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A Question of Balance:
New Approaches for Science Based Regulations

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Public Policy Forum

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Note from the Series Editor

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This policy brief, the eighth in the series, was originally published in 1998 and is still highly relevant to the topic. Since it is no longer available on the Internet, it is republished here with permission of the Public Policy Forum and the author.

The ISSP also carries out adjacent activities on the topics covered in these briefs. We hope they will be well received and are looking forward to any feedback you may have. You may reach me directly at msaner@uottawa.ca.

Marc Saner
Director, ISSP

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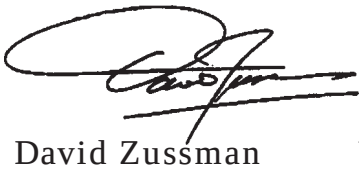
Preface

With assistance from Natural Resources Canada, through an executive interchange, the Public Policy Forum is undertaking a program of research in science and government. This paper was produced as part of that program and focuses on the challenges and opportunities faced by science based regulatory agencies.

In October, 1998, the Forum was invited to participate in the Conference on Science, Government and Global Markets: the State of Canada's Science-Based Regulatory Institutions: Carleton Research Unit on Innovation, Science and Environment, October, 1998. Papers from that Conference will be formally published by the University of Toronto Press. This version of the paper, is for the use of members of the Public Policy Forum.

The view are those of the author and do not necessarily represent the views of the Forum. We hope that this report will contribute to the evolution of critical thinking, about science, regulation and government.



David Zussman
President

About The Author

Bill Jarvis, Director of Special Projects at the Public Policy Forum, is on executive interchange with the Forum from Natural Resources Canada.

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This paper was developed with advice and assistance from a large number of experts in the field of science-based regulations; the author thanks all those who were generous with their time and ideas. Special thanks to Roy Atkinson and Ron Doering for their major contributions.

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Executive Summary

The development and implementation of regulations are core functions of government. As the process of re-thinking government sweeps through Canadian institutions, every activity of government must be scrutinized to assure that the goals of efficiency and effectiveness are being met. The purpose of this paper is to identify the driving forces for change in regulatory activities that are primarily science-based (mainly health, safety, and environmental regulations), to examine the criteria for organizational and funding changes, and to suggest how a path forward might be developed.

Three aspects of science-based regulation, when taken in combination, differentiate these activities from other government functions. Each of these aspects creates specific opportunities and constraints.

1. These regulations deal predominantly with emerging technologies, an area where industrial structure faces strong forces of globalization. This creates both pressure for change in order to assure competitiveness, and opportunities for benefits to Canada if our regulatory system can excel in both efficiency and credibility.

2. The objectives of these regulations are the protection of citizens and the environment. There can be grave consequences if there is a failure to achieve these goals. The expectations of Canadian citizens are exceptionally high regarding reliability and completeness of government regulatory programs in this area.

3. The regulatory process is infused with the need for credible science at every step, from initial conception through after-the-fact evaluation. Dealing with risk and uncertainty, which are inescapable aspects of the relevant scientific knowledge, is particularly difficult in these circumstances.

Options for institutional change need to be examined in the context of the **objectives** of the regulatory activities. These objectives reflect a blend of public and private interests. The absence of clarity in identifying beneficiaries can create problems in both organization and funding. Caution is needed to ensure that the fiscal or organizational objectives of governments are not met at the (unintended) cost of effectiveness of the regulations. Understanding the precise attributes of the public interests and the private (commercial) interests is essential for getting the signals right.

One of the key questions is who (institutionally) does, and who reports on, the science necessary for the development and operations of these regulatory activities. Three key factors are at play. First, dispersing scientific expertise too widely risks losing the necessary **critical mass** (both technology and human capital) needed to assure that regulatory decisions are based on the best and most up-to-date scientific knowledge. Secondly, the effectiveness of the regulations depends upon the **credibility** of the science upon which decisions are made. That credibility, in turn, depends upon the perception of neutrality and independence of the source of the scientific advice. Third is the importance of linkages between **science and policy** development . Access to reliable, and sometimes confidential, science advice is essential for the development of the policies and legislation that lie behind the regulatory functions. Critical mass, credibility and support to policy development need to be **balanced** to suit the particular aspects of each regulatory area.

Where private commercial interests diverge from the public interest, good science can help to mediate conflicts. However, different perceptions of **uncertainty and risk** will frequently require tough political choices.

The complexity of the individual regulatory functions strongly suggests that each application will need its own **unique** institutional setting to meet the challenges it faces. This does not mean that new approaches to science-based regulations should not be considered. To the contrary, change will be a necessary condition for success. However, centrally mandated, global solutions are unlikely to be successful.

Three examples have been identified to illustrate actions responsive to the pressures for change. These are not the only possibilities, or even necessarily the best for particular applications. However, they do reflect some strengths of the Canadian system that could make Canada a model for effective science-based regulations.

1. Both efficiency and effectiveness can be enhanced where horizontal and vertical linkages can be better integrated. Organizational integration in areas of overlapping interests is possible within governments, between governments, and even between nations if the necessary cooperation is forthcoming.

2. Trust in the scientific underpinnings of the regulations, from both Canadian citizens and international authorities, is necessary to achieve the goals. The creation of an institution that can act to develop a credible, neutral, and inclusive assessment of matters of science which are in dispute could build such trust.

3. Flexible and responsive processes are needed to sustain international competitiveness. In Canada, governments have developed the capacity to work with private sector companies in various informal arrangements. Using this institutional capital, it may be possible to develop voluntary approaches to regulation in a number of areas (not all) which could be both less costly and more effective than existing command and control approaches.

The potential benefits of a modern, flexible, responsive and reliable regime of science-based regulations are large. Much has already been done, and some of the possibilities have been successfully explored. Constructive change which enhances both efficiency and effectiveness is both possible and desirable, provided that we don't lose sight of the objectives which have lead to the regulatory regimes. Effective implementation is, in most cases, a question of balance.

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"The 1995 Regulatory Policy is designed to ensure that the use of the government's regulatory powers results in the greatest net benefits to Canadians."; Treasury Board of Canada Secretariat, July 1997

"The real fundamental danger in exploring alternative delivery schemes is that it is very easy to lose track of the effectiveness imperative."; Gilles Paquet in Ford and Zussman, 1997

I. Introduction

As Peter Aucoin notes in his book, **The New Public Management**;[1] "governments in all western democracies have been driven to seek significant changes in public policy and management by three major determinants." These are:

1. the enormous **financial pressures** faced by most of these governments resulting from a number of years of large and increasing debt financing of government operations;
2. the sharp decline of **public confidence** in the policy choices of politicians and the operational effectiveness of government bureaucracies;
3. the opening up of world markets and the increasing **internationalization** of demestic affairs.

The consequence of these problems has been a demand for more efficient, more effective, and less costly government. But equally important has been the demand for government that is more open, more accessible, and more accountable to Ministers, to Parliament,

and to the citizens of Canada. Clearly these demands required more than a minor tuning of the operations of governments. A major revision of some of the most deeply ingrained practices of public administration was called for. The key question, of course, was (and is) does there exist an alternative model for delivery of services to citizens that can help to resolve these problems?

Enormous changes have already occurred in the approaches of governments to the implementation of public policy in Canada, as elsewhere. For Canada, these changes have been shaped by three important factors:

1. the role of Ministers and their relationship to the administrative side of government in a Westminster-style parliamentary government;
2. the jurisdictional diversity of the Canadian federal system; and
3. the unique values that form and represent the Canadian community.

Large reductions in budgetary allocations (Program Review), the introduction of modern management practices[2], and the re-examination of the institutional framework for delivery of government programs, have been the dominant approaches to change. This paper deals principally with the institutional issues for a set of government activities (science based regulations), but not without reference to the other key elements of change.

Virtually all of operations of government in Canada are caught up in this process of profound transformation. There is virtually no area of government activity that is not subject to intense scrutiny and assessments of the potential for change. Even the most stable and fundamental roles of government are being subjected to review.

Among the most conservative (resistant to change) elements of public administration are the regulatory functions that the government undertakes to protect the health, safety, and

environmental integrity of the community. The stability and predictability of these regimes have been seen as necessary characteristics of good management. The responsibility of government to act in these areas is not seriously challenged. Yet even here significant change is underway.

For the purpose of this study, **science-based regulations** are those regulatory functions which are based principally, though not necessarily exclusively, in the natural sciences (including medicine). It excludes those regulatory functions that are based principally on economics, institutional contexts, or law. For the most part, science-based regulations are in the domains of scientific activity dedicated to protection (especially health and safety) and stewardship (as defined in Annex 1).

In section II, this paper looks at three dominant aspects of science-based regulations, in the current social and economic circumstances, which provide the motivation and the context for change. In the following section, some of the essential principles of the changing approach to government are explored, particularly in the context of science-based regulations. In section IV, a decision framework that emphasizes the balancing of competing interests and forces is put forward. In Section V we suggest three areas which should be examined further by science-based regulatory agencies as potential sources of constructive change.

The paper concludes by noting the complexity of the issues that influence new organizational and financing arrangements for science-based regulatory functions. In particular, it points to the need to examine opportunities on a case-by-case basis. For each discrete decision point, a balance must be sought, with a clear understanding of the intentions driving the proposed changes, and of the signals such changes will give to those affected by the regulatory framework.

II. Key Aspects Of Science-based Regulations

Many of the principles for reforming government apply quite broadly across all elements of the relationship of government to citizens. Although good models exist with respect to government relationships with citizens (for example, the categorization of government service recipients, by Caroline Farquhar, into voluntary users, entitled users and compelled users[3]), there are aspects of science-based regulations (in looking at new institutional forms and new financing arrangements) that create special circumstances which must be addressed. The most important are:

1. the commercial and economic aspects of the markets influenced by these regulations;
2. the nature of the public goods being addressed by these regulations; and,
3. the roles that scientific inquiry and information play in their development and operations.

It is no accident that these are closely linked to the three drivers for government change noted above, respectively; internationalization, cost of government, and public confidence.

Commercial and Economic Potential

This first element relates to the role of regulations in the evolution of fast-evolving, and internationally-integrated technology markets. The clearest (but certainly not the only) expression of this is in areas such as biotechnology, where major efforts are underway to standardize, internationally, elements of national regulatory processes. The OECD notes that "global interdependence in

economic, social and environmental spheres is reducing the effectiveness of governments when they act unilaterally. In response, governments of OECD countries are addressing common problems by creating cooperative arrangements linking supra-national, national and sub-national levels of government."[4] The intent of these changes is to serve the needs of (mostly) large multinational companies trying to get product to customer markets worldwide as quickly and as cost-effectively as possible, as well as to minimize the costs of regulations and to assure access to products as soon as possible for citizens. Three factors influence this process:

1. the **speed of technological change** ensures that those corporations who don't stay on the leading edge are quickly made irrelevant;
2. the **portability of the capital** (mostly knowledge and patents, often developed with significant government financial and non-financial assistance) partially disconnects investments from geography; and,
3. the **corporate structure** of the producing sectors, where large economies of scale drive the markets to conditions where few very large multinational companies control major product segments, creating monopoly or quasimonopoly conditions.

The consequence of these conditions is to create competition, not between producing companies, but rather between national economies that strive to position themselves to take advantage of the economic potential of these emerging technologies. Where these corporations locate their research, their development and testing, and their production, depends upon a large number of factors. As these organizations adapt from being multi-national corporations to truly global corporations, they have strong interests in ensuring active representation in as many major markets[5] as possible. The national manifestations of these corporations are usually structured to be in competition with each other for research activities, world product mandates and other transnational functions. In this context, these national branches are allies of the respective national

governments in trying to enhance the allocation of corporate activities performed in their jurisdiction. They will perceive all elements of national competitive circumstances most clearly in relation to the situations faced by the other (competing) units of the parent corporation.

A key factor of national circumstances that can influence the location of corporate activity is the regulatory regime. Clearly, the more efficient the regime and the "friendlier" it is to the research, testing, producing and marketing interests of the companies involved, the more the regime can be an element of comparative advantage in attracting (or sustaining) investment. Characteristics such as:

- service standards that ensure the timeliness of decisions,
- transparency of the process,
- the cost of the process and of compliance,
- international credibility and acceptance of the national regulatory regime, and
- responsiveness to the rapidly evolving needs of the industry

will all affect the competitiveness consequences of the regulatory regime. Such characteristics do not necessarily or normally mean the lowering of national standards.[6]

It seems inevitable that the regulatory requirements for the acceptance of new technologies will gradually become more homogeneous. The global industry structure provides strong economic incentives for companies to press for harmonization. Their market power suggests that they are likely to have considerable success, especially where these changes are consistent with fiscal objectives of governments. In those circumstances, national governments will have less individual say over the conditions of regulatory approval.

Mutual recognition of regulatory testing and even approval is likely. In such circumstances, companies will look to the most efficient and least onerous regulatory regimes **that have the confidence of the international community** to process their regulatory needs.

This emerging situation creates three opportunities for regulatory authorities:

1. to become a **provider of first choice of regulatory services** to these emerging industries by creating a competitive regulatory regime. In effect, one could conceive of this as the creation of a new economic sector - the international regulatory services sector as a commercial enterprise.

2. associated with regulatory operations is a considerable investment in **human capital**. This capital includes both expertise in regulatory system as well as subject knowledge of the products and industries being regulated. Such capital can, under the right conditions, become an additional source of advantage. Providing **access to this expertise** in a consultative approach to regulations development can enhance the regulatory process both in terms of timeliness and effectiveness.

3. the regulatory system itself can become **an important element of comparative advantage** by providing reliable, timely, effective regulatory services to the highest world standards. Lower regulatory costs can improve the competitiveness of domestically-based regulated industries.

The "business" of regulation has the potential to provide significant economic opportunities for Canada. Furthermore, one could expect significant spin-offs from the successful commercial exploitation of regulatory comparative advantage. It would be associated with both an exportable service such as training, and development of regulatory processes for other countries (especially those without the critical mass of resources and expertise necessary to do their own regulations). The corporate interests developing the new

technologies would find more advantages to locating in Canada close to those sources of expertise. Much of the commercial potential for the regulatory sector, in such globalized markets, is influenced by increasing economies of scale of significant proportions. Location theory suggests that, once established, such sectors can create self-re-inforcing properties, establishing strong market position in "growth poles".[7]

This context creates a very complex set of relationships between the regulator and the regulated. There is little doubt that the domestic regulatory regime will have large potential economic effects. The important aspect of this discussion is to point out the multiple implications of any such change. Without a well-articulated set of objectives for all the various possible consequences (protection, commercial exploitation, economic development), not only could some significant opportunities be missed, but, over time, the domestic implementation strategy could be rendered irrelevant by international circumstances.

The Public Good and The Damage Function

The second characteristic of science-based regulations that needs special consideration in any examination of structure and financing is the nature of the objective (or the public good) which the regulatory regime has been created to serve. The objective associated with science-based regulation depends on the field of regulation. In particular, it is useful to look at those regulations that are aimed at protecting the public from harm (health and safety regulations) separately from the regulations that are part of the management of resources held in common by the community under government stewardship (environmental regulations).[8] This distinction is not always perfectly clear in real world applications. It is useful, however, for clarifying the intentions of regulations to separate those that protect the individual from those that protect the environment (acknowledging that the latter may have consequences for the former).

The outstanding characteristic of regulation implemented to protect the public is the extreme nature of the risk function. Shortcomings in regulatory decision-making can result in severe consequences for citizens, including exposure to disease, serious injury or death. The

lives of individual citizens can be irreparably damaged. Even where compensation is possible, it is not always (or even often) able to eliminate the harm done. A building that collapses causing injury or death, a drug that causes childbirth deformities, or a regulated food product that causes severe illness or death, result in consequences that cannot be undone.

Two other factors exacerbate the problems. First, the **expectations of citizens** in Canada are quite high with respect to performance in this area. As David Zussman notes the relationship between the public and the provider of government services is not "mechanical". (The) "expectations were formed on the basis of a value structure which also relates to the clients perception of the role of government in society and, specifically, about the type of service expected from a normal governmental organization".[9] In this case the values of Canadians include an expectation that the government will take responsibility for a wide area of the health and safety of its citizens. The reactions of Canadians to the Krever Inquiry into Canada's blood system and the subsequent hepatitis C issues are instructive in this regard. Error free performance is not just desirable for this activity of government, but expected.

In application, too often, the risk premium is zero up to a certain point, after which it becomes infinite for all practical purposes. This leads to "acceptable consequences" and "prohibited consequences". A much more flexible and responsive approach, where the transition between acceptable and prohibited is gradual and based on particular circumstances, would be very helpful (and in some cases is under development).[10]

The second complicating factor is the **credibility of government science**. On a multitude of issues, as Powell and Leiss[11] have pointed out, where personal health or safety are concerned, the public is often unwilling to accept scientific research that reports on the safety of certain products or processes, even when there is a strong scientific consensus. The level of trust needed to sustain a rational regulatory context does not seem to exist.

For stewardship regulatory responsibilities, the damage function is not as direct. Normally what is at stake is the integrity of resources

held in common by the community. In the case of renewable (biological) resources, this can include the survival of a species or a stock. Nonetheless, the indirect damage to individuals and communities can be extensive. Communities that depend on communal resources (fish, forests, rivers) for their economic well-being can be severely impacted if decisions on resource stewardship result in long-term damage to those resources.

All this results in a system of regulations where the tolerance for error is very, very low.[12] This differentiates this function of government from many other government activities. For those areas where the damage function is not beyond remediation, or can be offset by equivalent gains without severe damage to individuals, the tolerance of citizens to experiment with new ideas or new institutional forms to search for efficiency and effectiveness improvements is much higher. Inherent in institutional experimentation is the increasing risk of error. For science-based regulations, as a general rule, this risk factor has a very high premium.

The Need for Scientific Inquiry and Information

The third distinguishing feature of science-based regulations is the extent of the need for a variety of applications of science and the scientific method. The characteristics of the applications of science for purposes of these regulations are:

- importance - the dominance of scientific aspects of the regulations in the decision processes;
- diversity - the larger number of decision elements (tasks) for which the science is a necessary component; and,
- interconnectedness - the requirement for information and advice from several different disciplines (and institutions) on particular questions.

Although the nature and the depth of the science differ somewhat for each regulatory application, the tasks for which science is required are roughly the same. They are:

1. **Policy Definition** - For each application of regulatory intervention, the initial development of the policy requires an assessment of the damage that might be done to citizens or to the natural environment by the product or process under consideration. New science leads to better understanding of these risk functions and hence to the continuing potential for new regulatory activities. Regulations to improve urban air quality, for example, may need significant input from air chemistry, atmospheric science, respirology and other health sciences, industrial and automotive technology, fuel chemistry, and transportation studies.[13]

2. **Public Consultation** - Normally, new or revised regulations are subject to public review. It is important to have credible scientific expertise available to answer questions and explain the scientific basis for the proposed regulations.

3. **Risk Assessment** - Once the nature of the problem has been determined and the need for government action decided upon, the natural sciences need to be integrated with economics and social sciences to determine what the parameters of the regulations should be, based principally on assessments of the risks associated with the damage which might be done and the economic and social costs of taking action at various levels. Rarely is the scientific basis of regulation sufficiently clear and unambiguous to provide a basis for decision on its own. Some of our regulatory systems have been built on that basis, but both the complexity of the decisions required and the demand by citizens for participation have rendered such approaches less effective in many cases.

4. **Legislation and Regulation** - The drafting of legislation and regulations requires accurate interpretation of the scientific underpinnings. This means that detailed knowledge of the science associated with the regulation must be an integral part of legislative and regulation drafting. Otherwise the outcome flowing from the regulation may well distort, diminish, or fail to realize its original intention.

5. Evidence for Applications - When a new product or process or activity is proposed for approval under science-based regulations, a body of scientific evidence is necessary to assess whether or not the proposal meets the requirements of the regulations. More generally, decisions under science-based regulations require specific scientific information.

6. Analysis of Evidence - Once the evidence is available, an analysis of the evidence is normally necessary to check the integrity and completeness of the evidence in order to take a decision. While the initial data can come from a variety of potential sources, the regulatory process demands that the assessment be conducted in an impartial and disinterested context.

7. Appeals - The scientific basis for regulatory decisions need to be available and sustainable in the event that the any decision is appealed.

8. Monitoring - The application of and compliance with regulations need ongoing monitoring. Measuring effluents or inspections of buildings (for instance) are normally seen as necessary aspects of effective compliance programs and require applied science and engineering activities.

9. Performance Assessment - Finally, continuing measurement of the consequences of the regulations is important in ongoing program evaluation (i.e. side effects of new drugs, or incidence of toxins in watercourses). There is a need for a continuing stream of scientific data to ensure that the objectives of the regulations are being met, and that no unacceptable side effects are identified.

Each one of these functions can, and should, be considered separately with respect to the institutional choices available. There is no overarching reason, except for functionality, which would dictate that these activities need to be done in the same organizational context. Conversely, creating separate agencies or agents for each task should not be seen as an end in itself. Clearly some of the functions

are closely related, providing functional advantages to close institutional ties. The choices remain open, and should be examined based on the issues and the decision framework described below (or their equivalent).

III. The Context For Organizational Decision

The decisions on whether to maintain or to change the organizational context will be based on a large variety of issues specific to each regulatory activity. But three important aspects of science-based regulations will be common to most decisions. A common understanding of the differences between the public interest and private interests, and governments' role in managing them, is the first basic underpinning. The feedback influence that funding choices will have on the effectiveness of regulatory functions is a second key issue. And third, a good understanding of the context in which the science is developed and communicated is a necessary condition for effective organizational decisions.

The Public Interest

The public interest, that is, in this case, the protection of citizens and stewardship of common resources, and private interests, determined in part by access to markets and international competitiveness, are the yin and yang of science-based regulations. These two sets of interests provide the tension which form the basis for policy choices in the area of science-based regulations, as they do in many areas of public policy.

With respect to the government's role in the management of private interests, the economic literature, and the recent literature on public administration, provide good guidance to the basic framework for government action. Intervention in the marketplace should be avoided unless there is a demonstrable need, and a reliable public process which can satisfy that need, with net benefits to society. Where intervention is required, the cost of the intervention should be borne by the beneficiaries of that intervention where possible and practical. Governments should enable (and encourage) the realization of private interests where possible, subject to the

necessary public management of monopolies or quasi-monopolies, externalities (costs borne by other parties), and adequate information for the effective exercise of individual choice. Of crucial importance is the understanding that the expression of private interest is by far the most important source of wealth-creation for our community. In general, barriers to the pursuit of private interest are likely to reduce the overall wealth of the country.

Issues are more complex when there is a 'public interest' involved. Inherently, the identification of the beneficiaries is often difficult or impossible. Who, for instance, benefits from a regulation that requires universal inoculation against a communicable disease? Presumably, the beneficiary is the person who did not contract the disease but who otherwise would have. The commercial supplier of the vaccine gets a direct benefit (a guaranteed market), but the intention of the regulation is not to further the suppliers' interests. Regulatory activity which is oriented towards the prevention of 'bad things' happening (health, safety, or many environmental regulations) can rarely find a process to attribute the costs to intended beneficiaries. There are exceptions such as air safety programs where travelers can be targeted through airport taxes for instance. (These should not be confused with airport capital development charges that emerged recently in Canada. These provide a good example of a situation where the beneficiary is not the one who pays the charge.[14])

A key question is; how far is it possible to go in using market mechanisms to provide the public interests that are the intentions of science-based regulations?

As Charles Schultze of the Brookings Institute pointed out in his well-known work on *The Public Use of Private Interest* [15], *"in designing techniques for collective intervention, the gains from preserving some or all of these (market based) arrangements should be given significant weight".*

Market-based instruments have proved to be very effective in delivering policies efficiently, and have become well-accepted as

the preferred models for government intervention. It remains important to distinguish the objective (the public good) from the instrument (the market-like mechanisms).

Kernaghan defines public interest as *"what people would choose if they saw clearly, thought rationally, acted disinterestedly, and acted benevolently"* [16]. Even if the private sector can act benevolently (which, in spite of micro-economic theory, is sometimes observed), it is almost inconceivable to imagine private-sector interests acting disinterestedly.

Therefore, where a public interest can be identified, and where a community believes it is worth pursuing, there must be an agent acting for the community (i.e. a government) to ensure its realization. As Gilles Paquet points out, "the real fundamental danger in exploring alternative service delivery schemes is that it is very easy to lose track of the effectiveness imperative."[17] Efficiency can, in some circumstances drive out effectiveness. The achievement of the benefits[18] from incentive-based action as described by Schultze, while, at the same time, ensuring that the public-good objectives are realized, requires careful design of government interventions.

Funding Sources

One particular area where the issues of public and private interests impact on decisions for science-based regulation is the question of how the costs of the regulatory activity should or can be allocated. In recent years, an important element of the restructuring of government has been the expansion of the use of fee-for-service charges or user-pay policies. There are two separable (but not always separate) intentions for the introduction of cost-recovery policies. The first objective is based upon well-established theory concerning the responses of people and institutions to economic incentives. How an activity is financed, and by whom, has important consequences for the efficiency and the effectiveness of delivery.

If the direct beneficiaries (that is, those citizens who benefit from the primary objective) of a government service (including regulatory services) must pay for the delivery of the service, they will ensure

that they express their needs clearly, review the delivery options regularly to ensure efficiency, and try to ensure that they receive value for money to the greatest extent possible. For the service-deliverer, where a part of the income they receive comes from service recipients, they will tend to do what is possible to satisfy the beneficiaries' needs as effectively and efficiently as possible. Economic determinism[19] asserts that they will align their approach with the interests of the source of revenue.

> Provided then, that the source of revenue is the intended beneficiary of the policy, these forces should result in more effective and efficient service-delivery. Conversely, if the source of revenue is not the intended beneficiary of the policy, then cost-recovery can distort, rather than support, the intentions of the policy.

The other objective of cost-recovery is management of the overall fiscal position of the government. In this case, the objective is to **reduce the financial burden** of program (including regulatory programs) delivery to the taxpayer as much as possible without (usually) defeating the purpose of the program itself. Political decisions focus on the trade-offs between program-effectiveness and cost-recovery rather than their intersect.

For programs intended to address a public good, a difficulty in the implementation of measures to achieve the efficiency objective is that it is not always clear who the intended beneficiaries are. Beneficiaries include, for different regulations, health, safety and stewardship interests (mostly public goods) and economic development interests (mostly private interests). There are four basic requirements for an effective cost-recovery policy that is intended to go beyond simply fiscal objectives:

- the careful identification of the real interests being served
- the allocation of full costs according to those interests
- the avoidance of "regulatory capture" by financial dependence on a single interest for a significant share of total revenue
- the maintenance of a competitive regime relative to the costs of similiar regulations in other countries.

These objectives can clearly be in conflict in some circumstances. One of the basic themes of this paper is that the resolution of such conflicts cannot be effectively resolved by a blanket "one-size-fits-all" policy. Rather, careful assessment of the options and their implications on all interests (and on the credibility of the regulatory regime itself) needs to be done on a case-by-case basis. Such an approach would normally require consultation with the interested parties both to clarify their interests and to assure that the information on which the policy is based is robust.

It is usually easy to identify and consult with those who represent the private interests. However, it is much more difficult to identify appropriate representatives of the public interest. This could result in an unintended bias in the source of funds and the operational context of the regulations. Conversely, regulatory bodies can find it is easier to raise revenues from identifiable targets (usually the private interests) when those sources are compelled users[20] of regulatory services, and/or when there is pressure on the political process to resist user fees or additional tax revenues. These pressures and ambiguities create a difficult decision context for effective cost-recovery.

There are many circumstances where the public interest and private interests overlap. That is, regulatory policies and operations that serve one set of interests, also serve the other. For example, an effective and highly credible meat-inspection program can both ensure the highest level of food safety for Canadians and it can also provide assured access to foreign markets for Canadian meat producers. In such circumstances, the design of regulations can be

relatively easily agreed upon, but the allocation of costs according to who receives the benefits is correspondingly more difficult to determine.

The Science Establishment

The possibility of separating the scientific research activities from the operational aspects of science-based regulations provides some interesting opportunities. As noted in Section II, there are a number of discrete science-related activities that can be examined for potential change. But, such opportunities must be balanced against some potential drawbacks. Before making the general case for institutional reform, it is worthwhile to identify three particular aspects of the science establishment.

A consideration that lies partly within the efficiency objective, but deserves some special attention, is the issue of scale. The scale of operation, and hence the scope of human and physical scientific capital, is of great importance in many scientific functions. Organizational decisions on the science aspects of these regulations must include the implications for maintaining a **critical mass** of human capital and achieving the economies of scale available to large and/or narrowly focused scientific establishments. As science interests from the time of Vannevar Bush[21] have been quick to point out, the scale, scope and the long term focus of science argue strongly for significant government involvement in the creation and maintenance of an effective scientific establishment.

The **credibility** of the science, at each stage of the regulatory process, is one of the most critical ingredients of science-based regulations' success. In this area, perceptions are as important as the underlying reality. International acceptability will certainly depend on perceptions of the reliability and integrity of the science. Citizens' acceptance of the regulatory regime that protects their health, safety and environment also depends upon the citizens' confidence in the scientific basis for decisions.

> The perception of neutrality, integrity and hence credibility of science is not independent of the institutional context in which the scientific advice is developed.

Scientific views on forestry practices which come from a forestry industry association or from an environmental NGO, justly or unjustly, will be assessed only in the context of the interests of the source, and are unlikely to be perceived as neutral or disinterested. Similarly, if government views on the potential dangers of some new chemical are provided from an industry ministry, they may be perceived quite differently from (perhaps the same) information from an environment ministry. The independence of the science from commercial or political interests is an important factor in its credibility.

The third key issue that needs to be taken into consideration is the need for significant input from the experts on the science for the development of policy for science-based regulation. To fulfill this responsibility, a source of scientific expertise must be available and in close contact with the policy development. Furthermore various streams of science information need to be integrated with social and economic perspectives to allow for informed decisions. The more remote and independent the science establishment is from the policy world, the more difficult it will be to establish effective linkages.

These factors must be considered when the case for or against specific institutional options is examined. The next section provides a more general framework for decisions.

IV. The Essence Of Decisions: Balancing Interests

Competing Interests

The first characteristic identified in Section II (commercial potential, or private interest) of science-based regulations provides a strong rationale for an intensive examination and transformation of the form and financing of science-based regulatory agencies and functions. A long-term strategy seems to be called for that can situate the Canadian context in a way that will take maximum advantage of Canada's potential advantages in this emerging domain of economic potential. Without a comprehensive plan based on new and open thinking, Canada may well be left behind.

However, the second characteristic (the damage function, representing the public interest) seems to argue equally strongly for a very conservative approach to institutional change. Governments are, to some extent, hostage to the strong risk aversion of their constituents on matters of personal health and safety, and on issues that threaten to do significant damage to the environment. Change for the sake of change, or for purely fiscal reasons, may carry unacceptably high risks - personal, social and political.

Finally, the variety of needs for scientific input described above suggests that one factor that is encouraging organizational reformation is the increasingly interdisciplinary nature of the issues and the interaction of various disciplines. Quite simply, for purposes of public policy, the boundaries between scientific disciplines are less and less relevant. The need for a more inclusive approach to scientific and other information that feeds into regulations is widely accepted. In addition, the credibility of the science needs to be maintained at a high level to satisfy the need for public confidence. The diminishing trust in institutions (including governments) suggests that new institutional approaches may help if they can be

the basis for more open and transparent scientific information for regulatory decisions.

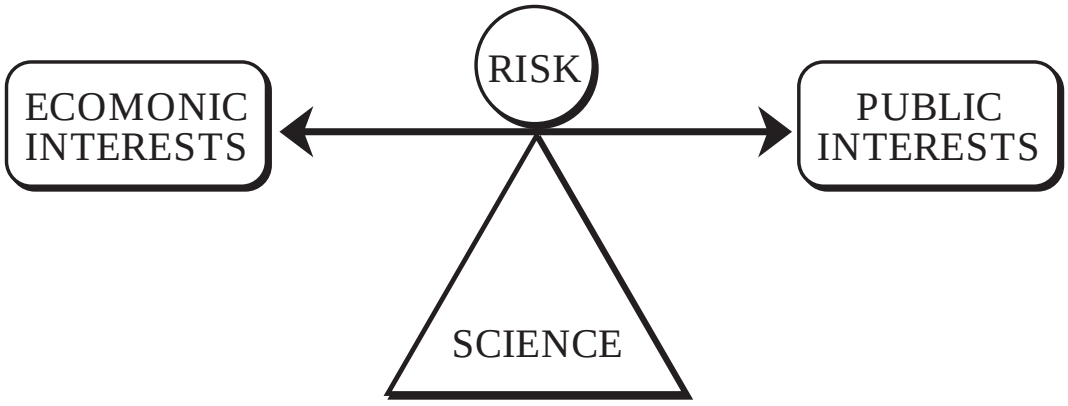
> The reality that science is inextricable from the policy and decision making processes argues for a conservative approach to institutional change (keeping science close to policy), while the urgent need for enhanced credibility and transparency argues for a more aggressive pursuit of new approaches.

In the final analysis, decisions will have to be made on a case-by-case basis, trying to balance these competing forces. The key requirement is to ensure that all the relevant considerations are examined in such decisions. Annex 2 provides a list of the questions that should be asked in the process of choosing new approaches to science-based regulation. They focus on the attributes that the agent or agents responsible for the regulatory functions must have.

Finding a Balance

The decisions made on the institutional basis for science-based regulations will all, in different ways, affect the essential trade-off being faced. Economic interests are served by speedy, predictable, and efficient regulation. Citizen engagement and trust, reflecting the high level of public concern for the areas under consideration and the increasing demands for citizen participation in decision-making, requires a time-consuming, unpredictable, and often cumbersome process. On most of the critical elements of the decision processes, science is a necessary component of the arbitration of these competing interests. But, science is not, as we have seen in recent history[22], sufficiently certain to be completely authoritative. It cannot provide unambiguous advice without an assessment and understanding of the risks involved, and the interpretation of those risks by all parties. For decision-making, the science must also be combined with other goals and objectives of the regulatory system to provide a complete and robust context for the ultimate decision.[23]

Science Arbitrates Interests Subject To Risk Perceptions



There are a variety of ways to look at the trade-offs inherent in this model. The core concept, which lies at the heart of any of these conceptual frameworks, is the notion of the public interest and the role of governments in identifying and serving the public interest.

Decision Model

The public interest itself cannot normally be portrayed as a one-dimensional aspect of the decision process. The primary objective (protection) is nested inside a variety of attributes of the institutional framework. These attributes address issues of governance, effectiveness (and perceptions of effectiveness), cost to the society of obtaining the benefits, and other key objectives of the government of the day (in current circumstances, costs to the treasury cannot be ignored).

The effectiveness of science-based regulatory activities, that is, the delivery of the principle societal objectives, will ultimately depend on the capacity to satisfy all these attributes. Each of these characteristics is, in turn, affected by the institutional framework within which the regulatory activities are undertaken. In a very simplified form, these characteristics can be grouped under the general areas of:

- **Accountability** - the Westminster system makes Ministers accountable for their portfolios to Parliament, and hence to the Canadian public

- Neutrality (Credibility) - the trust and confidence that the Canadian public, and external users of Canadian regulations, have in the regulatory system depend on the perception of disinterested (neutral) and effective process
- Efficiency - the quality and quantity of product per unit cost - not necessarily the total cost or the effectiveness with respect to outcomes
- Cost to the Treasury - the financial burden that must be borne by governments from general tax revenues

The organizational options, although rich in detailed variety (see Annex 2) can be grouped in a similar fashion to represent the main generic options. These options are:

- Departmental (In-house)
- Stand-alone Agency (with legislative base)
- Non-Governmental Organization (NGO) - Voluntary Sector
- Private Sector Enterprise (including industry-led voluntary or compelled regulatory programs)

The usefulness of these general categories is that they can be used to demonstrate a decision-matrix for desirable organizational options for science-based regulations. As this chart shows, in very abstract terms, accountability is strongest within the established accountability systems of normal government operations. The departmental and ministerial accountability are clearly defined in precedent, regulation and operational practice. Conversely, the more that the functions can be undertaken within a private sector environment, the stronger is the potential for cost-minimization to the public purse. Thus the table attempts to show a continuum of options for organizational form on the basis of each form's strengths and weaknesses against key criteria.

A Conceptual Decision Framework				
Criteria/ form	Accountability	Neutrality (credibility)	Cost (to gov't) Minimization	Efficiency
Department	★★★★	★★★	★★	★
Stand Alone Agency	★★★	★★★★	★	★★
Non Gov't Organization	★★	★★★	★★★★	★
Private Sector	★	★★	★★★	★★★★

The decisions regarding form need not be taken, for any particular regulatory function, as an all-or-nothing proposition. In fact, the argument of this paper is quite the opposite. It is not only conceivable, but desirable to separate the scientific activities upon which the regulatory process is based from the operational/policy elements of regulatory activities for purposes of organizational decisions. Furthermore, as indicated in Section III of this paper, each step of the regulatory process has different characteristics, and by extension different criteria for selecting an optimal organizational form. For instance, the policy development, and the writing of legislation and regulation, probably require direct and unambiguous political accountability as the first priority. The assessment of submissions function, and the consultation function, need the perception and reality of neutrality and credibility. The development of evidence for assessment and regulatory decisions needs to be as efficient as possible to sustain competitiveness, and that may argue for application of private-sector options.[24]

More detailed institutional decisions concerning form and responsibilities, as illustrated in Annex 2, can also be taken in the context of this framework. So, for instance, financial authorities and the auditing function can and should be tailored, case by case, to the particular intentions of the organizational form. Specifically, the application of desired procedural changes, such as cost recovery criteria, will have widely differing implications for the various aspects of the regulatory implementation process. Careful assessment is necessary in all cases to ensure that the universal pursuit of one or another of the key objectives does not, in fact, diminish the pursuit of other objectives where they are most important for an effective regulatory regime.

V. Options For Change - Three Proposals

The discussions above provide a mostly-conceptual look at the issues of institutional change for science-based regulations. They provide the basis for a decision-framework, as well as identifying some of the forces for change. Can this framework be used in real applications that deal with the problems and challenges that must be faced? This Section moves beyond the conceptual framework to examine real opportunities for change.

How should governments in Canada proceed? On a case by case basis, and subject to the criteria noted above, this paper proposes three key areas of opportunity: 1) cooperation, 2) scientific authority, and 3) voluntarism. Each of these areas responds to some of the concerns and/or opportunities identified in this paper. Provided that the development and implementation of change respects the need for balance and for comprehensive assessment as discussed above, these suggestions can provide the basis for effective and productive change.

Cooperation

In many areas, complex systems of regulation are managed by diverse, sometimes competing, organizations. Where these organizations co-exist within one level of government, a rationalization of regulatory programs along the principles which guided the development of the Canadian Food Inspection Agency should be examined. There, eighteen government programs from four departments were integrated into one agency. Not only did this create a critical mass of regulatory expertise in the area of food system regulations, but it also addressed issues of duplication and gaps in the exercise of federal responsibilities, as well as giving industry and consumers a single reference point for issues related to Canada's national food regulations.

The next logical step in coordination is the federal-provincial areas of common regulatory interests. On a small scale, agencies, such as the Canada-Newfoundland Offshore Petroleum Board, give examples of how joint responsibility can be shared through one agency. The harmonization of federal and provincial information requirements that are inherent in such an arrangement could provide valuable efficiency gains if the jurisdictional integrity of the actors can be sustained.

To accomplish this, the Federal Government would need to take the lead. Establishing "open-ended" regulatory agencies, where other jurisdictions could "opt-in", with carefully-structured decision-making authority, could provide the basis for a step-wise movement to integration at the national level. As pointed out for the case of food inspection in How Ottawa Spends (1997 edition, page 131) "***the federalism problem ... is not (only) a case of eliminating costly duplication. Rather the task is to coordinate disparate regulatory systems and fill in gaps in the system.***"[25]

Cooperation, with the objective of harmonization and possibly integration at the international level, should also be carefully considered in light of the emerging trends in markets discussed above. Bi-lateral agreements can proceed step-by step if agencies have the authority and the flexibility to undertake the necessary compromises for harmonization. The establishment of joint review processes, such as the ones being developed by the Pest Management Regulatory Agency, demonstrate the potential for progress. However, issues of sovereignty form a major impediment to the creation of international agencies with shared decision-making powers. Multinational harmonization may require the establishment of arms-length agencies to "negotiate" a research consensus amongst nations. Only where there is a genuine bilateral desire for harmonization, with identified shared interests, are the prospects for successful harmonization worth pursuing.[26]

Cooperation at all levels provides an opportunity to improve overall efficiency, as well as reduce costs to governments. Ultimately, successful implementation will require the development of new institutions where decision-making authority is shared by the parties according to their particular roles. The question of accountability

of Ministers for decisions taken by agencies with multiple reporting structures needs careful consideration. The risk of capture by the strongest existing international organizations (the major corporate interests), which poses a concern about the neutrality and effectiveness of the resulting process, must also be managed to the satisfaction of citizens.

Scientific Authority

Two propositions have been raised in this paper: 1) trust and credibility of the science base for regulations are essential elements of effective regulation; and 2) government science is no longer always viewed as neutral or disinterested. Organizational and/or financing options can be used to address this difficulty.

As noted in the paper, dependence on a particular source of financing can affect the independence, or at least the perception of independence, of the information put forward by scientific authorities. A formal scientific review agency, serving many departments and agencies, as independent as possible from Departmental budget decisions (and fluctuations) could help establish a framework for more authoritative science review. It would be used as a supplement to the normal sources of science to regulatory agencies (whether in-house or externally based) when the science is challenged or when there is a specific need for an independent view. Such an agency need not have on-site expertise in particular fields of science. It would act more as an organizer of scientific review by Canada's experts in particular fields as requested by regulators or Ministers when faced with challenges to the scientific advice from normal channels.

Such a separate agency (reporting through, not to, a central agency of the government administration) could resolve the difficult tension between the need for independent scientific assessments and the internal and policy needs for science for the operation of regulatory activities. The main scientific work would remain close to the policy areas, but with a fallback to the independent structure in the case of controversy. To be successful, secure and independent funding would be required. The incentive structure should be to sustain credibility, not to seek out more business or to benefit from higher levels of controversy.

Provided the incentive structure for both the new agency, and its potential users is well structured, enhancing the authority of the science base for regulations is achievable. But, it would not be achieved immediately. Trust in the institution would build up over time. Unlike commissions of enquiry or other such one-off review processes, such an institution could build confidence over time on the basis of its performance. That is, a sort of "confidence capital" could be built up.

Voluntary Approaches

Over the past decade the increased use of formalized consultation processes on issues of public policy has established a better understanding in all the communities involved of the needs and the potential for action of each of the main sectors. The openness of the relationship between business, government and other sectors in Canada provides an opportunity to take some creative steps in utilizing the self-interests of companies to provide more effective and less costly regulatory regimes. Some examples of such approaches already exist (through commitments of the chemical industry and the electricity generating industry to environmental standards for instance). Science-based regulatory processes could take advantage of such approaches provided that a sufficient degree of confidence can be established.

At the center of such an approach is the implementation of an outcomes basis for achieving the intention of regulations rather than, or in parallel to, prescriptive approaches. Provided that the administrative and organizational overhead are not major costs relative to the overall costs of compliance, it is reasonably easy to demonstrate that a performance-based, self-administered program **can** minimize the costs of achieving the desired outcomes. Experience seems to show (an issue that requires some further study), that not only is compliance less costly, but the standards achieved often exceed those which result from non-voluntary prescriptive measures. The reason for this is that, in a voluntary approach, **the incentive for companies is to demonstrate the best possible achievement, whereas, in a prescriptive, non-voluntary approach, the incentive is to minimize the cost of achieving the prescribed levels. Successful implementation depends upon a well-**

structured framework, including well-specified objectives, prescribed monitoring and reporting regimes, and mechanisms for verification of performance.[27]

Problems remain. Accountability is difficult to manage, and the issue of free riders must be addressed. However, it is possible to envisage a two-tiered regulatory process whereby commitment to a voluntary approach, together with an auditable reporting system to the responsible Minister, could exempt companies from a second tier prescriptive regulatory regime. Clearly such a plan would not be suitable for all areas of science-based regulations. However, where achievable, it could improve efficiency, lower costs to the taxpayer and provide increased effectiveness.

Such an approach must be developed by industry, and a necessary condition is that there be sufficient flexibility in the legislation to permit it. An industry-based institutionalization of such a program, through an industry association for instance (as is the case for both the chemical industry and the electricity-generating industry), would be a necessary component. Virtually all costs except policy development and monitoring could be borne by the companies involved.

Finally, the system would need to pass the test of public acceptability. This would require significant investment in public relations, and may prove to be impossible in highly contentious areas. In spite of the difficulties, the potential benefits warrant serious examination in many areas of science-based regulation.

VI. Conclusion

This paper has argued that, across a large numbers of dimensions, the re-thinking of the institutional underpinnings and the financial basis for science-based regulations face competing tensions. Independence versus relevance, public versus private interests, efficiency versus effectiveness, among other trade-offs, are at the heart of decisions for reform. The issues are sufficiently complex and case-dependent that a prescriptive approach to reform is not only unwarranted, but inadvisable.

This does not suggest that reform is either unnecessary or impossible. On the contrary, to meet the emerging challenges of a more internationally linked and more publicly engaged context, continuous review and reform will be essential to achieve "the greatest net benefits to Canadians."

The paper ends with some examples of areas where opportunities exist and should be examined. However, as recommended for others, this paper is not intended to be prescriptive. Each regulatory function needs to be looked at on its particular merits. Change should be an on-going process for science-based regulators with an expectation of continuously-emerging new challenges calling for well-targeted reforms.

To be successful, such reforms will need to be informed by: *1) the intended consequences of the reform; 2) the potential unintended implications for the regulatory framework; and, 3) a good understanding of the implicit and explicit signals to all participants that result from the reform*. This can only be done with a case-by-case approach, based on political direction that includes **all** the important aspects of the regulations. Ultimately, the resolution of the difficult trade-offs will require political decisions. It is absolutely essential that these decisions, just like the regulatory decisions themselves, be based on sound and complete information.

Annex 1

I. Science in Governments

Governments' interests in science stem from several key roles which society ascribes to government. The borders of these functions, how and where they are executed, and the resources necessary for their execution are all matters of continuous debate and adjustment. But the key responsibility framework remains. These responsibilities are:

1. Expansion of our knowledge of the physical universe[28];
2. Protection of the community through health, safety, and defense;
3. Stewardship of shared community resources;
4. Economic development through enhancing technology options;
5. The provision of scientific information to help society take decisions

The first four responsibilities require the direct application of science and scientific methodology. The last requires knowledge of the science but generally no direct application. These responsibilities require the performance of a variety of different tasks. Although these tasks are sometimes considered to be discrete, and associated solely with one or the other of the responsibilities, in the context of government interests in the 1990s, there is less and less a notion of boundaries between the different functions. These functions are:

1. Basic research;
2. Applied research (goal driven research);

3. Standard development and compliance testing;

4. Technology development and transfer;

5. Observation, monitoring, and information management.

Rather than a one-to-one correspondence, it is best to look at these tasks and responsibilities as a matrix. The strongest links are across the diagonal, but each element is related to and affected by the others. The following table is a conceptual illustration of the linkages arrayed as a matrix. The most important feature (for the sake of this argument) is that there are no empty cells.

Science In Government
Integration of Instruments and Objectives

Objectives/ Instruments	Knowledge	Protection	Stewardship	Economic Development	Decision-Making
Basic Research	★★★★★	★★★	★★	★	★
Applied Research	★★★	★★★★★	★★★	★★	★
Standards & Testing	★	★★★	★★★★★	★	★★
Technology Development	★	★★	★★	★★★★★	★★
Monitoring, Information Management	★	★★	★★★	★★★	★★★★★

The ability to deal with issues that arise in managing governments' science portfolios depends on a clear understanding of the implications of this matrix approach to describing objectives and tools. Ministers and their senior advisors may tend to see science and technology (S & T) activities as a unified whole that can be shaped and tuned to be responsive to the government's priorities. At the operational level there are still strong tendencies to see isolated elements of this system as existing in their own discrete space, unlinked to the larger S & T system. Both of these perspectives are dangerously limiting.

Any prescriptive approach to managing S & T that does not explicitly **deal with the diversity** of responsibilities and activities represented in this framework, is likely to overlook key aspects of the governments' interests. The consequences can be to put vital inter-

ests at risk. Equally important is the second key implication of this matrix view. The objectives and tools of government science cannot be isolated one from another. The boundaries between basic research, technology development, and/or regulatory implementation are not fixed or discrete. All these issues flow together, and the ability to integrate the pieces within the wider framework is an important ingredient of operational effectiveness.

The implications are equally important for the process of providing advice emanating from government science-based functions. Each of the individual aspects of science activity carries with it its own perspective on policy advice (as discussed in Section IV below). A full understanding of both the diversity of perspectives and the horizontal and vertical linkages which affect them, is one of the basic elements required for effective advice. This matrix provides a taxonomy to help understand and exploit the links between the operational science activities of the government and the objectives for which advice is needed.

Annex 2

Elements of Decision

The establishment of a new organizational form to manage science-based regulation will present policy-makers with a large array of possible institutional arrangements. The list below is indicative of the choices that should be considered. It is useful to note that some of the choices are interdependent, but for most of the areas identified, a full spectrum of choices is available.

Type Of Institution

- unit within department (division, branch etc.)
- special purpose agency
- co-operative venture (joint ownership)
- non-governmental organization (not for profit)
- Commercial enterprise (for profit organization)

Source Of Legitimacy

- federal legislation
- parallel federal/provincial legislation
- departmental mandate (from minister)
- Industry/government agreement
- Contract for services

Market Position

- competes with private sector service-providers
- monopoly provider of regulatory services
- virtual monopoly (only provider with legislative authority)

Governance

- departmental responsibility (Deputy Minister)
- Board of Directors (advisory, quasi-judicial, recommends, reviews)
- responsible for substance or administration
- Governing Council (representing parties to contract)

Reporting/Accountability

From:

- DM, Executive head, Board of Directors, Governing Council

To:

- Minister (s)
- Prime Minister through Minister
- Parliament through Minister

Scope Of Minister's Responsibility

- policy (development of regulations)
- operational decisions under regulations
- compliance
- science for regulation
- administration of agency

Procedures - Human Resources

- subject to Public Service Staff Relations Act (PSSRA) and PSC administration
- subject to P.S.S.R.A. but with local administration
- separate negotiated HR regime
- private sector HR status
- remuneration/pension rules

Procedures - Finance / Audit

- Subject to Financial Administration Act
- Freedom re contracting, borrowing, rate setting, financial controls
- Auditing by Auditor General
- Private sector auditing

Source Of Science

- in-house
- from regulated companies and intervenors
- contract i.e. from universities
- purchase from commercial vendors (incl offshore)

Source Of Revenue

- appropriations from federal budget
- costs covered by beneficiaries (i.e. home owner pays inspection fee)
- costs allocated to system users (annual charge to be in system)

- fee for direct services (builder pays inspection fee)
- endowment (revolving fund and interest income)

Disposition of Revenue

- to central revenue fund
- to agency budget (for discretionary spending)
- to outside funders (to reduce annual contribution)
- to reserve fund (to be spent when instructed)

NOTES

[1] Aucoin, Peter; *The New Public Management: Canada in Comparative Perspective*; The Institute for Research on Public Policy, 1995; page 2.

[2] Seidle, Leslie, *Rethinking the Delivery of Public Services to Canadian Citizens*; Institute for Research on Public Policy, 1995. The author divides this instrument into two parts, the use of total quality management and the use of performance-oriented measures.

[3] Farquhar, Caroline, *Focusing on the Customer: A Catalyst for Change in the Public Service*; Ottawa, The Conference Board of Canada, 1993; quoted in Seidle, op cit,page 8.

[4] From OECD web page on PUMA Work on Regulatory Management and Reform, www.oecd.org/puma/regref/coopern.htm

[5] Major markets are mostly in OECD countries, where up to 80% or 90% of sales of new, technologically advanced products occur.

[6] Large multinationals with quasi-monopolistic market power can engage in strategic behaviour to pressure countries to improve their regulatory regimes from the perspective of the companies. Fortunately, in most cases, these companies share the objective of having regimes that are effective and dependable at high, internationally acceptable standards of protection.

[7] See for example Arthur, Brian, Positive Feedbacks in the Economy, Scientific America, February 1990, pages 92-99.

[8] For further elaboration of these distinctions, see Jarvis, Bill; *The Role and Responsibilities of the Scientist in Public Policy*; Public Policy Forum, 1998.

[9] Zussman, David, Government Service to the Pubic: Public Perceptions, in Optimum, vol22-4, 1991-92

[10] This idea comes from notes provided by Tom Ledwell.

[11] Powell D and Leiss W, *Mad Cows and Mother's Milk*; McGill-Queen's University Press, 1997.

[12] Most errors are only evident in retrospect. Some are apparent very quickly, such as food poisoning, but some take a long time to become clear, such as fish stocks depletion.

[13] Information on the chemical process which created smog (NOX + VOCs + sunlight), the sources of these elements (emissions from combustion and other sources), the atmospheric conditions which kept the smog from dissipating (temperature inversions), the health effects on human populations, and the potential impact on the incidence and severity of smog episodes from various regulatory options (auto and industrial technology, traffic flow, fuel composition etc) may be required for an assessment of the appropriateness of government action.

[14] Capital charges at airports result in costs to today's travellers for benefits which will accrue to travellers in the future (after the new construction for which the charges

are being collected). Such a charge would be impossible in a normally functioning market where active direct competition exists. Note the exemption from the charges by passengers in transit who presumably have options for stop-over points. In theory, only a monopoly, without regulation to prevent it, could result in such a charge.

[15] *The Public Use of Private Interest*, by Charles Schultze; The Brookings Institute, 1977, reprinted in Harpers, May, 1977, page 45.

[16] Kernaghan, Kenneth, *The Responsible Public Servant*, Institue for Research on Public Policy, 1990, page 33.

[17] Paquet, Gilles, Alternative Service Delivery: Transforming the Practices of Governance; in *Alternative Service Delivery:Sharing Governance in Canada*, edited by Robin Ford and David Zussman, KPMG and IPAC, 1997, p. 42

[18] Schultze identifies four "virtues of the market": 1) markets are a form of unanimous consent (under normal conditions); 2) markets reduce the need for, and cost of, hard-to-get information; 3) markets promote change; and, 4) markets direct innovation into socially desirable directions (efficiency of resource use).

[19] The theory of economic determinism states that peoples belief systems are influenced by their economic interests.

[20] As per Farquhar, op cit

[21] The report by Vannevar Bush to the U.S. President in 1945 entitled Science: The Endless Frontier established a post-war orthodoxy with respect to the government's role in science.

[22] See Powell, D and Leiss, W, *Mad Cows and Mother's Milk*, McGill-Queen's University Press, 1997 for a review of the limitations of science on its own in the management of public policy.

[23] See the discussion of science perspective vs decision-makers' perspective on the decision process in *The Role and Responsibilities of the Scientist in Public Policy*, op cit.

[24] In fact, this is the approach taken by many of Canada's regulatory agencies. Information on the proposed application of regulatory functions is the responsibility of the proponent, sometimes augmented by public or NGO information sources.

[25] In Food for Thought: Food Inspection and Renewed Federalism in *How Ottawa Spends* 1997 edition.

[26] I am grateful to George Jack for reminding me of this important consideration.

[27] The New Directions Group, a multi-sectoral interest group, has developed eight criteria for credible and effective voluntary programs:

-developed and implemented in a participatory manner;
-transparent in design and operation;
-performance-based with specified goals, measurable objectives and milestones;
-clearly specified rewards and consequences re performance;
-encourage flexibility and innovation;
-prescribed monitoring and reporting requirements, including timetables;
-mechanisms for verifying the performance of all participants;

-continuous improvement for participants and for the program.

[28] Whether or not this is a fundamental role of government is an important question. Post-war evolution of science policy was based on this function playing a key and necessary role. Some recent literature, for example Donald Stokes' book *Pasteur's Quadrant* (Brookings, 1997) challenges this view.

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