PERSPECTIVES ON POLICY AND SCIENCE:

BUILDING BRIDGES FOR SUSTAINABLE DEVELOPMENT

By

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I.   INTRODUCTION

Economic globalization and technological innovation especially in the area of information technology, have been major forces in reorienting the role of governments in recent decades. (1) In striving to be competitive in the new global economy, governments have come to play a more limited role in some respects. In many industrialized countries, governments have gotten out of the way of market forces through down-sizing, privatization and deregulation in areas such as transportation, public utilities and the financial sector. (2) In Canada, enhancing competitiveness in trade relations and improving cost-efficiency in government service delivery are all part of this paradigm shift in governance.

While some might argue to the contrary, environmental protection has not been an area where governments have not gotten out of the way although down-sizing and budget reductions have affected public environmental agencies. At the national level in Canada, the direction taken has been to adapt environmental policies and approaches to meet the challenges of the new economic and technological milieus. Many environmental issues by their nature are global in scale and the forces of economic globalization have served to highlight the need to link international efforts in environmental policy with economic initiatives. (3). At the same time, global market forces have challenged national and local governments to find ways to make environmental policy more competitive with economic development interests.

The need to reconcile economic and environmental goals in order to advance environmental objectives was identified as a major policy issue at the international level in the l980s. The work of the United Nations World Commission on Environment and Development (Brundtland commission) and its report in l987 offered a policy approach that helped create a bridge between environmental and economic concerns by recognizing that development is needed to support human well-being.(4) The Commission provided an alternative to the dominant economic model and called for "a process of change in which the exploitation of resources, the direction of investment, the orientation of technological development and institutional changes are made consistent with future as well as present needs". (5)

For the Commission, the concept of sustainable development had three main features: the explicit entrenchment of environmental considerations in economic policy making, the implication that the needs and equity between the developed and less developed countries and of future generations must be considered; and, an acknowledgment that development also includes the non-financial aspects of economic welfare. The Commission advanced the argument that there are natural limits to economic growth. But this notion was presented not as an absolute but as a function "of the present state of technology and the capacity of the biosphere to absorb the effects of human activity". (6)   In other words, there had to be a qualitative change in the content of growth to make it less material and energy intensive and more equitable in its impact. Among its recommendations, the Commission also called for the annual accounts of a nation's environment and resource base "to complement the traditional fiscal budget and economic development plans". (7) It was recommended that environmental assets and liabilities be measured in the same way as monetary and materiel assets and liabilities.

A recent study on environmental trends and environmental governance in Canada sponsored by the Policy Research Initiative Group of the Government of Canada has reviewed the current status of major environmental issues as well as the role of national and international institutions. Three aspects of the public private interface – regulation, voluntarism and sharing of authority were also explored. In considering environmental pressures and paradigm shifts in policy, the editor of the study report observed:

> Central challenges in successful governance of the environment over the next few decades will involve developing more effective ways to integrate high quality, objective scientific and technical assessment with key decision needs; learning more effective processes for managing under uncertainty and responding adaptively to advances in knowledge; and effectively coordinating inevitably shared authority and capacity across multiple levels of government and between diverse public and private actors."(8)

The purpose of this paper is to explore the interface between policy and science from a number of perspectives and to consider ways in which the sustainable development agenda may be advanced. The paper begins with an examination of two policy concepts originally borrowed from science and considers how ecological attributes might enhance the dimensions of those concepts. Secondly, approaches to the implementation of environmental policy are reviewed and the implications for advancing sustainable development are assessed. Finally, the paper considers practical issues in the application of science in decision-making and in the management of policy issues. Understanding the inherent tension between policy and science as well as the conceptual and practical linkages may help us determine where to focus on improving the linkages. Some future directions for policy making are suggested.

II.   ADAPTING CONCEPTS

How we conceptualize or characterize social phenomena can influence our understanding and appreciation of practical policy issues. Theoretical models and frameworks in the social sciences have often drawn on concepts from science and engineering. These concepts provide proxies that help describe and explain human behaviour and processes governed by laws and structured by institutions and organizations. While seldom recognized as such, this aspect of 'integration' may also be considered as part of an interdisciplinary perspective on policy issues. The discussion below will consider how two basic concepts currently applied in policy analysis may be reformulated to provide a more integrative perspective on policy and science.

A. The concept of system

The term 'system' is common nomenclature in the social sciences and is applied in a variety of contexts from macro-models of political systems to micro-models of organization specific planning systems. The need for systematic approaches in managing the environment has been advocated, at least since the early 70s. In a paper prepared for the Washington Environmental Research Center in l973, Kenneth Boulding, a well-

known economist, encouraged the adaptation of the biological concept of ecosystem to include social factors and to be applied as a framework for environmental decision-making.(9) In biological science, ecosystems are generally characterized by complex, non-linear relationships between the part and the whole. They are open systems governed by the laws of thermodynamics. These 'laws' determine that matter and energy cannot be destroyed but are transformed from one form of energy or matter into another. Entropy or disorderliness in the system always increases the more that energy and matter are transformed into wastes. Ecosystems can also be described as self-determining, self-organizing and self-renewing. They exert a systemic interconnectedness among all natural processes over space and time. They are dynamic living systems whose norms of which are uncertainty and unpredictability. (10).

Early 'systems' models in the social sciences were developed in the 1950s and 1960s and were based on concepts borrowed from physics.   With a view to making the study of politics more empirical, for example, David Easton developed a model of political systems that involved a simple input-output process with a feedback loop within a closed system.(11) The process from inputs of ideas and issues through a 'conversion process' or transformation through decision-making structure to outputs and outcomes in the form of laws and policies was a linear one. Some of the early methodological problems with the model included establishing the boundary of the system and the criteria that would be used to determine variables and factors would be taken into account in developing the systems model. Because the system sought stability and predictability, it was considered to have a conservative bias and was not designed to account for uncertainty. The model provided little basis to explain the process of converting inputs to outputs. Interestingly, the conversion process or the contents of the 'black box' as it was called became a major focus of academic policy research for many decades thereafter. Finally, while the model claimed to be value neutral, democratic and euro-centric cultural values were implicit in its design and application.

Notwithstanding these issues, some of which continue to be debated, 'systems' analysis has been widely used in social science disciplines especially the policy sciences. Generally, a policy making system is understood to encompass those sets of relationships among individuals, groups and institutions that are engaged in a process or processes directed to the achievement of some goal or outcome. The relationships are structured formally and informally governing institutions and policies. In an effort to open up the processes, Ann Dale has recently proposed in her work on sustainable development that holistic change in the way policy systems are designed is needed. (12) What she proposes in effect is a reconciliation of policy and ecological frameworks.   In particular, she argues for a more open system approach that recognizes greater diversity than is currently the case. In her view, there should be a fundamental redesign of human activity systems from "linear input-throughput of processes to closed loop operations" which represent cyclical processes similar to models of organisms and natural ecosystems. She argues that policy systems need to be seen as dynamic processes whereby inputs such as resources may transform or 'recycle' themselves as issues are resolved or acquire new characteristics. To use a commercial example, she notes that industries would not simply use resources to produce products and throw away waste material but would focus on means of reducing energy use and reducing, reusing and recycling materials across the life cycle of a product and so on. The scientific information used in these processes

ideally would be based on an integrative inquiry using natural science and social science techniques as well as multiple sources of evidence.

Some of the features of ecological systems and policy systems may be compared if only approximately. Each involves processes that are influenced by a number of variables through various stages of development and evolution. Perhaps the most important distinction between them is that policy systems are conceived generally as closed systems rather than open systems and while exogenous variables are taken into account, those processes are considered to be primarily linear. While both approaches may be said to seek stable states, policy systems seem driven to reduce uncertainty whereas ecological systems do not. The non-linearity of ecological systems has, in particular, been a difficult concept to capture in the design of policy making models. Dale's analysis avoids some of the practical issues of policy-making processes. Her recommendations, nevertheless, provide useful suggestions for adjustment and adaptation in policy-making to better integrate ecological considerations.

It is interesting that there is a model and indeed a multi-faceted theory thought out some forty years ago by a practitioner with many years' experience in government and policy-making that addresses many of the contemporary theoretical issues. Why the work of Sir Geoffrey Vickers did not make as a great an impact among academics as other system approaches is a subject for other discussions. But Vickers' work is particularly relevant for those interested in realigning systems theory with ecological considerations. Only a brief summary of some of his key ideas will be presented here but the ideas provide insights into how we might conceptualize and operationalize new systems models to address issues of sustainable development. For Vickers, the definition of policy is described "as the setting of governing relations or norms, rather than the more usual terms as the setting of goals, objectives or ends."(13). For him, the purpose of policy making and the human behaviour that drives it are not comparable to rats in a maze seeking an endpoint. Rather, it is an on-going process that involves the evolution and modification of the standards and norms that govern and regulate a society. Above all, he depicts policy making within dynamic systems that are open and responsive to variety of influences whether based on factual i.e. reality or value judgments.

For Vickers, governing takes place within an appreciative system that involves prediction, innovation and valuation. In particular, he adopts an open systems approach, a human ecological system where the basic framework within which policy making takes place includes all individuals who have participated in, who are affected by, or whose support is needed to implement it. As he explains:

> Open systems depend on and contribute to their surroundings and are thus involved in interdependence with it as well as being dependent on the interaction of their internal relationships. This interdependence imposes constraints on all their constituents. Organization can mitigate but not remove these constraints which tend to become more demanding and sometimes even more contradictory as the scale of organization rises. This places a limit, though usually not a predictable one, on the possibilities of organization. (14)

In depicting open systems by interdependence, limitation and organization, Vickers sets the stage for the next level of analysis that provides insights into how

institutions and individuals interact in setting governing relations. But before we consider some of these features, let's examine how the concept of network is currently applied in policy making.

B. The concept of network

Network is also a concept that is linked to physical sciences. The term connotes the ideas of interconnectedness and interrelation of particular elements. In an age of information technology, the notion of a wired society is widely understood. The Internet affords members of society the opportunity to become increasingly connected to a vast number of sources of information. People networking via the Internet is a growing phenomenon and professional networking has benefited from technological changes. The development of "virtual" policy networks that link researchers and experts is taking hold and, for all intents and purposes, appears to be having and important impact. Perhaps one of the first and best known in Canada is Judith Maxwell's Canadian Policy Research Network. Networking around four policy themes, researchers interact and generate research that is disseminated widely. More recently, the federal government has established thirteen health research institutes that operate in much the same way. Within the federal government, the Policy Research Initiative has provided a means for policy networking across the public service. The information technology revolution has allowed individuals to connect with one another across space and time that was difficult to imagine even twenty years ago.

The effect of information technology on traditional networks within government and between government and its constituencies has been discussed elsewhere.(15) Whether we like it or not, policy making systems are being driven to be more open and transparent because their 'boundaries' can no longer resist the penetration by those who want to play a part. The degree of connectedness of those interests between and among themselves will determine the level of influence. Increasingly, we have come to talk of governance and networks, not government and institutions.

Current policy literature situates policy networks as a subset of policy community members. A policy community has been described as one which includes all those involved in policy formulation. The concept of network relates to those particular community members who interact with each other on a regular basis. Networking is the linking process within a policy community or between two or more communities.(16) At the same time, it is argued that policy networks are directed to the pursuit of some material interests. In other words, they are considered to be purposive, if not goal-seeking. The types of networks that may exist are wide-ranging. Some of the categories offered might focus on issues, or clients, or simply are constructs contrived to support and/or develop a policy initiative.

For many years, the analysis of environmental policy issues has included case studies focused on some type of interest group analysis that assesses the influence (or not) of interest groups in shaping public decision-making. In many instances, the activities of interest groups have been credited with placing environmental issues on the public policy agenda. Therefore, the behaviour of groups—their formation, their activities, their perceived impact on policy outcomes – have been the subject of many of the theoretical assessments of environmental management. In terms of interest group

analysis, the initial model used in examining environmental issues was not that complex. Depicted in systems terms, environmental groups were shown to put pressure on governments who, in turn, pressured business (firms) primarily through the imposition of laws and regulations. As additional interests emerged and new networks developed, the framework within which 'group' activity around environmental issues has been reformulated. As Macdonald has noted, by the end of the l990s regulatory pressure appeared to have been relaxed through deregulation and reductions in the size of environment departments, but environmental concerns of those buying its products were on the rise. (17) As a result, the current environmental pressure on the firm is now more complex as the network of interests has expanded. It is not primarily government acting on behalf of environmental groups, rather it is commercial businesses reacting to new consumer demands, with or without the support of government. Issues of certification and labeling, for example, have become key issues for business interests. And in turn, investors, lenders and insurers all prescribe a number of different standards to which the company should comply if it wants to maintain its market niche and commercial viability. A single element such as demand for labeling can cut across the interests of a number of these players creating a 'network' of labeling interests that was not there a few decades ago.

As the number of groups and organizations engaged on environmental policy issues has increased, governments have had to respond and adapt not only in how they structure themselves but also in the application of policy instruments used to address problems and resolve issues. As Bruce Doern has commented the Department of Environment had to reconfigure itself into a much more networked institution relative to its shape and form in the l970s and l980s. As he states: "It is networked in the sense that it has had to develop more complex relations based on trust and exchange, a greater reliance on partnership and joint funding, and more complex networks of persuasion and cajoling within the federal government." (18). More broadly, Michael Howlett has characterized environmental governance as complex network management as the number of international and national organizations involving numerous actors and systems of exchange has increased significantly.(19) In his view, there has been a significant increase in the number of actors and systems of exchange at the international and transnational level. At the domestic level, the increasing complexity of contacts among the organizations in the system has grown significantly.

Emphasizing the spatial dimension of policy making, Chris Bryant, a geographer, has captured the complexity of policy networks and policy constituencies in a three dimensional model setting out four levels of decision-making – local, regional, national and international.(20) He locates actors, formal and informal organizations and networks on the various planes. Interests, objectives and action of the players along with observed and latent orientations may be identified in any particular context. His model provides a stimulating mental picture of how environmental issues have been moved to the international level of organization even though practical action is still required local and regionally. The approaches provides an excellent depiction of the phrase "Think globally, act locally'.

Vickers identified networks as essential parts of human ecological systems and defined his systems as "nets of relations which are sustained through time." (21) For him, the ecological comparison was easily made. The relations between and among

networks were sustained and influenced by government action. But, they were limits within which they could be sustained as a condition of their stability. If we take Vickers' concept of systems as nets of relations within which human processes and activities may be analyzed and if the current configuration is viewed as networks within these systems, then some of the questions which become relevant for sustainable development are: how are the basic values and ideas associated with sustainable development to be incorporated in practical policy making? What adaptations are needed in the policy instruments that governments use to advance these ideas and enhance their impact? Channelling the values of sustainable development within and across the variety of networks that exist to support our systems of policy relationships would appear to be a relevant and necessary objective. Let's examine some of the current policy instruments.

III.   IMPROVING INTEGRATION OF SCIENCE IN POLICY

For policy-makers, the concept of sustainable development has created new opportunities as well as new challenges. To make economic development sustainable, the challenge has been to seek to establish limits where human, natural and man-made environments may co-exist. The concept promotes the need for a better integration of ecological principles in decision-making and the development and application of new technologies that are environmentally friendly. By establishing a link between economic development and environmental protection, the concept implies an 'invitation' to the corporate sector and society in general to participate toward objectives that required a collaborative, even conciliatory relationship among the various interested parties in society on a global scale. As Dale has commented: "the concept…has brought a wide diversity of industrialists, environmentalists, public policy practitioners and politicians to round tables in their attempts to define, deal with, and actualize it." (22)

Recent developments in governance are actually quite supportive of these imperatives. The idea that governments have a range of policy instruments available to them that may be used in differing circumstances has been a subject of study for many years. In the study of Canadian public policy, the development of policy instrument taxonomies have been based either on the degree of coercion (23) or the level of state involvement applied in the policy instrument in question.(24) For example, in using coercion as the key characteristic determining a spectrum of policy instruments, the most coercive type of policy is one that requires action by law and can result in penalties or fines if there is non-compliance. The least coercive type of policy is one where government may simply exhort or advocate that certain actions be taken. In these cases, compliance is generally voluntary in nature and non-compliance carries no penalties.

The focus on policy instruments in the case of sustainable development has also been international in scope. The Organisation for Economic Co-operation and Development (OECD) in recent reviews of sustainable development initiatives has classified the different types of policy instruments used by governments in the environmental policy area.(25) There are six major categories in the OECD schema which include: command and control; economic instruments; liability, damage compensation; education and information; voluntary approaches; and management and planning. Its conclusions support the general thesis that governments are shifting in their

use from highly coercive to less coercive instruments with noticeable trends towards increased use of voluntary agreements.

With the development of a broad range of policy instruments combined with changes in the policy environment added and abetted by information technology, the choice of policy instruments has become more complex. As Howlett has observed: "Government capacity in terms of human and organizational resources has increased, but its autonomy or ability to effect change independently has been eroded." (26) The complexity of networks and levels of exchange diffuses responsibility and hence dilutes accountability to any one actor or set of actors. He has argued that, as a result of both movements, states have undergone a kind of 'hollowing' out, as various functions and activities traditionally undertaken by governments now involve a variety of significant non-governmental actors. As a result, the use of 'procedural' instrument such as government NGO partnerships, public advisory commissions, interest-group funding and information dissemination is more evident. Governments have to act in less direct fashion to guide or steer social actors in the direction the government wishes.(27) Other explanations of governments' need for more indirect than direct action expand on reasons that link factors such as varying ability of governments to act along with the distribution of power or jurisdictional authority in an issue area. (28)

In Canada, as elsewhere there has been a discernible shift in the style and approach used to implement environmental policy away from conservation per se towards efforts to modify business behaviour. But rather than a hollowing out of the state's role, one might argue the state's role has become more pervasive albeit less coercive in the measures that have been and are being adopted. And, keeping Vickers' definitions in mind, there may be good reason for that development. The implementation of sustainable development principles into policy making especially economic decision-making involves more than introducing new policies and programs. As noted earlier, it involves a 'paradigm shift' in approaches to policy development and implementation. The core of the matter is the issue of values. The dominant governing paradigm (i.e. set of principles) underlying policy making in government and corporation has generally been acknowledged to be endogenous economic growth that increasingly emphasizes a competitive, knowledge-based society focused on wealth accumulation. Efforts to introduce sustainable development principles will be muted until these values are reconciled with dominant economic imperatives and accommodated as part of the dominant value and translated in a tangible way into policy.

The importance of society's dominant ideas and values is an essential feature of the model developed by Bruce Doern and associates that has been used to assess public policy issues in a variety of substantive public policy areas in Canada. In their assessment of the federal government in environmental policy and their analysis of the Canadian government's capacity to advance the concept of sustainable development, Doern and Conway described sustainable development as a 'latent paradigm'. Writing in l994, they concluded that, while the principles of sustainable development had staying power, more government action was needed. (29) The adoption of the Green Plan in l990 by the federal government provided an important first step for developing a policy framework but other 'interventions' in policy processes were needed to give effect to the values of sustainability throughout the system. In l995, for example, the federal government amended the Auditor General Act and created the Office of the Commissioner of

Environment and Sustainable Development. The mandate of this Office is to review of how government policies, programs and spending support Canada's move towards sustainable development; and providing liaison, monitoring, and encouragement to government, parliamentarians and the public on sustainable development.(30) All federal departments, including the Department of Finance are now on their second generation of strategic plans and are engaged, at least at the level of process, in refocusing their policies and programs to incorporate sustainable development principles and initiatives. There are challenges with this process. The fact that the Commissioner has identified more than 2,500 unfulfilled federal commitments on environmental issues provides an appreciation of the scope of the task.(31) A second step initiated by the federal government in February 2000 was the development of a set of environmental indicators. The National Round Table on the Environment and Economy, established by legislation in l994 (32) has been assigned responsibility for this undertaking. The outcome and more particularly the application of these indicators could have significant impact and hopefully will be included in the National Accounts in due course.

One could carry on in listing initiatives – federal, provincial and corporate that indicate increasing attention to sustainable development but there are the realities of public policy making that must be kept in mind. The nature of the issue appears to argue for broader involvement on the one hand and more refined analysis on the other. The government cannot act alone nor on all fronts. Following Vickers' line of reasoning, they must seek to effect changes in the relations in society based on a new value set. In a democracy this will require techniques of persuasion, participation and perseverance.   In enhancing an appreciative system, governing policy instruments must be adapted not only to improve linkages among the affected parties but also to expand the scope of application. Let us look at some of the major types of policy instruments and consider how science and policy might be better applied to enhance their effectiveness.

A. Regulatory Measures

Regulation is usually defined as government imposition of rules and control designed to direct, restrict, or change the economic behaviour of individuals and businesses, and these rules and controls are supported by sanctions and penalties for non-compliance. (33). Regulatory activities for the most part do not involve the provision of direct benefits or goods to society and can take a variety of forms. These may include: licenses, permits, monitoring activities, establishment of standards relating to the quality and content of products and conditions of production e.g. emission standards. And there are regulatory regimes, federal and provincial, designed to protect air, water and soil.

Traditionally, regulatory policies respecting environmental protection have been viewed as antagonistic to economic development. To interested parties the system of groups 'bargaining' with government has been a closed system, thus allowing industry to protect its interests. Analyses of regulatory policies during the period l960 to l990 concluded consistently that business interests were able to exercise significant influence over the enactment of environmental standards and their implementation.(34) But it was also noted that there was little monitoring of the degree of compliance with those regulations. Notwithstanding the recent shift from a regulation setting/penalty focus to the establishment of new cooperative institutions and programs, government regulation

can be expected to remain an essential tool in the continued protection of the environment and in the promotion and advancement of sustainable development. And to the extent that the role of science is central to the development and implementation of standards and guidelines for public and private interests, the methods of integrating science are also important.

Among various possibilities, three kinds of modifications that could help to enhance the application of sustainable development principles through regulation might be considered. The first relates to the role of industry in the development of regulations. The traditional model of government becoming a captive of industry interests may benefit from wider use of 'procedural' approaches in the development of regulations. Finding a better balance of interests in a 'win-win' context could adjust relationships in a positive way. For example, a collaborative approach between government and industry which involves the setting of standards based on commonly accepted scientific results, possibly from an independent third party could shift the focus to common interests based on sustainability. The use of methods of principled negotiation and mediation between parties could help to reduce the tendency to traditional bargaining involved in any regulation-setting regime. This could be important as standards on the various elements affecting climate change are acted upon by governments.

Secondly, the conceptual framework respecting the scope and content of regulations affecting sustainability could be revisited. Broadening the 'appreciative system' of regulation making is one possibility. For example, the recognition that there are non-linear linkages among pollutants that may affect habitats over time is particularly germane to sustainable development. It would be significant if regulators would move beyond simple measures of levels of toxic waste, for example, and attempt to build multi-dimensional data bases which are updated and revised to assist in on-going periodic assessments. Cumulative effects assessments are a case in point.

Measuring cumulative effects "commonly determined to be residual impacts which remain after planned mitigation efforts" can be a major challenge for a firm or industry.(35) Only three jurisdictions in Canada have enshrined cumulative effects assessment in their legislation – federal, Alberta, and British Columbia. Other provinces such as Ontario, Saskatchewan and Manitoba have developed guidelines. How governments have incorporated the practice into law has varied.   For example, the Alberta Environmental Protection and Enhancement Act provides for cumulative effects assessment as part of environmental impact assessment reports. The concept that environmental impacts are caused by numerous activities over time is not a new one. However, there is little consensus on the meaning of the term and many continue to debate the questions of who is responsible for performing these kinds of assessments and what role they play in decision-making. But the tool is important for it helps prepare for future management of developments, projects or resources in a manner that protects and enhances, or at least encourages the wise use of, natural resources. (36)

Thirdly, one could examine the current regime respecting mandated scientific research undertaken to support standards of regulation. Are current management systems ensuring the proper allocation of research resources? Some authors have noted that there are areas of research in support of regulation of contaminants, for example, that yield no new or value added results.(37) At the same time, there appears to be no clear way of deciding when to discontinue research on a subject. If an objective in the application of

mandated science to policy is effectiveness a means probably needs to be found whereby current scientific research may be challenged. The establishment of a rigorous review process could lead to reallocation of resources in more pressing areas. This is particularly important in environmental regulation where the number of issues outweighs the resources available to cover them adequately.

In the final analysis, there is a need to recognize the limitations of regulation by the government and interested groups. Not all behavioural change can be effected by coercion however applied. Adding to the volume of rules and standards may have limited or little impact. What is also needed is some set of principles or rules that may guide policy makers in determining the effectiveness of existing regulations on the one hand and assist them in determining when regulation is the desired step to take. These changes can be promoted if there is a broader acceptance of sustainable development objectives. For this other policy instruments may be more effective.

B. Voluntary Agreements

Sustainable development encourages the participation of a wide range of groups, individuals, governments and corporations in a broad range of activities. Cooperative action within the framework of voluntary agreements has grown in popularity and application at all institutional levels—national and international.(38) In Canada, with the issue of jurisdictional responsibility often a matter for legal debates, the need for cooperation among governments is especially evident. One might argue that a positive aspect of deficit reduction initiatives in the early l990s, led federal and provincial governments to consider how they might discharge their respective responsibilities in a cooperative fashion. The environmental area was targeted as one in which initiatives to eliminate duplication and improve coordination were undertaken. For example, in l995 a Canada-Wide Accord on Environmental Harmonization and subsequent sub-agreements has promoted collaboration in environmental efforts including sustainable development. With respect to industry, the Accelerated Reduction/Elimination of Taxes (ARET) initiative along with the promotion of eco-labelling have been two high profile voluntary agreements.(39)

Case studies in the literature, nevertheless, tend to be critical of the effectiveness of voluntary agreements. According to the evidence, it appears that they only work if there is a consensus not only on objectives but also on the means to achieve the objectives. From a practical point of view, it is important to remember that there may be instances where voluntary participation is the most cooperation that a government may be able to achieve with other governmental players or with private sector firms. And this may be measured as progress depending on the measures used. Firstly, a voluntary agreement may bring in players who would not participate in any other process. Secondly, the experience with a voluntary agreement may help define more precisely the actions that are needed to change that status quo. Finally, the process itself may be important in changing the value set of the players at least in making them more supportive of sustainable development objectives.

A current major environmental issue with a high international profile is climate change. The year 2002 was one in which the media focused on the debate on whether Canada should become a signatory of the l997 Kyoto Protocol, following Canada's

commitment to the l992 Framework Agreement emanating from the Rio Summit. The Protocol which sets out a schedule for reduction of carbon emissions for countries has still not been ratified by major greenhouse emitters. For some, the Protocol has been criticized for the limited impact it is likely to have in actually reducing emissions; for others the process which has been used has been questioned. While the federal government signed the Protocol following parliamentary debate and approval, it continues to be an area of controversy between the federal and some provincial governments, especially Alberta. The issues are not so much controversy about the objectives of the Protocol to reduce carbon emissions, rather the means whereby the reduction standards may best be set and met. The international agreement is a voluntary one, and while the government of Canada has signed the Protocol without the 'consent' of the provinces, provincial cooperation is essential to effective implementation. This voluntary agreement, however controversial, has served to elevate the issue in the minds of Canadians, including and especially Western Canadians and has acted as a challenge for some provincial jurisdictions to develop and design ways and means whereby they can participate in the achievement of the ultimate objective. The recently created Ministry of Innovation and Science in Alberta has a significant number of projects underway to that end.

Notwithstanding the critiques, voluntary agreements likely have the greatest potential to help change the nature of the relationships between and among environmental and economic players and incorporate sustainable development principles in the broader appreciative system of policy making. For policy makers, compromise is preferable to confrontation.   Building trust and better understanding is a crucial element of national and international systems of exchange.

C. Education and Information

There are no current measures of adult literacy in sustainable development but many do not believe the average person understands the issues well, notwithstanding the vast amount of information that is available. A cursory review of federal and provincial environmental websites alone reveals a significant number of programs, publications, studies, conferences and events that are available. Sustainable development has been taken up as a major theme for government policy and action with multi-faceted opportunities for participation by the public and educational material for school curricula has been developed. Education and information alone do not translate into action but they are a start and the data and research bases are growing. At the same time, assessments of the impact of informed citizen engagement on environmental and related issues have shown mixed results.(40) Circumstances which seem to yield the best results are ones where by the participation is used selectively to supplement processes of representative government. Citizen engagement can be useful in defining values, objectives and priorities as well as provide local knowledge.

Given the importance of education and information access in a knowledge-based economy, it can be expected that scientific knowledge and skills will be at a premium. Innovation and technology are linked and considered to be the keystones of a more sustainable economy and society. The search for environmentally sound technology, cleaner production, cleaner technology, waste minimization, pollution prevention, green

productivity and industrial ecology will receive more emphasis. But these products have to be brought to market and whether the links between sustainable development and economic development can bridge this gap is one of the current challenges.

Writing forty years ago, Vickers noted that there was more technology available that was needed or could usefully be applied. (41) There is also a important human factor at play in this context. Resistance to change can inhibit the uptake of technology as much as financial incentives. When we think of the slow uptake of technology in the energy efficiency area, for example, we have to look for explanations beyond the commercial factors respecting its development. Practical appreciative systems of the Canadian economy, especially those applied by resource industries, continue to consider resource extraction as the primary model. Serious policy work involving scientists and others needs to be done to develop incentive systems based, for example, on customer preferences. One example here is to create a demand for energy efficient homes, that will require a positive response from manufacturers and contractors in the same way that demands for eco-labelling changed corporate behaviour in the last decade. These incentives will need policy tools that use information and education.

It is also interesting to note that scientists participating in a recent international conference on science and technology cooperation lamented the lack of understanding on the part of the media relating to suitable technologies and the lack of understanding of clean technologies among the general public.(42) It was also their view that there was insufficient access to relevant and credible information on potential partners to allow for the timely formation of effective relationships with commercial interests which could enhance the spread of advanced technologies and a lack of sufficient assessment for technology transfer to support policy making. Whether a policy on technology transfer that uses policy instruments of education and information would address these issues is probably a matter for debate. But it is likely useful, at least, to explore this avenue.

For Vickers, communications was the main challenge to improving the broader arrangement of relationships as well as the adoption and adaptation of new values and ideas. Policy making systems, like ecosystems, have limits. And education and information can provide a basis for improved or enhanced communication but, of themselves, will not ensure change.

IV.   MANAGING UNCERTAINTY

A principal attribute of ecosystems is uncertainty and unpredictability while a major objective of policy making is to reduce uncertainty. In the context of sustainable development, a key element involves the application of the precautionary principle. This principle is generally understood to mean that governments and others should anticipate potential environmental harm in order to avoid it. The strategic application of this principle in environmental policy has been coined in terms of anticipate and prevent. But it has also been understood in term of "when in doubt, don't".

 In science, research results may be non-conclusive and not provide the information needed by policymakers to make a sound decision. In fact, the area of risk assessment and risk issue management may be one of the more difficult interfaces between policy and science. As Leiss explains, managing risks involves using scientific risk assessments to estimate the probable harm to persons and environments resulting

from specific types of substances or activities. (43) Risk issue management on the other hand deals with managing issues as they play out in society at large. They are not primarily driven by the state of scientific risk assessments. Risk management and risk issue management are activities that have been incorporated in policy making not only by governments but also at the level of the firm. Blending scientific and policy information into effective decision-making remains a key challenge.

The debate on the role of science in policy making is long standing and on going. Writing in the l950's, C.P. Snow described two cultures that represented the nature of science and the nature of politics. His analysis concluded that scientists needed to be mixed up in political affairs.(44) Writing in the new millennium, Bill Leiss has supported a different conclusion in looking at the mix of science in politics. In an erudite analysis of the relation of science and policy, Leiss has contrasted the imperatives for each realm and the tensions between them.(45) In the practical world of policy making, he notes that policy requires yes/no decisions whereas science often is continually evolving from one level of uncertainty to another. The management and resolution of policy issues most often does not require scientific understanding. In particular, environmental issues are often concerned with long-term effects, whereas policy issues need to be resolved in the shortest time span possible. There is a complexity in policy making involving jurisdictional, institutional, political, legal, social and other factors making science only one part of the information process. As he states: "In this context, policies driven primarily by long-term ecosystems trends framed within inevitable scientific uncertainties are doomed to disappointment or crippling compromise."(46).

Leiss sees risk assessment and management as subordinate activities to the strategic maneuvering between participant organizations in their respective efforts to achieve their objectives. His observation is that scientific assessment may be needed sometimes but not always. His conclusions favour a restructuring of the interface between science and policy that ensures science remains 'completely true to itself'.(47) He upholds the traditional theme of the need for the independence of science in policy. While the arguments put forward may be persuasive and reflect a sophisticated understanding of policy making, there is a fundamental issue that seems to be overlooked.

In his book on Value Systems and Social Process, Vickers acknowledged that ecology as a science of interrelationships did not include a set of preferences or set of values implying betterment or progress. But he noted that "the human ecologist must take account among the facts of his field, that men themselves are valuers".(48) Scientific assessments are affected by subjective values and beliefs, including political and societal influences. To try to argue for a separation of science and policy as a means of maintaining objectivity is missing an essential point. Rather the issue might be, as Vickers suggests, to consider more closely the actual formulation and generation of scientific hypotheses themselves and the values and frameworks that influenced their generation.

Notwithstanding the uncertainties in scientific assessment, there is a growing recognition that more, not fewer, scientists with better policy skills could help provide better appreciative systems for policy making. If we accept a larger role for science in policy, the question then becomes 'What is the right mix'. As sustainable development principles are infused in public and corporate policy, finding the right balance of

expertise and identifying the appropriate contexts in which it will be brought together will become increasingly important to corporate strategies. There are recent assessments of the role of scientists in policy making that argue for a balanced approach in the development and deployment of scientists in public policy activities. (49) The types of roles that scientists play whether operational, advisory or managerial need to be placed in the appropriate context. Science in policy is not just a matter of using the results of laboratory research. If this were so, there might be very limited application of scientific research. Greater acknowledgment of the role that scientists, many of whom have excellent policy and policy analysis skills could be reflected in the design and operations of governmental and non-governmental organizations. Traditionally, we have seen in government, and sometimes corporate, organizational models a position of Senior Science Advisor. Another example that comes to mind is the Scientific Officer program, now disbanded, that placed a science advisor in Canadian embassies around the world. A small office or a single individual, however, is a minimal organizational commitment. If we are to be successful in advancing the infusion of sustainable development approaches into policy, scientists with policy skills and policy managers with scientific backgrounds need to be more pre-eminent and pervasive in public and private organizations. The conclusion of a recent federal workshop on the role of scientists in policy making makes the case made a very strong case for the practical integration and the active participation of scientists in policy. Recent work within the federal government has focused on how effective integration of science and technology advice in government decision-making can be achieved.(50)

At the same time, the relationship of applied and basic research might also be reexamined. Liora Salter's study of the role of mandated or applied science reminds us that mandated science comes from the needs of policy, not science but the science that is developed and used is important because it involves the such things as the scientific collection of data needed for valid standard-setting.(51) It is has already been noted that a challenge function for mandated science might be useful to determine the on-going relevance of applied research that supports environmental regulation. Such a process for mandated research might help the policy process in its determination of priority issues and risks. At the same time, scientists engaged in basic research might benefit from some degree of interaction with applied researchers. Current data on funding support for basic research in relation to applied research should allay any fears basic researchers may have about being subsumed by the imperatives of mandated research.(52) But declarations of absolute independence from applied research or unwillingness to acknowledge pertinent policy and social issues that might influence the directions of basic research are misplaced.

Noting Vickers' commentary on hypothesis generation, it is possible that basic scientific research might benefit from a better understanding of applied research and policy needs. It is unlikely that basic research objectives would be corrupted from some degree of exposure and interaction. It is also quite possible that research hypotheses might be better framed if the researcher had some informed perspective of the environmental policy considerations of the broader society. There are ways to protect the objectivity of scientific research. Ted Schrecker, for example, has noted that there are three prerequisites for the responsible use of scientific evidence in Canadian environmental policy: sound "firewalls" between scientific inquiry and the process of

evaluation; the relevant decisionmakers must articulate the principle on which they resolve scientific uncertainty in situations where the evidence is incomplete or inconclusive, and the evidentiary basis for all environmental policy and management decisions must be publicly disclosed in enough detail to enable outsiders to identify each step in the decision-making process. (53)

The logic behind sustainable development policy requires greater involvement and improved procedures for the application of science into the center of policy and policy making and corporate decision-making. Identifying the roles for science as well as the limitations of research in answering policy questions are key to improving the structuring of organizations and the relationships that are established within and between them. Understanding how uncertainty is managed within policy and science milieus is a useful first step to designing new approaches or adapting existing approaches that will create new synergies of experience and information. The more clearly the limits are known, the easier it may be to identify what is at risk and what needs to be done.

V. COORDINATING AUTHORITY AND CAPACITY ACROSS GOVERNMENTS

As students of Canadian public policy know, there is an array of legal, jurisdictional and structural considerations that must be taken into account in examining public policy issues. Responsibility for environmental issues is shared between the federal and provincial governments in Canada. Not an explicit area of jurisdiction in the Constitution, the federal government has exercised responsibility under such authorities as the peace, order and good government clause, the seacoast and inland fisheries, and the navigation and shipping articles of section 91. Provincial jurisdiction over the management of public lands and resources, natural resources, forestry, property and civil rights, and, matters of a local or private nature set out in section 92 have provided the legislative basis for provincial action.(54) First Nation governments also have a role in matters relating to their aboriginal and treaty rights protected under section 35 of the Constitution Act l982.(55) The particular application of legislative authority has also been shaped by judicial decisions and practical conventions. This evolving legal basis for environmental authority combined with the activities of international agencies and organizations involved not only in data gathering, but also in efforts to provide policy direction, make environmental policy dynamic and fluid. These factors combined with the way governments may choose to assign ministerial responsibilities and to design structural configurations that assume responsibility for certain matters.

Whatever the jurisdiction, nevertheless, sustainable development may be described as both a horizontal and a vertical policy issue. It is a horizontal issue in that, within a single jurisdiction, it cuts across all other policy areas. Its development and implementation requires the collaboration of all other organizations within that level of government. At the federal level, the department of Natural Resources has been given the lead on sustainable development issues but there is a cluster of departments including Environment, Fisheries and Oceans, Agriculture, and Health that also have major designated roles. On high profile issues such as the Kyoto Protocol, central agencies' role may be prominent. But perhaps the most important structural change that helps support the horizontal nature of the policy and more particularly its integration into all areas of government is the Office of the Commissioner for Environment and Sustainable

Development. By establishing the basic framework and reporting requirements for departmental sustainable development strategies, this Office serves an important role in ensuring the infusion of principles and practices across the government as a whole. At the provincial level, the structures and processes may be less elaborate but are discernible. In Alberta, for example, there is no formal clustering of departments around sustainable development but the Ministry of Environment along with the Ministries of Innovation and Science, Sustainable Resource Development and Energy play key roles.

The vertical nature of sustainable development has already been described by Chris Bryant's spatial model of policy networks. Tom Courchene, in his recent book State of Minds has described a phenomenon that lends itself to describing the actual dynamics around sustainable development issues.(56) According to Courchene, globalization and the knowledge/information revolution are creating a new paradigm of governance that places citizens as the lead actors and agents of future economic and social policy. This revolution is enhancing the importance of cities both in terms of their original urban territorial role and in their more recent networking role. Cities act as 'nodes' or inter-connectors in long-distance networks but also because companies and firms rely on local public goods, access to local labour and work amenities to succeed. This gives rise to the phenomenon of 'glocalization'. The term describes the situation whereby issues that may become elevated to an international level as major policy concerns, can nevertheless only be effectively addressed at the local level.

Recent research findings of the Canada West Foundation on the role of Western Canadian cities also note that two major trends, urbanization and globalization, are interacting to ensure that cities are fast becoming the foundations on which the social and economic health of Canada, and its provinces, depends.(57) To be globally competitive, cities require a strong, advanced economy, a high quality of life and efficient infrastructure. A reconfiguration of national interests and the processes by which national strategies are developed might benefit from the inclusion of the main 'doers' in the piece being given more prominence in the planning stages. Practical experience with energy-efficient alternatives to fossil fuels such as wind power to drive transit systems and local laws to limit use of gas-powered vehicles might make a positive contribution. While traditional processes of federal-provincial conflict continue to swirl around climate change policies, a lack of significant involvement from major cities seems an obvious omission of the vertical integration needed to address sustainable development issues. What major cities do or don't do to deal with carbon emissions, for example, may ultimately be more important than what the federal or provincial government do or don't do to reconcile their differences.

Evidence that new configurations and networks are emerging to achieve the kind of vertical and horizontal collaboration that will be needed to address sustainable development issues may also be found in a number of international initiatives. A project convened by the Coalition for Environmentally Responsible Economies (CERES) is a case in point.(58) The Global Reporting Initiative was established late in l997 with the goal of designing globally applicable guidelines for preparing sustainability reports at the organizational level. CERES is a non-profit non-governmental organization based in Boston, USA and comprising environmental organization, socially-responsible investment professionals, institutional investors, labour and religious organizations. It seeks to establish a common framework that includes environmental, economic and

social reporting. Moreover, four international institutions including UN agencies, the World Bank and the World Resources Institute have undertaken a major project to survey the state of global ecosystems.(59) The availability of the kind of assessment data generated by these projects provides an important base that could be used to promote the development of global regional strategies that link international, national and local interests in collaborative efforts. In the United Kingdom, the Global Environmental Change programme of the Economic and Social Research Council has published regular briefings on a broad range of sustainable development initiatives that include comparisons of cross-country experience.

There are many opportunities to change the configuration of interests and players in light of initiatives such as these. A changing 'appreciation' in Vickers' terms of the stakes that are involved could, potentially, change not only the pattern of relationships involving government and corporate sectors but also accommodate values based on sustainability. As the number of these types of initiatives increase involving more and different kinds of actors and institutions, the opportunities for change in terms of scope of issues and extent of impact can also be expected to increase.

CONCLUSIONS - WHERE DOES THIS LEAVE US?

Sustainable development is concerned with the relationship between people and the environment over time. Vickers' concept of policy making as the setting of governing relationships provides a focus for re-examining the frameworks we use to describe and act on policy problems. Sustainable development requires adaptation in our appreciative systems. It is already creating a variety of new forms of networks within government and society that may need steering by governments and authoritative institutions. If we consider modern governance as part of a dynamic continuum – an ecological system seeking adaptation and adjustment which in a democracy requires consent, we need to look to the decision systems – government and private sector – and examine how the problems are formulated and understood. If a primary objective is to focus on the set of relationships that are desired, rather than a series of goals to be achieved, it may be that current hypotheses will change and that the approaches taken will be more holistic, more inclusive and more integrated. Value judgments in an appreciative system have to involve resolving dilemmas such as knowing and deciding when to stop doing research on particular issues and shifting resources elsewhere. It also means managing risk better so the wrong issues stay out of the public relations domain.

Leiss' conclusion that policies driven by long-term ecosystems trends are doomed to disappointment or compromise only holds if one assumes that the application of these concepts would be used to predetermine outcomes. As noted earlier, models are proxies that help us understand but do not replace the dynamics of human behaviour in a policy making system. Vickers observed that many species have perished in ecological traps of their own devising. (60) He explained that ecological traps arise because biological evolution works too slowly to adapt some species or populations to some environment change. His diagnosis pointed to communication as a fundamental element.(61)

Like scientific inquiry, the future of sustainable development policy is not guaranteed or certain. One of the consequences of the varying models of New Public Management approaches in government in western democracies in recent decades has

been to focus planning and management systems on specific issues and situations. The objective has not been to try to build brave new worlds with elaborate support systems. Rather it has become customer oriented, identifying and focusing on specific needs. To advance the sustainable development agenda, it may be necessary to return to broader, more integrative planning systems. For example, sustainable development strategies prepared by federal departments and agencies should not be developed as an exercise separate or tangential to departmental planning and, I might add, the preparation of risk management strategies. In fact, sustainable development strategies intended for the office of the Environment and Sustainable Development Commissioner should be a product, a result of the broader departmental planning process and should incorporate relevant elements of risk management strategies and programmatic budgets as well. It is not useful to have over 2,500 commitments on sustainable development unfulfilled. Why make more promises in strategies that are not central to overall policy management and direction. In terms of risk management strategy, it may be necessary to go beyond the precautionary principle.

At the decision-making level, the traditional approach to assessing performance of development activities has focused often on basic financial outcomes. There are a number of management tools already available that demonstrate how sustainability can be incorporated as a component of any decision making process. They need to be marketed and adopted in all industrial sectors but especially those firms that are environmental high risk. The need to ask about the science and technology in every decision, just as we ask for financial costs, is not as far-fetched as it may initially appear. And the potential impact could be significant.

Finally, efforts to develop sustainable development indicators and to incorporate them into broader national and international indexes of economic and social well-being can be an important influence in advancing the sustainability agenda. These indicators can be expected to provide a better basis for assessing the interplay between economic and environmental factors and for identifying measures to improve sustainable economic performance. The development and application of standard, acceptable indicators could go a long way to integrating decision-making and improving our information bases for those decisions. In the view of the Brundtland Commission, sustainability emphasized conserving or maintaining resources together with sharing benefits in an equitable manner, throughout the course of conducting development activities. Building bridges that support the integration of sustainability in development activities – environmental, social and economic is the key. And increasingly, we have the means to evaluate how well we do.

ENDNOTES

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11. See David Easton, l953. <u>The Political System: An Inquiry into the State of Political Science</u> , (New York: Alfred A. Knopf) 320 p. and _____, l965. <u>A Framework for Political Analysis</u> , (Englewood Cliffs, N.J.: Prentice Hall) p. ll2. As Easton noted on page 34: "The concept of 'system' corresponds in some ways to the idea of mass in physics."
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