State of the Lakes Ecosystem Conference
Peer Review Report

October 7th and 8th, 2003
Toronto, Ontario

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Acknowledgements

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- Peter Hardi of the International Institute for Sustainable Development,
- Hans Herrmann of the Commission for Environmental Cooperation,
- Robin O'Malley of the H. John Heinz III Center for Science,
- William E. Rees of the University of British Columbia,
- Risa B. Smith of Environment Canada, and
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Section 1.0 Introduction

In 1992, the governments of Canada and the United States established the State of the Lakes Ecosystems Conferences (SOLEC) to fulfill the requirements of the Great Lakes Water Quality Agreement (GLWQA), which called for coordinated, consistent and science-based reporting on the state of the health of the Great Lakes basin ecosystem every two years. Environment Canada and the United States Environmental Protection Agency (US EPA) are the lead agencies supporting the SOLEC initiative and they work with many partner agencies and organizations to successfully report on multiple components of the Great Lakes basin ecosystem.

SOLEC has evolved into one of the primary venues by which the governments of Canada and the U.S. report progress on attaining the goals of the GLWQA. The SOLEC approach is comprised of two main elements: the biennial conferences and the subsequent State of the Great Lakes reports that are based on ecosystem health indicators. The biennial conferences provide a forum for Great Lakes stakeholders to review the initial assessments provided by indicator reports, to discuss their management implications, and to provide any additional information or interpretation on the indicators. The State of the Great Lakes reports provide an overall assessment of the health of the Great Lakes based on individual indicators.

In the interest of improving SOLEC, Environment Canada and US EPA are implementing two peer reviews. The first peer review involves a panel of experts in indicator development and implementation (see Attachment 1 for biographies of the panel). The overall goal of the peer review is to enhance the quality and credibility of the SOLEC work products so that any future decisions or positions have a sound, credible basis. A second SOLEC review, or review workshop to assess the entire suite of SOLEC indicators, is planned for January 2004, for managers and stakeholders within the Great Lakes basin. Participants will evaluate the indicators' utility, success, and effectiveness in influencing decision makers, and make recommendations for improvements. This document summarizes the findings from the first peer review.

The first peer review meeting was conducted from October 7-8, 2003 at Environment Canada, in Toronto, Ontario. The peer review panel was comprised of the following experts:

- Ronald Colman, Genuine Progress Index for Atlantic Canada
- Peter Hardi, International Institute for Sustainable Development
- Hans Herrmann, Commission for Environmental Cooperation
- Robin O'Malley, H. John Heinz III Center for Science
- William E. Rees, University of British Columbia
- Risa B. Smith, Environment Canada
- Ben ten Brink, Netherlands Environmental Assessment Agency

The peer review panel was asked to provide objective evaluations of the SOLEC process, approach, and efficiency, based on comparisons to other national and international indicator reporting systems, as well as to evaluate the products of SOLEC. US EPA contractor staff facilitated the meeting.

Prior to the meeting, each peer review panelist received the following documents on a CD-ROM:

- three journal articles,
- Terms of Reference for the peer review,
- *State of the Great Lakes 1995: Standard Report*,
- *State of the Great Lakes 1997: Standard Report*,
- *State of the Great Lakes: Standard Report*,
- *State of the Great Lakes 2001: Standard Report*,
- *State of the Great Lakes 2003: Standard Report*,
- *Implementing Indicators 2003: A Technical Report*,
- *Selection of Indicators for Great Lakes Basin Ecosystem Health*,
- *The ABCs of Indicators*, and
- the SOLEC 2002 presentations.

At the meeting, panelists received a copy of the *Peer Review of the State of the Lakes Ecosystem Conferences Briefing Binder*, containing:

- the meeting agenda,
- the peer review technical charge,
- a list of the purpose and objectives of SOLEC,
- a copy of the presentations being given at the peer review,
- an abridged version of the report *State of the Great Lakes 2003*,
- the peer review panelist biographies, and
- peer review participant contact information.

The meeting began with extensive presentations by the SOLEC Executive Committee describing SOLEC's history, objectives, biennial cycle, conferences, products (e.g., three types of reports), partnership process, audience, indicator selection and development, and societal indicators. During the presentations, an open question and answer forum was encouraged to promote discussions and to ensure the panelists had a complete understanding of SOLEC.

The SOLEC Executive Committee requested that reviewers specifically consider and address the topics and questions provided in the peer review technical charge (Attachment 2). Sections 2.0 to 4.0 of this document contain a detailed summary of the panel's comments on the charge. Finally, Section 5.0 discusses any comments provided by the panel that did not address the questions in the charge.

Section 2.0 SOLEC process

The reviewers' comments on the effectiveness and efficiency of SOLEC are based on their impressions and the information provided by the SOLEC Executive Committee and not on a scientific survey or other systematic means of assessment.

Section 2.1 Biennial cycle

The panel members agreed that the biennial cycle is adequate and important to SOLEC's success. A five-year cycle would be too long. One panelist suggested that SOLEC might be more effective if it employed separate cycles for different tasks. He noted that it is worthwhile for SOLEC to be constantly reporting on the full suite of indicators on a regular cycle, even if the assessments have not changed. "No change" may also be an important feedback to managers and decision makers.

Section 2.1.1 Effectiveness

The panel members agreed that the SOLEC conference has great impact. The conference provides an extensive and very successful networking forum for a multitude of stakeholders. If mayors and other stakeholders, who are not typically in attendance at such events, participate in the conference, then SOLEC is a model of public debate and is very effective. The panelists emphasized how important it was that SOLEC expanded the scope of Great Lakes management focuses from only chemical toxins in the early 90's to a variety of important and complex issues, such as land use and invasive species. The State of the Lakes Ecosystem Conference is a regular event on the calendars of many Great Lakes stakeholders.

All panelists felt that, from the outreach perspective, SOLEC is unique and effective, but noted that the SOLEC process and products are the areas that could use improvements. They noted that earlier reports were too narrowly focused. One panelist stated that SOLEC is one of the most important indicator projects around.

A few panelists suggested that the reports would be more effective if they provided recommendations on environmental management and if environmental managers and policy makers would provide responses to the SOLEC reports. At least one panelist strongly disagreed, noting that adding a major emphasis on management recommendations, without appropriate safeguards and "firewalls" between SOLEC as an indicator and reporting effort and the making of recommendations, is a potentially dangerous direction for SOLEC to take. This is discussed further in Section 3.0. One panelist suggested that in order to judge the effectiveness of the SOLEC conference, a questionnaire could be circulated to attendees and the answers could be evaluated. One panelist mentioned the need to measure the SOLEC indicators against some form of desired future state, such as targets or management objectives, and this would improve the ability to assess effectiveness. SOLEC has begun to do this in some instances and should continue these efforts.

Section 2.1.2 Efficiency

All panelists agreed that SOLEC is very cost-efficient, given that the report, conference, and other SOLEC products, are developed by only a few individuals. They noted that SOLEC is very efficient, due to the unique cooperation between the United States and Canada. In terms of return on investment, SOLEC is highly efficient due to the collaboration with other agencies, academia, and monitoring groups. The partnership with monitoring groups, especially, is a very efficient component of the process. The panelists suggested that in order to judge SOLEC's

efficiency, the labor of all SOLEC report authors, monitoring groups, and other contributors must be accounted for. One panelist cautioned that the monitoring groups might be less likely to contribute to SOLEC if a larger group administered SOLEC. Several panelists suggested that additional funds could be used to do further analysis, improve data quality, frequency of data collection, and data management. The reviewers highlighted that although SOLEC is obviously run very efficiently, and both governments receive an excellent return on their investments, additional funds could be used not just to improve data quality and management but also communication products and the development of indicators. A specific example of a need for improvement is in the easy access to "drill down" data.

Section 2.2 Indicator selection and development process

The panelists agreed that SOLEC has done a remarkable job in developing the current suite of indicators. At the same time, the panel had many specific suggestions for improving the process. Many panelists commented on the state-pressure-activities (SPA) model that is used for indicator development by SOLEC. They noted that there is a worldwide trend to avoid the SPA model because it is linear and does not allow linking multiple causes and multiple effects. The World Health Organization, for example, changed to the multiple effects model (Gibson model with driver) because it allows for linkages among the SPA indicators. One panelist suggested that the SPA indicators as they are right now do not show the relationship among them, making the analysis of the overall system more difficult; the model could be more effective by directly linking the state indicators with the pressure and response indicators.

One panelist noted that it might be unwise for SOLEC to change in midstream, because the SPA model is well known and respected; another panelist cautioned that the model can still be useful if it is not viewed and used in the strict linear sense noted above. It may be useful to add a fourth dimension, focusing on "Uses (U)." Additionally, the Organization for Economic Co-operation and Development (OECD) is committed to a version of the SPA model, the "Driver-Pressure-State-Impact-Response" (DPSIR) model. That model has the advantage over standard SPA models of focusing on whether policy response (R) does or does not effectively influence the driving force (D) that underlies and moves environmental impacts. Yet it was noted that SOLEC should be keeping an eye on developments in this area to ensure that it is not out of step with directions in other indicator reports.

One panelist believes that in an ideal world, the indicator development process should be based on modeling; however, the costs associated with this effort are prohibitive. Another panelist noted that still the best way to expand the work is to link the SPA and U indicators through quantitative modeling. It would also allow linking of socio-economic scenarios to the state of the ecosystem and considerably increase the usefulness of indicators as policy-making tools.

The panel discussed the indicator development process in the context of the human component. They all agreed that SOLEC should integrate the lake ecosystem and human activities to understand the overall system. This point was raised repeatedly by the panel in the context of many topics that were discussed throughout the meeting.

The panelists agreed that SOLEC should reduce the number of indicators. Some of the indicators are unnecessary and redundant. SOLEC should determine which indicators are missing and which are over-represented. The panelists all agreed that it is difficult to narrow the number of indicators, but it is important: having too many indicators results in diluting the more important indicators. One panelist noted that, in reading the 2003 report, six significant issues emerged: contaminants, invasive species, fisheries, lake levels, eutrophication and nutrients, and loss of habitat. Another panelist suggested to add a seventh issue: the extent of remaining ecosystem types and quality. The panelist suggested that the full suite of indicators could be collapsed to these six "headline" issues, thus greatly simplifying the lake assessments and reporting; a hierarchical approach was suggested, in which a short set of headline indicators would be complemented with a larger set of supporting measures. Another panelist recommended clustering the indicators into 2 categories: pollution and resources, using freshwater quality and waste generation for the pollution category, and freshwater resources, fish resources, biodiversity (habitat and species) for the second category. The panelists noted that indicator selection was currently driven more by which agencies or experts were already collecting data rather than by prioritizing indicators according to importance or significance.

The panelists all agreed that to adequately affect decision makers, SOLEC must decide what are the most important indicators and report on those. They suggested that perhaps SOLEC could collapse and bundle several indicators into one. The use of a small number of themes (such as the six or seven identified above) would be very useful in improving the readability and accessibility of the written product as well.

The panelists noted that there are two levels/layers of indicators applying to the two major audience groups: policy makers and environmental managers. Environmental managers would still need specific indicator information at a smaller scale, as opposed to being aggregated, while policy makers need a more aggregated and smaller suite of indicators.

The SOLEC report presents what at least one panelist would consider an "assessment approach" as opposed to an "indicator approach." The latter has a discrete well-defined set of indicators and these are monitored over time using standard methods. An assessment approach has a set of endpoints that are of interest, with a process for obtaining data and information about the endpoints and making judgments about them. SOLEC takes its set of endpoints and every two years, finds pertinent experts to gather available information for them, make judgments about them, and report on their state. The reports include detailed narratives of what the author knows about a particular subject and then makes a judgment about it.

Section 2.2.1 How well does this process work to identify a suite of Great Lakes indicators?

All panelists felt that the assessment of indicators is not transparent, not standardized and is too subjective. They noted that SOLEC has accomplished important tasks, but it is time to make it more credible and internally consistent. The science must be more rigorous, transparent, and focused. Additionally, the indicator assessments are confusing for the SOLEC audience. For example, if an indicator is listed as "good" one year and as "mixed improving" the next year, the

category may not reflect deterioration to the majority of the audience. SOLEC should re-evaluate the categories of indicator assessment.

All of the panelists noted that SOLEC should establish indicators that more accurately represent ecosystem characteristics of interest. They provided specific examples of inappropriate indicators and suggestions for more appropriate indicators. Most of the issues concerned the societal indicators and the lack of relationship with the suite of ecosystem indicators. Several panelists noted that the SOLEC development process is missing the human component.

Section 2.2.2 Does the peer reviewer have advice to improve the indicator selection/development process?

The panel members recognized that the management of SOLEC is a developing process, but all agreed that the biggest shortcoming in the SOLEC process is the lack of standard methodology and harmonization among indicators over the years. SOLEC must establish standard protocols to improve data comparability and reliability. SOLEC currently trusts the integrity of the data and the assessment process from a multitude of monitoring agencies. All panelists agreed that some type of data verification should be instituted. One option suggested by the panel is to review the quality control (QC) protocols that are being used by each agency, instead of reviewing each data set. Another more rigorous approach is that SOLEC could review the procedures that were used to collect data and confirm that the QC procedures were followed.

The panel raised the concern that the SOLEC process has serious flaws regarding lack of repeatability and transparency. SOLEC needs to include much more detail regarding how the assessments of the indicators were done. This is especially true given that the present assessment of the indicators is subjective. The reports should clarify how and why the indicators were selected and should provide more justification of the assessment.

One panelist suggested that in order to be effective, the indicators must be defined by the actual users, and that policy makers and environmental managers need to be involved in the early stages of indicator development. SOLEC's indicator development process is too weighted by expert opinion. There is a disconnect between the development of the indicators and the usefulness to the policy makers. The indicator assessments should be presented in terms of baselines that are consistent across indicators and relevant in regards to the ecosystem and policy. The baselines should be realistic in terms of the ecosystem characteristics and also should consider environmental policy; they would help establish policy targets and link the indicators to policy objectives. It was also noted that there is currently no systematic monitoring of the degree to which the SOLEC indicator process impacts management decisions and effects change. This is essential in order to bridge the current gap between the excellent work of the scientists, experts, and SOLEC core group on the one hand, and the management, policy actors on the other.

One panelist in particular (generally supported by others) felt that SOLEC was uniquely positioned to identify the "load" imposed by human activities taking place within the Great Lakes basin (particularly economic production/consumption) on other regions outside the basin and on the global commons. This panelist argued that at least some of the stable or improving environmental quality of the Great Lakes could be explained by the facts that many polluting

industries have migrated to other areas of the world (which now must bear the pollution burden), that the region dumps much of its waste into the global commons (e.g., the atmosphere and oceans) outside the basin, and that many of the resources and commodities consumed in the region are produced in "distant elsewheres." In short, the high quality of life enjoyed by many in the Great Lakes basin is supported, in part, by carrying capacity imported from outside the basin. This means that the study region grows and develops partially at the expense of environmental quality in the rest of the world. The panelist noted that the extent of this "impact off-loading" could be illustrated through ecological footprint analysis (EFA) and that developing such an index would help raise to popular and political consciousness the Great Lakes basin's responsibilities as a regional "global citizen," to tread lightly on the planet.

A second panelist cautioned that developing a regional "ecological footprint," while potentially useful, would be a difficult process and that the results would be politically sensitive. Yet another panelist agreed that SOLEC should address human economic activities in some way if only to demonstrate how people have to tread more lightly on the Great Lakes system itself. Panelists noted that these points are being missed because the SOLEC process involves scientific experts and one cannot get an over-arching perspective from a group of experts where each individual is responsible for assessment of specific indicators. One panelist noted that such a significant policy change as addressing human impacts in this holistic sense might be dangerous for SOLEC. The panelists agreed that the inclusion of specific indicators in the SOLEC process could stimulate the environmental agenda; however, too many agendas could collapse the entire process.

The panelists all agreed that socio-economic indicators are worth including in the suite of indicators being developed by SOLEC because they address human activities, as long as they relate with the suite of ecosystem indicators. The biggest challenge with societal indicators is obtaining pertinent and consistent data across the Great Lakes communities and developing meaningful indicators that influence people. The societal indicators are too scattered, incomplete, unstructured and not as rigorous as the ecosystem indicators; they do not show a cause-effect relation with the ecosystem indicators. The panel discussed the fact that for societal indicators, a better evaluation needs to be made regarding what types of data should be collected and tracked to obtain a more meaningful assessment.

Section 3.0 SOLEC products

The panel members agreed that the *SOLEC 2003 Standard Report* is a very good report. Most of the panelists agreed that there were only a small number of relevant issues. Many of the indicators in the report can be thought of as "signals" supporting the relevant issues. One panelist suggested that SOLEC should revise the reports to include five pages up front detailing these issues with representative indicators. The rest of the report would discuss the full suite of signals.

The panel members agreed that, in the reports, SOLEC should clarify how the authors made their judgments (mixed, mixed-declining, etc.). It should specify how the various data components were weighed in each assessment and clarify the basis for the judgments. The background for the derivation of the calculations also should be detailed in the reports.

The report should more clearly state who is making the assessments. One panelist suggested that in order to improve readability, SOLEC should impose "meta-metrics" by collapsing many graphs of data on separate species into one graph that shows if the overall population of the species group (such as several frog species) is declining or increasing. Further, there are different formats and metrics being used for different lakes and this requires extra work in interpretation. The metrics need to be harmonized over the entire process.

Several panelists agreed that the reports should include environmental management recommendations, while at least one of them strongly disagreed. Those in support noted that the management issues should to be organized and presented in much more detail in order to be effective. The management challenge structure that occurs at the front of the report is a good format for the beginning of the document. The groupings of indicators should follow this structure. The final chapter could include management recommendations and responses. The panelists who disagreed strongly recommended that there be a clearly demarcated distinction between the management recommendations element of the report and the indicators and reporting elements. A management report could be a valuable product especially if it is developed by a group that does not have a scientific or political agenda. One panelist added that if this were done – in a transparent, open, accessible, and inclusive manner, it could be an important (national, maybe even global) model for regional decision-making.

One panelist suggested that SOLEC could request several independent scientists to develop a companion document that provides analysis, interpretation, and policy recommendations that may be beyond the scope of an internal government process. Such a report could be the product of a SOLEC workshop, isolating the government agencies from any potential conflicts.

The panel noted that the SOLEC reports discuss effects and do not discuss what is driving the effects, and therefore, the reports are directing management responses at indicators and not at the causes. One panelist, however, expressed serious caution in pointing out causes. If SOLEC intends to point out causes, it must be on very firm ground and be disciplined in making the links between states and drivers and making judgments about causes. One panelist made a reference to the earlier comment on OECD's DPSIR model, which provides a framework that is: (1) linked to the existing pressure-state model but goes beyond it by adding the "driving force" component; and (2) places judgments about "causes" within an accepted conceptual framework and thus makes them potentially more palatable to a management and policy audience.

Another panelist thought that identifying causes is exactly what needs to happen because controversy provides visibility and may precipitate change. This panelist felt that if SOLEC does not point out the causes, the products are much less useful. Another suggestion was that it would be worthwhile to establish a management response to the report. Many of the environmental managers reading the reports will believe the management challenges are not in their purview. For example, few of the managers will deal with an issue such as land use.

One panelist questioned the utility of the fact sheets. They tend to focus on one isolated issue, which is difficult when the science being described is based on an ecosystem approach. Managers can be misled that there is only one issue to address. The panelist suggested an option

in which SOLEC could develop short trend reports that provide a broader picture. Another suggestion was that SOLEC could produce two products: one technical report for environmental managers and scientists, and one less technical report for decision makers. Policy makers tend to want a reduced report, however, there is also an opportunity to educate the policy makers and environmental managers. SOLEC should not lose the technical aspects of the process and it is important to educate the policy makers. Fact sheets often lose both capabilities. One panelist noted that the reporting function could take a dual track approach: Reporting on current state of affairs with diagnoses and policy evaluation; and presenting scenario calculations and policy outlooks.

All panelists agreed that SOLEC should put everything on the Internet. The web site should contain levels or hierarchies of information. The site can have condensed and summary information, but include the ability to drill down to more detailed levels and the specific data.

Section 3.1 Are the biennial conferences an effective and efficient venue for information exchange?

This question is addressed in Sections 2.2.1 and 2.2.2.

Section 3.2 One of the stated objectives of SOLEC is to help managers contribute to policy-making. Are the products likely to achieve this goal?

The panel felt that the present structure of reports is not helpful if the ultimate goal is policy-making. They suggested that the report respond to questions raised by environmental managers, including: "What should we do to improve the state of the environment? How much will it cost?" A model that includes the drivers provides a more direct connection to policy. It answers the questions: What is changing? Why? and What can we do about it? There should be clear distinctions between these types of data/indicators.

All panelists agreed that the report does not present the ecosystem as a whole. Ecosystem health or ecosystem quality cannot be measured by one single indicator and not from one single standpoint/assessment principle (such as economic, ecological or esthetic); this means that the report needs a small, representative set of indicators for each point of view. In this report the assessment principles for each indicator are often implicit, hybrid and differ by indicators, making the interpretation of what is good or bad less transparent and the aggregation to an overall judgment difficult. The next step for SOLEC is to provide the holistic understanding of the ecosystem and enable managers to make recommendations that address the environmental issues raised by the indicator evaluation. This will complete the loop from environmental assessment to practical management decisions. One panelist suggested that SOLEC should employ multiple baselines to make the reporting more neutral. If multiple baselines are used the report will be better received by the variety of stakeholders. Similarly, SOLEC could describe several management scenarios instead of setting specific targets. One panelist strongly suggested that the SOLEC reports include separate sections for assessment and recommendations. Another suggestion was that the conference could include a session where experts make environmental management recommendations based on the indicator assessments.

All panelists agreed that the growth of the human component of the basin ecosystem must be addressed. In this light, one panelist argued that industrial society's policy preoccupation with material growth was in conflict with a basic principle of complex systems science, namely that we could maximize only one variable at a time. He further observed that in a stable non-human ecosystem, all ecosystem compartments normally operate sub-optimally (under the influence of negative feedback) which ensures the integrity of the whole. By contrast, human beings strive to maximize their material "appropriations" (energy and resources) from the ecosystems that support them. Human society is driven by positive feedback and, in general, this means that as the human compartment expands, other local ecosystems compartments (species, bio-communities) necessarily contract. (There may be an exception if the human population is supporting itself largely on imported resources [see Section 2.2.2], in which case many of the negative impacts of economic growth are exported.) In any event, the general principle stands: attempting to maximize human performance (e.g., incomes, economic growth) will generally result in the depletion and possible destruction of other essential compartments of supporting ecosystems.

Another panelist did not view the process as a zero-sum game, but agreed on the importance of putting more emphasis on the impact of human actions. SOLEC is missing the human drivers and demographics (human ecosystem) affecting the basin.

Section 4.0 Advice based on the panel's own experience

The entire panel felt that SOLEC provides an extraordinarily important contribution. This is especially true because SOLEC has done this for several cycles. As a result, there are now greater expectations of SOLEC's future contributions. It is likely that SOLEC will be asked to do many additional tasks. The panel cautioned that the Executive Committee must bear in mind that SOLEC has its limitations and will have to refuse some of these requests in order to stay focused on its objectives. One panelist felt that SOLEC should be an independent body to maintain validity. It can still be funded by the government, but needs to be independent from the governments.

The key thing that SOLEC needs to accomplish is closing the loop at the end of the biennial cycle to include environmental management recommendations. SOLEC should evaluate what types of information it needs to develop to provide groups with the material needed to affect change.

The panel compared SOLEC to several similar initiatives including: The Living Planet, Global Environment Outlook, the Georgia Basin Puget Sound Ecosystem Indicators initiative, and the McKenzie River Basin initiative. They discussed how these initiatives are similar, how they are different, and pointed out components of the initiatives that may be of interest to SOLEC.

The panel noted that in the State of the Great Lakes report, SOLEC should state where the data are coming from and list the monitoring agencies. SOLEC also should detail the gaps in the information and identify areas that need additional funds in order to fill those gaps. SOLEC also should identify priorities for financial investments. One panelist suggested that SOLEC should

go one step further and assist the monitoring groups in maintaining their funds. This can be done by identifying the monitoring agencies that are supporting SOLEC and describing the effect of losing each group.

The importance of environmental non-government organizations (NGOs) is of critical importance for SOLEC; a panelist suggested that through the Commission for Environmental Cooperation (CEC) a dialog with NGOs could be started and eventually that would build a more inclusive partnership.

Section 5.0 General comments

Each member of the panel felt that SOLEC is an outstanding group of people with limited resources that are developing outstanding products. They noted that it is rare to see a team with this kind of integrity, cooperation, and friendship. They concluded that SOLEC is not *the* world leader in indicator development, but it is *a* world leader. In particular, it is a leader in the consultation process, which is one of SOLEC's greatest strengths.

SOLEC is at the stage of its development where database management is critical. The data need to be publicly accessible and user-friendly so that users can see how their community compares to the Great Lakes as a whole. SOLEC should maintain a centralized data repository. SOLEC could be linked to the Canadian Information System on the Environment (CISE). A strong link to CISE would enhance the data accessibility component of SOLEC.

SOLEC now has a visible profile. If it includes a specific indicator as necessary for the suite, then this will highlight the need for specific data. If more money is spent now on environmental monitoring and expanding SOLEC, the governments can save money by not making the wrong environmental management decisions.

The panelists were most impressed with the SHEMO presentation, and felt it to be an outstanding educational tool. One panel member suggested that SHEMO might have a greater and deeper long-term impact than all the SOLEC reports

Finally, a comment on the review process itself:

"The group of reviewers [was found] to be extremely knowledgeable, prepared, and thoughtful, and the EPA and Environment Canada participants to be equally knowledgeable (which one would expect, since this is their bread-and-butter) but also quite open and receptive to our comments (which is not always the case...)."

ATTACHMENT 1: PANELIST BIOGRAPHIES FOR THE PEER REVIEW OF THE STATE OF THE LAKES ECOSYSTEM CONFERENCE

OCTOBER 7-8, 2003
TORONTO, ONTARIO

RONALD COLMAN, Ph.D.

Executive Director, Genuine Progress Index for Atlantic Canada

Dr. Ronald Colman is founder and executive director of Genuine Progress Index for Atlantic Canada (GPI Atlantic), a non-profit research group that is constructing an index of sustainable development for Nova Scotia as a pilot project for Canada. He previously taught for 20 years at the university level and was a researcher and speech-writer at the United Nations.

GPI Atlantic has produced environmental and natural resource accounts for forests, soils and agriculture, fisheries and marine environment, water resources, air quality, greenhouse gases, and solid waste management, as well as a wide range of social, economic, and health indicator reports, and ecological footprint analyses. These reports are available on the GPI Atlantic web site at http://www.gpiatlantic.org.

Dr. Colman sat on the sustainable development indicators steering committee of the National Round Table on the Environment and the Economy and is editor of *Reality Check: The Canadian Review of Wellbeing.*

PETER HARDI, Ph.D.

Director and Senior Fellow, Measurement and Indicators Branch, International Institute for Sustainable Development (IISD)

Dr. Hardi is a Senior Fellow of the Measurement and Indicators strategic objective. He joined the Institute in 1993 as Senior Fellow and Director of the Measurement and Indicators work. He has a Masters of Science in chemistry and a Ph.D. in political science. Over the past decade, the main focus of Dr. Hardi's research interest has been related to sustainable development assessment and decision-making. He combines a comprehensive knowledge of the theoretical and methodological issues of sustainable development with practical field experience in designing and working with decision-making tools, including indicators in a variety of settings, ranging from local communities through regions to international agencies and from highly developed countries to developing nations and countries in transition.

Dr. Hardi has tested different frameworks and approaches, applied several innovative methods in practice. Dr. Hardi brings valuable experience in performance evaluation to the area. He participated in several project evaluations in Canada, in Central and Eastern Europe as well as in Asia. Dr. Hardi is a highly experienced presenter both at academic and public fora; he has designed organized and moderated workshops and public meetings in culturally diverse settings. He sits on several Boards of Directors and Advisory Committees of international and Canadian organizations dealing with sustainable development; he is a member of the editorial board of the journal Ecological Indicators.

HANS HERRMANN

Head, Conservation of Biodiversity, Commission for Environmental Cooperation

Mr. Herrmann is a marine ecologist with over 20 years experience in the fields of phytoplankton ecology, primary productivity, biodiversity conservation and natural resource policy. Before joining the Commission for Environmental Cooperation he was for 8 years the General Director of Pronatura, a Mexican non-governmental organization devoted to the conservation of biodiversity. Prior to that, Mr. Herrmann was the Science Director at the Scientific Research Center of Quintana Roo (CIQRO) and responsible for the administration and management of the Sian Ka'an Biosphere Reserve.

In Mexico, Mr. Herrmann has served in the National Advisory Councils of Protected Areas, Sustainable Development, and Forestry. At the National Forestry Council he served as the Chairman of International Affairs. At the international level, Hans was very active as head of the Mesoamerican Delegation at IUCN, and as a Mesoamerican representative of the GEF Focal Points Network.

Since 1998 he has worked at the North American Commission for Environmental Cooperation as Head of the Biodiversity Conservation Division. He is responsible for implementing trinational-multistakeholder marine and terrestrial biodiversity conservation projects, such as: the North American Bird Conservation Initiative, Species of Common Conservation Concern, North American Marine Protected Areas Network, B2B (Baja California to Bering Sea Marine Conservation initiative), Aquatic Invasive Species, Mapping Marine and Estuarine Ecosystems of North America and the Global Programme of Action for the Protection of the Marine Environment from Land Based Activities.

ROBIN O'MALLEY

Senior Fellow and Project Director, The H. John Heinz III Center for Science, Economics and the Environment

Mr. O'Malley directs The Heinz Center's Environmental Reporting program, which recently released *The State of the Nation's Ecosystems: Measuring the Lands, Waters, and Living Resources of the United States*. Prior to joining The Heinz Center in November 1997, Mr. O'Malley was employed at the Department of the Interior, where he led U.S. government efforts to establish a biodiversity information network throughout the Americas. From 1993 to 1996, he was Chief of Staff for the National Biological Survey, where he was responsible for numerous program development, budgeting, implementation, and outreach activities. Mr. O'Malley has also served as a Special Assistant to Interior Secretary Bruce Babbitt, Deputy Science Advisor within the Interior Department; Associate Director for Natural Resources at the White House Council on Environmental Quality (CEQ); senior environmental advisor to Governor Thomas H. Kean of New Jersey, and in a variety of environmental positions involving financing of environmental infrastructure, hazardous site remediation, and solid waste management, within New Jersey's Department of Environmental Protection. He holds a Masters degree from Harvard University's Kennedy School of Government and a Bachelor's degree from the State University of New York.

WILLIAM E. REES, Ph.D.

The University of British Columbia, School of Community and Regional Planning

William Rees received his Ph.D. in population ecology from the University of Toronto and has taught at the University of British Columbia's School of Community and Regional Planning (SCARP) since 1969-70. He founded SCARP's 'Environment and Resource Planning' concentration and from 1994 to 1999 served as director of the School. Prof Rees' teaching and research focus on the public policy and planning implications of global environmental trends and the necessary ecological conditions for sustainable socioeconomic development. Much of this work is in the realm of human ecology and ecological economics where Prof Rees is best known for inventing 'ecological footprint analysis.' Dr Rees' book on the concept, *Our Ecological Footprint* (co-authored with then Ph.D. student Mathis Wackernagel) was published in 1996 and is now available in English, Chinese, French, German, Hungarian, Italian, Latvian and Spanish with other translations underway. Prof Rees is a founding member and recent past-President of the Canadian Society for Ecological Economics. He is also a co-investigator in the 'Global Integrity Project,' aimed at defining the ecological and political requirements for biodiversity preservation. Prof Rees has been invited to lecture on areas of his expertise across Canada and the U.S., as well as in Australia, Austria, China, Finland, France, Germany, Hungary, Japan, Mexico, the Netherlands, Norway, Indonesia, Italy, Korea, the former Soviet Union, Spain, Sri Lanka, Sweden and the U.K. In 1997, University of British Columbia awarded William Rees a Senior Killam Research Prize in acknowledgment of his research achievements and in 2000 *The Vancouver Sun* recognized him as one of British Columbia's top "public intellectuals."

RISA B. SMITH, Ph.D., P.Ag

Acting Director, Environmental Reporting Branch, Knowledge Integration Directorate, Environment Canada

Risa Smith has been working on state of environment reporting and environmental indicators for the past ten years. For the past year and a half she has been Acting Director of Environment Canada's Environmental Reporting Branch, which includes the National Indicators and Reporting Office and the Ecosystem Monitoring and Assessment Network. For the previous nine years she worked in the State of Environment Reporting Office for the province of British Columbia, first as the senior research scientist and from 1996 to 2001 as head of the program. In her position with Environment Canada, Risa led the development of the recently released federal report *Environmental Signals 2003: Canada's National Indicators Series* and is currently leading challenging efforts to develop a Canadian Biodiversity Index and a National Indicators and Reporting Strategy.

Risa is perhaps best known for her work in British Columbia, on the biennial reports, Environmental Trends in British Columbia. She is currently or has been in the past, a leader, advisor or team member on many sustainable development indicator initiatives including: Commission for Environmental Cooperation, Children's Health and the Environment Indicators Report; National Roundtable on Environment and Economy, Environment and Sustainable Development Indicators Initiative; Canadian Council of Ministers of the Environment, State of Environment Task Force; Convention on Biological Diversity Experts Working Group on Biodiversity Indicators, Georgia Basin-Puget Sound Ecosystem Indicators; the Pacific Northwest Environmental Indicators Working Group; Towards a Small but Powerful Set of Salmon Habitat Indicators; and the environment section of the British Columbia Provincial Health Officer's Annual Report.

Risa is an adjunct professor at the University of Victoria where she taught a 4th year undergraduate course for five years entitled *Canada in Transition: Ecological Challenges and Societal Responses*. Risa completed her Ph.D. in 1990 at the University of British Columbia, Institute of Animal Resource Ecology. Upon completion of her graduate work, she headed up a biological control program for a consortium of federal and provincial government departments and private industry.

BEN TEN BRINK

Netherlands Environmental Assessment Agency, National Institute for Public Health and the Environment

Ben ten Brink worked in various Dutch ministries as policy maker in the fields of nature conservation, water management and the environment in relation to sector policies. His special interest is finding vehicles of communication between science and policy such as the development of indicators, monitoring and assessments approaches. He developed new concepts and calculation methods for quantification of the condition, trends and future impact on biodiversity based on species abundance or pressure factors. He worked out biodiversity indicators for the Convention on Biological Diversity (in the first and second Liaison Group on indicators of biological diversity), the OECD, UNEP, and European Union, and made quantitative biodiversity assessments on several spatial scales: the Netherlands, the North Sea, Europe and the World. He is national focal point on biodiversity indicators, monitoring and assessment. In the above context, he also participated in the first technical design workshop of the Millennium Ecosystem Assessment in Bilthoven, the Netherlands, and is delegate of The Netherlands in CBD and OECD meetings on indicators.

ATTACHMENT 2: TECHNICAL CHARGE PROVIDED TO THE PANELISTS DURING THE TWO-DAY STATE OF THE LAKES ECOSYSTEM CONFERENCE PEER REVIEW MEETING

OCTOBER 7-8, 2003
TORONTO, ONTARIO

TECHNICAL CHARGE TO THE PEER REVIEWERS

STATE OF THE LAKES ECOSYSTEM CONFERENCE (SOLEC)

Background

The State of the Lakes Ecosystems Conferences (SOLEC) were established by the governments of Canada and the United States in 1992 to fulfill the requirements of the Great Lakes Water Quality Agreement (GLWQA), which called for the coordinated, consistent and science-based reporting on the state of the health of the Great Lakes basin ecosystem every two years. Environment Canada and the United States Environmental Protection Agency are the lead agencies for the SOLEC initiative, but they work with many partner agencies and organizations to successfully report on multiple components of the Great Lakes basin ecosystem.

SOLEC has evolved into one of the primary venues for the governments of Canada and the U.S. to report progress on attaining the goals of the GLWQA, and the SOLEC approach is comprised of two main elements: the biennial conferences and the subsequent State of the Great Lakes reports based on ecosystem health indicators. The biennial conferences provide a forum for Great Lakes stakeholders to review the initial assessments provided by indicator reports, to discuss their management implications, and to provide any additional information or interpretation on the indicators. The State of the Great Lakes reports provide an overall assessment of the health of the Great Lakes based on individual indicators.

SOLEC participants generally respond favorably to the SOLEC approach and products, and while the organizers feel that significant transfers of information have been achieved between the indicator reports, environmental decision makers and the public, improvements could be implemented. Therefore, this initial peer review session, October 7-8, 2003 in Toronto, Ontario, is a review of the SOLEC process and its products. This peer review is anticipated to provide many benefits, including an overall evaluation on the Parties' approach to science-based GLWQA reporting.

A second SOLEC review, or review workshop, is planned for January 2004 for managers and stakeholders within the Great Lakes basin to assess the entire suite of SOLEC indicators. Participants will evaluate the indicators' utility, success and effectiveness in influencing decision makers, and make recommendations for improvements.

Peer Review Charge

The charge to this peer review panel is to provide objective evaluations of the SOLEC process, approach, and efficiency, based on comparisons to other national and international indicator reporting systems, as well as to evaluate the products of SOLEC. The overall goal of the peer review is to enhance the quality and credibility of this work product so that any future decisions or positions have a sound, credible basis. The SOLEC Executive Committee requests that reviewers specifically consider and address the topics and questions listed below.

1) SOLEC process
- Biennial Cycle
  - Effectiveness: Given the established objectives, is SOLEC effective? How does the effectiveness of the SOLEC process compare to the peer reviewer's experiences?
  - Efficiency: Are there other ways to conduct SOLEC? Does SOLEC appear to be efficient? How does the efficiency compare to the peer reviewer's experiences?
- Indicator Selection and Development Process
  - How well does this process work to identify a suite of Great Lakes indicators?
  - Does the peer reviewer have advice to improve the indicator selection/development process?
    - Great Lakes indicators in general
    - Societal Indicators, in particular

2) SOLEC products
- Are the products effective and efficient? How do the following products compare to other projects that the peer reviewer has seen or is involved with?
  - Standard State of the Great Lakes Report
  - Technical State of the Great Lakes Report (new)
  - Fact Sheets (new)
  - Data CD
  - Website: http://www.binational.net
  - Poster (NOTE: Please see the poster on display during the session as an example.)
- Are the biennial conferences an effective and efficient venue for information exchange?
- Influence
  - One of the stated objectives of SOLEC is to help managers contribute to policy-making. Are the products likely to achieve this goal?

3) Advice based on the panel's own experience
- Are the SOLEC process and the current suite of indicators an adequate approach?
- From a global perspective, is SOLEC a leader in its field of indicator development or a "wannabe?"
  - How does the SOLEC process compare to other large-scale indicator assessments in other geographic areas?
- Should SOLEC better incorporate indices in the reporting process and if so, how? What is the peer reviewer's advice on using indices as a tool to group indicators?
- How should SOLEC maintain long-term monitoring with numerous partners?
- How should SOLEC maintain funding for the system?
- Influence
  - Does the peer reviewer have advice on how to become more influential in the policy arena?
  - Does the peer reviewer have comments on the managers session?
- Frequency (of reporting, not monitoring): Is the current biennial cycle inadequate, satisfactory or excessive?

Additional and Supporting Information

The *SOLEC Peer Review Briefing Book,* available to each peer review panel member, contains the meeting agenda, technical charge, SOLEC purpose and objectives, plenary presentations, *State of the Great Lakes 2003* abridged report, select references, peer review panelist biographies, and peer review participant contact information. During the meeting, the SOLEC Executive Committee will give a series of presentations that provide background information regarding the SOLEC process and products. In addition, the SOLEC Executive Committee will be available for questions during and after the meeting to ensure the reviewers have the information they need in order to provide a thorough evaluation of the SOLEC process and products.

Should the reviewers feel that any additional information or referenced materials are necessary to complete their review, they may contact the SOLEC Peer Review Coordinator, Christina Forst, listed below. Contact information for the entire SOLEC Executive Committee can also be found in the briefing book.

Time Frame and Format for Review

Following this peer review, being held October 7-8, 2003 in Toronto, Ontario, peer reviewers should submit an electronic-copy of comments (in Corel WordPerfect® or Microsoft Word®) to fellow peer review participants and team leader, Dr. Peter Hardi, of the International Institute for Sustainable Development. The submission should include comments that address the questions raised in this charge, in addition to significant comments discussed during the meeting. Dr. Hardi, with assistance from the CSC peer review coordinators, will compile the peer reviewers' comments and produce a final version of the report no later than December 1, 2003.

Peer Review Contacts

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