

**A METEOROLOGICAL INDUSTRY
STRATEGY FOR CANADA**

Canadian Meteorological and Oceanographic Society (CMOS)

November 27, 2001

Table of Contents

Foreword	3
Background	4
The Importance of Weather	6
Weather and the Weather Industry – A Discussion	8
The Baseline Study	8
The Academic Survey	11
The HLB Economic Study	11
Other Issues and Views	14
A New Vision	15
Benefits from Achieving the Vision	16
Recommendations	17
Recommendation #1:	17
Recommendation #2:	18
Recommendation #3:	18
Recommendation #4:	19
Recommendation #5:	19
Recommendation #6:	20
Next Steps	21
Appendix A: Membership of the CMOS Private Sector Task Force	22
Appendix B: “Baseline Status of the Private Meteorological Services Sector in Canada” by Global Change Strategies International	23
Appendix C: Optimizing the Public and Private Sector Roles in the Provision of Meteorological Services; a Study by HLB Decision Economics Inc.	24
Appendix D: Presentation on A Meteorological Industry Strategy for Canada	25
Appendix E: E-mail Survey Questionnaire for Faculty Heads and Students of Canadian Meteorology Universities	30

Foreword

This document reflects the commitment of many individuals to the advancement of the meteorological profession in Canada. Readers are encouraged to absorb everything contained in this report, including the attached studies.

As the co-chairs of the private sector task force that prepared this document, we would like to thank the many private sector members of the Canadian Meteorological and Oceanography Society (CMOS) who contributed their time, skill and finances to the development of this Canadian Meteorological Industry Strategy. We would also like to acknowledge the courage and vision of the management of the Meteorological Service of Canada for their openness to change and their encouragement, both moral and financial, to the CMOS Private Sector Task Force to develop this strategy paper.

An essential background study for this paper was carried out by Doug Russell and staff of Global Climate Strategies International (GCSI) on very short notice and under very severe time constraints. The GCSI study, done for the Meteorological Service of Canada (MSC) under a contract with CMOS, produced some results that opened many eyes about the state of the weather and climate industry.

David Lewis and the staff of HLB Decision Economics undertook – again under very tight time constraints – a first-ever economic study of the weather industry in Canada. That study opened eyes in other ways by demonstrating graphically how important Canada’s investment in weather is to the economy and by also showing why changes are needed in the way weather data is accessed and priced.

Finally, the co-chairs acknowledge, with special gratitude, the role played by Jeff Carruthers of Sussex Circle Inc.- Le Cercle Sussex as advisor, strategist, writer and presenter in all phases of the development of this strategy. In addition, we thank Ron Jackson of Sussex Circle for his useful advice and his management of the HLB contract.

Ian Rutherford, PhD
Susan Woodbury, ACM
Co-chairs

Background

The Canadian Meteorological and Oceanographic Society (CMOS), the national society of individuals and organisations dedicated to advancing atmospheric and oceanic sciences and related environmental disciplines in Canada, has long had an interest in creating the right climate (so to speak) so that new weather and climate products and services flourish in Canada.

With this objective in mind, private sector members of CMOS met with senior officials at Environment Canada in October, 2000. At that meeting, Marc-Denis Everell, the then newly-appointed Assistant Deputy Minister of the Meteorological Service of Canada (MSC), expressed interest in having CMOS provide suggestions on how the private and public sectors could develop a new approach to weather and climate in Canada. This in turn triggered the formation of a special private sector task force, with Environment Canada's participation (primarily in an advisory role), of CMOS, with the express mandate of developing a weather industry sector strategy that could be considered by CMOS and shared with MSC and others within the federal government.

Environment Canada provided a financial contribution to support the work of the task force through the spring and summer. The task force undertook to produce a report recommending the key ingredients and next steps for a weather sector strategy designed to create the right kind of environment for a significant expansion of the weather industry in Canada.

Members of the private sector task force (the "task force") held their first organizing meeting in Ottawa in February 2001 (see Appendix A for membership). One of the first initiatives of the group was to propose a baseline study of the meteorological private sector. EC contracted with CMOS to undertake this study to establish the number and size (including revenue) of the key players. Global Change Strategies International (GCSI) undertook this task, using a survey of Canadian firms and individuals providing meteorological services. The survey results were then used to determine the overall size (in revenue) of the industry.

The GCSI survey also explored issues that industry respondents felt would need to be addressed in the near future. The results of the GCSI study "Baseline Status of the Private Meteorological Services Sector in Canada" are described in some detail in the next section of this report. A copy of the complete report is attached as Appendix B.

During its deliberations, the task force identified a number of issues and irritants that needed to be addressed in any successful weather industry sector strategy. These included issues surrounding access to and pricing of data and information produced by Environment Canada and used by both the private and public sectors to produce "value-added" products and services for use by Canadians and foreign clientele.

As the discussions proceeded into the summer months, the task force used an interim report to the broader CMOS membership at the annual CMOS Congress (in Winnipeg) in June 2001 to raise a number of questions. Participants at the Congress (private sector and Environment Canada) confirmed that the task force was generally on the right track and the task force began work on capturing the various ideas and proposals for a final report, to be published in the fall.

It soon became apparent that an economic assessment of the benefits of weather services for the broader economy, on the one hand, and a comparison with the activities in the United States, where private sector weather services were more advanced, would be extremely helpful. The notion of an economic study was raised in a meeting in June with Dr. Everell of the MSC; he supported the notion, recognizing the value of such a study in providing economic context.

Through the existing EC-CMOS contribution agreement, MSC officials and CMOS subsequently agreed to produce an economic study of the weather industry in Canada. The study, entitled "Optimizing the Public and Private Sector Roles in the Provision of Meteorological Services", was undertaken by HLB Decision Economics Inc. during August and submitted to the task force in mid-September. The key findings of the HLB study are highlighted in the next section of this report. The HLB Report itself is attached as Appendix C.

The conclusions and recommendations of the task force, along with the HLB economic study, were discussed at a special meeting of MSC senior management in Toronto on September 23, 2001. (A copy of the discussion presentation is attached as Appendix D.)

One other survey, an informal e-mail survey of professors and students of meteorology in Canadian Universities carried out by the private sector task force over the summer of 2001, provided important information about the academic portion of the weather sector. (A copy of the e-mail survey questionnaire is attached as Appendix E.)

The Importance of Weather

Canada's economy is, on the one hand, extremely weather sensitive, given its northern latitude, huge landmass and dependence on resource extraction, primary industry and vulnerable transportation links to distant markets. An estimated \$100-billion+ is at stake in important sectors of the economy like agriculture, transportation, tourism, energy, manufacturing, just-in-time-delivery and retail sales. The financial and insurance sectors, in turn, depend heavily on what happens as a result of good – and bad – weather.

On the other hand, Canada's large land mass and its relatively small and spread-out population and transportation infrastructure make it that much harder and more expensive to gather the weather information that will allow accurate weather forecasting anywhere and everywhere in the country. Thus, it should not be a surprise that Canada spends more per capita for weather infrastructure and forecasting than its neighbor to the south, the United States.

If the suggestions that global warming will result in greater volatility in the weather – more storms, more droughts and floods, more extreme weather – are in fact true, high-quality and accurate weather forecasting will become all the more important for Canada.

Because weather is so important and because the information economy has made it much easier to find out what is happening across the country, major players are increasingly demanding to know more about the weather, both in terms of what is happening now and what is forecast to happen in the days or even weeks ahead. Insurance companies need to anticipate and assess risks of severe storms, as do airlines, trucking companies, Canada Post and couriers. The need to know how to avoid severe weather is an important factor for “just in time” delivery services. Electric utilities and water conservation authorities need to know both short-term and long-term predicted weather so they can regulate water flows and hydro-electric generation and build up inventories to meet heating and cooling demands.

The increasing sophistication of corporate, government and individual users of weather information will increase the demand for faster, more accurate and more customized weather products and services and, in the process, likely place more stress and strain on the existing weather infrastructure.

The Private Sector Task Force believes this stress and strain actually creates an important opportunity for private sector weather providers to take on an increasing share of meeting existing end-use needs, while at the same time creating new products and services to respond to emerging requirements. These same demands will also require greater attention to – and investment in – the core weather infrastructure that gathers the weather information all across Canada and then models all of this information for future timeframes to produce short, medium and long-term weather forecasts.

It would appear that Canada has a considerable amount of “catch up” to play vis-à-vis the United States, where the private sector plays a much greater proportionate role in the

overall weather industry and where the private sector has achieved greater market penetration. The task force also believes that the Canadian weather sector has unique opportunities to pursue in the United States, given its privileged access to the American market. However, it is very difficult to build an export base for these services without a significant home market, something that has been difficult to achieve in part due to the government dominance of the meteorological sector.

Weather and the Weather Industry – A Discussion

As the discussions leading to the final report evolved, each of the studies undertaken by the task force contributed a critical piece of the puzzle that would serve as the basis for the recommendations on the future of the weather industry.

The Baseline study undertaken by GCSI revealed the size and nature of the industry in Canada, along with basic concerns relating to the dominant player in the sector, the MSC. The HLB economic study reflected in economic terms the concerns about the need to change the public/private mix and to address problems of data access and pricing; both concerns were holding back the growth of a viable private weather sector in Canada. The informal e-mail survey of faculty and students in meteorology appeared to contradict the widely held view that the Canadian post-secondary system could not meet the challenge associated with a growth in demand for meteorologists, triggered by potential private sector growth.

The dominance of MSC in the weather industry – something that figured prominently in the other two stories – also appeared in the academic survey, with many of the students preferring government jobs to private sector jobs. The recommendations set out at the end of this report are largely – although not exclusively – derived from the results of these various studies. Readers are urged to review the reports and presentations in the Appendices as though they were in fact an integral part of this report.

The Baseline Study

The Baseline study by GCSI revealed an industry that was smaller than many had thought, less than 100 firms, with aggregate annual revenues of between \$55-million and \$65-million. Pelmorex, is the dominant private sector player. It operates The Weather Network/MétéoMédia and provides weather services to the media and commercial customers and generates some \$30-million in annual revenue. The MSC, which was not covered by the GCSI study, is the other dominant player in the weather sector. It generates some \$74-million in annual revenue, with \$49-million coming from arrangements with NavCanada, Coast Guard and DND, \$10-million in additional “commercial” sales, and the remainder coming from government-to-government, including federal/provincial arrangements.

It is worth noting that the study faced challenges in identifying companies and did not include any large companies that may have in-house capabilities, etc. In this regard, the study may not have captured the whole market in Canada.

According to the GCSI study, the industry players fell into a number of categories, including: climatology/global change; general consulting services; data processing and quality control; training/education; research; software design; modeling; forensic meteorology; operational meteorology; road weather; weather observing; radar services; media weather; and weather derivatives.

More specifically, according to the GCSI report, “Canada’s private Meteorological Sector is small (\$55-\$65M annual revenue) and diverse. The sector as a whole has grown relatively slowly over the past 15 years.”

The information in this report is based on an electronic survey distributed to 77 companies with operations in the sector (37 replies received), 11 in-depth interviews with a representative cross section of firms, and literature and Internet searches.

The GCSI study found that “Firms in the private meteorological sector typically envelop a wide range of disciplines, including meteorologists, engineers, instrument providers, software developers, hydrologists, private weather forecasters, trainers and educators, climatologists, as well as policy analysts and consultants.”

For the purposes of the report, these various firms were categorized as: “traditional” weather service providers (e.g., weather forecasting, briefing, training, weather data gathering and analysis); environmental science and policy development specialists; and instrumentation providers and software developers.

Firms were found to range in size from one-person owner/operator establishments to larger firms that provide meteorological-related services as a part, or branch, of a larger engineering or consulting firm. Very few firms had more than 15 meteorological professionals on staff or generated more than \$5 million in revenue each year. Nearly two-thirds of the respondents indicated they have experienced little-to-no growth in their meteorological staff levels during the past five years. However, of those representing the traditional weather services segment, nearly one half reported moderate to high levels of staff growth. In addition, nearly half of responding firms indicated that they had experienced difficulties in finding qualified Canadians to fill available positions.

“The survey showed that 41% of the responding firms have been in existence for more than 15 years, 27% between 5 and 15 years, and 32% less than five years. Companies are distributed across Canada, but the majority (nearly two thirds) are located in Ontario/Quebec and the Prairie Provinces. Firms conduct the majority of their business in the regions in which they are located, targeting primarily domestic corporations and governments, although nearly two-thirds of responding firms indicated that they also conduct some business outside of Canada.”

The GCSI study identified a number of issues facing the private weather sector as the main impediments to growth, including competition with the MSC for business and staff, the cost of data obtained from MSC and competition with US-based companies. When asked to comment on competitors, respondents claimed that the Government of Canada was their main competitor, while other Canadian and US private sector firms were secondary competitors.

To realize their potential growth, respondents, particularly those in the traditional weather services segment, suggested that it would be necessary to more clearly define the role of the MSC so the MSC is not in direct competition with the private sector. In addition, respondents suggested that increased accessibility and decreased cost of archived and real-time data would lead to improved profitability and opportunities for growth.

To grow, private sector firms also need to attract and retain professional staff. Respondents indicated concern over the capacity of the Canadian education system to provide enough “job ready” graduates in the meteorological/physical sciences. Firms in the sector typically need to conduct focused post-graduate level training to increase the on-the-job functionality of newly recruited staff. In general, the MSC is seen to be able to offer attractive salaries and benefit packages and as a result routinely recruits trained staff away from the private sector, according to the GCSI study.

Several respondents indicated that their ability to compete internationally could be enhanced through increasing levels of formal support from the federal government. Many of these respondents expressed the belief that the increased hiring of Canadian firms by the federal government would enhance their attractiveness to international clientele. Many respondents indicated that enhancements in the relations between the private sector and the MSC are necessary to allow the Canadian private meteorological sector to achieve its full potential. A formal clarification of boundaries between the private and public sectors was seen to be a necessary step in facilitating an improved level of trust that is required for fostering enhancements in this relationship.

In terms of possible future strategies, the GCSI study highlighted the following:

- MSC should clarify its mandate and associated level of services;
- Within the private sector itself, consideration should be given to the re-creation of a private sector meteorological association;
- MSC should, in pricing their services, build in costs covering all expenses borne by the private sector, e.g., taxes to ensure that if they are going to compete with the private sector that they do not artificially lower the price for services in the market place;
- MSC and the private sector should consider joint efforts to improve post-secondary education programs, including possibly taking on a joint responsibility for the operational training of meteorological graduates;
- Canadian government should link with US Government departments and coordinate information gathering and distribution to have a unified North American system;
- CMOS could play a role in helping grow the private sector, including ongoing professional certification, taking on responsibilities akin to those of the American Meteorological Society, and perhaps providing liaison between the government and the private sector.

Many of the conclusions of the GCSI study served as the basis for further discussion by the private sector task force.

The Academic Survey

The informal e-mail survey of meteorology department heads and students at Canadian Universities by the private sector task force over the summer of 2001 also provided some additional material for review and discussion. Canada's post-secondary institutions produce a small number (fewer than 50 each year) of meteorologists and the respondents believe that the existing academic infrastructure had the capacity to train additional meteorology graduates (and, as a corollary, the current infrastructure does not present a barrier) to meet any increased demand for graduates. This conclusion seemed to contradict some of the assertions by respondents to the GCSI study. The weak job prospects, especially at MSC during the late '90s, had in fact impacted on student enrolments in meteorology. In terms of the attitudes of the students themselves, few saw an opportunity in the private sector; most would prefer to stay in Canada, if possible; most expressed a preference for working in the public sector, because of higher beginning salaries and greater job security.

The HLB Economic Study

The economic study by HLB Decision Economics Inc., entitled "Optimizing the Public and Private Sector Roles in the Provision of Meteorological Services" viewed the current situation in the weather industry from a different perspective. It applied economic theory and models to the sector.

Note that as an economic analysis, the study does not address non-economic considerations in the formulation of both private and public policy. Such considerations might include, for example, the government sector's wider mission and commitments in relation to the environment.

The study posed three questions:

1. What is the economically optimal level of capital investment in meteorological infrastructure?
2. What are the economically optimal roles for the private and public sectors in the provision of meteorological technology, research and services? and
3. What policy options exist for optimizing the public and private sector roles and investment levels in the provision of meteorological infrastructure and prediction services? What are the benefits and costs of these options?

The study yielded five principal conclusions:

1. Just under three-quarters of the expenditures of Environment Canada's Meteorological Services of Canada (\$159 million in fiscal year 2001) involve meteorological infrastructure activities and outputs that address a market failure and thus belong in the federal domain. The remaining expenditures, \$66.5 million in fiscal year 2001, are for the production of value-added services that would be more efficiently provided by private firms;
2. The federal government has permitted the value of the capital stock of meteorological infrastructure to erode over the past 25 years. This erosion has contributed measurably to the nation's sluggish rate of growth in productivity and Gross Domestic Product. Although at one-time Environment Canada's five year capital proposal to Treasury Board¹ of \$280 million would yield net benefits of \$4.6 billion over ten years (a 69 percent annual rate of return), even higher levels of federal infrastructure investment are economically justified;
3. Environment Canada charges more than the optimal price (more than marginal cost) for meteorological infrastructure services, thereby preventing the maximization of the economic and social benefits of weather prediction. Treasury Board guidelines on cost recovery permit the use of the marginal cost pricing framework. On the other hand, the subsidies implied by the marginal cost pricing rule present certain economic and practical problems. Various pricing possibilities are available that serve the interests of public policy (see Box Essay in actual Report);
4. MSC does not impute an allowance for normal profit and commercial risk, taxes, etc. into the prices it levies for its value-added products and services. This places private providers at a competitive disadvantage that limits their growth and inhibits innovation in the private sector supply of such products and services. Treasury Board guidelines permit the use of such imputations; and
5. If the federal government were to withdraw from the provision of products and services in which no evidence of market failure is apparent, the value of private sector output and employment in the production of meteorological services would more than double.

¹ This figure represents a one-time capital proposal to Treasury Board for the Program Integrity Exercise I (July, 1999). MSC subsequently received some funding (5 million over five years) from this request. It should be noted this figure does not represent actual MSC capital spending plans.

The HLB study drew some other economics-based conclusions, among them:

- Each one-percent improvement in weather prediction accuracy yields at least \$1.02 billion in social benefits over a 30-year period and that the deterioration in the capital stock has almost certainly meant foregone opportunities to improve forecasting accuracy and the associated social benefits (an estimated \$2.6 billion).
- Of the \$225.5 million in MSC outlays in fiscal year 2001, a total of \$159 million (71 percent) are found to support infrastructure activities, with the balance, \$66.6 million (29.5 percent) supporting the production of value-added outputs – activities that would be supplied more efficiently by private firms. (This finding was based on information available from MSC during a short study period and may therefore be subject to adjustment. Note that the GCSI study identified \$74 million as the figure for MSC commercial revenues, including revenue from other government agencies.)
- If Environment Canada were to withdraw from the market for value-added commercial products and services, there would likely be a larger number of private firms and privately generated products and services, a greater private sector investment and innovation in value-added commercial forecasting products and services; and lower consumer prices for value-added commercial products and services.
- The HLB study also examined the impact on market size of Environment Canada's withdrawal from the provision of value-added commercial services. Based on its economic analysis, the private sector in meteorological products and services would expand from its current level of about \$60 million in total annual revenues to between \$159.6 million and \$186.2 million annually (depending in part on the nature of the transition period). If average revenues per firm remain at the current level (of about \$2 million in revenues a year), the number of firms in the Canadian market would expand from about 30 today to more than 110.

Other Issues and Views

A number of other issues arose during the deliberations of the task force and its interaction with MSC. One was a difference of perspective when it came to examining the options open to the government in terms of reducing MSC's current role in providing numerous so-called "value-added services", in competition with the private sector. For the task force and for the sector players interviewed during the Baseline study, the "solution" was for the government to get out of that part of the business and instead focus on its core strength, namely the operation of the core infrastructure of the national weather system. The issue, in this context, was how quickly could this happen – in other words, the need to develop a "transition" plan.

For MSC, the issues (and the potential solutions) are more complex. For one, there is no clear, simple line between infrastructure and value-added services. Over time, revenues from value-added services have been used to support activities that were underfunded through normal appropriations – the example cited is data archiving, including the necessary quality control functions. Sorting out how and where to draw the line could turn out to be a challenging proposition. A related difficulty facing Environment Canada is the fact that net revenues lost when value-added services are eliminated will not automatically be replaced, in part or in whole, through appropriations. In other words, MSC will not be able to easily redirect resources now dedicated to value-added services to core infrastructure services.

MSC also considers that it is important to maintain the "contracting out" (also known as "make or buy") option should MSC phase out providing "value-added" services. However, the task force perspective is that contracting out should be reserved for core infrastructure activities and not used for "value-added" services; for the latter, the task force is recommending that the MSC get out of these businesses altogether as soon as reasonably possible and that it develop, cooperatively with CMOS, a transition plan to manage the devolution.

It is worth noting that some of the "value-added" services are unlikely to be of interest to the private sector in the near-term. Examples cited are the specialized weather services provided by MSC to NavCanada, the Canadian Coast Guard and the Defence Department. At the same time, the task force feels that some other services – such as road weather forecasting – could be provided by the private sector, but that they need to be disentangled from information and infrastructure sharing arrangements that MSC has recently developed with some provinces, territories, municipalities and Crown Corporations.

Another major issue that will require considerable discussion is the nature of – and pricing for – data that the private sector (and academic clients) require from MSC, in order for them to be able to provide products and services (and undertake research). The consensus that emerged during the task force discussions is that unformatted data should be either free or at marginal cost (with the latter related to bandwidth costs). Users

should be prepared to pay an additional fee if they want (or need) special formatting for data feeds from MSC. The task force felt that a not-for-profit intermediary would be a promising option that should be investigated in detail.

The task force also concluded that some changes in data access and pricing and in the withdrawal from “value-added” services could be accomplished quite quickly (say, in months) whereas other issues might take longer to resolve. The strong feeling was that both should be pursued urgently, with the immediate steps being extremely important to demonstrate progress and the longer-term activities and timeframes being the ingredients of a reasonable transition plan. A number of companies are concerned that data access agreements do not remain in limbo until all the issues are resolved.

A New Vision

The underlying assumption of both the task force work and this final report is that the public and private sectors need to work together to maximize the benefits from Canada’s weather sector, for the general public, for commercial clients, for MSC, for the private sector and for academia. This view is reflected in the Vision that the task force is proposing for the weather sector, namely:

“To develop a uniquely Canadian public/private arrangement so that:

- all citizens and all organizations have instant access to the critical weather and climate information they need, at the lowest cost possible, when they need it and wherever they need it, from competitive Canadian suppliers;
- all Canadian entities know about and adapt to the weather-related risks and opportunities better than those of any other country in the world, thus obtaining an important competitive advantage;
- the accuracy of Canadian weather forecasting improves decade over decade, generating net benefits for the economy”.

The Vision, which would serve as the heart of a new sector strategy for the weather and climate industry, reflects the fact that weather and climate are both particularly vital to life and business in Canada.

Benefits from Achieving the Vision

Successful achievement of such a Vision will have many benefits, among them:

- Canadian weather-sensitive organizations will be able to adapt quickly to changing weather conditions and climate, improve their cost structure and efficiencies, and stay ahead of the competition, both domestic and foreign;
- Canadians will have access to new innovative weather and climate “content”, to help them plan their business operations and recreational lives and to protect property and lives;
- The Canadian financial sector will be able to play a greater role in the burgeoning weather derivatives market; and
- The provinces and territories will have access to new and more accurate weather forecasting for managing their resources and for transportation systems optimization;
- Important export opportunities will be opened up.

The weather-sensitive sectors of the economy – and the economy as a whole – will benefit substantially, through the economic and social benefits that flow from improved weather forecasting and its improved availability to weather-sensitive users. And growth of the weather industry will create new jobs in the knowledge economy in Canada, by providing opportunities and high-quality jobs for graduates of Canadian universities.

Recommendations

Recommendation #1:

The Meteorological Service of Canada (MSC) withdraw as quickly as practical from providing “value-added” services that are or could be provided by the private sector.

This withdrawal should be undertaken in an orderly fashion over the next five years commencing immediately, based on a timetable and transition plan developed collaboratively by the MSC and private sector representatives nominated by CMOS. This would allow MSC to focus on providing and improving its core infrastructure activities and services.

To implement this recommendation, MSC should agree to the establishment of a joint MSC/Private Sector Committee to:

- Establish immediately and fund a nine-member tri-partite committee, to:
 - Establish the principles that will guide the withdrawal;
 - Review, in detail, the lines of business carried on by MSC and to identify those that potentially should be included in the withdrawal plan;
 - Oversee, as appropriate, the division between value-added and core services;
 - Identify priorities and sequencing;
 - Establish firm dates for MSC to exit commercial services.

Membership of the committee should consist of three persons from MSC, three persons from the ADM’s advisory committee and three nominated by CMOS from the Private Sector Task Force. The first meeting of the committee should be held as soon as possible, with a progress report to be tabled by the end of the following three months.

Recommendation #2:

The MSC implement as soon as possible (i.e., early in 2002) a new pricing and data access policy, based on “marginal cost pricing”, for companies and institutions to obtain both data and modeling services from MSC, for use in creating “value-added” services for sale to public and private clients.

A first discussion with industry representatives nominated by CMOS should take place as soon as possible: To establish the principles for the new pricing and data access policy;

- To agree on a definition of “marginal cost pricing” that reflects the concept used in the HLB study; and
- To establish a timetable for implementation that is both speedy and reasonable.

For the purposes of this first discussion, “marginal cost pricing” would mean no-charge for the actual information/data (which is being developed for use by the public), with at-cost charges for access.

To oversee the ongoing development of the new pricing and data access policy, MSC should establish an implementation task force to interface with CMOS representatives of the private sector and the academic community. The task force should be funded by MSC and be charged with developing a consensus draft policy by the end of fiscal year 2001/02, i.e., March 31, 2002.

Recommendation #3:

The Government of Canada approve the proper funding/investment in Canada’s core weather infrastructure over the next five years, to rectify the erosion since 1976 and to serve as a base for a viable improvement of public-good forecast services by government and “value-added” services by the private sector.

This should include an appropriate amount (initially estimated at \$10-million per year) in new appropriations funding, to allow MSC to withdraw from value-added services and to stop using associated revenues to invest in A-base activities.

To support this recommendation, MSC should undertake to refine the HLB economic study if deemed necessary and, at the appropriate time, share the study with officials of the Finance Department and Treasury Board.

MSC should also identify those resources (human, capital and operating) that are essential to the core infrastructure that are currently being funded (directly or indirectly) by revenue derived from value-added services. This in turn will require a careful and urgent assessment of what services are “core” and should continue to be undertaken by MSC and what services are “value-added” and should be covered by Recommendation 1.

Given the direct relationship between Recommendation 1 and 3, the committee established under Recommendation 1 should oversee the MSC activities in this area.

The MSC should report quarterly to CMOS and other interested parties on both the progress of and basis for its funding requests.

Recommendation #4:

The meteorological sector (public/private/academic) develop a multi-year cooperative employment and training plan and examine the benefits of professional certification of Canadian meteorologists, including the standards, testing and organization to be used.

The multi-year plan would be designed to forecast and advertise job employment opportunities and maximize the use of Canadian graduates, in order to stabilize hiring from year to year. It should include a cooperative plan on hiring and job postings and could include joint forecasting of job hirings, apprenticeships and co-op programs with the private and public sector, and a sector-wide system for posting job opportunities at universities. A small committee should be established to oversee this work and report back with recommendations within six months; membership might include one private sector and one academic member (both nominated by CMOS), a DG-level MSC member and a MSC employee representative.

This same committee should examine the pros and cons of professional certification of Canadian meteorologists and include recommendations on this issue in its report. In both cases, its recommendations and reasoning should be made available publicly.

Recommendation #5:

The public and private sector examine how best to encourage innovation and technology transfer, on an on-going basis, to ensure continued improvements in weather forecasting accuracy.

This work, which should involve both MSC and CMOS, should:

- Engage Industry Canada, Granting Councils, research foundations (federal and provincial) to develop an approach to tackle this issue, including the possibility of undertaking the development of an Industry Canada-sponsored “roadmap” exercise that would examine future directions and barriers to weather and climate science and technology.
- Examine the feasibility (and financing) of a study on the barriers preventing greater commercial sector support of research and development; on the pros and cons of establishing a not-for-profit institution to act as the catalyst for commercializing new science and technology; and on the role of tax incentives for R&D on weather and climate.

Recommendation #6:

The weather sector, both public and private, should work collaboratively to develop a communications/marketing plan to raise the public's appreciation of the value of weather-related services.

This should include development of cooperative advertising and surveying, to sensitize target markets to value-added weather services, and development of a collaborative web site strategy, to highlight opportunities, detail available services and link to the web sites of public and private weather sector partners.

Next Steps

The private sector task force is committed to pursuing the implementation of all of the recommendations in this report. This will be accomplished in a number of ways, including:

- Meeting with politicians and senior government officials to promote a dialogue on the importance of the appropriate mix of public and private sector participation in the weather sector, of improved access and pricing of critical weather data, and of enhanced investment in the core weather infrastructure;
- Using the studies undertaken as part of this sector strategy study to help key decision makers recognize the urgency of action by the federal government; and
- Participating in the ongoing dialogue needed to move the strategy forward;
- Determining whether the weather industry needs a private sector association, apart from the CMOS private sector committee, and if yes, determining what role the new organization would fulfill.

In this regard, the private sector task force members believe that considerable progress can be made in a very short period of time (weeks, not months) by building on the work and the dialogue that has already taken place.

Appendix A: Membership of the CMOS Private Sector Task Force

- Ian Rutherford, Canadian Institute for Climate Studies (co-chair)
- Susan Woodbury, Seimac Limited (co-chair)
- Beverly Archibald, True North Weather Consulting Inc.
- Robert Boggs, World Weather Watch
- Neil Campbell, CMOS
- Philip Jacobson, Environment Canada
- Jean-Jacques Rousseau, Centre de Recherche en Calcul Appliqué (CERCA)
- Ambury Stuart, Weather Research House
- Peter Taylor, York University
- Paul Temple, Pelmorex

Appendix B: “Baseline Status of the Private Meteorological Services Sector in Canada” by Global Change Strategies International

Appendix C: Optimizing the Public and Private Sector Roles in the Provision of Meteorological Services; a Study by HLB Decision Economics Inc.

Appendix D: Presentation on A Meteorological Industry Strategy for Canada

A METEOROLOGICAL INDUSTRY STRATEGY FOR CANADA INITIAL THOUGHTS FOR DISCUSSION

Presentation by R. Ambury Stuart, Ph.D.
On behalf of the CMOS Private Sector Task Force
May 29, 2001

I want to say first of all that it is an honour to follow Dr. Everell in this session of the Canadian Meteorological and Oceanographic Society, and to recognize and affirm the new directions that he is urging for Canadian meteorology. Unlike the other sessions of this Congress where we will be looking at highly specialized academic studies, this session is trying to look at the BIG picture, the overall policies and ideas that will shape Canadian meteorology for the next ten years. In a moment I will try to respond to Dr. Everell's vision of this future, and I will do so from my limited perspective as a member of the private sector community of meteorologists.

First though, I think we need to understand again how we all participate in the BIG picture. I have participated in conversations among government, university and private sector scientists long enough to know that whenever we approach these discussions we all make sure that we have our government, university or private sector hats firmly attached to our brains. Often these hats become football helmets as we bash into one another. I would like to suggest another approach. We all work for a single corporation which I will call Corporation Earth. Those of us in this room work for two different branches of Corporation Earth which are the Atmosphere Branch and the Oceans Branch. We live and work in a geographical area called Canada, but you don't have to work in either the Atmosphere Branch or the Oceans Branch for very long before you realize how secondary and irrelevant these human divisions into nation states really are. The atmosphere and the ocean don't give a fig for national boundaries. It is the most natural thing in the world for us to think hemispherically or globally when we do our work. Does it make any sense for example to have a Canadian global climate model or a Canadian global weather prediction model? Maybe a made in Canada meteorology or oceanography is just as unrealistic and finally unworkable as made in Canada oil prices that the government tried to achieve with the National Energy Program in the 80's. Anyone who has been to a gas station recently will know that that program failed. Surely the flow of atmospheric and oceanic currents across national boundaries is just as disrespectful of these boundaries as the economic forces of the global energy market for oil and gas. Why don't we stop trying to kid ourselves and join forces with our counterparts in the United States?

For most of us in this room these ideas are a kind of heresy that we reject right away. "Things are different here in Canada", we argue with varying degrees of conviction. "We might just as well become the 51st state and be done with it". This society - The CANADIAN Meteorological and Oceanographic Society - exists to promote the advancement of meteorology and oceanography in Canada. These dangerous and crazy ideas would suggest that this society become a branch of the American Meteorology Society - just as we started out as a branch of the Royal Meteorology Society over 50 years ago.

Let me say right now that I too reject these heresies. I, like most of you sense a value of being part of our profession in this country, but I think that we must admit that our position is becoming harder and harder to defend. The world is becoming smaller, national economies are being merged as large trading blocks in Europe and North America are being formed. If we are going to maintain our separateness as Canadian meteorologists and oceanographers, then we need to work harder at doing this than we ever have before.

I think we must begin by learning to work together more effectively. If we don't hang together, then we'll hang separately! Those of us who work in the private sector believe independent companies have strategic and tactical advantages over government organizations and universities in the application of private capital investment to meteorology. We would like to exploit these advantages and grow our companies, but over the past five years or so it has been almost impossible to do this for reasons that most people understand very well. Some companies have closed their doors, others have given up on Canada, and still others have given up on meteorology. However, now it seems the wind has changed. There seems to be a new interest in MSC to revisit the idea of partnerships in more meaningful ways. And we in the private sector welcome that change - first with scepticism and now with optimism.

Today I am going to report to you on a unique new attempt to build a Meteorological Industrial Strategy for Canada. Notice that this strategy still believes in a distinctively Canadian approach to this issue and for this reason alone it has value, not only to the private sector but also to everyone who wants to maintain a unique Canadian profession.

The purpose of this talk is to present initial thinking on an industrial strategy for the "weather" commercial sector, where weather includes meteorology, climatology, air quality and hydrology. You need to know that this strategy has been developed by a Task Force made up mostly of members of the CMOS Private Sector Committee, and while we are grateful to MSC for helping us with the funding to do this study, we need to emphasize that none of the views to be presented here necessarily reflect the views of Environment Canada. We are here to seek your feedback both in this session and the panel discussion after the coffee break, and to move forward to take advantage of opportunities.

We all know why weather is important from a commercial sector perspective - most of our industries in Canada are affected by the weather, either directly or through transportation and energy costs. As our technological capacity improves, we need to know weather information will become more and more important.

Climate as well - especially climate change and variability - has important commercial sector implications, especially in long-range planning and infrastructure decisions.

Despite its importance, the commercial weather sector today is quite small - \$65 Million - which includes MSC commercial activities outside intergovernmental "sales" like the large contracts with Nav Canada, Defence, Coast Guard and the provinces. Together, the private sector and MSC generate more than \$130 Million in revenue. In the U.S., commercial services have a value of \$1 Billion. There are about 100 firms in commercial services in Canada including traditional weather services, environmental science and policy and instrumentation and software. Most are small with

the exception of the Weather Network which accounts for about half of the non-MSO revenues in the commercial weather sector.

These details don't matter very much. There are two players in the commercial weather sector today - Pelmorex and MSO who together have about 70 per cent of the market and who have been responsible for virtually all of the growth in the past decade.

Times are changing though. Government spending constraints have reduced contracts to private companies for research and services forcing those companies to look elsewhere for revenues. Some of the survivors and newer companies as well are moving into value-added weather and climate services to non-government clients. The Weather Network has become the prime Canadian source of weather information through the mass media including the Internet. The MSO is refocusing on its core services most of which are in the public sector as opposed to the commercial sector. Finally, the communications revolution is having its impact on commercial weather services in a variety of ways. The availability of information of all kinds has stimulated increased demands for weather information so that is a plus. However, the ease of access of Internet communications has also increased the number of providers of this information and greatly increased the competition. Like Corporation Earth, the Internet also has no respect for national boundaries.

MSO has announced that it needs more money for key infrastructure improvements, but it will have to compete with all the other demands for government money, including for example the demand for reduced taxes so that doctors, nurses, scientists, engineers and mobile high-tech industries don't leave the country for more after-tax dollars in other jurisdictions. Without new revenues, MSO services will deteriorate which will in turn make them vulnerable to suggestions that everything except the raw observations be done south of the border. If the new infrastructure investment can be secured however, public good needs will be better met, and we have a chance to develop a commercial sector industry that returns strong economic benefits to industries that operate in Canada and who have to deal with Canada's weather. With growing international competition, these weather sensitive companies will need all the help they can get, and governments at all levels will value the expertise that provides this help.

So our vision for the future is the development of a uniquely Canadian public-private partnership so that all citizens and organizations have instant access to critical weather and climate information they need, when they need it and wherever they need it, from Canadian suppliers so that the Canadian economy knows about and adapts to the weather-related risks and opportunities better than any other country in the world. This as I see it is our response to homogenizing effect of globalization that would submerge our Canadian ship into a global sea. We are different up here because our weather and its related risks and benefits are different. Also, it is not just a matter of dollars and cents. If we plan our commercial and recreational activities with more attention to the weather then we will expend less energy and pollute less. If we use less pesticides on a field because we better understand the winds then less pesticides will end up in the ground water. We have unique weather challenges in Canada that would not be a priority in a U.S. led initiative either in the private or public sector.

What are the outcomes of such a vision?

- Canadian weather sensitive organizations will be more efficient economically and they will pollute less.
- Canadians will have access to information that is specifically tailored to Canadian conditions.
- The Canadian financial sector will discover the weather derivatives market and will open up even more opportunities for weather expertise.
- Public services will also be improved - things like improved highway weather forecasting will be better.

In addition to advantages to Canadians and Canadian business, the commercial weather itself will become a valuable part of Canada's high-tech sector.

- It will lever Canada's advantages in research, technology, communications and resources.
- It will develop leading edge content for Canada's Internet agenda.
- It will provide growth opportunities in the information, high tech and science sectors and the career opportunities that go with that.
- It will grow very rapidly as new high tech initiatives often do from about \$70 Million now to \$500 Million in 2011 which is about half the size of the current U.S. industry.

So how do we do this?

From government we need a collaborative weather network that collects timely, high-quality weather information, forecasts and weather services, both for public good and as input for private sector commercial products. By "collaborative", we mean a weather network where many players assist Environment Canada in gathering the core information from which all participants benefit.

From universities we need training of the required professionals and cutting edge research that serves both government and industry requirements.

From the private sector we need a weather industry that is recognized around the world as innovative and competitive.

And now we get to the tricky part. We don't have an adequate commercial services sector now and if we are going to get one then things have to change. Change is always difficult and difficult to negotiate. In order to begin this process, the Task Force has planted some seeds in the form of questions to begin discussion.

We need a new partnership model if we are going to be successful.

What could be a redefined role for MSC? Is it possible for them to focus on core infrastructure collecting and analyzing activities that only they can do in gathering and analyzing weather and climate information? Is it possible that they could provide data outputs at little or no cost to stimulate new products and services?

How might the academic sector provide more qualified people and more targeted research products? Is it possible that the private sector might become more actively involved in the allocation of government R&D grants to universities?

How might the commercial sector outside MSC quickly expand its capacity for value-added services? Is it possible or realistic to envision the private sector taking on more/most commercial weather activities?

We need to expand the private sector.

What are the barriers? Is growth being blocked by small Market size? Do we lack Investment Capital? Are we short of talented People?

What commercial services should be targeted first?

How should the commercial services people in Environment Canada respond to the need to expand the private sector?

Are there better ways to distribute data?

What other government agencies outside Environment Canada might be helpful?

Should the weather industry be better organized? How would we do this?

We need rapid transfer of data and the results of relevant research

How can we encourage this?

What are the barriers? Is it Investment capital? Organizational issues?

What other areas of science and technology need to be brought into play? Where is the expertise for that?

Who in the government/university/industry mix does what?

How do we deal with legal issues around intellectual property?

We need qualified and energetic people.

Can future demands be met with current educational institutions?

Can we coordinate with Environment Canada's hiring needs better?

Should there be an accreditation standard for meteorologists?

Should there be a sector council to oversee growth? How can we tap expertise in Human Resources agencies in federal and provincial governments?

Finally there are marketing issues

What are the market opportunities?

What kinds of products and services are needed?

How do we get the word out?

Would an industry-wide web site be useful? Who would run it?

Where do we go from here?

Following our discussions today, we intend to hone our thinking and carry out appropriate economic research in Canada and elsewhere before completing our report in the fall.

The Task Force is grateful to MSC for support for this work. We have presented a private sector perspective on what the future of our industry should look like if it is to become an effective player in the Canadian economy. We believe that with more effective use of weather information, improved efficiencies will also result in less waste and environmental degradation. This is truly a win/win situation which will enhance the environment and will at the same time ensure that those of us who consider the environment to be so important that we have dedicated our working lives to it to be able to continue our work in Canada, whether it be as a public servant, an academic or an entrepreneur.

Thank you.

Note:

Dr. Stuart's talk was accompanied by a slide presentation. If you would like further information on this presentation or would like to provide feedback to the Private Sector Task Force, please contact one of the co-chairs of the Task Force, Susan Woodbury swoodbury@seimac.com or Ian Rutherford ian@houlerutherford.com

Appendix E: E-mail Survey Questionnaire for Faculty Heads and Students of Canadian Meteorology Universities

Context

A private sector weather strategy task force of Canadian Meteorological and Oceanographic Society (CMOS) is developing a meteorological sector strategy, for consideration by the federal government this fall. As part of its work, the task group is seeking the views of students and professors in the academic sector as input for the task force as it develops the overall strategy and specific recommendations for action under the strategy. The sector strategy would address roles, responsibilities and strategies of the public sector, the private sector and the academic sector.

We would request that you support our work by responding to the questions, below, by e-mail by August 1, 2001.

Questions for students

1. What, in your view, are the challenges facing students pursuing a career in meteorology?
2. When you think of your future job prospects, do you think of working in Canada or elsewhere (if in the U.S., specify)? Why?
3. Would you expect to work for the private sector or for the public sector (government, national or international); in an operational role, research, teaching, consulting or in another occupation where your meteorological training would be useful? Why? Are you thinking of employment outside of meteorology and, if so, where? Why?
4. How would you describe your view of the prospects of working in the public sector, in the private sector or in academia? Consider opportunities for entry-level jobs and advancement, salary levels, interest-level/challenge factor?
5. What could be done to improve prospects for working in the private sector? In what ways can the current meteorology programs (at universities) be altered to better prepare students for employment?
6. One issue identified in the task force's work to date is the need to smooth-out the hiring from year to year, especially by large players like the Meteorological Service of Canada (MSC) and Pelmorex/The Weather Network? Is this something you feel needs to be done and, if so, have you any thoughts about how this could be accomplished?
7. Should accreditation be standardized for meteorologists and, if so, how? Should there be a standard defining an accredited meteorologist and, if so, what?

8. Is it worth establishing a way to accredit meteorologists?
9. What are your salary expectations for the your first job; in 5 years; in 10 years?

Questions for academics

1. What, in your view, are the challenges facing the academic sector in meteorology: from a teaching point of view; from a research point of view?
2. How could the academic sector help to fill the needs for more professionally-qualified meteorologists? What in your view is needed to enhance meteorological research in your institution? in Canada?
3. What is the training capacity of your institution? Can future demands be met by existing Canadian post-secondary training capacity?
4. What should the appropriate roles be for academia, governments and the private sector in carrying out meteorological R&D? What is your view about the current level of funding by the private sector of R&D? What could be done to encourage more R&D in the private sector?
5. How could the private sector work with government and the academic sector in providing input on the allocation of government R&D funds? Are there examples where this is already happening that the task force should examine?
6. What can be done to encourage/enable increased technology transfer between universities/research establishments & the private sector? What are the appropriate roles for each?
7. What are the barriers to commercializing new science and technology developed in universities and other R&D institutions? Are there special tax incentives or institutions that would help?
8. What are the critical areas of Science and Technology that could be applied to weather & climate?
9. Is there a need for a new policy on licensing and intellectual property rights in connection with the results of academic research?
10. What are your major deterrents in setting up, organizing or pursuing meteorological research programs in Canada?