinforced. The macro-level field cannot be controlled or managed, but creativity can be induced within the field to generate emergence of new parameter orders. His argument anticipates world system transformation at the most inclusive levels, but remains deterministic to the extent that the system environment link is not explored and change/stability are generated simply by the system.

Dyke, Charles. 1988. *The Evolutionary dynamics of Complex Systems: a study in biosocial complexity*. New York: Oxford Univ. Press. HM106.D95 1988 (ubc-koerner)

Etzioni, Amitai. 1985. "Making Policy for Complex Systems: a medical model for economics." *Journal of Policy Analysis and Management* 4(3) Spring: 383-95. H97.J68 (ubc-main,david lam)

**Folke, Carl, Fikret Berkes & Johan Colding. 1998. "Ecological practices and social mechanisms for building resilience and sustainability." In *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*, Fikret Berkes and Carl Folke (eds.). Cambridge: Cambridge University Press (pp.411-436). GF21.L55 1998 (National Library of Canada)** Analyzing the themes of many case studies of ecological adaptive local resource management systems, the 1) management practices based on ecological knowledge and 2) the social mechanisms behind these practices including a) the generation, accumulation and transmission of ecological knowledge, b) the structure and dynamics of institutions, e) the mechanisms for cultural internalization and d) the supporting worldview and cultural values, are summarized (418). Several principles for the design of social institutions are proposed including 1) using management practices based on local ecological knowledge (LEK), 2) designing management systems that 'flow with nature', 3) developing LEK for understanding cycles of natural and unpredictable events, 4) enhancing social mechanisms for building resilience 5) promoting conditions for self-organization and institutional learning, 6) rediscovering adaptive management, and 7) developing values consistent with resilient and sustainable social-ecological systems. The redistribution of federated governance, the role of novelty and wisdom in the re-organization and renewal of social systems faced with ecological crises, and adaptive local institutions that co-evolve with nature are proposed to overcome the current crisis in resource management.

Folke, C., C.S. Holling and C. Perrings. 1996. "Biological diversity, ecosystems, and the human scale." *Ecological Applications*, 6(4): 1018-1024. QH540.E273 (ubc-mcmillan, woodward) Human activity depends on the continuing production of ecological services. Ecosystem dynamics and functional robustness depend on critical processes driven by keystone species. But resilience, the capacity of a system to buffer disturbance and avoid being dislodged into a different equilibrium state which provides different often degraded functions, depends on species that establish and maintain niches created by the keystone species. They provide "natural insurance capital", provide plasticity and self-organization capacity in times of environmental stress. The relation between drought-resistant and bio-mass productive grasses in semi-arid Africa, and the relation between migratory insectivorous tropical birds and boreal forest budworms are examples. The policy response is to preserve biodiversity thresholds globally to preserve function and resilience, rather than create isolated natural reserves ignoring the functional interconnectedness of ecosystems.

Funtowicz, Silvio and Jerome R. Ravetz. 1994. "Emergent complex systems." *Futures*, 26(6) July/August: 568-582. HB3730.F8 (ubc-koerner) The authors distinguish between ordinary and emergent complex systems, which they contend have different structures and relationships. Ordinary complexity has an inevitable complementary pattern of competition and cooperation; a diversity of elements and subsystems; dissipative structures formed autopoietically; maintain dynamic stability with gradual development; and exhibit simple functional teleology (survival). Emergent complexity oscillates between hegemony of a functional element or subsystem; has relations built on three types of contradiction {a) fragmentation/plurality of functions in conflict, b) creative tension, or c) aware/committed complementarity}; displays increased individuality/identity of the elements/subsystems; changes through continuous novelty, and evolves through purposeful action of the elements (meaning). In emergent complexity technique and consciousness, therefore, are complementary, creating positive feedbacks which give functional hegemonies durability, but also increase their long-run vulnerability to paralysis or oscillation, internal contradictions or continuous novelty, leading either to creative destruction (diversity) or (chaotic) fragmentation. Systems must be managed at an appropriate level. For example, human exchange cannot be managed by markets alone (ordinary) but needs to also deal with creative synthesis of contradictions (emergent) through constraining regulations. In the modern technological world, all ordinary systems are becoming emergent. Co-evolution "something like solidarity to maintain its own sort of dynamic stability (p.581)" per Richard Norgaard's *Development Betrayed*, and not a retreat towards ordinary complexity is required to sustain a life worth living.

Giampietro, Mario. 1994. "Using hierarchy theory to explore the concept of sustainable development." *Futures*, 26(6) July/August: 563-567. HB3730.F8 (ubc-koerner) The traditional limits to scientific inquiry required that spatio-temporal scale be bounded as close as possible to the phenomena of study, that higher level influences are slow, and that lower level influences are negligible and described as initial conditions. On the other hand, hierarchy theory recognizes that there is a tension between levels each operating in its own self interest: higher levels need to exert some control over lower while allowing sufficient freedom for variability. Current discourse on sustainability has defined the bounding conditions too closely in time (needing a perspective toward future generation) and in space (needing to include environmental stability). The increased dimensions increase uncertainty and the need to make decisions on risk in a public forum, especially regarding technological development.

Goodwin, Brian C. 1994. *How the Leopard Changed its Spots*. N.Y.: C. Scribner's Sons. QH366.2.G655 1994 (ubc-woodward)

■ Goodwin, Brian. 1994. "Toward a Science of Qualities." In *New Metaphysical Foundations of Modern Science*, Willis Harman (ed.). Sausalito, California: Institute of Noetic Sciences. Beginning with a demonstration that the tenants of modern science simply replaced the laws of God with the fundamental laws of nature, the article attempts at fresh look at natural phenomena, hypothesizing that the organism is the fundamental unit of life. Experiments are presented demonstrating that morphogenesis is the result of the autopoietic dynamics of living systems exploring a morphogenic possibility space through endogenous dynamics constrained but not determined by the organism's genetics. As a result, the inherent morphogenic dynamics leads inevitably toward improbable structures like limbs and eyes, rediscovered by many different species without any genetic similarity. Understanding the dynamic capabilities of living systems provides a

qualitative understanding of the paths that evolution is capable of pursuing through changing environmental and morphogenic landscapes.

Gowdy, John M. 1994. "Progress and Environmental Sustainability." *Environmental Ethics*, 16(1) Spring: 41-55. HC68.E58E84 (ubc-koerner)

**Harman, Willis and Elisabet Sahtouris. 1998. *Biology Revisioned*. Berkeley, California: North Atlantic Books. (290pp.) QH331.H364 1988** Published post-humously, this final book marked the end of Harman's career as president of the Institute of Noetic Sciences founded in 1973, and director of its Causality Program which researched the fundamental assumptions of contemporary science, and the development of a science that includes consciousness as a causal factor. This book was one of the results of the Program. The holistic biology proposed begins with a theory of autopoietic 'organisms' as the fundamental entity of analysis (exhibiting independent agency, interdependent communion, self-dissolution and self-transcendence) in a 'holarchy' (after Koestler) which binds them to their environment and in which the central quality is creative emergence, which is conceived as the operation of an intelligent/intentional consciousness that permeates nature, rather than of a consciousness that is just an emergent property (after George Wald). This is the reverse flow from the genetic determinism that pervades mainstream biology. It replaces natural selection and adaptation with 'mutual consistency' or interspecies negotiations of creative agents constrained by flows from a context (which could be essergy or information) and the integrity of that containing level of organization. This leads the authors to favour local self-reliance where creative individuals/communities strike mature cooperation with other communities (like the symbiotic alliances in a cell) to explore evolutionary possibilities arising from increasingly distinct entities (from Wheatley). Although the book favours the work of Lynn Margulis, Brian Goodwin and Mae-Wan Ho, it takes a speculative leap beyond their more careful empirical work.

Heap, Nicholas I. 1997. *The Synoptic and Dynamic Paradigms of City Planning: Re-interpreting planning methods through Newtonian physics and chaos theory*. Vancouver, B.C.: UBC School of Community and Regional Planning Master's Thesis.

**Henderson, Hazel. 1996. *Building a Win-Win World: Life beyond global economic warfare*. San Francisco: Berrett-Koehler Publishers. HD75.6.H458 1996.** Henderson takes an overt dynamic systems perspective in her analysis and prescriptions for the rejuvenation of economic, culture, political democracy, international security, international financial transactions, and the balance of power between states, corporations and global civil societies/organizations. Her credentials include participation in the UN Symposium on "The Science and Practice of Complexity" in Montpellier, France (May 1984) with notables like Peter Allen, Kenneth E. Boulding, Ilya Prigogine and Milan Zeleny. Her concern is that the win-lose rules of competition may be appropriate or at least will work in open systems, but that most systems inevitably evolve until they create a commons, where resources are indivisible, where impacts are interconnected, where redistribution/equity/fairness is critical, where complementarity, uncertainty and change prevail, and where cooperative win-win agreements are required at the level of the new system, that is global. These agreements must inspire confidence/trust, be designed by people (not invisible hands), include ethical standard setting, exact fees for the use and abuse of the commons which includes oceans, atmosphere, satellite orbits, the electromagnetic communications spectrum, Antarctica, information highways, financial cyberspace and the world economy. The book serves as a road map of the many organizations (private, public and civil) for grassroots globalism who are seeking breakthrough metamorphosis of economies, technologies, and cultures at the breaking point---and their detractors.

■ **Holling, C.S. 1994. "Simplifying the complex; the paradigms of ecological function and structure." *Futures*, 26(6) July/August: 616-625. HB3730.F8 (ubc-koerner)** Ecological interrelationships are described using three concepts of change/management: 1) equilibrium-centered where spatially and temporally averaging systems are homeostatic given disturbance; expansion of key functions has no structural impact 2) multiple equilibria (engineered or resilient) where systems are dislocated into new stability domains (endogenous or exogenous forces); variability is constrained to maximize benefit of single phase state, or is considered necessary to maintenance of functionality which requires finding benefit in each phase state, and 3) evolutionary or organizational change where the possibility landscape is or attractors are structurally altered; resistance leads to surprise/catastrophe, adaptability leads to co-evolution. Experience with attempts to constrain behaviour show system behaviour results from interaction of multiple equilibria

resulting in different attractors: jumps are exogenously triggered, evolution responds to changes in "slow" variables, management for efficiency and constancy result in loss of resilience and vulnerability to increasingly small events. Given evolution is inherently unpredictable, adaptive systems can both generate and benefit from change. In the case of resilient systems, interaction between exploitation, conservation, creative destruction and mobilization/retention functions maintains system resilience. Stewardship of the process at local biophysical scales (transferring temporal variability into spatial variability) allows social development at a larger scale. The need for a management model at the level of evolutionary change is recognized, not developed.

**Holling, C.S., Fikret Berkes & Carl Folke. 1998. "Science, sustainability and resource management." In *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*, Fikret Berkes and Carl Folke (eds.). Cambridge: Cambridge University Press (pp.342-362). GF21.L55 1998 (National Library of Canada)** The objective of this essay is to combine adaptive resource management in a dynamic world of uncertainty and surprise with the development of cultural capital and property-rights systems. The metaphor of ecosystem development through a four-stage cycle of renewal—renewal, conservation, creative destruction, reorganization—is used to guide a science for 'living at the ecological margin' (after Ophuls 1992:190). The features of resource systems is that behaviour is complex and unpredictable and causes are non-linear, cross-scale in time and space, and evolutionary. The goal of management is to maintain organizational integrity despite cyclical behaviour of multi-equilibrium systems, allowing small-scale internal renewal of fast-changing variables while maintaining overall structure provided by slow-moving variables which must adapt to environmental change. It is suggested that overcoming pathological tendencies toward brittle/vulnerable ecosystems, unresponsive management agencies and dependent societies requires localized common property rights institutions.

Inayatullah, Sohail. 1994. "Life, the universe and emergence." *Futures*, 26(6) July/Aug.: 683-696. HB3730.F8 (ubc-koerner)

Jencks, Charles. 1995. *The Architecture of the Jumping Universe: a polemic: how complexity science is changing architecture and culture*. London: Academy Editions. I1004.2182 (ubc-main)

**Jorgensen, S.E., B.C. Patten and M. Straskraba. 1992. "Ecosystems emerging: toward an ecology of complex systems in a complex future." *Ecological Modeling*, 62(1-3): 1-27. QH540.E36M63 1992 (ubc-woodward)** This is an introduction to forthcoming articles outlining a comprehensive theory of complex ecosystems (treating organisms as inherently environmental structures, as well as genealogical ones), where ecosystems represent the highest development of terrestrial energy-matter. Properties discussed include co-adaptation and co-evolution of organisms/environments, cooperative structural synergism (self-organization) and cooperative functional synergism (the slaving principle of order from chaos) are in continuous tension, ecosystems have diffuse/decentralized controls, where organisms have increasingly centralized controls, evolutionary creativity is spurred by decentralized interdependence, and evolution increases the awareness distance between entities. Ecosystem principles include: 1) energy-matter conservation, 2) energy-matter and information dissipation (catabolism) 3) open to environment, 4) generate exergy by anabolism moving further from thermodynamic equilibrium, 5) parametric order smoothes variability and buffers disturbance, 6) constraints bound and distribute functional differentiation, 7) goal-orientation is emergent, and 8) system coherence is a manifestation of organismic fitness.

**Kay, James J. and Eric D. Schneider. 1994. "Embracing Complexity; the challenge of the ecosystem approach." *Alternatives*, 20(3): 32-39.** To answer how; we should manage ecosystems, the authors dispose of linear cause and effect in favour of a complex systems approach. Open systems self-organize to create dissipative structures to resist moving further from equilibrium. Changes in energy create either new levels of organization or system collapse, depending on the balance of flexibility and efficiency of the system. Successful systems live within the constraints imposed by the super-system or environment. Records of these constraints are retained in genes (for organisms), culture (for societies), or biodiversity (for ecosystems), bounding the developmental engine of self-organization. But these constraints must be read in a functioning context (healthy environment) that gives them meaning. Ecological integrity includes 1) ecosystem health (functional efficiency), 2) flexibility to cope with change, and 3) the ability to evolve (autopoietic capacity), and can respond to environmental change in 5 ways: 1) return to status quo, 2) expand/contract 3) develop new levels of organization, 4) evolve into a new system or 5) collapse.

Acceptable change is dependent on observer values/criteria. Ecosystem management requires 1) recognition of system dynamics, 2) an optimization of functions (rather than maximization) and 3) stewardship of developmental cycles (rather than resisting them), and complementary institutions.

Khalil, Elias and Kenneth Boulding (eds.). 1996. *Evolution, Order & Complexity*. N.Y.: Routledge. GN360.E89 1996 (sfu)

**Koppers, Bernd-Olaf. 1992. "Understanding Complexity." In *Emergence or Reduction?* Ansgar Beckermann, Hans Flohr and Jaegwon Kim (eds.). Berlin: Walter de Gruyter (reprinted in Robert J. Russell, N. Murphy and A.R. Peacocke. 1995. *Chaos and Complexity: Scientific Perspectives on Divine Action*. Vatican City State & Berkeley, Ca.: Vatican Observatory Publications and the Center for Theology and the Natural Sciences).** Reductionist interpretations of complexity are contrasted with "emergentists" who contend that emergent phenomena is irreducible to the properties of its parts, and that emergent structures affect their components through 'downward causation'. The argument, building on the Hempel/Oppenheim model of scientific explanation (1948), first distinguishes simple systems (contingent boundary conditions that require no explanation) from complex systems (sensitive boundary conditions requiring explanation) to show that reductionist physics, in the 'paradigm' of self-organization, provide adequate explanation by recursively shifting the boundary to a new level where classical contingency applies. This permits the deterministic principles of 'selection and optimization' under non-equilibrium conditions to explain the existence of the sensitive boundary condition, but requires recourse to evolutionary history (and not natural law) to explain the fine structure. Unfortunately his argument is dependent on biological development being fully explained by the mechanism of DNA.

**Laszlo, Ervin. 1996. *Evolution: The General Theory*. Cresskill, N.J.: Hampton Press. QH371.L37 1996 (ubc-woodward)** Also subtitled *The Grand Synthesis*, Laszlo proposes that contemporary theories of evolution in complex systems is the first among the Grand Unified Theories (GUTs), adequate to provide rigorous explanation of the invariant patterns of change, persistence and transformation underlying the diversity of matter, living organisms, human society, and mind (all of which are third state, far from thermodynamic equilibrium). His observations include: 1) systems evolve from strong/rigid bonds to weaker/more flexible bonds 2) organization increases with decreasing bonding energies, 3) higher levels of organization are structurally simpler than lower subsystems, 4) higher levels control lower because of selective disregard for detailed dynamics of lower levels, and the ability to constrain patterns of collective behaviour independent of the inherent behaviour of component subsystems (*convergence* or *hypercycle formation* or *hierarchization*), 5) structural and functional complexification follows the simplified controls provided by higher organizational levels, 6) evolution succeeds to the extent that structures inevitably and spontaneously emerge that increase the free-energy flux available in the environment that is captured, retained and used, 7) transformation is triggered by changes in environmental control parameters; systems become indeterminate, chaotic, sensitive to perturbation, 8) transformed systems exhibit phase changes to new stable states described by different attractors where the system achieves greater dynamism and autonomy in its milieu at the expense of vulnerability; specialists speciate under environmental pressure, generalists adapt, peripheral species invade the niches abandoned by dominant specialists. He proposes 6 evolutionary axioms of society (an emergent system) and that the motive force in cultural transformation is technological innovation (agricultural, writing, industrialization, information) and the autopoietic functions provided by social institutions. Bifurcation resulting from instabilities in the information pool results from uncontrolled fluctuations caused by technological innovation, war, and socio-economic unrest, all of which are illustrated. Through human consciousness of the system-environment relationship, Laszlo proposes that the realist will act to steer evolution despite the risk of wrecking the society that produced the opportunity: "conscious evolution can emerge from the evolution of consciousness—and from the consciousness of evolution. (139)" The book is exuberant, confident in contemporary science to lead the further evolution of formal orders.

Laszlo, Ervin. 1994. *Vision 2020: Reordering Chaos for Global Survival*. Yverdon, Switz.: Gordon and Breach Science Publications.

**Lewin, Roger. 1992. *Complexity: Life at the edge of chaos*. New York: Macmillan Publishing Co. B105.C473L48 1992 (ubc-koerner)** [Cohen and Stewart 1994 say "A people-based description of the work of the Santa Fe Institute."] Focused on the work of Stuart Kauffman, Chris Langton, Per Bak, Brian

Goodwin and Stephen Jay Gould, etc., the book describes how the emergence of internal self-organization, creativity, hierarchical control, and drive toward increasing complexity at the critical state between equilibrium and chaos is at the root of evolutionary change. The author presents the work of complexity scientists who argue that computational dynamic systems 'seek' the edge of chaos where there is maximum sensitivity and adaptability in relation to other complex systems. The quite readable scientific reporting does not try to present the explanatory theory so much as the experimental observations and philosophical implications. Although the edge of chaos is seen to be a rich environment for both speciation and extinction, there is little discussions on whether there is any way to influence the outcome: "the emergence of an inexorable drive toward ever greater complexity and ever greater information processing in nature, which if true, suggests the evolution of an intelligence sufficiently powerful to contemplate it all was inevitable. Life, at all levels, is not one damn thing after another, but the result of a common, fundamental internal dynamic (pp.191-2)."

- **Luhmann, Niklas. 1990. *Essays on Self-Reference*. New York: Columbia University Press. HM131.L817 1990 (ubc-koerner)** Luhmann, who according to E.M.Knodt is Germany's most prominent and controversial social theorist, includes Heinz von Foerster, Humberto R. Maturana and Francisco Varela, George Spencer Brown in his intellectual genealogy. The central impact of new developments in the hard sciences surrounding a recursive universe of non-linear complexity, unpredictability, self-referential feedbacks and chaos was to eliminate the external observer in all theories of human reality. Published after his 600-page theory of Social Systems, this collection of essays summarizes some implications of the preceding opus. In "**The Autopoiesis of Social Systems** (ch.1:1-20)," begins with a radical anti-Aristotelian premise that not all systems organized by autopoietic closure are living, so that the means of production and reproduction for each system must be clearly distinguished. In human meaning using systems, these means are consciousness in psychic systems and communication in social systems. In general "(a)utopoietic systems, then, are sovereign with respect to the constitution of identities and differences. (3)." Recursivity in communication entails self-observation of previous communications and the decomposition and reassembly of the elements of information, utterance and understanding. Where decay is the entropic opportunity for evolution in living systems, decay in conscious systems are internal to the systems that produce decay by packaging communications as events that quickly vanish, making instability a condition of social duration preserved in the decision-structures built by memory. Contrary to Dawkins hypothesis of cultural 'memes', Luhmann proposes that the key function of social systems to produce difference. Because social communications must live within an environment including living and conscious systems (85) and are recursive, the distinction between system and environment is the key difference produced, transformed and presented within itself through its operations. In this way, "communication is an evolutionary potential for building up systems that are able to maintain organizational closure under the condition of openness (13)." "**Complexity and Meaning** (ch.3:80-85)" begins with the hypothesis that the increase in systemic relations created through its own operations enforces the need for selection. The production of meaning is the way in which enforced selectivity is experienced and handled by linking possibility (uncertain but stable) with actuality (certain and unstable). Therefore 'we have no access to stable certainty (84)". In "**The World Society as a Social System** (ch.10:175-190)" social systems are defined by their internal mode of meaning production or their structure of internal differentiation. Modern society evolves these structures through functional differentiation instead of hierarchical role segmentation and has become a global or universal communicative system built on the *distinction* between system and environment rather than on the *identity* of guiding principles or values. Since the operations and structure of whole systems at the leading edge of their self-creation remain invisible to the system except in retrospect and planners, by definition, can not escape the social system in which their own meanings are constituted, planning, he contends, never achieves its goals and always has 'unanticipated consequences" (179) with costs that exceed the benefits. Actions based on simplified descriptions of a coupled societal system ('hypercomplexity') stimulate self-reinforcement of the description and amplify components/functions which through positive feedbacks push the system further from equilibrium and exacerbate its instability. Evolution proceeds by deviations in the way that differentiations/meanings and the created problems are constructed [Ellul referred to these as social techniques and technologies] brought about through these amplifications, which usually produced through socially-reinforced habitually activity, can also be intentional, even though the outcome will remain unpredictable. The social absorption of planning will increase the scale and speed of unintentional evolution. The immediate need is for adaptability to this change. On the other-hand, the sophistication of functional

differentiation has created partial self-referential autonomy at the sub-system level, creating plural sources for amplification within the encompassing system adding unpredictability to its evolution. At the same time, subsystems are more amenable to a relevant self-observation, leading to more adaptive capacity at that level, and to communications about potential hybridizations for the intentional construction of alternative ways to produce meaning/differentiate system/environment, leading to potentially different evolutions.

Mainzer, Klaus. 1996. *Thinking in Complexity: the complex dynamics of matter, mind and mankind*. New York: Springer. Q175.M257 1996 (ubc-koerner, main)

Martin, Emily. 1996. "The Society of Flows and the Flows of Culture: reading Castells in the light of cultural accounts of the body, health, and complex systems." *Critique of Anthropology* 16(1) March: 49-56. GN1.C73 (ubc-koerner)

■ **Maturana, H.R. and F.J. Varela. 1992. *The Tree of Knowledge: The biological roots of human understanding*. Boston & London: Shambhala. WL102.M3813 1992 (ubc-koerner)** A profound examination of how autopoietic organization results in all three levels of living organization: single cells, multicellular organizations, and human social entities. Evolution is historic structural change of coupled entity/environment systems on the basis of mutually conserved autopoiesis and adaptability, not on the entity's optimization of the use of the environment. Language is to social systems what ontogeny is to organisms and chemistry is to life: the emergent means of communication/distinction that is the adaptive strategy that produces, maintains and transforms social reality (entity/environment) as a third order phenomena. Language is not a tool for understanding, but the foundation for bringing forth a social world. Evolution of social reality is possible through the enlargement of the possibility space through languaging, which is possible only through the creation of structural congruence between other human identities and/or the environment. In this way human integrative exchange IS the world. "Language was never invented by anyone only to take in an outside world. Therefore, it cannot be used as a tool to reveal that world. Rather, it is by languaging that the act of knowing, in the behavioural coordination which is language, brings forth a world. We work out our lives in a mutual linguistic coupling, not because language permits us to reveal ourselves but because we are constituted in language in a continuous becoming that we bring forth with others. We find ourselves in this co-ontogenic coupling, not as a preexisting reference nor in reference to an origin, but as an ongoing transformation in the becoming of the linguistic world that we build with other human beings. (p.235)."

**O'Connor, Martin, Sylvie Faucheux, Geraldine Froger, Silvio Functowicz, Giuseppe Munda. 1996. "Emergent Complexity and Procedural rationality: post-normal science for sustainability. In *Getting Down to Earth: Practical applications of ecological economics*, Robert Costanza, et al. (eds). Washington, D.C.: Island Press. HC79.E5G478 1996 (ubc-koerner)** Applies the 'science of emergent complexity' to policy analysis on 1) ecological distribution in the management of natural capital (therefore social conflict), 2) the management of uncertainty, 3) procedural rationality (as opposed to substantive rationality which is impossible when the outcomes of system dynamics are unpredictable) in setting environmental norms and policy objectives including a multi-criteria decision aid --- a 'sustainability tree'. Argues that the application of emergent complexity is most suited when decision stakes and system uncertainties are high. *Emergent complexity* (distinguished from *normal complexity*) is characterized by the intentionality of the related components resulting in continuous novelty, evolution through oscillating hegemony and fragmentation, and change which transcends growth to emergence and the "violation of distinctive system identities over time". The decision process is demonstrated in consideration of environmental depletion sustainability (emergy surplus) pollution capacity (entropy production minimization), and the retention of free energy after production and consumption (exergy surplus), recognizing the paramount need for the communal political processes to establish goals and define acceptable risk across generations and species.

O'Connor, Martin. 1994. "Complexity and coevolution: methodology for a positive treatment of indeterminacy." *Future*, s 26(6) July/Aug.: 610-615. HB3730.F8 (ubc-koerner)

**Peacock, Kent A. 1995. "Sustainability as Symbiosis: Why we can't be the forehead mites of Gaia." *Alternatives*, 21 (4):16-22.** On the basis that there are three kinds of relationship between two or more organisms sharing a common habitat (parasitism, commensalism, symbiosis), Peacock suggests that in the

long run, only symbiosis is sustainable. Symbiosis is the interchange of matter, energy and information between life forms to their mutual survival advantage which creates a net enhancement of vitality to all, and "a qualitative broadening of the adaptive strategies available to the whole or its members (18)", and a major source of evolutionary leaps in the transcendence of limits to survival. Although humanity has been and remains parasitical, undermining the autopoietic capacity of the host must be moved through the temporary restraints of commensalism to 'constructive participation' (Aldo Leopold's 'land ethic', Eugene Odum's 'mutualism with nature', or Roszak's person/planet, or the symbiosis of Murray Bookchin, Carolyn Merchant, Vandana Shiva, Hazel Henderson), or quoting Guha "a finely tuned but nevertheless conscious and dynamic manipulation of nature (p.21)" aimed at preservation, amplification, and diversity, achieved idiosyncratically through a localized learning through doing, first through healing and regenerating the landscapes we have degraded.

Perry, D. 1995. "Self-organizing systems across scales." *Trends in Ecology and Evolution*, 10(6): 241-44. QH540.T7451 (ubc-woodward/unbnd)

**Prigogine, Ilya (with Isabelle Stengers). 1998. *The End of Certainty: Time, Chaos, and the New Laws of Nature*. New York: The Free Press. Q175.P7513 1997 (ubc-koerner)** Prigogine and Stengers are at the forefront of a science that replaces Newtonian time-reversible determinism with the irreversible, indeterminism characteristic of the nonequilibrium processes of creative self-organizing dissipative structures at all levels of nature where time plays a constructive role and in fact precedes our universe. Basic to his thesis is the understanding that real phenomena are complex systems (non-linear ensembles) and far-from-equilibrium (unstable). Where trajectory had been relevant to the behaviour of isolated entities, probabilities are the irreducible description of ensembles. These systems are nonintegrable, and at certain energy values, will diverge because of resonances between the degrees of freedom; a situation which increases with persistent interactions between elements that becomes inevitable in all macroscopic systems, i.e. novelty is to be expected in all real world phenomena. Several key consequences are discussed: instability at one level leads to collective resonant coherence at the next; irreversibility is inscribed in matter at the level of chemistry and beyond, that is matter is the result of far-from-equilibrium processes which are amplified at each level of order from the macroscopic through life to the human/social. Finally, it is proposed that universes are created at prominent fluctuations/instabilities in the matter/gravitation fields. This book provides plenty of scientific / mathematical argument, but maintains contact with the philosophies of Whitehead, Bergson and Popper to give the non-technical reader some hint of the phenomenological implications.

**Prigogine, Ilya. 1996. "The Laws of Chaos." *Review*, 16(1) winter: 1-9.** Post-modern science, has reincorporated probability and irreversibility into nature through the discovery of the creativity and coherence of non-equilibrium systems, attributes which were once dichotomized from matter in the concept of thought. The significance of time's arrow increases with the level of complexity, making thermodynamics and evolutionary biology key sciences of the time. He proposes that modern science tried to eliminate time to achieve harmony of eternity, and reunite with the ground of being, by demonstrating that both life and time and events were illusion, that only death was real. On the other hand, post-modern science, grounded in time, underpins a creative alliance/identity between man and nature.

**Roe, Emery. 1998. *Taking Complexity Seriously: Policy Analysis, Triangulation and Sustainable Development*. Boston: Kluwer Academic Publishers. HC79.R628 1998 (ubc-koerner)** Defining complexity as functions of the 1) number of components, 2) functional differentiation of components, and 3) interdependence between them, where policy is required where interactions between elements are complex and causal interdependencies are either loose or tight, Roe's thesis is that "the essence of analytic choice is to underwrite and stabilize the assumptions for decision-making in the face of high uncertainty and complexity" by seeking for the convergence (if any) between distinctly different theoretical analyses of the issue through a process of triangulation. Its essence is the identification of the processes by which surprise is systemically created and then accommodated by affected social actors. Using the four analytical frameworks of Girardian Economics developed by Andre Orlean (mimetic rivalry), the cultural theory of Mary Douglas, Aaron Wildavsky and Michael Thompson (power relations between group and social context), the Critical Theory of Paul Piccone and Tim Luke (the manipulation of artificial and organic negativity by power elites), and the Local Justice Framework of Jon Elster (the inevitable global/local justice/injustice cycle), Roe

examines what sustainable development is, why it is an issue, what needs to be done ideally and what can practically be done in a search for policy confidence derived from the convergence of plural perspectives. His injunctions include 1) differentiate situations, 2) beware of persecutory language, 3) acknowledge the unmanageable, 4) search for feedback cycles, and 5) problematize need; stabilizing the assumptions.

- Rosenau, Pauline. 1992. "Modern and Post-Modern Science: some contrasts." *Review*, 15(1) winter: 49-89.** Examines the affirmative and skeptical post-modern critiques of modern science through an analysis of representative texts on 1) the ontological character of reality, 2) the goals of science, 3) theories of reality 4) the epistemological basis for explanation, 5) the resolution of the subject/object duality, 6) the role of the researcher, 7) admissible methods, 8) the significance of interpretation, 9) the status of reason and rationality, 10) the criteria for evaluating 'truth', and 11) the role of religion. She finds modern science so bounded and conditional, that "broad and far-reaching interpretations are precluded. Skeptical post-modernism provides a dismal negativism that resolves in nihilism, and affirmative post-modernism, seeking a synthesis of science and theology, primarily as an article of faith or a double jeopardy repeating the cardinal sin of the modern scientific mechanistic faith. She proposes some compromises, which she then shows to be unsatisfying. A science that retains integrity and esteem for rigorous inquiry, while transcending the mechanistic limits of the modern, the pessimism and fanaticism of post-modernism, in her opinion, has not yet been found.
- Santos, Boaventura de Sousa. 1992. "A discourse on the Sciences." *Review*, 15(1) winter: 9-47.** The critique of the modern paradigm has been from within, traced through the critique of Einstein (the non-universality or locality of space and time), Heisenberg (the non-reducibility of nature), Godel (the selectivity of mathematics and quantification) and Prigogine (the spontaneous evolution of order in far-from equilibrium systems), opening the door for Haken's synergetics, Eigen's hypercycles, Jantsch's evolutionary theory, Chews 'bootstrap philosophy', Bohm's 'implicate order' and Maturana/Varela's autopoiesis. Santos proposes that the modern paradigm of intervention and control of nature based on the functional requirement of survival will be superceded by a paradigm of 'prudent knowledge for a decent life (p.30)' where prudence is 'the acknowledgment and control of insecurity (p.45)'. He proposes four theses: 1) knowledge is non-dualistic given the interdependence of matter and consciousness and the metaphors of text, play, drama and biography will replace the machine, 2) knowledge is total (non-reductionist, non-deterministic, non-descriptive) and local (epistemologically pluralist) understanding of the conditions of possibility of human action, 3) knowledge is a creative act, a value judgment and therefore self-knowledge which must be appreciated aesthetically (not instrumentally), and 4) knowledge must collapse cause and intention to common sense and a technology reflecting 'life wisdom'.
- Sardar, Qiauddin. 1994. "Conquests, chaos and complexity: the other in modern and postmodern science." *Futures* 26(6) July/Aug.: 665-682. HB3730.F8 (ubc-koerner)
- Sardar, Ziauddin and Jerome R. Ravetz. 1994. "Complexity: fad or future?" *Futures*, 26(6) July/August: 563-567. HB3730.F8 (ubc-koerner)** The article, an introduction to a special issue of *Futures*, identifies several findings of complexity that should erode our confidence in reductionist science, such as 1) the management of ecological systems often leads not through a natural phase of creative destruction (Holling) but to irreversible degradation, 2) bifurcations in systems are not predictable, 3) emergent complex systems can collapse from within, 4) dynamic complex living systems seek to maximize the production of entropy, that is heat death is the outcome of life, and 5) complex systems operate at several nested spatio-temporal scales where relationships, not causality prevail and defy instrumental interventions. Although other systems of non-instrumental rationality have observed similar phenomena, the authors are concerned that a science based on conquest and control, will fail in attempts to appropriate those insights and instead merely accelerate systemic collapse of western society.
- Schneider, Eric D. and James J. Kay. 1995. "Order from disorder: the thermodynamics of complexity in biology." In *What is Life? The Next fifty Years: Speculations on the future of biology*, Michael P. Murphy and Luke A.J.O'Neill (eds.). Cambridge, New York and Melbourne: Cambridge University Press. pp. 161-174. QH331.W465 1995 (ubc-woodward)** This is a summary of the authors' "Complexity

and thermodynamics" (1994) article, prepared for the 50<sup>th</sup> anniversary of Erwin Schrodinger's *What is Life?* Lectures. It highlights a few points:

- Based on Kestin's Unified Principle of Thermodynamics (1968) "as systems are moved away from equilibrium, they will utilize all avenues available to counter the applied gradients. As the gradients increase, so does the systems ability to oppose further movement from equilibrium. (P.165)
- The mechanism to dissipate gradients is the formation of self-reinforcing self-organizing autocatalytic activity. Increasing gradients result in higher levels of organization, nested hierarchies.
- Far-from-equilibrium dissipative structures maintain local levels of organization at the expense of increasing entropy/decreased exergy (work potential) in the environment.
- Life, unlike ordinary complexity, encodes a memory (genes, biodiversity) of efficient organizations for various environmental gradients to ensure survival over time (resilience) including retreat to earlier successional stages when gradients reduce or organization is hampered (internally or externally).
- Growth replicates dissipative pathways, development is the emergence of new pathways (diversity).
- Self-organization creates order from disorder and is the emergent pressure generating life, encoded rules constrain the process to ensure survival, generating order from order. The two work together.

■ **Schneider, Eric D. and James J. Kay. 1994. "Complexity and thermodynamics: Towards a new ecology." *Futures*, 26(6) July/Aug.: 626-647. HB3730.F8 (ubc-koerner)** Beginning with a restatement of the 2<sup>nd</sup> law of thermodynamics, several illustrations are provided to show that complex self-organizing systems and especially ecosystems evolve structures that increase the efficiency with which applied energy gradients are dissipated, including the storage of energy to maintain system stability/survival during cyclic alterations in energy gradients, and complex webs for the continued degradation of energy and recycling of material. Exergy capture and energy degradation must be optimized through any structural evolution (a mature ecosystem will have a colder surface temperature and more degraded reradiated energy, and in this way rainforests contribute more to global climate than as CO<sub>2</sub> sinks). The authors propose that the insights of complex systems are key to understanding ecologies: hierarchically nested system/environments, affected by study, exhibit emergent dynamic behaviour, unpredictable, self-producing via catastrophic change, thriving in a window of sufficiency (or the edge of chaos), balancing structural evolution and functional development (not brittle). Internalized rules (genes, biodiversity) record successful adaptations (information, propensities) to environmentally dependent properties of relations processes (constraints) complement the innovative adaptation of the self-organization process. Preservation of systemic information and the environmental context are necessary if the information is to have meaning and the system is to continue to evolve. System management must incorporate the notion of balanced functional and structural development and a birth/renewal-growth-death cycle at all levels.

**Stengers, Isabelle. 1997. *Power and Invention: Situating Science (Theory out of bounds, v. 10)*. Minneapolis, London: University of Minnesota Press. Q175.5.S736 1997 (ubc-koerner)** [includes 4 essays on "Science and Complexity"] As a philosopher of science, Stengers has written with Prigogine about far-from-equilibrium systems for twenty years, grounding him in the history of ideas and making his work relevant to social requirements. She demarcates good science from bad by a 'cosmopolitical' criterion that requires that the scientist risk self-transformation as a result of listening to the objects of study, demanding a science in all realms that eschews domination. This volume includes 4 essays on "Science and Complexity".

The first, "Complexity: A Fad?," she argues that the "discovery of complexity" cannot provide a new vision of 'the world'. In far-from-equilibrium systems, the collective regime of activity decides which perturbations and parameters are relevant in charting its own unique history. Science that intervenes in that history either interrupts the becoming of the object, or becomes part of it. Where emergence implies a physical genesis of a qualitative distinction, complexity should be the conceptual genesis of new questions about the attractors that define historical objects (the living and their societies), i.e. that produce meaning. To analyze open learning systems (as opposed to informationally closed) produced by and capable of history, demands relevant questions and all the risk that entails. The second, "Braking the Circle of Sufficient Reason," describes the work of Prigogine as questioning theories that put the power of judging before the requirement of relevance. The third, "The Reenchantment of the World (with Ilya Prigogine)," begins recognizing the predictable trajectory of Laplace is an impossible idealization, and therefore that unpredictability is not due

to insufficient knowledge, but is inherent to each entity, reintroducing creative plural times. Science can no longer be exterior to its objects, but can only engage in communication that expands our understanding of what is possible in a world of radical insecurity. The fourth, "Turtles All the Way Down," Stengers attests to the heroism required to resist the desire for a general law of self-organization throughout nature and society that will assure us of the open harmony we wish for. But if the physics of processes can not be reduced to the mapping of states, because processes resolve in the probabilities of a history, irreducible to successive events. Dissipative structures prolong the instant of genesis which by the kinetic phenomenon of amplification reveals improbable intrinsically collective processes, rather than distinguish any particular systemic fluctuation. The study of dynamic systems focuses on global functions and local feedbacks and interactions within and between systems/environments. The choice of which to study is privileged by the current state of the system and the intentions of the investigator, that is, models are political. They will remain reductionist if they ignore a systems potential futures to manipulate its frozen present.

**Stengers, Isabelle. 1992. "The 'New Sciences': Models or a Challenge?" *Review*. 15(1) winter: 91-112.**

Notes that the 'objects' of old sciences are created in a laboratory, have no history and can be isolated from the instability characteristic of whole systems in time, which although perfectly determinant, disallow the jump from narration to deduction. Her concern that the new science is not a new rationality based on a deeper logic, but a recognition that science is 'practice that works', learning which is not a function of rules but of the global system network. She argues that the new science is biology, but where this reconstitutes the past, the study of social reality must produce meaning in the production of human reality, a judgment that invokes the power of judgment and its associated risks.

**Stewart, Ian and Jack Cohen. 1994. "Why are there simple rules in a complicated universe?" *Futures*, 26(6) July/August: 648-664. HB3730.F8 (ubc-koerner)**

The article begins with an analysis of observation ('discovery') and 'explanation' in modern science; a science that presumes that observable phenomena are the consequence of simple or at least fundamental rules. The ultimate objective of reductionism, then, is to find the fundamental rules behind the most fundamental level of reality, the Theory of Everything, a 'fundamentalist' project that replaces God outside the system with the 'laws' (rules) of nature within the system. The analysis shows, however, that science is composed of locally valid hierarchical models where the rules generate regularities and patterns that they cannot explain. Langton's Ant (an artificial life computational simulation) is used to illustrate. The features recognized at one level of phenomena as manifestations of the rules are transposed to the next level of phenomena without the rules and fully independent of them, that is the rules are fungible, only the features are critical to understanding. Between the 'laws' and the phenomena is analogue and model. Emergence is when low level 'laws' generate high level features, but without direct causality, and it applies to just about everything we know. Chaos examines complex behaviour arising from simple rules. Complexity examines simple behaviours arising from complex rules. Simplexity examines the convergent behaviour of systems of similar rules and complicity examines convergent behaviour of interacting systems of differing rules. And none of them are reducible to the rules, divided from reality by the concepts we use to name the features that regularly appear, but never by necessity. The search for explanation in the end must be non-reductionist.

**Stock, Gregory B. and John H. Campbell. 1996. "Human society as an emerging global superorganism: a biological perspective." In *Evolution, Order and Complexity* (Routledge Frontiers of Political Economy series), E.L. Khalil and K.E. Boulding (eds.). London and New York: Routledge (pp181-198).**

Since globalization has resulted in human analogues of digestive, circulatory, excretory and nervous systems at a planetary dimension, it is proposed that a global entity/organism has emerged: "metaman". Not only does this organism 'live' and 'think', but it exhibits all forms of change (turnover, growth, ontogeny and evolution), where evolution results from 1) internalized natural selection (internal competition between component elements), 2) internalized random selection through conscious design, and 3) interrelations elevated from material elements to abstract representations. The authors contend that metaman is an organism, not an ecology because of its absolute indivisibility. Policy implications include the need to promote rapid technological advance, increasing energy supplies, fostering industrial growth and facilitating institutional replacements, increasing global interdependencies (i.e. trade), developing global (and local) governance systems appropriate to the scale of 'metaman', and remaking the environment as "it wishes" since "attempts to simply stop human impact on the environment...will neither arrest it nor effectively direct its course. (p.196)" This is a brutally reductionistic (and deterministic) image of humanity as a collapse of

complex systems into a unitary and non-intentional survival machine, where there is no paradox, contradiction or even simple succession, but only the linear progress of 'metaman'. (The article's selection for this volume on whole systems is surprising.)

**Tainter, Joseph A. 1995. "Sustainability of Complex Societies." *Futures*, 27(4) May: 397-407. HB3730.F8 (ubc-koerner)** A summary of his previous book (Tainter, Joseph A. 1988. *The Collapse of Complex Societies*. N.Y.: Cambridge Univ. Press. CB311.T245 1988 (ubc-koerner)) and similar to his subsequent article (in Robert Costanza, et al. (eds). *Getting Down to Earth: Practical applications of ecological economics*. Washington, D.C.: Island Press. HC79.E5G478 1996 (ubc-koerner)). His thesis is that societies grow in complexity to solve the problems created by their success and to increase their competitive advantage over other societies, but that increased adaptive complexity requires investments which inevitably encounter decreasing returns, less residual resource to counter emergencies and finally social collapse. The decrease in US life expectancy/health expenditure as % of GDP, the collapse of Rome and the Lowland Classic Maya are used to illustrate, showing that final collapse is preceded by the consumption of capital resources. His solution is to increase the availability of per capita energy through source increases and utilization efficiencies, allowing the expansion of complexity to meet current sustainability challenges, and to have a better understanding of our position in historical cycles. The article fails to recognize that simplifications of this complexity through the emergence of new levels of organization have provided civilizational renewal, as in the agricultural, industrial, and informational revolutions. Although he mentions that energy throughput expansion must be within some environmental limit, he does not expand on the relationship between the growth of complexity and environmental carrying capacity. Finally, he looks at the total cost of problem solving, whereas it might have been useful to look at the difference between planning/design, implementation, and monitoring/evaluation, each having different energy requirements, and the differing trends therefore having an impact on his "increase per capita available energy" strategy.

**Timmerman, P. 1987. "Mythology and Surprise in the Sustainable Development of the Biosphere." In *Sustainable Development of the Biosphere*, Clark and Munn (eds.). Laxenburg, Austria: IIASA and Cambridge: Cambridge University Press.** Since threats to sustainability are due to the uncertainty of complex systems, an understanding of responses to the unexpected (surprise) is necessary. Surprise is always understood within a myth of nature's behaviour over time. He provides two basic myths (equilibrium, variability) and a typology of social strata that hold them.

| Myth        | Bias              | Mgmt. Strategy                     | Social strata    |
|-------------|-------------------|------------------------------------|------------------|
| Equilibrium | stability         | build redundancy, dampen change    | entrepreneur     |
|             | instability       | precautionary, preserve status quo | lost individual  |
|             | cyclical renewal  | functional optimization            | hermit           |
| Variability | multi-equilibrium | impose behavioural limits          | bureaucrat       |
|             | resilience        | learning through testing           | consensual group |

Each myth of nature predisposes a response to surprise. Surprise is most welcome to the resilient myth which sees nature (as well as the contained system) as an active subject that also learns through time. Thus there are four sources of surprise: erupting from the system, irrupting into the system from the environment, observed in close encounter with the system, emerging from the interaction of the system and the environment and have four informational impacts: anomalies (ignored), shocks (freeze), epiphanies (reflexive revelation), catastrophes (destructive). The myth of resilience tries to court surprise, especially resulting from system/context interaction, and incorporates adaptive management rather than control management, making it better suited to a management of sustainability.

■ **Ulanowicz, Robert E. 1997. *Ecology, the Ascendent Perspective*. New York: Columbia University Press. 201pp. QH540.5.U42 1997 (ubc-woodward).** Based on the measures of thermodynamics, the book proposes a taxonomy for the quantification of material/energy flux and hierarchical structure in ecology. Key concepts introduced include 'ascendency' (the difference between a systems capacity for development and the systems unavoidable encumbrance in redundancy (overhead)) and 'information' (the biases in the connectivity between components in an autopoietic system leading to efficient structures). Together these are the basis for empirical modeling of ecosystem development (growth-development-maturation-

senescence) and a reworking of C.S. Holling's figure '8' model (exploitation-conservation-creative destruction-renewal), The revised model reinforces the need for redundancy (system overhead) and adaptability through structural restraint (paedomorphosis) in dynamic balance with the dynamic tendency toward increased ascendancy to promote system health and evolution.

- Ulanowicz, Robert E. 1996. "The propensities of evolving systems." In *Evolution, Order and Complexity* (Routledge Frontiers of Political Economy series), E.L. Khalil and K.E. Boulding (eds.). London and New York: Routledge (pp. 217-233).** According to Popper (1990) a propensity is the occurrence of 'forces' in uncontrolled real situations where system behavior is contingent on circumstances and interfering events. These are formal causes (from Aristotle) "inherent in a situation (219)" that arise at the level of the process under observation, not from the laws beneath or the observed determined bounding conditions beyond. He finds autocatalytic self-referencing configurations are growth enhancing (increasing exergy flows or throughput/extensity), exert selection pressure on favourable interrelationships (having direction toward efficiency/intensity/'average mutual information'), where the process can replace all constituents and is immaterial of them. The agency derives from spatio-temporal juxtaposition of processes, that is a network based focus. Increasing 'ascendence' (the product of throughput and intensity) is the measure of the maturity of an autocatalytic system (including economic systems), and equivalent to thermodynamic power, but at some point power (the reduction of systemic overheads and the reservoir of potential adaptations) decreases resilience to external disturbance.
- Waldrop, M. Mitchell. 1992. *Complexity: The emerging science at the edge of chaos*. New York: Simon & Schuster (Touchstone Book). Q175.W258 1992** [Cohen and Stewart 1994 say "How emergence is becoming respectable; a detailed look at the Santa Fe Institute and the theories that it is developing."]
- Wallerstein, Immanuel. 1996. "History in Search of Science." *Review*, 19(1) winter: 11-22.** Argues for the construction of a new scientific vision based on the "re-enchantment of the world" through overcoming the three modern antinomies (idiographic/nomothetic, fact/value, micro/macro) and re-integrating the trinity of human action (market, state, civil society), and providing a basis for a renewed legitimacy of social knowledge. He proposes that this intellectual crisis reflects the social crisis of the modern capitalist age, one that puts us on the brink of systemic collapse.
- Wallerstein, Immanuel. 1992. "The Challenge of Maturity: whither social science?" *Review*, 15(1) winter: 1-7.** Suggests that social science has lived in the shadow of physical science to achieve legitimacy and has inherited a methodology based on 4 pillars which science itself now questions: 1) predictability is inherently impossible, 2) quantitative precision has limits which can only be superceded by qualitative discrimination of meaningful, stable identities, 3) simplification (universalization) is balanced by the complexification of times arrow (particularization), and 4) processes are irreversible. Social science must reinvent itself on the discoveries of the 'new sciences' of complexity.
- Webster, Gerry and Brian C. Goodwin. 1996. *Form and Transformation: generative and relational principles in Biology*. N.Y.: Cambridge University Press. QH491.W435 1996 (ubc-woodward)**
- Weston, Roy F. and Matthias Ruth. 1997. "A dynamic, hierarchical approach to understanding and managing natural economic systems." *Ecological Economics*, 21:1-17.** Based on energy/material flows in biological systems, the authors propose a model of industrial metabolism to sustainably manage large-scale complex systems. Postulates that technology, infrastructure and social institutions have expanded human ability to efficiently degrade matter/energy gradients as evolution provides the same ability in living systems. Evolution changes both the attributes of individuals in the system, and the rules of interrelationship. The model is driven by interactions between micro and macro scales, and requires quantification of individual attributes (resources) and the rules of the game and system constraints (conditions) created by an assemblage of individuals. Identifying attributes, spatial temporal boundaries and causal relationships is necessarily interdisciplinary and the computational outcomes are plural. The model is applied to the steel industry. The choice among alternative futures remains an issue of morality. Improved shared knowledge, they contend, improves moral decisions. The model appears to be reductionist, however, in that behaviour is the outcome of resources and conditions, rather than the indeterminate interaction between systems and environments.

- **Zeleny, Milan. 1996. "On the Social Nature of Autopoietic Systems." In *Evolution, Order and Complexity* (Routledge Frontiers of Political Economy series), E.L. Khalil and K.E. Boulding (eds.). London and New York: Routledge (122-145).** Using the definition and operational criteria of autopoiesis proposed by Varela, Maturana and Uribe, Zeleny argues that all autopoietic systems must be social systems, organizations of self-producing components characterized by inner coordination of individual action achieved through communication among temporary agents. Cells, osmotic growth and kinship are analyzed according to the autopoietic criteria. Importantly, communication is the deformation/in-formation of environments that in turn triggers sustaining responses between environment and the other components of the system, and is simultaneously selfish (self-preserving) and altruistic (context preserving). The communicative mechanisms include the transfer of regulatory rules and the filtering of dysfunctional signals. Long-term adaptability requires the coordinated production, linkage and disintegration of component parts to create space for innovation and adaptation. The unit of evolution is a network capable of innovating self-organizing configurations that adapt to an environment and adapt the environment to itself symbiotically. Organism/environment co-evolve as mutual creations. [This is similar to Cohen and Stewart's (1994) concept of complicity.] "What evolves is neither genetically encoded nor environmentally acquired, but is ecologically embedded in a social network (p.141)."

## Appendix 8a: Glossary of Terms

Combs, Alan and Herbert Guenther (eds.) 1995. *Radiance of Being: complexity, chaos and the evolution of consciousness*. Edinburgh: Floris Books: 277-280) provide an appendix of technical terms for dynamical system theory. Since these are useful for readers new to this field, the entire glossary is reproduced here. Combs and Guenther go on to provide a second glossary of terms from perennial philosophies to demonstrate parallels between the concepts of emergent systems and the principles of the intentional transformation of consciousness, but this is not reproduced here. It is important to note that this is part of a genre of work that focuses on states of matter and consciousness, rather than the processes. This inevitably leads to 'misplaced concreteness'.

*anabolic processes*: constructive processes that tend to move a SYSTEM toward a more complex structure. *Ana* (Gr.) means 'upward,' and *bolein* (Gr.) means 'to throw.'

*attractor*: In plain English, an attractor is a relatively stable configuration (or STATE) of a system. When the system finds itself in a nearby but different configuration, it tends to rebound back into that state. Speaking mathematically, an attractor is a configuration that the system approaches asymptotically as a limit. The approach itself is a transient response of the system. There are three known types of attractors: STATIC ATTRACTORS, PERIODIC ATTRACTORS, and CHAOTIC ATTRACTORS.

*attractor basin*: All the possible states of a SYSTEM that lead it to a particular ATTRACTOR. On a STATE SPACE diagram the region representing these states can appear as a depression or basin.

*autopoietic system*: A self-creating system. Maturana and Varela (1987) define an autopoietic system as a network of interconnected component-producing processes that create the same network that produces them. Organisms are prominent examples of such systems.

*bifurcation*: A significant change in a DYNAMICAL SYSTEM. There are three known types of bifurcation: SUBTLE BIFURCATIONS, EXPLOSIVE bifurcations, and CATASTROPHIC BIFURCATIONS.

*catabolic processes*: Processes that break down or deconstruct complex SYSTEMS into less complex configurations. *Kata* (Gr.) means 'down,' and *bolein* (Gr.) means 'to throw.'

*catastrophic BIFURCATION*: When, in a DYNAMICAL SYSTEM, an ATTRACTOR along with its ATTRACTOR BASIN abruptly appears or disappears.

*chaotic ATTRACTOR* (strange attractor): Strictly speaking, this describes the pattern of a system that is neither at rest (STATIC ATTRACTOR) nor in a fixed cycle (PERIODIC ATTRACTOR), and so is 'strange.' When modeled by computer graphic methods such attractors are often found to reveal highly ordered geometric patterns. Speaking more casually, it is a common misconception to think that such attractors have no visible order at all. In fact, each is contained in its own ATTRACTOR BASIN, and may behave in a relatively systematic fashion, so that it is sometimes difficult to distinguish between an approximately PERIODIC ATTRACTOR such as the cardiac rhythm and a truly chaotic attractor such as described by weather patterns.

*control variable* (*control parameter*): Variable or values that control the behaviour of a system. The temperature of a chemical system, for example, is one variable that controls the rate of reactions.

*cybernetic SYSTEM*: A system that utilizes feed-back information about its own condition or behaviour to regulate its output. Examples range from thermostats to living organisms.

*disruptive force*: An influence that tends to disrupt a STATE OF CONSCIOUSNESS. For example, loud noise tends to disrupt that state of sleep.

*dissipative systems* (*dissipative structures*): SYSTEMS that retain energy, increasing their own internal order while dissipating disorder or entropy, usually in the form of heat. Prominent examples are living organisms.

*dynamical system*: see SYSTEM, DYNAMICAL.

*emergent evolution*: This concept is that of a relatively abrupt and spontaneous transition of a SYSTEM to a new or higher order of organization. This involves a quantal or CATASTROPHIC BIFURCATION in the system's history.

*explosive bifurcation*: An ATTRACTOR undergoes an abrupt change, and possibly a change of type. For example, a STATIC ATTRACTOR rapidly becomes a large CHAOTIC ATTRACTOR.

*general theory of evolution*: A systems-based understanding of evolution that emphasizes the development of DYNAMICAL SYSTEMS into complex hierarchical organizations.

*grand evolutionary synthesis*: Originally proposed by Ervin Laszlo (1987) in reference to THE GENERAL THEORY OF EVOLUTION in its broadest application...includ(ing) the evolution of human consciousness toward its highest potentials.

*historical evolution*: This concept is that of a gradual development through time which involves incremental accumulation of changes or BIFURCATIONS in a SYSTEM.

*patterning force*: An influence that tends to move consciousness toward a particular STATE. For example, fatigue tends to push consciousness in the direction of the state of sleep.

*periodic ATTRACTOR (oscillations, fixed cycle attractor)*: The system comes to a cyclic pattern as a limit (attractor). The rotation of the Earth around the sun describes a periodic attractor, as does (approximately) the rhythm of the human heart.

*phase portrait*: A topological diagram of the STATE SPACE of a system showing, usually with smooth arrows, the direction of change or flow' of the system from STATE to state.

*saddle*: If a STATE SPACE is drawn to represent the energy of the SYSTEM at each state, a saddle-shaped ridge (or saddle) may sometimes be seen to separate two distinct ATTRACTOR BASINS. In plain language a saddle is a type of threshold across which a dynamical system must move to come into the range of influence of a new ATTRACTOR BASIN.

*separatrices*: Elevated or peak regions of the STATE SPACE that separate two or more ATTRACTORS. In plain English this simply means that certain states of a system lie between attractors, and thus separate them. Such a state is that experienced halfway between sleeping and waking, from which one tends to slide back into sleep or forward into wakefulness.

*state (of a SYSTEM)*: A pattern of activity, or more broadly, a condition of a SYSTEM, the latter being organized into a particular STRUCTURE. A tuned violin is a system with a structure. It can be set into a number of states of resonant vibration or tones according to the values of the CONTROL VARIABLES supplied by the finders of the violinist. Also see STATE OF CONSCIOUSNESS.

*state of consciousness*: A coherent pattern of psychological processes such as cognition, emotion, memory, body sense, and sense of identity. States of consciousness such as ordinary wakefulness, non-cream sleep, and dream sleep, each have distinct properties an are relatively stable compared to conditions such as momentary surprise or vertigo, but less stable than a STRUCTURE OF CONSCIOUSNESS.

*state space*: The topological representation of all possible STATES OF A SYSTEM.

*static ATTRACTOR (rest point)*: The SYSTEM comes to a resting state as its limit (attractor). For example, a cup set on a table at a slight angle rotates (TRANSIENT RESPONSE) until it comes to rest.

*structure*: A pattern of activity or configuration of a system that is relatively stable and may be capable of supporting a variety of STATES. Also see STRUCTURE OF CONSCIOUSNESS.

*structure of consciousness*: An entire experiential agenda. For example, Jean Gebser's structures of consciousness are noetic styles through which the world presents itself.

*system*: A set of processes that form a self-contained unit. A system, can, however, be part of a larger system, if it retains its integrity. The processes of a living cell, for example, form such a unit, and at the same (time) form a sub-unit within the larger organism.

*system, dynamical (dynamical SYSTEM)*: A system is understood to be dynamical when it has a rule of evolution,' in other words a rule according to which, for each possible STATE OF THE SYSTEM, the next future state is specified. Such a rule is usually mathematical. Indeed, conceptually the notion of dynamical systems is a mathematical one.

*subtle BIFURCATION*: A small change (bifurcation) in a dynamical system.

*transient response (of a SYSTEM)*: The temporary response of a system before it settles down into a stable pattern of behaviour. Mathematically, it is the temporary response of a system that has been displaced from its nearest ATTRACTOR, or of a system that has just come into existence through A CATASTROPHIC BIFURCATION.

## **Appendix 9: A Proposal to develop 'Sustainable Community Indicators for the Assessment and Management of Change' in Arctic Communities<sup>90</sup>**

### **1. Issues to be addressed: an Overview**

- Successful implementation of sustainable development will include changes to individual behaviour, civil institutions, and cultural values. Citizen and community involvement is critical particularly in collaborating on:
  - developing an understanding about how environmental/human systems work,
  - establishing goals and objectives, and
  - designing and implementing strategies for concrete action
- The purpose of the project is to engage representative communities across the circumpolar north in developing a capacity to recognize and proactively adjust to and or manage changing conditions. One key to this capacity is the generation of simple, measurable, insightful and comprehensive indicators of environmental sustainability and human well-being that are linked to practical action strategies and ongoing communication about successes and surprises.
- Solutions for sustainability must be pluralistic, finding convergence between different ways of knowing and different defensible models of ecosystem behaviour
- Sustainable community indicators, action strategies, and the final outcomes of actions need to be compiled in a data base and made accessible through an internet site, and other media as necessary to facilitate access for participating nations and communities.

### **2. Anticipated financial needs and implications: an Outline**

- The costs for a community would include the participation of the local governance institution and functional specialists and authorities with jurisdiction (health, education, community economic development, etc.), the operation of the venue, advance communications and information, local participant solicitation and selection, and any refreshments to be provided during the week-long workshops, as well as the cost of sending a local facilitator to a training session in the host country.
- The costs for the Arctic Council would include the construction and maintenance cost of an internet site to data-base the experience and results in each community, and the travel and expenses of a team of technical experts/facilitators who would train local community facilitators through a demonstration project in one community in each participating member state. Assuming:
  - all eight states donate a member to the facilitation team, including their salaries
  - each demonstration workshop is five-days long bounded by a day of travel on either end
  - accommodation costs at \$200/day and air travel at \$2500/expert member
  - Canada would assume the personnel costs expenses of coordinating, producing, reproducing, and shipping workshop materials developed jointly (through electronic communication) by all participating states. The development cost contributed by Canada is expected to be 4 person

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<sup>90</sup> This proposal was improved through review and discussion with Tony Hodge, Ph.D., a planning consultant in Victoria, B.C. who has considerable northern experience in the Yukon, is a recognized expert on "sustainability" indicators, and was a member of the Panel of Advisors to the Commissioner of the Environment and Sustainable Development for the 1998 "Green Report". See also Hodge 1996.

months (600 hours x Cdn\$100/hr) or Cdn\$60,000. The contribution of prototype materials (brochures, handouts, overhead slides, videos) is expected to be Cdn\$8,000. The contribution for communications from Canada is expected to be Cdn\$2000) for a total contribution of Cdn\$70,000.

- the reproduction and shipping costs of workshop materials is approximately \$1000 per community
- the construction and maintenance of a database and internet site (an Arctic Council secretariat responsibility) would be \$1000/participating community
- then, the base cost for participating nations (assuming full participation) would be:
  - \$3900/ expert/ community x 8 demonstration communities across the Arctic = \$31,200/ nation, and
  - \$1000/community x 5 participating communities /nation = \$5000/ nation for the database/internet site, which totals
  - \$36,200/nation or \$289,600 total
- NB. All costs in US dollars unless noted

### **3. Sourcing Resource Needs: a proposal**

- Each member country would pay the salary of their technical expert/facilitator during the development of the workshop materials and the delivery of each workshop, as well as the travel and accommodation of that person.
- Each community would source their participation costs through their own funds, or donations from the member state, interested NGOs and/or corporate and private donors .

### **4. Participation by other Arctic States**

- By working together and sharing experience, a more effective approach to recognizing, measuring, and assessing change in Arctic communities will emerge. In time, a common roster of sustainable indicators for circumpolar communities may develop that would:
  - help focus the design of future joint sustainable development projects,
  - provide a common criteria for measuring the effectiveness and efficiency of different sustainable development projects implemented in similar circumstances, and
  - facilitate comparison and evaluation of similar sustainable development projects executed in different circumstances
- Universities and graduate students associated with the proposed University of the Arctic would be invited to provide analytical evaluations of the data received at no cost to the Arctic Council.

### **5. Administrative organization to oversee implementation**

- The Sustainable Development Working Group will assign a project manager to coordinate the project implementation including logistics, and to liaise with the Arctic Council Secretariat regarding electronic data base specifications.
- Community interest in participating needs to be solicited in each member country by the representative SAO. The criterion for participation would be based primarily on a community's level of commitment to follow through with the development of indicators, the design and execution of sustainable development projects and policies, and the measurement of results.

- To build institutional legitimacy and project credibility, a community's participation in the project would be politically accountable. To build civic capacity, individual participation in the project would be fully representative; including both genders, all cultural groups and all age categories.

## **6. Anticipated benefits**

- The bottom-up, community-based development of an approach to performance measurement/progress assessment tailored to Arctic communities will encourage self-reliance within local carrying capacity as well as facilitate the identification of issues that cannot be resolved at the local scale and that might be advanced through national or international action.
- All member states and communities will provide input for an open-access database of best practice thus encouraging the growth of knowledge through collaboration.

Local institutions that can self-organize for successful sustainable development will be strengthened.

- A broad cross-section of northerners will be immediately engaged in sustainable development and the adaptation to or management of change. This will increase public awareness of the work and issues of the Arctic Council, bolster the Arctic Council's credibility, and enable confidence-building at the community level.

## **7. Impact on residents experience and needs**

- The project will help northerners construct a self-assessment of their environmental, social, cultural and economic health, provide meaningful information to community residents on the cumulative change resulting from exogenous and endogenous activities, and provide unambiguous feedback about the net impacts of local sustainable development and change management strategies.
- The project will integrate both traditional ecological knowledge and contemporary scientific approaches to indicator selection, monitoring approaches, the interpretation of change, and the choice and communication of action.

## **8. Related work of other international fora**

- The *Healthy Cities Network* began with the work of the World Health Organization(WHO) *Health for All by the Year 2000 Program* in the 1970s. Indicator work is now based on an integrated approach to the determinants of health that address not only traditional health measures but also economic, cultural and social factors.
- The UNDP's Human Development Index (HDI) provides an evolving annual suite of country-specific human development indicators.
- The *UN Commission for Sustainable Development* is drawing on the work of many others in the development of sustainable development indicators. Included in this network are: the UNDP, the World Bank, the European Community, the UN Environment Program (UNEP-Nairobi), the Organization for Economic Cooperation and Development (OECD), FAO, amongst many others.
- The *IUCN/World Conservation Union* initiated Phase 1 of an indicator project in the developing countries of India, Columbia and Zimbabwe in 1991 supported by IDRC (Canadian) funding. Phase 2 has just begun.

- President Clinton's *President's Council on Sustainable Development* led to the creation of the Interagency Committee on Indicators of Sustainable Development
- The *Redefining Progress Institute* in San Francisco maintains a web-based network of several hundred cities and rural communities in the US and elsewhere engaged in developing systems of performance measurement and progress assessment towards sustainability
- The Habitat II (Istanbul) Cities Conference and Declarations (1996), recognizing the scale and extent of global urbanization, reinforced the need to consolidate integrated social, economic and environmental responsibilities at the city/community level, strengthen requisite authority and accountability, and develop new networks of civil institutions. The healthy community indicator work contributes to that evolution.
- The International Institute of Sustainable Development (IISD-Winnipeg) has both a "communities" and a "measurement and indicators" program group
- Approaches to "performance measurement and progress assessment (PM/PA)" has evolved considerably in the past 20 years. Still a great deal is undone, particularly in bringing the best insights available from business management, public administration, and planning to application at the community level. Although there is indicator work going in the North, such as the work on "community wellness" with a focus on physical and social health in the context of community empowerment in the Northwest Territories, there is very little international work focused on comprehensive sustainable/healthy community indicators specific to Arctic communities.

## Appendix 10: The Iqaluit Declaration

[This appendix is provided given the difficulty of accessing the document and the uncertain future of the Arctic Council Website]

### THE IQALUIT DECLARATION

**The First Ministerial Meeting of the Arctic Council  
Iqaluit, Canada, September 17-18, 1998**

The Arctic Council Iqaluit Ministerial Meeting is the first Meeting under the Arctic Council established on September 19, 1996, in Ottawa, Canada. The *Declaration on the Establishment of the Arctic Council* created the Council as a high level forum to provide a means for promoting cooperation, coordination and interaction among the Arctic States, with the involvement of the Arctic indigenous communities and other Arctic inhabitants on common Arctic issues, in particular issues of sustainable development and environmental protection in the Arctic; oversee and co-ordinate the programs established under the Arctic Environmental Protection Strategy; adopt terms of reference for and oversee and coordinate a sustainable development program; and disseminate information, encourage education and promote interest in Arctic-related issues.

The category of Permanent Participation is created to provide for active participation and full consultation with the Arctic indigenous representatives within the Arctic Council. The Council acknowledges and appreciates the contributions of the Permanent Participants: the Inuit Circumpolar Conference, the Saami Council and the Russian Association of Indigenous Peoples of the North, and the contributions from Observers, in the work and programs of the Arctic Council.

WE, THE MINISTERS OF THE ARCTIC COUNTRIES HEREBY:

1. **Adopt** the Arctic Council Rules of Procedure and Arctic Council Terms of Reference for a Sustainable Development Program, attached as Annexes 1 and 2, respectively, to the Senior Arctic Officials (SAOs) Report 1998;
2. **Approve** the Aleut International Association as a Permanent Participant in the Arctic Council;
3. **Welcome and approve** the status of Observer for:

The Federal Republic of Germany  
The Kingdom of The Netherlands  
Poland  
The United Kingdom of Great Britain and Northern Ireland  
The Nordic Council  
The Northern Forum  
The United Nations Economic Commission for Europe (UN-ECE)  
The United Nations Environment Programme (UNEP)  
The International Arctic Science Committee (IASC)  
The Standing Committee of Parliamentarians of the Arctic Region (SCPAR)  
The World Wide Fund for Nature (WWF)  
The International Union for Circumpolar Health (IUCH);

4. **Direct** SAOs to continue to review applications relating to Permanent Participant status and Observer status to the Arctic Council, and to recommend applicants for approval at the next Arctic Council Ministerial in 2000;
5. **Welcome** the SAOs' Report to the First Ministerial Meeting of the Arctic Council and **adopt** the recommendations contained within the Report;
6. **Commit** to the well-being of the inhabitants of the Arctic, and **affirm** that the goal of the sustainable development program of the Arctic Council is to propose and adopt steps to be taken by the Arctic States to advance sustainable development in the Arctic, including opportunities to protect and enhance the environment, and the economies, cultures and health of indigenous communities and of other inhabitants of the Arctic, as well as to improve the environmental, economic and social conditions of Arctic communities as a whole;
7. **Establish** the Sustainable Development Program, and **welcome** the sustainable development proposals from Arctic States and Permanent Participants in the areas of Arctic children and youth, health, telemedicine, resource management, including fisheries, cultural and eco-tourism, technology transfer to improve Arctic sanitation systems, and national sustainable development strategies. We **direct** the SAOs to guide the completion of work on proposals in these areas and **encourage** that funding be sought, so that projects can be initiated as quickly as possible before the next Ministerial meeting;
8. **Welcome** Canada's offer to take the lead with respect to the project on Arctic children and youth, and to provide staff support, and **welcome** the offer of the United States to take the lead with respect to the project on telemedicine, and **further welcome** the offer of the Saami Council to take the lead with respect to the two fisheries management projects. We **request** that Canada and the Arctic Monitoring and Assessment Programme cooperate in reviewing knowledge on the impacts of environmental contamination on the health and development of children and youth, under the direction of the SAOs;
9. **Establish** a Sustainable Development Working Group, comprised of SAOs and Permanent Participants, or their designated representatives, which will meet prior to the SAOs' regular meetings, or at other times to be determined, and **request** that it facilitate completion of work on sustainable development proposals identified above, propose possible priority areas in the further development of the sustainable development program, and review specific proposals and prepare them for approval by the Ministers;
10. **Encourage** the Sustainable Development Working Group to take special note of proposals which reflect the importance of traditional and indigenous knowledge and the perspectives of indigenous communities in developing a sustainable future for the Arctic;
11. **Welcome, and are pleased to announce**, the establishment of a University of the Arctic, a university without walls, as proposed by a working group of the Circumpolar Universities Association. We **note** the kind offer of Finland to support the interim secretariat. We **encourage** the working group to continue its efforts and to consult with northern educational and indigenous authorities and colleges. We **look forward** to further reports on this issue and to seeking ways to promote the success of this initiative;

12. **Acknowledge** the successful integration of the Arctic Environmental Protection Strategy (AEPS) and the four working groups as constituted in the AEPS: Arctic Monitoring and Assessment Programme, Conservation of Arctic Flora and Fauna, Protection of the Arctic Marine Environment, and Emergency, Prevention, Preparedness and Response; into the Arctic Council and **direct** SAOs to continue their efforts in enabling a smooth transition;
13. **Receive with appreciation** the comprehensive Arctic Monitoring and Assessment Programme (AMAP) Assessment Report: Arctic Pollution Issues, which contains the substantive scientific documentation in support of the Arctic Pollution Issues - A State of the Arctic Environment Report, presented to the 4<sup>th</sup> AEPS Ministerial Meeting in Alta;
14. **Welcome** the establishment of the AMAP Human Health Thematic Data Centre by Denmark;
15. **Reaffirm** our commitment from the Alta Declaration to take the findings and recommendations from the AMAP Report, Arctic Pollution Issues: A State of the Arctic Environment Report, into consideration in our policies and programmes, to increase our efforts to limit and reduce emissions of contaminants into the environment and to promote international cooperation and make a determined effort to secure support for international actions in order to address the serious pollution risks reported by AMAP;
16. **Recognize** the need to continue to identify actions to address the pollution sources identified in the AMAP Report, and **instruct** SAOs to continue to develop an overall plan of action complementary to existing legal arrangements and the Regional Programme of Action for the Protection of the Arctic Marine Environment from Land-Based Activities. This plan, the Arctic Council Action Plan to Eliminate Pollution of the Arctic (ACAP), should include actions of a wide scope on pollution prevention and remediation measures, also including the identification and implementation of specific co-operative projects;
17. **Welcome with appreciation and support** the three-part cooperative pilot project for the phase out of PCB use, and management of PCB-contaminated wastes in the Russian Federation as an example of a cooperative project under ACAP, and **endorse** Part I of the PCB project, which has financial and other support from all Arctic States. We **encourage** and **support** AMAP in its activities to complete Part I of this project;
18. **Agree** to work vigorously for the early ratification and implementation of the Protocols on the elimination or reduction of discharges, emissions and losses of Persistent Organic Pollutants (POPs) and of Heavy Metals under the framework of the United Nations Economic Commission for Europe Convention on Long-Range Transboundary Air Pollution. We **encourage** other states to do the same, with the aim to bring the Protocols into force as early as possible. We **fully support** regional cooperation to facilitate the delivery of the measures that are needed to meet the obligations of the Protocols on POPs and Heavy Metals;
19. **Strongly welcome** the establishment of an Intergovernmental Negotiating Committee under the auspices of United Nations Environment Programme to work towards the conclusion of a global agreement on POPs by the year 2000, and **encourage** the Arctic States to act together to assist the early conclusion of such a global agreement;
20. **Welcome and endorse** the Conservation of Arctic Flora and Fauna (CAFF) Strategic Plan for the Conservation of Arctic Biological Diversity as an overall framework for CAFF activities; **encourage** its timely implementation through more detailed Work Plans, to be approved by

SAOs; and **welcome** CAFF's continued role in coordinating the implementation of the Circumpolar Protected Areas Network and the conservation strategies for murres and eiders;

21. **Welcome** CAFF's intention to prepare an overview on the status and trends in changes to ecosystems, habitats and species in the Arctic and to identify elements of a program to monitor circumpolar biological diversity and to assess, in collaboration with AMAP, the effects of climate change and UV-B radiation on Arctic ecosystems;
22. **Endorse** the Emergency, Prevention, Preparedness and Response (EPPR) Work Plan set forth in EPPR's Strategic Plan of Action; **ask** the working group to initiate new projects and activities as indicated in the chapters: Activity Areas and Possible Future Activities of the Work Plan; and **endorse** the development of a Circumpolar Map of Resources at Risk from Oil Spills in the Arctic;
23. **Welcome** the Field Guide for Oil Spill Response in Arctic Waters, as a source of information on how to deal with oil spills in the Arctic; and **take note** of both the report of Phase I Analysis of Communication and Notification Systems in Place for Arctic Risks and the Revised Environmental Risk Analysis of Arctic Activities;
24. **Welcome with appreciation** the Regional Programme of Action for the Protection of the Arctic Marine Environment from Land-based Activities (RPA); **agree** to work vigorously for the early implementation of the actions described in the first phase of the RPA and in a manner consistent with the associated international agreements and arrangements; **further agree** to develop additional actions to protect the Arctic marine environment; **recognize** the important role of the Protection of the Arctic Marine Environment (PAME) in the implementation and further development of the RPA; and **accept** the kind offer of the Government of Iceland to host the PAME Secretariat on a voluntary funding basis;
25. **Support** the efforts of the Russian Federation to develop and implement a Russian Programme of Action for the Protection of the Arctic Marine Environment from Land-based Activities (Russian NPA-Arctic); including seeking appropriate support to help Russia finalize the Russian NPA-Arctic and host a Partnership Conference to be organized with the assistance of the Advisory Committee on Protection of the Sea which would seek funds to remediate regional priority pollution sources and activities identified in the RPA and Russian NPA-Arctic;
26. **Promote** the application of the Arctic Offshore Oil and Gas Guidelines and recommend their review in the year 2000; the assessment of current and potential shipping activities to assist in determining what, if any, additional Arctic shipping measures are required, including work on an International Code of Safety for Ships Operating in Polar Waters (Polar Code) under the auspices of the International Maritime Organization (IMO); and an assessment of the adequacy of existing international agreements and arrangements related to the protection of the Arctic marine environment;
27. **Acknowledge with appreciation** the voluntary contributions in support of the Working Group secretariats and request that Arctic States consider taking part in voluntary, adequate and reliable funding of all Working Group secretariats, as appropriate;

28. **Undertake** to strengthen our efforts to achieve reliable funding systems for all Arctic Council activities, including seeking support from other international and regional fora and governmental and non-governmental sources;
29. **Request** Arctic States to consider the financial questions involved in securing the participation of the Permanent Participants in the work of the Arctic Council and in the operations of the Indigenous Peoples' Secretariat. We **acknowledge with appreciation** the generous financial support by Denmark, Greenland and Canada to the Indigenous Peoples' Secretariat;
30. **Emphasize** the need for the Arctic Council and its programmes to cooperate closely with existing organizations such as the Barents Euro-Arctic Council, the Nordic Council of Ministers, and other appropriate fora, including scientific bodies;
31. **Take note** of the statements and recommendations of the Third Conference of Parliamentarians of the Arctic Region, held April 22-24, 1998 in Salekhard, Russia, and of the Summary Report of the Circumpolar Conference and Workshop on Sustainable Development in the Arctic: Lessons Learned and the Way Ahead, held May 12-14, 1998 in Whitehorse, Canada, as well as the Experts Workshop on Sustainable Development in Northern Timberline Forests, May 10-11, 1998 in Whitehorse, Canada; and **encourage** SAOs to consider the recommendations in the development of project proposals and future activities of the sustainable development program;
32. **Acknowledge with appreciation** Canada's role in chairing the Arctic Council since its inauguration and in hosting the first Ministerial Meeting of the Arctic Council;
33. **Accept with appreciation** the offer of the United States of America to chair the Arctic Council and to host the second Ministerial Meeting of the Council in 2000.

Signed by the representatives of the Arctic States in Iqaluit, this 18th day of September 1998.

**For the Government  
of Canada**

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Lloyd Axworthy  
Minister of Foreign Affairs

**For the Government  
of Finland**

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Pekka Haavisto  
Minister of Environment and  
Minister at the Foreign Ministry (development co-operation)

**For the Government  
of Norway**

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Knut Vollebæk  
Minister for Foreign Affairs

**For the Government  
of Sweden**

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Anders Bjurner  
Deputy Secretary of State

**For the Government  
of Denmark**

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Niels Helveg Petersen  
Minister for Foreign Affairs

**For the Government  
of Iceland**

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Guðmundur Bjarnason  
Minister of the Environment

**For the Government of  
The Russian Federation**

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Vladimir Goman  
Chairman of the State Committee  
for the Development of the North

**For the Government of  
The United States of America**

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Wendy Sherman  
Ambassador