

Delivery of Ecological Monitoring Information to Decision - Makers

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Executive Summary

At the 2005 Ecological Monitoring and Assessment Network (EMAN) Business Meeting, EMAN partners identified the need for a methodology to better connect results of monitoring with decision-making, with an emphasis on building dialogue with municipal officials, identifying their information needs and raising their understanding of monitoring issues. Decision-makers are defined as municipal planners, city councillors, industry, resource managers and other influential players. Delivery of information refers to communicating monitoring information in a way that is needed, desired, understood and useable. The objective of the research was to build capacity in monitoring organizations to better understand and cultivate both the “pull” and the “push” for monitoring information. The “pull” was to better understand how to increase the receptivity and desirability from policy or decision-makers for ecological monitoring information, while the “push” would examine best practices in communicating information from monitoring agencies who wish to see constructive outcomes from their efforts in local planning decisions.

In response to feedback from the membership, EMAN contracted the International Institute for Sustainable Development to investigate methodologies and practices used by monitoring practitioners for the delivery of information to decision-makers.

The research was bound first by the community-based monitoring framework developed by Pollock and Whitelaw¹, which is based on the practical experiences of communities engaged in monitoring. The framework consists of four themes; community mapping, participation assessment, capacity building and information delivery. The information delivery theme most closely relates to this research, and includes questions such as:

- Is monitoring data turned into useful information?
- How should monitoring results be communicated?
- In what ways can decision-makers use the new information?
- How can monitoring continue in the future?

With these questions as a basis, the research was then bound by a second, compatible framework that is really a strategy of implementation. Developed by IISD, and later applied by the United Nations Environmental Protection Agency, an “impact” strategy is intended to help with focusing efforts on the relationships and processes that are most likely to yield an impact or a change. The strategy includes indicators to measure impact or change over time, in an incremental sense, based on whether the desired change cited at early stages of the strategy has been influenced. Level of influence refers not only to specific policies and programs that have been put in place; the ability to engage in dialogue with decision-makers, resulting in reciprocal

¹ Pollock, Rebecca M. and Graham S. Whitelaw. “Community-Based Monitoring in Support of Local Sustainability.” *Local Environment* 10 (3, June 2005): 217.

information flow and increased mutual relevance is also considered an indicator of impact. In fact, relationship building is considered central to the strategy, as it includes the identification of those who are most likely to influence the change being sought and implies an understanding of their perspective on the issues. Knowledge management then follows, as monitoring information and knowledge is developed taking into account the focused change statement and the key audiences who will be in a position to receive the information. Once information is obtained, strategies for communicating and delivering the information are implemented and success is measured.

The research included both a literature review and case study research. Interviews were conducted to identify practices for effective delivery of monitoring information with the following organizations: the Atlantic Coastal Action Plan (ACAP), Arctic Borderlands Ecological Cooperative, H₂O Chelsea Community Water Research Program, Citizens' Environment Watch and Save the Oak Ridges Moraine (STORM) Coalition's joint Monitoring the Moraine (MTM) project, and the Rocky Mountain Trench Natural Resources Society. Practices identified by the research were then "mapped" to the impact strategy. The following table summarizes some practices that were identified.

Impact Strategy Framework	Practices
<p>1. Change Statement</p> <p><i>What is the change you seek?</i></p>	<ul style="list-style-type: none"> ◆ Identify emerging issues that could be addressed by monitoring ◆ Identify political, policy and/or planning processes that could be connected to the monitoring work. ◆ Develop change statements early in the process that reflect emerging issues and focus on specific political, policy and/or planning ◆ Use the change statement to hold a focus for the monitoring work. ◆ Be clear and specific. ◆ Ensure the change statement is appropriate for the context. Some may need a broad statement to achieve buy-in, others may need specific statements that help focus efforts. ◆ Adapt change statements over time as circumstances change and new information or experience is gained. ◆ If change statements are very specific, more than one change statement may be needed to enable monitoring of impact.
<p>2. Relationship Management</p>	<ul style="list-style-type: none"> ◆ Identify and involve key actors early in the process. Understanding the sphere of influence of key actors is an important part of making sure the right people are at the

<p><i>Who are the people that are positioned to have influence on the change?</i></p>	<p>table.</p> <ul style="list-style-type: none"> ◆ Identify steps for building networks and relationships. Include a variety of different methods, such as attending events hosted by key actors, setting up meetings, hosting a workshop. ◆ Find out what is important to the to the people in a positin of influence and help them make a connection with the monitoring work. ◆ Use good practice when building relationships such as following-up regularly. ◆ In some cases, it may be beneficial to work towards institutional bridges that are less reliant on a single person.
<p>3. Knowledge Management</p> <p><i>What knowledge to they/we need?</i></p>	<ul style="list-style-type: none"> ◆ Identify the issues that are most relevant to key audiences. ◆ Identify the type of knowledge that is most sought by key audiences and from where it is normally sought. ◆ Identify the type of information that you think is most needed by key audiences. ◆ Identify ways of ensuring the information produced by the monitoring work is usable by key audiences.
<p>4. Opportunity Management</p> <p><i>What are the key opportunities to communicate?</i></p>	<ul style="list-style-type: none"> ◆ Identify different types of communications materials and timelines suitable for different audiences. ◆ Use language and formats that are desirable and needed by those receiving the communications. ◆ Avoid assumptions that those you are trying to reach with monitoring information have been reached. ◆ Be ready for diverse media.
<p>5. Evaluation and Monitoring</p> <p><i>How can we measure our impact?</i></p>	<ul style="list-style-type: none"> ◆ Identify incremental ways of measuring progress towards the change statement in the areas of building and maintaining relationships, managing knowledge, and managing opportunities to communicate. .

The research concludes with a number of recommendations, primarily addressing the potential for capacity building in this area. There is also reference made to increasing connectivity with municipal, provincial and national assessment processes. The report includes a series of worksheets to assist monitoring agencies in implementing the strategy.

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1. The Push and Pull for Monitoring Information: An Introduction

It is sometimes said that societies measure what they care about and care about what they measure. If this is to hold true at the community level, mechanisms need to be in place to ensure that what is measured is indeed contributing to decisions about what is cared for. The collection of ecological monitoring information at the local level has grown significantly over the past decade²; at the same time there appears to be an unmet capacity to effectively deliver science-based monitoring information to decision-makers. This is not happening in isolation; indicator initiatives at all levels, from global to regional, national and local, face similar issues of ensure that decisions are well informed, reflect legitimate concerns of society while maintaining policy relevance^{3,4}. The interface of science and policy frequently enters political and scientific discourses as we seek to better communicate across an at times seemingly large divide.

The Ecological Monitoring and Assessment Network (EMAN) is seeking to identify practices for effective information delivery by community-based monitoring organizations to policy-makers and other decision-makers that are relevant to the issues being monitored. At the core of this work is the desire to build capacity in monitoring organizations to better understand and cultivate the “pull” and the “push” for monitoring information. While much has been learned regarding the communication of monitoring results by information collectors to decision-makers and policy makers, there remains capacity for growth in ensuring information is “pushed” effectively. At the same time, receptivity and desirability on the part of decision-makers for monitoring information, also understood as the “pull” for monitoring data, is an area that is generally in need of understanding and cultivation by monitoring groups. Effective information delivery involves a number of key principles, which can be summarized as ensuring information is needed, relevant, desired, useable, accessible and timely.

This research undertook to identify good practices that monitoring organizations are already using to effectively deliver their data. Case study research included 5 community-based monitoring groups and over 15 interviews were conducted. In addition a literature review identified relevant issues and provided background information and context for the study.

In the process of conducting this research, it became apparent that by understanding the “pull” for environmental data, community organizations are able to be increasingly strategic about how they deliver their monitoring data. The development of strategies to better target policy-makers and

² International Institute for Sustainable Development. (2006) Compendium of Sustainability Indicator Initiatives, www.iisd.org/measure/compendium.

³ Meadows, D.H. (1998) *Indicators and Information Systems for Sustainable Development. A Report to the Balaton Group*. Hartland Four Corners, VT: The Sustainability Institute.

⁴ Parris, T. M. and R. W. Kates. (2003) “Characterizing and measuring sustainable development.” *Annual Rev. Environ. Resour.* 28: 13.1-13.28.

other decision-makers with monitoring and assessment information is occurring in other assessment contexts as well, at national and international levels. To this end, the International Institute for Sustainable Development (IISD) has been working on a strategic framework to influence decision making with assessment information for a number of years known as an impact strategy. Recently, this framework was adopted by the United Nations Environmental Program in relation to the Global Environmental Outlook (GEO). The work is being published as a training module in the GEO Integrated Environmental Assessment Resource Book, currently in press⁵.

As shown in Figure 1, the impact strategy is made up of 5 main steps beginning with the identification of the change being sought along with barriers to effecting that change. The change statement serves to anchor the rest of the strategy and identifies broad or focused goals targeted at policies, programs, or other structures that could be influenced by the monitoring work.

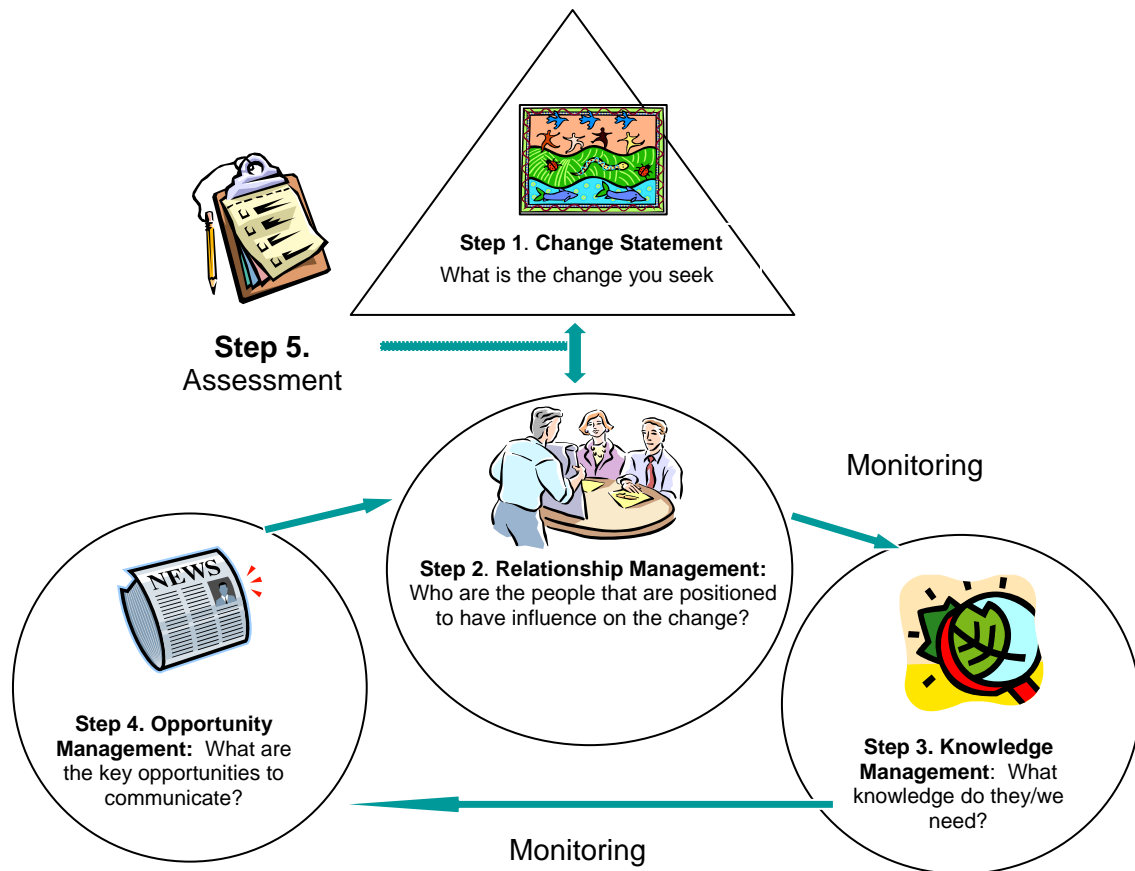


Figure 1 Impact Strategy

⁵ Creech, H., Jaeger, J., Lucas, N., Wasstol, M., Chenje, J. (2006) Training Module 3: Developing an Impact Strategy for your Integrated Environmental Assessment. UNEP GEO Resource Book, in press. United National Environment Program.

The second step initiates the process of identifying those who are in a position to affect the change being sought and their interests. It also includes steps to building relationships over time that engender trust and mutual respect, thereby enabling a receptive environment for information flow between key audiences and the monitoring group. **The third step** involves understanding of the type of information most needed and desired by the key audiences in step 2 and orienting the monitoring work to ensure that it will be relevant to them, in addition to being relevant to the monitoring group. **The fourth step** refers to the challenge of communicating the information in a way that can be used by key audiences, including formats and language. Finally, **the fifth step** involves assessing progress towards achieving the change statement, by developing incremental indicators. This step is both challenging and very important to the overall implementation of the strategy because it provides information that will allow the strategy to be adapted over time.

This paper integrates case study research of community-based organizations in Canada with the impact strategy as presented above. Integration was done by mapping case study results to each of the five steps, and includes “push” and “pull” elements for each of the steps. Section two of this paper is a brief overview of the literature describing key issues and practices that community-based monitoring organizations are using to better communicate and achieve influence with their science. Section three is an overview of the methodology used in this research and an introduction to each of the case studies. Section four presents research results, mapped to the impact strategy. For each of the five steps, there is a brief introduction to the step, followed by a synthesis of research results, an overview of practices, and an example of one or more case studies that highlight different tools or approaches. The final section provides conclusions and recommendations for further steps in this work.

2. A Context for Delivery of Community- Based Monitoring Information: A Literature Review Synopsis

By way of providing a larger context for this research and to inform case study research protocols, a preliminary literature review was conducted. This review further confirms underlying themes of communication and achieving influence with monitoring information, in addition to providing useful perspectives on cultivating the “pull” among decision-makers for information. The following is a literature snapshot, and the full review is located in Annex A.

EMAN partners include government, academia, non-governmental organizations, local-level stakeholders and others who are continually refining their ecological data collection and management and information dissemination and communication efforts with the mutual aim of

better influencing decision making in policy and non-policy contexts. Pollock and Whitelaw⁶ describe a community-based monitoring conceptual framework that expresses “the practical experience of communities engaged in implementing CBM” in Canada. This conceptual framework consists of four dynamic themes: community mapping, participation assessment, capacity building and information delivery, as shown in Figure 2⁷.

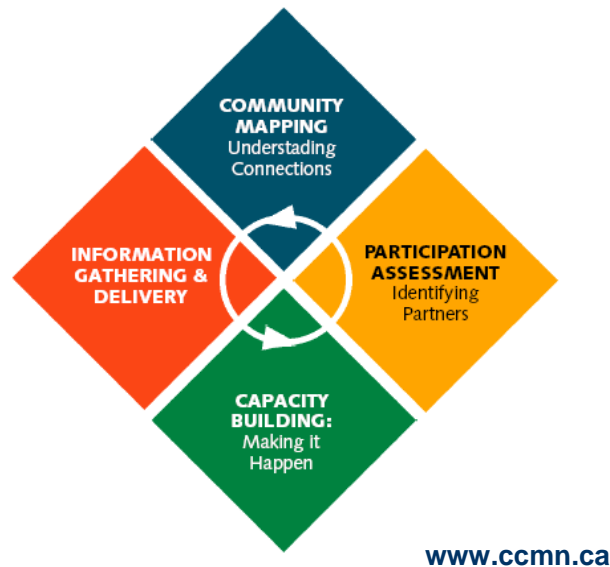


Figure 2 The Four Key Phases of the CCMN Model for Community-Based Monitoring

This literature snapshot focuses on the information delivery theme, which has three components, namely ecological monitoring, communication and achieving influence, and draws from both the science-policy and community-based monitoring literature.

Community-level *ecological monitoring* “depends largely on protocols that are easy to obtain and understand, tested and packaged for community use, and accompanied by training manuals and sources of assistance⁸. Good *communication* is vital both “internally between participants and externally to media and the wider public”⁹. To achieve *influence* data needs to be timely, usable, accessible and relevant¹⁰. Several challenges exist, however, and include data management, fluctuating levels of interest in monitoring, capacity of local decision-makers to identify and articulate their information needs, sufficient political will and so on¹¹.

⁶ Pollock, Rebecca M. and Graham S. Whitelaw. “Community-Based Monitoring in Support of Local Sustainability.” *Local Environment* 10 (3, June 2005): 217.

⁷ Ibid, 218

⁸ Ibid, 224

⁹ Ibid.

¹⁰ Valughan et al 2001 IN Pollock and Whitelaw 2005, 224

¹¹ Pollock, Rebecca M. and Graham S. Whitelaw. “Community-Based Monitoring in Support of Local Sustainability.” *Local Environment* 10 (3, June 2005): 224.

For this literature review several databases were searched using keywords such as community-based monitoring, local monitoring, science communications, risk communications and so on. The literature was selected if it was on topic and applicable to local-level ecological monitoring activities and associated efforts to influence local-level policy. Pollock and Whitelaw's framework (described above) is used to organize the review into three sections, namely ecological monitoring, communications and influencing policy.

2.1 Ecological Monitoring

Citizen monitoring volunteer programs have become increasingly popular. While many such projects in North America are intended primarily as education and outreach opportunities by government agencies some "contribute to national data sets on trends in species habitat or abundance—such as Audubon bird counts"¹². One re-occurring issue is that of data quality. Comparisons of data collected by community groups and scientists have shown both comparability and differences^{13,14} and emphasize the importance of "adequate resources for equipment and the regular training of volunteers and staff"¹⁵.

Another comparison of expert-led government monitoring and community-based monitoring in British Columbia¹⁶ looked at difference in data collection and data quality. The study found that government data tended to cover larger spatial areas than community-based data and was sourced internally or from peer-recommended external sources. Community-based data included both methodologically rigorous and anecdotal sources, and greater emphasis was placed on place-based knowledge and experience.

2.2 Communication

Lomas¹⁷ identified three types of decision-makers with each using research differently. Legislative decision-makers are often non-experts that tend to be interested in "defensible policy options and justifications for impacts of actions already taken", and prefer short memos or face-to-face meetings. Administrative decision-makers are more likely to have specialist knowledge and seek research to assist with difficult resources allocations or to diagnose planning problems; they are more amenable to longer versions of research evidence and are likely to attend conference and

¹² Overdevest, Christine, Cailin Huyck Orr and Kristine Stepenuck. "Volunteer stream monitoring and local participation in natural resource issues." *Human ecology review* 11 (2, 2004) : 177-185.

¹³ Mayfield, Colin, Michelle Joliat and Donald Cowan. "The roles of community networks in environmental monitoring and environmental informatics." *Advances in environmental research* 5 (4, 2001): 385-393.

¹⁴ Sharpe Andy et al. 2006. "Community based ecological monitoring in Nova Scotia: Challenges and opportunities." *Environmental Monitoring and Assessment* 113 (1-3): p 395-409 FEB 2006

¹⁵ *ibid*

¹⁶ Holden, Meg. "GIS in land use planning: lessons from critical theory and the Gulf Islands." *J Planning Educ and Research* 19:287-96 no 3 Spring 2000.

¹⁷ Lomas, Jonathan. 1997. *Improving research dissemination and uptake in the health sector: beyond the sound of one hand clapping*. McMaster University Centre for Health Economics and Policy Analysis, 1997. 67p.

workshops¹⁸. Industry decision-makers are oriented towards marketable products and are often try to 'pull' findings from researchers. This categorization of decision-makers illustrates that researchers need to tailor their findings to each audience, i.e. there is no 'one size fits all'.

Norton¹⁹, however, argues that ecologists have generally failed to communicate about ecology to both policy makers and the public. He attributes this failure to a lack of "terms, indicators, and measures that are based in ecological science, but that are also associated with important social values²⁰." Reasons for this lack of communication include ecologists being wary of mixing values with scientific study and ecologists failing to study nature at a scale relevant to decision makers and hence being slow to pick up on signals flowing from the policy discourse to ecological science. Recommendations include a better integration of policy and science under the rubric of broader adaptive management systems that would include an integrated language.

Chess, Johnson and Gibson²¹ point out the importance of early participation in the development of indicators may help reduce some communication problems, but note that community-based efforts that may be close to the ultimate audience do not necessarily translate into clearer and better communicated indicators²². Specific recommendations to practitioners by the authors are:

1. spend time meeting with intermediary groups to solicit their input
2. develop key indicators in consultation with intermediary groups
3. pre-test indicators with intended audiences

(After Chess, Johnson and Gibson 2005, 74)

Wakefield and Elliott²³ note that face-to-face communication with friends, neighbours and officials at public meetings were considered highly reliable sources of communication and that "people—not print—are the most effective risk-communication tools. In the context of decisions made by local authorities and between tiers of government, collaborative methods, including personal communications and meetings, were also found to be more effective than one way communications, such as reports and bulletins. One case study "highlighted the virtue of presenting scientific data in a form that can be readily interpreted by all stakeholders", thus allowing for questioning and refinement, something not possible if one-way communication modes are used²⁴.

¹⁸ *ibid*

¹⁹ Norton, Bryan G. "Improving ecological communication: the role of ecologists in environmental policy formation." *Ecological Applications* 8 (2, 1998): 350-364.

²⁰ *ibid*

²¹ Chess, Caron, Branden B. Johnson and Ginger Gibson. "Communicating about environmental indicators." *Journal of risk research* 8 (1, 2005): 63-75.

²² *ibid*

²³ Wakefield S.E.L.; Elliott S.J (2003). "Constructing the news: The role of local newspapers in environmental risk communication." *Professional Geographer* , 55/2, 225

²⁴ Dorfman, Paul et al. "A conceptual model of the role of complex science in local authority consultations about air quality management." [Local Environment](#), Volume 11, Number 4, August 2006, pp. 399-419(21)

2.3 Achieving influence

One approach to community-based ecological monitoring in Canada, as advocated by Pollock and Whitelaw, is the multi-party approach, designed to include all stakeholders²⁵. The level of integration with local government varies, with some issues having more relevance at particular points in time. Also, the methods by which citizen stakeholder groups influence policy are difficult to assess^{26,27}. Sutherland et al²⁸ maintain that “the popular perception amongst many ecological practitioners and researchers is that policies are often developed without sound evidence derived from research and that the results are not used to the extent that they could be to inform decision-making”. Part of the issue may be a mismatch between problem formulation by scientists and policy makers, highlighting the need for an analytical-deliberative process that would involve key stakeholders at early stages of the problem formulation process²⁹. Scientists, however, are integral to correct formulation of questions and problems and need to continue to provide the best evidence available, monitor how well current policies are working and provide solutions to unexpected events and policy failures³⁰.

The value of government scientist – community partnerships is outlined by McNeil, Rousseau and Hildebrand³¹. Successful outcomes from this type of partnering included: government scientists learned the value of working with local community groups to garner knowledge about local conditions; the government department was better able to achieve its environmental management goals; and trust was built between stakeholders and government leading to a Memorandum of Agreement.

The Evaluation Unit of the International Development Research Centre (IDRC) evaluated the public policy influence of IDRC-supported research and found that “the production of policy-relevant research and analysis was the principle activity through which projects sought to influence policy³². Indeed in many instances the participation of government agencies and individual decision-makers encouraged joint agenda setting and a greater probability that the research would feed into policy processes. This was one of a number of factors identified by

²⁵ Pollock, Rebecca M. and Graham S. Whitelaw. “Community-Based Monitoring in Support of Local Sustainability.” *Local Environment* 10 (3, June 2005): 211-228.

²⁶ *ibid*

²⁷ Whittaker, Stella, Andrew Major and Patricia Geraghty. “Victoria’s emerging framework of regional governance for sustainability: the case of catchment management authorities and regional catchment strategies.” *Local environment* 9 (6, 2004) : 575-593

²⁸ Sutherland, William J. et al. “The identification of 100 ecological questions of high policy relevance in the UK .” *Journal of Applied Ecology* 43 (4): p 617-627 AUG 2006

²⁹ Sutherland, William J. et al. “The identification of 100 ecological questions of high policy relevance in the UK .” *Journal of Applied Ecology* 43 (4): p 617-627 AUG 2006

³⁰ *Ibid* (p.625)

³¹ McNeil, T, Colleen et al. “Community - based environmental management in Atlantic Canada : The impacts and spheres of influence of the Atlantic Coastal Action Program Canada 's ecosystem initiatives.” *Environmental monitoring and assessment* , 2006, 113 (1-3) 367-383

³² Adamo, Abra. Strategic evaluation of policy influence: what evaluation reports tell us about public policy influence by IDRC supported research. Ottawa: IDRC Evaluation Unit, 2002. vi, 46p.

Adamo to facilitate policy influence. These are listed below, along with factors that are thought to inhibit policy influence.

Factors that facilitated policy influence:

- meaningful involvement of government officials and policymakers in the project,
- high quality and relevance of research to active policy processes;
- visibility, reputation and positioning of researchers and/or institutions in policy arenas;
- novelty of the approach or structure used by the project; and
- presence of a supportive policy environment.

Factors that inhibited policy influence

- poor relevance and usefulness of research outputs to current policy processes
- poorly targeted and structured activities that failed to reach and incorporate policymakers and their ideas into project activities
- project delays
- resistance of powerful interest groups to policy reforms
- deteriorating or lack of supportive policy environment and / or weak government structures; and
- slow, complex and political nature of policy-making processes

(after Adamo 2002, v-vi)³³

Tools to further facilitate policy influence might include publications, newsletters, policy briefs, websites and databases, networking, workshops, seminars, policy roundtables and government outreach³⁴. Other mechanisms include training, mentoring and peer review and dialogue initiatives such as working groups and task forces.

3. Collecting Practices and Insights: Introduction to the Case Studies

Community-based monitoring across Canada has grown substantively over the past decade, and periodically, experiences from these efforts are documented and analyzed. Valuable insights can be captured about what works well and what works less well, resulting in collective learning about ways of solving problems and improving the success of individual programs. As practices and approaches become time honoured and generally accepted based on explicit or implicit standards, they may be referred to as best practices. This research sought to draw out practices from a variety of case studies for effectively delivering community-based monitoring information to decision-makers. The research included key informant interviews with community-based monitoring group coordinators as well as public sector decision-makers associated with the initiative. Three to five key informant interviews were conducted per case study. Practices were then mapped to the impact strategy presented at the beginning of this paper. The criteria for case

³³ *ibid*

³⁴ *ibid*

study selection and interview protocols are provided in Appendix B. The selected case studies are introduced below, as follows: Atlantic Coastal Action Plan, Arctic Borderlands Ecological Co-operative, H₂O Chelsea Community Water Research Program, the Monitoring the Moraine (MTM) project, and the Rocky Mountain Trench Natural Resources Society.

3.1 Atlantic Coastal Action Program

The Atlantic Coastal Action Program (ACAP) is a long standing community-based monitoring program comprised of 16 organizations located in the Atlantic region. Each organization operates independently, with formal linkage to the overall ACAP program, initiated by Environment Canada in 1991. All of the organizations have multi-stakeholder boards that bring together local decision makers, industries, businesses and citizens who are engaged in setting monitoring goals for their programs. ACAP has also cultivated important relationships with Environment Canada (and other federal government) scientists, through the Science Linkages Initiative. A recent report indicated that ACAP successfully delivered data to decision makers, often resulting in remedial action, and less often in direct changes to written policy³⁵. For this case study, experiences were drawn from ACAP Cape Breton and Northeast Avalon ACAP. ACAP stories provided valuable examples of linking data to decisions, multi-party processes, communication of data and associated challenges^{36,37,38}.

3.2 Arctic Borderlands Ecological Co-operative

The Arctic Borderlands Ecological Co-op has been monitoring ecological change for over 10 years using both scientific and local knowledge. Data is collected in the both the U.S.(Alaska) and Canada (Yukon and NWT) within the 'Arctic Borderlands', an area defined by the range of the Porcupine Caribou Herd, Mackenzie Delta and adjacent near-shore environment. Formed in 1996 as a non-profit ecological monitoring program, the program has three focus areas: climate change, contaminants and regional development. The co-op is a collaborative alliance between Indigenous communities, First Nations, Inuvialuit organizations, co-management boards, government agencies and university researchers. Run by a board of directors and funded by Canadian, Territorial, and US government agencies, and co-management boards, the Co-op is exemplary in its collaborative approach to monitoring³⁹. At the same time, a recent survey of monitoring information users shows that the co-operative still faces some challenges in directly

³⁵ Sullivan, D. and Beveridge, M. (2005) "Ecological Monitoring and Reporting; A Survey of the Atlantic Coastal Action Program". Report prepared for Environment Canada Sustainable Communities and Ecosystems Division.

³⁶ Hildebrand, Larry, Manager, Sustainable Communities and Ecosystems Division, Environment Canada. Personal Communication, October 30, 2006.

³⁷ White, Kellie, ACAP Cape Breton. Personal Communication, October 30, 2006.

³⁸ Sharpe, Andy, ACAP Clean Annapolis River Project, October , 2006.

³⁹ Kofinas, G., Aklavik, Arctic Village, Old Crow, and F. McPherson. 2002. "Community Contributions to Ecological Monitoring: Knowledge Co-Production in the U.S.-Canada Arctic Boderlands." Pages 54-91 *In* I. Krupnik and d. Jolly, editors. The Earth Is Faster Now: Indigenous Observations of Arctic Environmental Change. ARCUS, Fairbanks.

influencing decision-making⁴⁰. This case study is particularly insightful in the areas of identifying and building momentum around long term goals, trust building and maintaining relevance to members, and developing diverse communications strategies for different users and monitoring impact of information delivery^{41,42}.

3.3 H₂O Chelsea Community Water Research Program

The H₂O Chelsea project was created out of a need for better understanding of water resources in the municipality of Chelsea, Quebec. Located on Precambrian Shield Bedrock of the Gatineau Hills, municipal water and sewage systems are not a feasible option for the community. Formed in 2003 as a partnership of the municipality of Chelsea, the Institute of Environment at the University of Ottawa, and ACRE (Action Chelsea for the Respect of the Environment), an environmental NGO, the project includes research, monitoring and education initiatives related to water quality and quantity of private wells, lakes and streams. This case study emphasizes the importance of municipal buy-in and structures to handle monitoring information obtained from community-based monitoring projects. The Municipality's Sustainable Development Coordinator has a key role in working with the H₂O Chelsea coordinator to ensure that H₂O Chelsea's annual reports reach city council and municipal planners. Valuable insights are gained in terms of the role of an intermediary in communicating monitoring science, as well as the importance of context and relevance of an issue to politicians and planners at the local level. Other practices, such as timing of communications and process for delivery of reports are also gained^{43,44}.

3.4 Monitoring the Moraine Project

The Monitoring the Moraine (MTM) project is a more recent monitoring initiative focused on “engaging community volunteers in science, stewardship, monitoring and decision-making on the Oak Ridges Moraine” (www.monitoringthemoraine.ca). Composed of boulders, stones, and other debris, this landform stretches 160 kilometres from Caledon to Northumberland, like a huge “eyebrow” over Toronto. Known as the “rain barrel of southern Ontario”, the moraine provides drinking water to over 250,000 people through municipal wells and is the headwaters to over 65 rivers and streams that deliver cold clean water to millions of people. The MTM project is a collaborative partnership between the Citizens' Environment Watch, Save the Oak Ridges Moraine (STORM) Coalition and the Centre for Community Mapping (COMAP) that was formed following the implementation of the Oak Ridges Moraine Conservation Plan (ORMCP) by the Ontario Government in 2002. One of the roles of the MTM project is monitoring the

⁴⁰ Johnston, B. (2005) 'Arctic Borderlands Ecological Knowledge Co-op: Making the Data Relevant to Policy and Decision-Makers.' Environmental Conservation Branch, Environment Canada.

⁴¹ Gill, Mike. Environment Canada. Personal Communications. November 7, 2006

⁴² Branigan, Marsha, Government of North West Territories. Personal Communications, November, 2006

⁴³ Henry, Patrick, H₂O Chelsea Coordinator. Personal Communications. November 3, 2006.

⁴⁴ Deslauriers, Rachel, Sustainable Development Coordinator, Municipality of Chelsea. Personal Communications, November 10, 2007.

implementation of the plan by the 32 municipalities that are affected by it, by building capacity at the community level to conduct ecological and policy level monitoring. Ultimately, it is desired that informed citizens will have a strong voice at the 2014 review of the ORMCP. A monitoring advisory committee consisting of multiple levels of governance, conservation authorities, citizens' and environmental groups, and the private sectors helps to guide and advise the work. While there is yet limited monitoring information present from this case study, there are a number of insights related to identifying key champions and stakeholders, relationship building, and understanding perspectives of decision makers. It also highlights the importance of context, political relevance, and is an interesting example of linking ecological and policy monitoring^{45,46,47,48,49}.

3.5 Rocky Mountain Trench Natural Resources Society

The Rocky Mountain Trench Natural Resources Society has been an integral part of a larger process to bring about landscape restoration of the Rocky Mountain Trench in south eastern British Columbia. The Society is a multi-stakeholder platform of 9 organizations representing 2800 individuals within wildlife, guide-outfitters, environmental and ranching associations. The Society works towards restoration of the traditionally fire maintained Rocky Mountain Trench region, which has been altered significantly due to fire suppression. As a member of the Rocky Mountain Trench Ecosystem Restoration Steering Committee, a larger multi-stakeholder process formed by the BC Government to create restoration plans and implement them, the Trench Society has a main role of raising public awareness. At the same time, the Trench Society has also advocated for a specific restoration program to the Steering Committee, and is an example of using information to make a case to decision makers that was well received and resulted in change. This case study is of value to this research particularly in the area of identifying key relationships, building relationships and understanding perspectives of those one is trying to influence, and multi-stakeholder processes. It also shows the importance of painting a broad picture that speaks to what is most relevant in the context, namely cost effective tools that reach the desired goal of ecological integrity^{50,51}.

⁴⁵ Dong, Sonia, Citizens Environment Watch. Personal Communication, October 27, 2006.

⁴⁶ Chau, Joyce, Citizens Environment Watch. Personal Communication, October 30, 2006.

⁴⁷ Fahey, Nathan, Save the Oak Ridges Moraine (STORM) Coalition. Personal Communication, November 3, 2006.

⁴⁸ Whitelaw, Graham, University of Waterloo. Personal Communication, November 1, 2006.

⁴⁹ Salter, Todd, Municipality of Caledon. Personal Communication, November 3, 2006.

⁵⁰ Hansen, Maurice, Rocky Mountain Trench Natural Resources Society, Personal Communication, October 27, 2006.

⁵¹ Anderson, Greg, Government of BC Forest Services, Personal Communication, November 7, 2006.

3.6 Additional Data Sources

In addition to gleaning practices for effective delivery of monitoring data to decision-makers from the case studies described above, data was also obtained from two other pilot processes. The first was a virtual workshop hosted by the Canadian Sustainability Indicators Network, which brought together indicator developers and users from multiple levels of government and communities to discuss the impact strategy outlined in this paper. The 1.5 hour discussion resulted in a rich and informative discussion about challenges and benefits of using an impact strategy to inform information delivery. The second was a workshop at EMAN's National Science Meeting in November 2006, comprised of about 40 monitoring information gatherers and users. Both of these events served to refine and confirm elements of this approach as well as voice key areas of challenge for community monitoring. Worksheets and verbal feedback from the EMAN National Science Meeting are provided in Annexes C and D.

4. Strategy and Practice: Overview and Synthesis of Results

In this section, case study results are mapped to each step of the impact strategy, as shown in Figure 2. Each section includes a brief description of the step, a synthesis of data from the case studies, a brief example from one or two case studies where applicable, and a summary of practices. Worksheets developed as a pilot for the EMAN National Science Meeting 2006 also provide summaries for each of the steps, and in some cases, there is additional information that is not elaborated in this paper (Annex C).

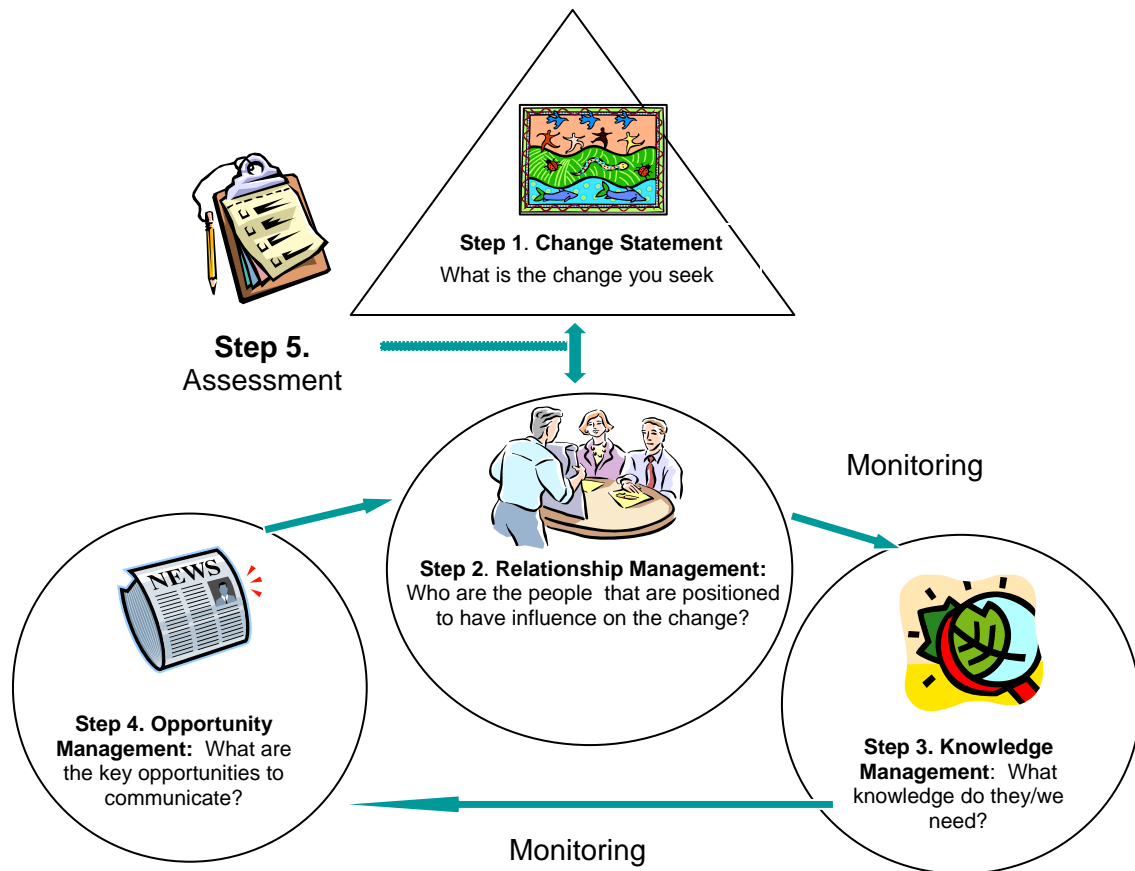


Figure 3 Impact Strategy

4.1 Step 1: Change Statement

The impact strategy begins with a clearly defined change statement. Ideally, the change statement links a desired outcome of ecological monitoring to a specific decision-making process, such as a policy, plan, or project. It is an adaptive statement that may begin broad and as more information comes in, becomes more focused. The change statement is used to focus relationship and knowledge management, and to develop measures for understanding impact of information delivery. It helps with setting parameters around the monitoring work and with making choices about energy and resources. Creating a change statement involves understanding decision-making processes related to the issue being addressed through monitoring, as well as related social, economic and other ecological factors.

4.1.1 Synthesis of Results

While all of the case studies naturally included high level goals, fewer were directly linked to specific processes, such as policy or public planning at municipal and provincial levels. There were also some direct linkages to the research community in the change statement, such as informing further research questions. Given that all of the cases were multi-party, having high

level goals with broad buy-in from multiple interests is likely more effective for cohesion than single, issue based goal statements that tend to be divisive. At the same time, a certain level of specificity and clarity about the goal statement appeared to be useful as a way of setting parameters around the work. The parameters could then be communicated to outside interests that might otherwise erode boundaries, potentially diffusing efforts to maintain common ground within the monitoring group.

The following are examples of change statements that have been adapted based on the contexts of the cases studied.

A [specified] land use plan review process will incorporate our monitoring work to assist with identifying gaps and successes in the implementation of the plan.

The municipality will use the information gathered from our monitoring when they assess the performance of a current water quality policy

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) will declare the species being monitored a Red Listed Species, as a result of the monitoring work.

The academic community will use our traditional ecological knowledge indicators to inform further research related to caribou herd migration and climate change.

4.1.2 Summary of Practices

The following practices, derived from this research, point to additional considerations when developing a change statement.

- ◆ **Identify emerging issues that could be addressed by the monitoring work.**
There is a strategic benefit in linking change statements to issues or topics that are early on the radar screen. By the time the issue hits the political radar, ecological monitoring information will have already been collected and is poised to be used for decision-making. At the same time, it may take some convincing to include those who do not yet see the issue as important. Some say that one of the true values of monitoring is to provide an early warning system to society. If the issue is truly emerging, those keen to be involved from the beginning may see multi-party community-based monitoring efforts as an opportunity to begin at the ground level and offer their input. The Save the Oak Ridges Moraine (STORM) Coalition advocated early on, beginning in 1989, for a long term plan to promote ecological integrity in the Oak Ridges Moraine. When the Province of Ontario put a long term plan in place, they identified themselves as the entity to monitor. When it became

apparent that the province was not carrying out this task, it was a logical progression that a group form to monitor the impacts of the plan. Because the STORM Coalition was involved when the issue was emergent, it was easier for them to help form the Monitoring the Moraine project to monitor the plan because they were well known and regarded to multiple audiences.

- ◆ **Identify political, policy and/or planning processes that could be connected to the monitoring work. processes, as is appropriate.** By identifying processes that are already underway, such as water quality policy development and implementation, it is not only easier to identify the main actors influencing the process, but it also adds political salience to the monitoring work. Identifying policy and planning processes could also be part of the relationship building, resulting in greater buy-in from the start. While it doesn't guarantee that policies or plans will be changed, it does increase the probability. H₂O Chelsea produced an annual report that has become embedded in city council decision-making processes. The municipality has been a strong partner from the beginning, and as citizen values for ecological integrity are also reflected in voting patterns, city council is receptive to the monitoring efforts of H₂O Chelsea related to water quality and quantity. Each year, council reviews the report and develops responses to report outcomes. The report and council response is then presented to the public.

- ◆ **Additional Practices**
 - Develop a change statement early in the process and use it to hold a focus for the monitoring work.
 - Be clear and specific.
 - Create a change statement that is appropriate for the context. Some may need a broad statement to achieve buy-in, others may need specific statements that help focus efforts.
 - Adapt change statements over time as circumstances change and new information or experience is gained.
 - If change statements are very specific, more than one change statement may be needed to enable monitoring of impact.

4.2 Step 2: Relationship Management

Relationship management involves understanding the people who are in a position to influence the change being sought, as well as those who are in a position to support those efforts. In the context of an impact strategy, the emphasis is on specific people, rather than a broad audience of

people who could work. In addition to decision-makers, related audiences might include people who “whisper in the ear” of decision-makers; policy advisors or political staff; those in civil society who can pressure decision-makers; those in the academic community who can support recommendations; and those in the media who can reach the public and thereby also influence decision-makers.

Relationship management helps focus energy and efforts in relationship building. Sometimes, key audiences are identified much later in the monitoring process, such as at the time of communicating results. At that point, much more energy and time is needed to build the relationship and cultivate receptivity to the information, because the audience is being asked to buy into an end product rather than a larger process that they can potentially contribute to.

Relationship management involves identifying who is most able to influence the change being sought and who is in a position to help with that process. This is also an adaptive and iterative step that can be modified as more information becomes available. There are a number of ways of identifying key audiences; the following are two models that are used in coalition building processes (adapted from Roberts⁵²):

Expanding network model: A core group of interested participants is formed and as more information becomes available, others are recruited into the process. They may be experts and leaders who take part in the whole process or participants who are asked to be involved for a limited amount of time on a specific aspect of the work.

Stakeholder analysis model: There are a variety of approaches that may be used to identify appropriate stakeholders.

Positional approach: identification of key organizational staff directly connected to the issue with a stake in finding a resolution.

Reputational approach: suggestions are sought through interviews with community members or formal electoral processes.

Social participation approach: stakeholders are identified based on past or current participation in efforts to address the issue.

Opinion leadership method: leaders are identified based on their leverage or influence in relation to the issue or goal.

Demographic method: participants are selected based on demographic characteristics that are relevant to the issue.

⁵² Roberts, Joan. 2004. *Alliances, Coalitions and Partnerships: Building Collaborative Organizations*. Gabriola Island: New Society Publishers.

Referent group: a core group of organizations identifies additional stakeholders by creating a map of the wider environment and who key actors are.

Self selection: a champion for the initiative calls a meeting or forum of concerned individuals and organizations; those who attend would then be considered part of the process. While this approach tends to be the most common, Roberts (2004) suggests that including people who are not the “right” actors may potentially lead to process sabotage and/or failure.

As connections begin to form, it might be useful to gain a better understanding of the perspective of key audiences, such as understanding their views on an issue, how the issue fits in the larger context of their work, what their mandate is for that issue, and what type of information would be helpful to them. Key audiences may also have questions for the community-based monitoring group, such as intentions and the value of ecological monitoring information to decision-making processes.

4.2.1 Synthesis of Results

All of the case studies had formal multi-stakeholder processes, such as advisory committees and boards. The process of identifying who to include in these processes reflected many of the approaches listed above, ranging from hosting open community events to inviting stakeholders based on their influence and ability to make decisions. Other methods included identifying opinion leaders, those well connected in the community or experts in policy or science through interviews and based on past involvement with the issue. Long standing institutional relationships and personal relationships previously developed were also tapped into when building collaboration.

From a decision-maker perspective, neutral processes that were apolitical and non-divisive about issues seemed to elicit more participation and collaboration from participants. Some cases built trust by keeping meetings closed and confidential, particularly when decision-makers were involved. Codes of conduct were also used in a small number of cases, particularly to cultivate group cohesion and to present a united front to the public, media and funders.

Feedback from the EMAN National Science meeting indicated relationship building is an area of substantive potential growth, particularly understanding perspectives and contexts for decision-making.

4.2.2 Practice in Action

When BC Forestry Services convened a group of stakeholders to discuss the restoration of the Rocky Mountain Trench, they used a formula that has since proven it's worth: include people who have the ability to make decisions about projects and finances, keep the group size small for increased effectiveness, keep the meetings confidential, and present a united front in the media

and the public. The group, known as the Rocky Mountain Trench Ecosystem Restoration Steering Committee, has been able to secure large amounts of funds for their restoration work, as well as public support on an issue that has some controversies. At least partially, the success of the group has been attributed to having the right group of people at the table, in addition to practices that promote trust building, and group cohesion. This isn't to say that the group has been conflict free; internal conflicts have been weathered over time. Some point to a strong sense of leadership, particularly by its champion, in this case a forest management with CFS. In many ways, this individual has acted as a bridge between government and stakeholder interests, in addition to setting the code of conduct and standard for the Committee.

4.2.3 Summary of Practices

The following practices, derived from this research, provide tips and points for building and managing relationships.

- ◆ **Identify and involve key actors early in the process.** Including key actors early in the process provides them with the opportunity to provide input early in the process. It is also an avenue to learn about their decision-making processes and the type of information they access when making decisions, as well as where they access it from. When the Rocky Mountain Trench Natural Resources Society advocated for a new project to restore the Rocky Mountain Trench, two factors made it much easier to achieve buy in: there was a long standing relationship between the advocate and a key actor in government, and the advocate had familiarity with the decision-making structures and formalities of the B.C. Forest Service.
- ◆ **Understand the sphere of influence of key actors.** During the relationship building process, it is important to have a clear understanding of what the key actor audience could potentially do to influence the issue, as well as their constraints. For example, while the municipality of Chelsea is monitoring water quality and quantity for wells, lakes and streams, there are some jurisdictional issues that would fall to the provinces to develop policies for or regulate. In the province of Quebec, water quality and quantity is increasingly being devolved to municipalities, resulting in a shift in the types of policies that can be made at the municipal level.
- ◆ **Identify steps for building networks and relationships. Include a variety of different methods, such as attending events hosted by key actors, setting up meetings, hosting a workshop.** One approach is to begin by identifying 5-10 key actors who could be most influential in moving the issue forward. It may not be suitable to invite everyone into a multi-stakeholder process; some may only be able to be reached indirectly by

others who are more connected with them. It may work well to begin with informal meetings with a variety of key actors or those connected to them, to find identify areas of converging interest and common ground. This would also give key actors and opportunity to learn more about the value of community-based monitoring as an information source. In the specific context of meeting with a mayor or a city councillor, an approach used by the Rocky Mountain Trench Natural Resources Society included the following steps. Meet with a new mayor or councillor and provide concise documents about the monitoring work, as well as a brief message. Identify ways that the monitoring work is connected to the mandate of the municipality and if appropriate, make a small request that the mayor/councillor can easily do on behalf of the monitoring effort. Then follow up periodically in a neutral, non-adversarial way.

Additional practices:

- ◆ Find out what is important to the person you want to build a relationship with and help them make a connection with your work.
- ◆ Use good practice when building relationships such as following-up regularly.
- ◆ In some cases, it may be beneficial to work towards institutional bridges that are less reliant on a single person
- ◆ Where possible, attend public meetings held by key actors, to better understand their perspective and what information they are using to be informed. It also gives some visibility to the monitoring work.
- ◆ Identify other monitoring initiatives that may be doing similar things. One the one hand, it may be useful to join forces with other efforts, such as those at academic institutions; on the other hand, other initiatives may carry some political baggage and it may be better to start a new effort.

4.3 Step 3: Knowledge Management

Knowledge management involves understanding the broader context of the information, the perspectives of those who are receiving the information, what knowledge they are looking for and where they are looking for it. It ensures that the information being delivered is needed, desired, relevant, useable, accessible and timely.

Telling the broader story involves understanding what aspects of the story or issue is that target audience more interested in. One way of organizing thoughts around a bigger story is to use

something like the Driver – Pressure – State – Impact – Response framework (Figure 4). This framework is used when doing an environmental analysis of a situation, with arrows showing causes and effects between relationships. Each element of the framework is summarized below:

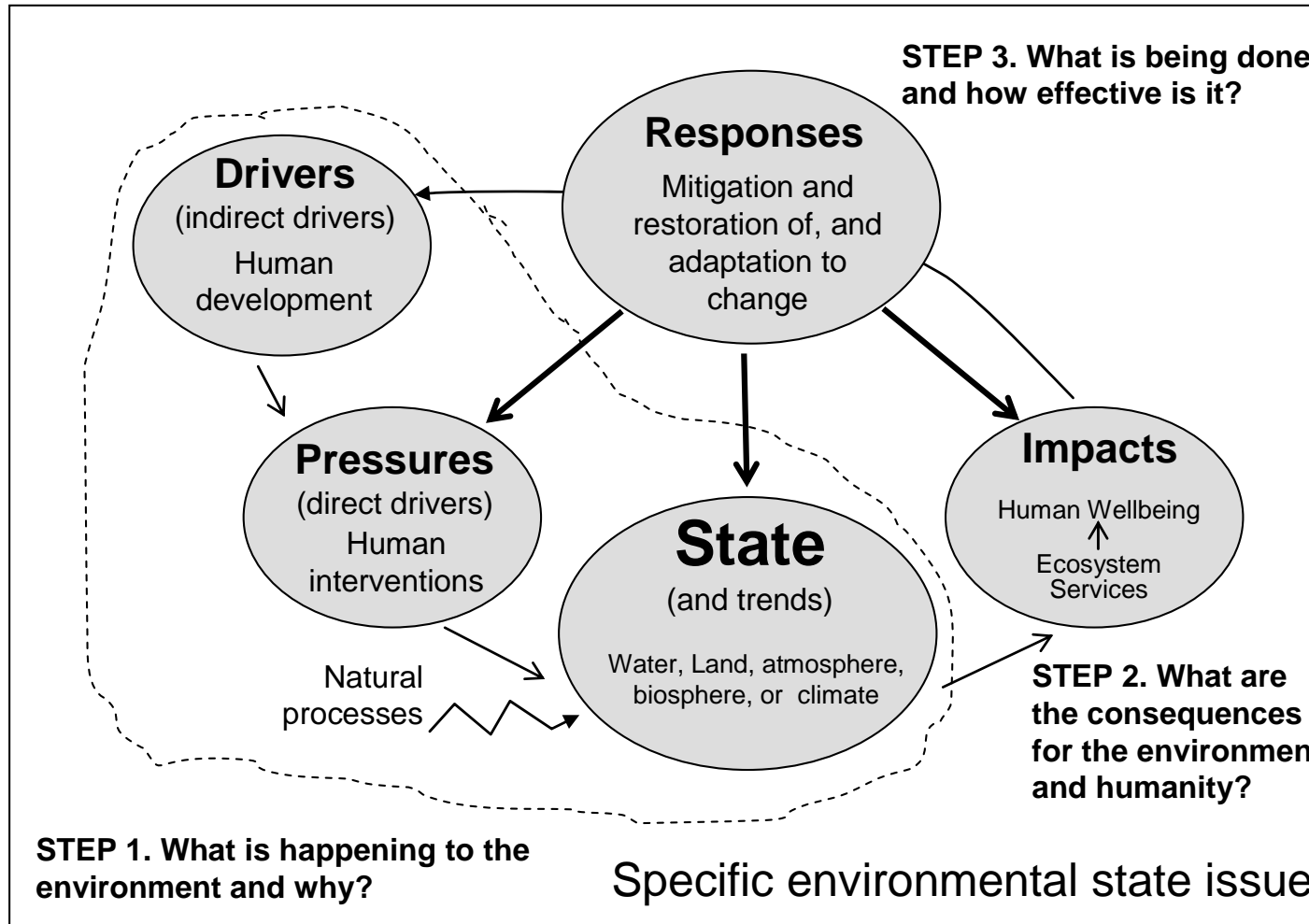


Figure 4. Driver - Pressure - State - Impact - Response Framework

- ◆ **Drivers:** These lead to pressures which impact the state of the environment, and include demographic changes, or economic and societal processes.
- ◆ **Pressures:** These cause a change in the state of the environment, such as land use changes, and emissions.
- ◆ **State:** This involves asking the question, what is happening in the environment and why?
- ◆ **Impact:** As a result of changes to the state, there is a change in the ecological services that the environment provides to people and all beings, such as clean air, water, food, protection from UV. These changes result in an impact on human well-being such as health, social relationships, material assets and security.

- ◆ **Response:** Responses from society can then influence the states and pressures and drivers; these responses may be either to mitigate exposure to impacts (such as restoration) or to help society adapt to the impacts that occur. This is where public policy comes in.

Understanding what is happening in each of these areas, in relation to the issue being addressed by community-based monitoring, and then identifying where key actors are placing their efforts and focus can assist with drawing linkages between the monitoring work and larger issues and responses at play. The focus might be on larger drivers, such as regional development and migration, or it might be on local pressures, such as industry practices or municipal treatment of effluent. Alternatively, the focus might be on reducing impacts of other issues, such as air pollution abatement. Essentially, this step is about understanding the pulls for monitoring information, as well as the larger context within which those pulls (and pushes) are occurring. In addition to understanding what types of information target audiences are interested in, it is useful to find out where audiences typically look for data, and what kind of data they use when making their decisions.

4.3.1 Synthesis of Results

All of the case studies had elements of a “bigger story” that connected their information to larger issues, related pressures, and impacts. This included presenting monitoring information in the context of socio-economic pressures; combining policy and science monitoring in reporting; and providing monitoring information sparked further research on system dynamics related to habitat and climate.

Efforts to understand what knowledge decision-makers were looking for varied from cultivating relationships with municipal representatives who then sought information from city council, to directly issuing surveys to decision-makers with questions about information use and delivery.

A common theme was data form, type, and level of analysis. Some decision-makers asked that the data be provided in raw format so that it could be directly incorporated into internal data analysis processes. In other cases, information analysis by the monitoring group was needed to show linkages between their work and the interests of the decision-makers. Also, maintaining a balance between long term monitoring and flexible/adaptive responses to time sensitive and relevant issues was also raised as an important issue. Finally, the capacity of the decision-making body to handle the data was important particularly in the municipal context where in some cases, there was an absence of internal pathways and reporting systems that could include the monitoring information, while in others cases there were direct linkages between the monitoring group and city council, through a sustainable development coordinator.

4.3.2 Practice in Action

In St. John's, Newfoundland, the lack of sewage treatment was a significant issue to the **Northeast Avalon ACAP** in the early 1990's. At the time, the issue ranked #40 on a list of priorities for the area. To effect change, this ACAP group decided to build factual evidence in favour of addressing the issue of sewage treatment. After a decade of raising local awareness on the impacts of no sewage treatment on the harbour, water quality sampling, toxic contaminant measures, assessments of the biological impacts on biota, an irrefutable case was built: a lack of sewage treatment was having significant, negative ecological impacts. In addition, a socio-economic analysis was conducted showing that if \$93,000 were invested in a sewage treatment plant, positive impacts on housing prices, tourism, restaurant, and cruise ship industries were likely to result. The tipping point came when the issue went to the top of the priority list for the municipality. This was due to a combination of providing scientific information to decision makers, and awareness-raising. The end result was that all three levels of government, each of which had been involved in the ACAP process, decided to cost share the new sewage plant.

The **Arctic Borderlands Ecological Knowledge Co-operative** conducted a survey of members of the board to find out whether their 10 years worth of data collected by the Cooperative was being used to inform decision-making and how. The following list is an indication of the types of information decision-makers were looking for from the Co-operative.

- provide status and long term trends on the environment and communities in northern Canada;
- include rigor and sources of uncertainty in the data;
- provide an analysis of how ecosystems and human communities could change in the future;
- periodically review research protocols to ensure the appropriate information is being obtained and there is a common understanding of the questions;
- include spatial locations of data collection;
- provide a trend analysis.

4.3.3 Summary of Practices

- ◆ **Identify the issues that are most relevant to key audiences.** This practice works in tandem with relationship building, as it involves understanding the perspective of the target audience for the information. The Driver-Pressures-State-Impact-Response framework can also be used to frame issues according to where attention is being placed in the larger

system. As more knowledge becomes available, the change statement may also change to reflect where the most strategic influence could be made by the monitoring group.

- ◆ **Identify the type of knowledge that is most sought by key audiences and where it is normally sought from.** This is one of the more challenging practices because you may have a good sense of the issues that are important to your audience; it is less easy to find out how they access information about the issue. For the Rocky Mountain Trench Natural Resources Society, it was a matter of understanding how decisions were made within the provincial government, through years of experience and relationships. For H₂O Chelsea, it was a matter of liaising with the Sustainable Development Coordinator, who liaised with both city planners and city council, and was able to identify knowledge, needs from both decision-making and implementation perspectives. For the Arctic Borderlands Ecological Knowledge Co-operative, it was a matter of surveying partners and stakeholders directly. As shown in that example, an important challenge is meeting a variety of information needs, and can be informed by the strategy developed in Step 2.
- ◆ **Identify the type of information that you think is most needed by key audiences, then relate the information to their interests.** This practice acknowledges that there may be information you would like to present to key audiences that they are currently not asking for. Skilfully developing and preparing this information in a way that relates to them and their information interests is a challenging process. When the Northeast Avalon Atlantic Coastal Action Program advocated for a new sewage plant, they provided information and analysis that spoke to both the need for sewage treatment from an environmental perspective, and to potential socio-economic benefits to the region.
- ◆ **Identify ways of ensuring the information produced by the monitoring work is usable by key audiences.** This practice involves understanding the type of information that is most user-friendly to the decision maker, as well as the level of rigor needed, such as the use of Quality Assurance / Quality Control standards. It also involves understanding the scope of data that would be most useful to the target audience – in some cases, long term trends are useful (such as climate change related data); in other cases, shorter term data is acceptable (such as populations counts for a potentially endangered species). Scale can also be important: monitoring data may be collected at a different scale than the decisions that are being made. When ACAP Cape Breton set out to achieve COSEWIC Red Listed status for the yellow lamp mussel, the project was designed to meet the level of data quality needed for the information to be useable by COSEWIC. After a few years of collecting data on lamp mussel populations, and collaborating with other researchers doing similar work in the region, enough data was obtained for the lamp mussel to be successfully Red Listed in the province.

4.4 Step 4: Opportunity management

Finding the right opportunities to deliver information is a creative process of both identifying those opportunities and creating them. Having a clear message, understanding of issue cycles and a strategy are tools to with that process.

This step involves moving the information developed as a result of the monitoring work into the hands of key actors. There are many tools available to help with this step: reports and related projects to release, workshops to hold, as well as ways to amplify communications with electronic mailing lists and websites that reach a much broader audience. At the heart of this step is the management of opportunities that allows one to take advantage of both windows of opportunity for delivering information and creating opportunities directly.

A core element of this process is the development of “key messages”, a series of short, plain language statements that capture the essence of the work. Though it may seem trivial, it actually takes skill to draft statements that both capture what needs to be said and expresses it in a way that is relevant to potential audiences. To this end, it is useful to test the key message with end users and focus groups. The following example of a key message is thought to have been very influential in a decision making process that eventually led to the UN Framework Convention on Climate Change in 1992⁵³:

The world is likely to see “a rate of increase of global mean temperature during the next century...that is greater than that seen over the past 10,000 years.”

Another aspect of identifying opportunities is to understand “issue cycles” as they will help with recognizing the importance of timing in light of other competing or comparable public and political interests. Social attention to environmental risks appears to follow issue attention cycles as identified by the Social Learning Group⁵⁴.

The **first phase** consists of a gradual build-up of scientific and analytic capacity as research and monitoring activities take place. At this point, there is little widespread public attention. During this time, society’s capacity to address new issues

⁵³ ⁵³ Creech, H., Jaeger, J., Lucas, N., Wasstol, M., Chenje, J. (2006) Training Module 3: Developing an Impact Strategy for your Integrated Environmental Assessment. UNEP GEO Resource Book, in press. United National Environment Program.

⁵⁴ Social Learning Group (2001). *Learning to Manage Global Environmental Risks*. MIT Press, Cambridge, MA. in Creech, H., Jaeger, J., Lucas, N., Wasstol, M., Chenje, J. (2006) Training Module 3: Developing an Impact Strategy for your Integrated Environmental Assessment. UNEP GEO Resource Book, in press. United National Environment Program.

accumulates gradually among a small group of institutions that, by historical circumstances, are collecting the information.

The **second phase** is a rapid rise in public and political attention for the issue. At this time, new leadership and institutions emerge to address the issue. It is also at this time that coalitions form to develop shared understanding of the issues and to push the issues forward. Usually in this phase, collective efforts become more prominent than increased participation by individuals.

Follow a peak in public attention, the **third phase** involves increased flow between knowledge and action as knowledge is used to influence action and vice versa. .

In the **first phase**, it is likely that most attention to the issue is in the scientific and technical community. Those most interested in the information will likely be in this realm, and it will take more effort to get the attention of the general public, and private and political interests. During the **second phase**, when the public and political attention to the issue is on the rise, there may be a “window of opportunity” to reframe the issue and attract new actors to become involved. In the **third phase**, when the issue is already on the agendas of the scientific, public and political communities, it may be that the impact of monitoring data could be the most obvious and immediate. It is important to remember that an impact strategy developed in the third phase is much less effective than one developed early on in the process. One of the benefits of an impact strategy is that it helps to mitigate reduced public attention and to shorten the attention cycle by bringing the issue back into the public eye more frequently.

Opportunities can also be managed through the development of scenarios based on findings. Scenarios help decision-makers deal with uncertainty and identify options for action. In this type of process, implications of monitoring findings can be shown to target audiences. Mapping software can be used to enable visualization of different scenarios.

Responding to opportunities to communicate monitoring work may arise unexpectedly, requiring some amount of creativity. At the same time, a communications strategy can include a variety of products and approaches.

4.4.1 Results Synthesis

One aspect of opportunity management is the development of a communications strategy and related approaches. A broad base of communication tools was present in all case studies. Developing products that were more strategic in the sense of language and content proved to be

challenging for most cases. Less strategic practices included sending a single report to all audiences, sometimes including large sections of raw data. More strategic examples included developing and delivering different products to meet different audiences, such as targeted executive summaries and Q&A sheets, or strategically sending the report to those most interested in the subject. At least two case studies developed communications strategies for delivering information in various formats and to various audiences, and at least two surveyed recipients of the information to obtain feedback on reporting style and content.

The presence of issue cycles may have been an undercurrent in some cases. The Monitoring the Moraine project formed following intense public interest over the Oak Ridges Moraine and subsequent formation of a provincial plan that then provided an opportunity to monitor. Because of this, it was easy to bring people on board initially, and create a network of interested audiences for information delivery. The Rocky Mountain Trench Natural Resources Society formed in an atmosphere of heightened conflict between rangeland managers and hunters over wildlife in a forest ecosystem that was undergoing rapid in-growth due to lack of fire. This was one of the factors that enabled an umbrella group made up of key decision-makers to form that could be functional in finding solutions to the issues. At other times, issue cycles had an impact on interest in ongoing monitoring information. Results from H₂O Chelsea's monitoring work that revealed presence of uranium in the water led to heightened public interest in Chelsea water quality, at a time when Walkerton water quality issues were still very much on the minds of the public. This led to increased attendance at public meetings and requests for monitoring information. And increasing attention is being paid to the monitoring work at the Arctic Borderlands Ecological Knowledge Co-operative as development in the Mackenzie Delta is requiring cumulative impact assessment that draws on local knowledge. The Co-op is considered to be a positive example of local knowledge collection.

4.4.2 Practice in Action

Formed in 1996, the **Arctic Borderlands Ecological Knowledge Co-op** brings together science and local knowledge to monitor the ecological change in Northern Yukon, Alaska and the Mackenzie Delta. The ecological monitoring is positioned to address climate change, contaminants and regional development. An important factor of success for the co-op has been a communications approach that has focused on keeping messages "simple and...relevant. They should be clear and plain language for all audiences". Their strategy, developed in 2002, set out to answer the questions⁵⁵:

⁵⁵ Arctic Borderlands Ecological Knowledge Co-op (2002) Communications Strategy. <http://www.taiga.net/coop/business/CommunicationsStrategy.pdf>

- Who needs to know about the Arctic Borderlands Co-op and its programs?
- What do people need to know?
- How would they like to learn it?

For each of their target audiences, they developed communications goals. An example of a communication goal for Academic and Research Institutions reads as follows:

Should have access to the results of monitoring done by the Co-op and have an awareness of the unique model used by the Co-op. This awareness may spur further research and aid in the sharing of information by researchers who work in the North.

The strategy then lists 16 different types of communication products targeting different audiences.

4.4.3 Summary of Practices

- ♦ **Develop a communications strategy.** This is an initial step that most monitoring groups will have already done. There are many materials available on how to develop a communications strategy, including how to communicate effectively with the press, and the range of materials to prepare and who to deliver them to. The following are aspects of a communications strategy that seemed to work well for the cases studied for this research:
 - Regularly report to the target audience, such as on a yearly basis, and choose a time of year when the report is more likely to be read.
 - Have the report “translated” into a language suitable to the target audience.
 - Keep the messages simple and relevant, and use clear and plain language for all audiences.
 - Develop products that make good use of maps and photos, such as posters, in addition to including them in regular reports.
 - Make use of in-kind donations from partnering organizations by asking them to print and distribute communications.
- ♦ **Identify different types of communications formats materials suitable for different audiences.** Reaching target audiences effectively involves tailoring information to their needs. Does the target audience need rigorous information, such as the kind presented in the table at the beginning of this section? For example, when ACAP Cape Breton provided monitoring information to COSEWIC, raw monitoring data was incorporated into other sets of data from other sources, followed by data analysis. Or is an executive summary that provides highlights and linkages to other areas of interest needed? When monitoring information is presented to city council in Chelsea, executive summaries are provided, along with an in-person presentation, and Q&A sheets councillors can later use to answer questions from the

public. The Arctic Borderlands Ecological Co-operative provided posters with information summaries to some of their key audiences.

- ◆ **Be ready for the media.** There may be unexpected opportunities to present the monitoring work to the media, or to decision-makers who are in a position where the information provided from the monitoring work is needed. In the former, it is useful to build a rapport with the press over time, so that they will where they can obtain the monitoring information when needed. Being ready with concise documents containing clear messages in easy to read formats is also useful; in the case of submitting a press release, it is also a good idea to use accepted press release formats which have specific formatting requirements.
- ◆ **Avoid assumptions that those you are trying to reach with monitoring information have been reached.** Simply sending a report by mass e-mail doesn't guarantee that the report has been seen by the target audience. Depending on the target audience, one approach is to give the information in the form of a presentation, in addition to a shorter report, as was done by a number of cases, including the Rocky Mountain Trench Natural Resources Society and H₂O Chelsea. If the report is presenting science-based information, having a presenter who has credibility with the audience is effective. Alternatively, arranging follow up conversations or surveys to ask for feedback on the report, as was done by the Monitoring the Moraine project, can help ensure or at least gauge report uptake.

4.5 Step 5: Tracking and Evaluating Success

Monitoring and evaluation is a central step to the impact strategy, as it provides the necessary feedback for adaptation and learning over time. The challenge of understanding how information influences decision-making, particularly in policy, is part of a much larger, more complex discussion. As was indicated early in this paper, decision makers use a wide variety of information and the influence may be better understood in the context of contributing to the decision making discourse, rather than specific decisions (refer to Woof it⁵⁶ for more on this subject). One approach is to measure incremental changes that are pointing towards changes and decisions being sought, then adapting the strategy over time.

The signals for understanding whether the strategy is working may seem small and insignificant, and may appear as very incremental changes in attitudes, actions and behaviours that are a direct outcome of monitoring efforts. Are people returning phone calls? Is the monitoring group being asked to participate in processes or sit on committees that were closed in the past? Are

⁵⁶ Wooffitt, R. 2005. Conversation Analysis and Discourse Analysis: A Comparative and Critical Introduction. London: Sage Publications.

they coming to meetings? Are more stories being published about the issue than before? Have people been asking to see the monitoring work?

There are at least four ways of categorizing how behaviour may be influenced: receiving information, seeking and processing information, acting and demanding information. These are summarized as follows, as adapted from Creech et al, 2006⁵⁷:

Receiving information: Target audiences (i.e. decision-makers and those who can influence decision-makers) have received the monitoring information and have been available for follow-up meetings. Monitoring information is being published in the media.

Seeking and processing information: Target audiences are asking questions about the monitoring information, and are looking to verify it.

Acting: Target audiences are responding to the issue identified by the monitoring information by issuing new policy briefs, white papers, frameworks, regulations, and other responses.

Demanding: Target audiences are asking for the monitoring group to provide more information such as conduct follow-up investigations, and add monitoring parameters to the work.

Because monitoring can be a time intensive process, it is helpful to identify a few key indicators and to set up some easy ways to monitor those indicators over time.

4.5.1 Results Synthesis

While no case studies included a formal impact strategy, the need to better assess the impact of monitoring outputs and outcomes was identified. As mentioned earlier, it can be difficult to assess accurately whether policy is shifting in a certain direction, such as integrated watershed planning, as a result of the monitoring work. At the same time, there were a number of more incremental feedback mechanisms that groups were using including surveys, attendance at workshops, in-kind contributions from supporters, and the willingness of decisions-makers to take small actions on behalf of the monitoring group.

4.5.2 Summary of Practices

The following outlines a variety of measures that could be used to assess impact for steps 2, 3 and 4 of the impact strategy. These measures are drawn from this research as well as suggestions adapted from Creech et al, 2006⁵⁸.

⁵⁷ Creech, H., Jaeger, J., Lucas, N., Wasstol, M., Chenje, J. (2006) Training Module 3: Developing an Impact Strategy for your Integrated Environmental Assessment. UNEP GEO Resource Book, in press. United National Environment Program.

Step 2: Relationship Management

Key Question 1: Have key decision-makers and influencers been identified?

Possible Measures:

- ◆ Assessment of relative influencing power of identified key decision-makers and other influencers.
- ◆ Evidence that key decision-makers were targeted.
- ◆ Number of key persons identified for each relationship group; including specific names of from potential audiences.

Key Question 2: What important changes in the thinking and actions of key decision-makers have been observed?

Possible Measures:

- ◆ Receiving behaviour observed
 - Number of decision-makers who are subscribing (individuals and organizations) to listserv/e-mail newsletter.
 - Number of decision makers who receive and/or request monitoring reports.
 - Number of occurrences where a decision-maker has referred to the monitoring report in the media, or has used the same language when speaking to the media.
- ◆ Participation behaviour observed
 - Attendance of decision-makers at public workshops.
 - Presence of in-kind contributions from decision-making bodies such as print, copy or press services.
 - Number of decision-makers who participate in longer term multi-party processes, directly or indirectly through a representative.
 - Quality of participation of decision-makers in multi-party processes, such as contribution during meetings.
 - Participation of decision-makers in surveys and requests for feedback.
- ◆ Acting behaviour observed
 - Occurrence of meetings held to specifically review monitoring report findings and address issues.
 - Number of times decision-makers contact monitoring group for consultation on decision-making activities.
 - Number of projects that are initiated or supported by decision-makers as a result of the monitoring work.

- ◆ Demanding behaviour observed
 - Number of cases decision-makers contacts the monitoring group to request new information or process changes to be included in the next monitoring cycle.

Step 3: Knowledge Management

- ◆ Monitoring information is needed and desired.
 - Views of decision-makers on what they feel/think the key issues are.
- ◆ Monitoring information was useable
 - Types and forms of information decision-makers require are available.
 - Monitoring information collection and analysis follow the level of rigour needed by decision-makers, such as standard protocols and quality assurance.
 - Monitoring information reflect time and spatial scale needed for decision-making.

Step 4: Opportunity Management

- ◆ Monitoring information is accessible and timely.
 - Decision-makers are able to obtain the monitoring information in a language that is appropriate and in a format that is readily available.
 - Decision-makers are able to obtain monitoring information at a time when it is relevant

4.6 Summary

In summary, the following table lists the high level practices discussed in this section.

Table 1. Practices for Effective Delivery of Information

Impact Strategy Framework	Practices
<p>1. Change Statement</p> <p><i>What is the change you seek?</i></p>	<ul style="list-style-type: none"> ◆ Identify emerging issues that could be addressed by the monitoring work. ◆ Identify political, policy and/or planning processes that could be connected to the monitoring work. Processes, as is appropriate. ◆ Develop change statements that reflect emerging issues and focus on specific political, policy and/or planning ◆ Develop a change statement early in the process and use it to hold a focus for the monitoring work.

	<ul style="list-style-type: none"> ◆ Be clear and specific. ◆ Create a change statement that is appropriate for the context. Some may need a broad statement to achieve buy-in; others may need specific statements that help focus efforts. ◆ Adapt change statements over time as circumstances change and new information or experience is gained. ◆ If change statements are very specific, more than one change statement may be needed to enable monitoring of impact.
<p>2. Relationship Management</p> <p><i>Who are the people that are positioned to have influence on the change?</i></p>	<ul style="list-style-type: none"> ◆ Identify and involve key actors early in the process. Understanding the sphere of influence of key actors is an important part of making sure the right people are at the table. ◆ Identify steps for building networks and relationships. Include a variety of different methods, such as attending events hosted by key actors, setting up meetings, hosting a workshop. ◆ Find out what is important to the person you want to build a relationship with and help them make a connection with your work. ◆ Use good practice when building relationships such as following-up regularly. ◆ In some cases, it may be beneficial to work towards institutional bridges that are less reliant on a single person.
<p>3. Knowledge Management</p> <p><i>What knowledge to them/us need?</i></p>	<ul style="list-style-type: none"> ◆ Identify the issues that are most relevant to key audiences. ◆ Identify the type of knowledge that is most sought by key audiences and where it is normally sought from. ◆ Identify the type of information that you think is most needed by key audiences. ◆ Identify ways of ensuring the information produced by the monitoring work is usable by key audiences.
<p>4. Opportunity Management</p> <p><i>What are the key opportunities to communicate?</i></p>	<ul style="list-style-type: none"> ◆ Identify different types of communications materials and timelines suitable for different audiences. ◆ Use language and formats that are desirable and needed by those receiving the communications. ◆ Avoid assumptions that those you are trying to reach with monitoring information have been reached. ◆ Be ready for the media.
<p>5. Evaluation and Monitoring</p>	<ul style="list-style-type: none"> ◆ Identify incremental ways of measuring progress towards the change statement in the areas of building and maintaining relationships, managing knowledge, and

<i>How can we measure our impact?</i>	managing opportunities to communicate. .
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5. Building Capacity for Greater Impact: Conclusions and Recommendations

Informing decisions at the local level about environmental issues is at the heart of community-based monitoring. This research set out to identify practices and approaches that have contributed to the success of delivering monitoring information to decision-makers. To help organize this information, a framework that emphasizes strategy was used. A central element of the framework is importance of relationships and developing a better understanding of what the desired impact is, and who is in a position to influence that change. Using the push and pull metaphor, it is about coming to a better understanding of the “pull” side of the equation – the perspective of the one on the requesting and receiving end of the equation, whether it is a policy maker, a bureaucrat, or a decision-maker in another context.

Not surprisingly, the results of this research highlighted the value and importance of understanding the perspective, language, needs and desires of those in a position to have an impact. Many of the cases studied were already applying various aspects of the impact strategy, and the common response to it was that the while the parts were not new, having an organizing framework was structurally useful. Perhaps it validates what may already ring true, thus helping to create strategic focus. While many of the elements were already present in the case studies, it was more challenging for people to articulate the actual practices used to bring about successful results. Perhaps we are less accustomed to talking about process when efforts are focused on outputs and outcomes.

Possibly one of the most challenging steps is the first one, crafting a change statement, pointing to the outcome we are looking for. It is challenging for a number of reasons – a tightly worded change statement may work for some stakeholders and not others, which can create division instead of collaboration. There may also be resistance to creating a change statement when the monitoring group perceives that their role is to provide neutral monitoring information, rather than advocating for a specific change. At the same time, there is a desire that the information be used, which involves making decisions about who needs to use the data and for what purpose. The value of the impact strategic increases when the change statement provides a level of focus that enables specific measures and indicators to be developed to monitor change, via relationships, delivery and uptake of information.

There remains a significant area for capacity development among those who seek to better understand both the decision-makers and the community-based monitoring organizations. It seems to be a process of mutual learning, both individually and institutionally. As individuals build their capacity to better understand the perspective of the other, so too institutions need to build structures to be able to receive and work with community-based ecological monitoring information. Further, linking monitoring efforts with broader issues on the landscape and in the community seems to enhance the flow of information between the push and the pull, enabling a mutual relevance of monitoring information.

Taking increased connectivity a step further, linking community-based ecological monitoring systems to other assessment processes at multiple levels of governance, including municipal, provincial and federal could result in further use of monitoring information. Furthermore, it could result in dialogue to enable understanding of perspectives, and possibly shape monitoring work, as appropriate at both levels.

5.1 Recommendations

The following are recommendations intended to strengthen the capacity among community-based monitoring groups to develop strategic direction for the delivery of monitoring information.

1. Development of training materials. Foundational training materials to further build capacity among EMAN members for strategic delivery of monitoring information. Areas of emphasis could include the policy / science interface; municipal and provincial public sector information needs; structures and processes for networking, relationship building, and multi-party collaborations; communication strategies; and development of internal structures for measuring impact.

2. Development of an e-learning platform. A virtual e-learning platform would enable capacity to be built across the country. Possible components of the e-learning platform are: 1) e-dialogue panels with specialists in a particular area of capacity building (or as a conference call with virtual meeting technology); 2) interactive online presentation of training materials; 3) tutorial services including a forum for questions and answers; 4) additional resources such as how-to manuals; 5) opportunities to receive feedback on the development of an impact strategy.

3. Country-wide focus groups for capacity building. Small focus groups would be formed over a limited period of time for the purpose of further identifying best practices and building capacity. Monitoring groups would be selected based on an assessment of need and potential for increasing impact of monitoring information; would span the country; and would include a cross-section of participants from both push and pull perspectives. The focus could be on specific areas

of capacity building such as the community monitoring / policy interface; identifying leaders of influence; communication strategies; and measuring impact. Alternatively, each focus group could develop a full impact strategy for a specific monitoring initiative. The groups could be co-facilitated by EMAN and by a member of the monitoring initiative. The work would include both learning and applied components, and outcomes would be shared at EMAN National Science Meetings and on the Internet. Outcomes of the focus group would include a proposal for implementing the strategy, obtaining funding to do so and a mechanism to track progress over time.

4. Stimulate peer-to-peer learning by matching community-based monitoring groups. This would be a program where monitoring groups with specific challenges related to having an impact would be matched with other monitoring groups that have had success in specific areas, such as working with municipalities, setting up stakeholder forums, and so forth. This would be a voluntary effort that would connect those with specific needs with those who have adopted successful practices. It would likely begin as an informal process that could grow into a more formal mechanism to provide a system of mutual support to community monitoring groups.

5. Development of virtual infrastructure for sharing good practices. The infrastructure would include the outcomes of focus group work, as well as a platform for sharing of experiences of other monitoring groups, including what the impacts were of the monitoring initiative and what circumstances facilitated those impacts. This could also include a listserv or discussion group among those interested in further exploring principles and practices for having an impact. A dedicated effort and focused criteria for what would be included as a good practice. This platform could be connected to the e-learning platform; however the focus would be more on sharing experiences than on e-learning.

6. How-To Guide for Delivering Monitoring Information to Decision-Makers. This guide would focus on a specific element of the impact strategy – identifying and reaching decision-makers with monitoring information. It would include ways of identifying the true decision-makers in a decision-making process, strategies for communicating about community-based monitoring initiatives to decision-makers, steps for including decision-makers in the process and to understanding institutional capacity and flows for handling the information. It would be developed primarily in consultation with decision-makers operating in municipal and provincial contexts, as well as the private sector.

7. How-To Guide for Working with Community Monitoring Initiatives. This guide would provide an overview of community monitoring initiatives, including how the information can be and has been used by decision-makers. It could build on current efforts being undertaken by H₂O

Chelsea, and other related efforts to better connect both groups. It could be an adaptive document that monitoring initiatives could use when initially making contact with decision-makers, primarily working in public and private sectors.

8. Continued collaboration with the Canadian Sustainability Indicators Network. The Canadian Sustainability Indicators Network is a Canada-wide network of indicator practitioners. The network hosts periodic virtual conference calls called Learning Events, bringing together indicator developers and users operating in a variety of contexts. EMAN and CSIN could continue to co-host learning events focused on the topic of influencing decision making with monitoring information, as well as identify other ways of bringing together CSIN members to provide added value to the discourse.

Annex A: Literature Review

Communicating ecological monitoring information to local decision-makers

November 2, 2006 DRAFT

By Marlene Roy, IISD

Scope of Literature Review

EMAN members include both government experts and local-level stakeholders who are continually refining their ecological data collection and management, information dissemination and communication efforts with the mutual aim of better influencing public policy. As the literature on these topics is vast, especially the science – policy literature, it was necessary to narrow the scope of this literature review so that discernable patterns could be brought into sharper focus. A few key publications from the science to policy literature are covered, while the literature on community-based monitoring (CBM) is bounded by Pollock and Whitelaw's (2005) framework.

Pollock and Whitelaw (2005, 217) describe a community-based monitoring conceptual framework that expresses “the practical experience of communities engaged in implementing CBM” in Canada. This conceptual framework consists of four dynamic themes: community mapping, participation assessment, capacity building and information delivery (Pollock and Whitelaw 2005, 218). *Specifically, this literature review focuses on the information delivery theme, which has three components, namely ecological monitoring, communication and achieving influence, for both the science-policy and community-based monitoring literature.*

Community-level *ecological monitoring* “depends largely on protocols that are easy to obtain and understand, tested and packaged for community use, and accompanied by training manuals and sources of assistance (Pollock and Whitelaw 2005, 223). Good *communication* is vital both “internally between participants and externally to media and the wider public” (Pollock and Whitelaw 2005, 223). To achieve *influence* data needs to be timely, usable, accessible and relevant (Vaughan et al 2001 IN Pollock and Whitelaw 2005, 224). Several challenges exist, however, and include data management, fluctuating levels of interest in monitoring, capacity of local decision-makers to identify and articulate their information needs, sufficient political will and so on (Pollock and Whitelaw 2005, 224).

Several databases were searched using keywords such as community-based monitoring, local monitoring, science communications, risk communications, etc. The literature was selected if it was on topic and applicable to local-level ecological monitoring activities and associated efforts to influence local-level policy. Pollock and Whitelaw's (2005) framework (described above) is used to organize the review into three sections, namely ecological monitoring, communications and influencing policy.

Ecological Monitoring

Citizen monitoring volunteer programs have become increasingly popular. While many such projects in North America are intended primarily as education and outreach opportunities by government agencies some “contribute to national data sets on trends in species habitat or abundance—such as Audubon bird counts (Stepenuck 2004, 177). One re-occurring issue is that of data quality. In the City of Waterloo comparisons were made between students’ water quality testing and data gathering and that of professionals (Mayfield et al 2001). “Comparisons between the two groups showed that (given that the water quality test techniques were necessarily different for the two groups), there were both significant differences and correlations” supporting that view that community-level environmental monitoring has some applicability (Mayfield et al 2001, 391). The authors did note, however, that “issues of precision and accuracy remain unresolved” and that “simple, rapid, cheap and available storage, dissemination and analysis mechanisms” are critical to ensure that the information is valued and used (Mayfield et al 2001, 392-393). Other studies have also found that water quality data, for example, collected by community groups is comparable to that gathered by professionals with a caveat that community groups use validated protocols and “adequate resources for equipment and the regular training of volunteers and staff” (Sharpe & Conrad 2006, 396).

Another comparison of expert-led government monitoring and community-based monitoring in British Columbia by Holden (2000) looked at difference in data collection and data quality and found:

- Data collection:
 - o Government: covers large areas using a limited number of sources; Data from internal or well-marketed, peer-recommended external resources
 - o Community-based: more restricted in area incorporating a greater variety of data sources including both methodologically rigorous and anecdotal. Some data sets were inconsistent or overlapping
- Data quality:
 - o Government: data quality assessed by testing the data’s ability to meet methodological or scientific criteria
 - o Community-based: depend on local in-place knowledge and quality tests are more labour- and time-intensive often requiring less technical ability and more local experience.

Yarnell and Gayton (2003) echo the need for high-quality information derived from well designed and executed monitoring, but (Martell 1996, 1999 IN Yanell and Gayton 2003, 3) “cautions that scientific rigour and a focus on the ecological system should not marginalize lay perspectives.” Indeed, ‘good science’ alone will not command the necessary legitimacy for an ecological monitoring program, thus opening the space for community-based ecosystem monitoring that is reflective of the local context, but respectful of scientific integrity in the actual monitoring (Yarnell and Gayton 2003, 4, 26). This tension between expert monitoring and research is reiterated in Whitelaw et al (2003); Holden (2000, 292) and White and Hall (2006, 306). Sharpe et al (2000, 33

IN Whitelaw et al 2003, 413) warns that community-based monitoring should augment expert monitoring conducted by government and other experts and not be used to dismantle these programmes. They further argue that community-based monitoring data is most useful in the description of trends, but should be followed up with expert investigation where warranted. Holden (2000, 292) found that government GIS managers considered some community data to be entirely anecdotal and did not respect it, though in this situation data was not necessarily collected using calibrated scientific instrumentation but was often softer social data. Furthermore data and system management sharing was affected with government looking to increase control and decrease access, demonstrating the presence of issues around data ownership, access rights and power relationships.

Norton (1998), however, argues that ecologists have generally failed to communicate about ecology to both policy makers and the public. He attributes this failure to a lack of “terms, indicators, and measures that are based in ecological science, but that are also associated with important social values (Norton 1998, 350).” Reasons for this lack of communication include ecologists being wary of mixing values with scientific study and ecologists failing to study nature at a scale relevant to decision makers and hence being slow to pick up on signals flowing from the policy discourse to ecological science. Recommendations include a better integration of policy and science under the rubric of broader adaptive management systems that would include an integrated language.

Even when the right vocabulary, indicators and measures are in place data collection is often fragmented and data is not comparable across scales, though (Vaughan et al 2003, 402.). There are several reasons for this situation including lack of funding, lack of coordination across scales and monitoring initiatives and the fact that monitoring is done for particular purposes by different jurisdictions, agencies, volunteer groups and individuals (Vaughan et al 2003, 402).

Communication

Several researchers investigated differences between the actors involved in ecological monitoring - policy processes. Most often these differences are based on the roles of these actors or the ways they understood and used information and knowledge and how this affected communication among them. In some cases, the research focused on how messages should be tailored to suit various actors that when grouped based on similarities form specific target audiences.

Garvin (2001, 443, 444) investigates the “different definitions and uses of knowledge and evidence by scientists, policy makers and the public” in the area of environmental health risk. Scientists are considered to be knowledge producers and validators, policy makers are the actors engaged in the decision-making process within political and institutional contexts and may be elected officials, bureaucrats, technocrats or consultants, and the public incorporates groups and

individuals operating within the broad arena in which policies are implemented. “The players in the three arenas use different languages, as well as have their own discourses and agreed-upon conventions for identifying knowledge and constructing persuasive arguments (Throgmorton IN Garvin 2001, 445).

“Due to its compartmentalized nature, scientific knowledge is specific and limited, and it is used to add to the greater body of understanding (cumulative knowledge). Policy makers’ knowledge is contextual and instrumental; it is applied to the current context only. The public’s knowledge, by contrast, is tacit, experiential, and individual. It is added to the body of personal experience to help revise and reformulate how individuals and groups understand their particular worlds (Garvin 2001, 452).”

Ginsburg and Cowling (2003) discuss some of the differences between major actor groups—scientists, policy analysts, decision makers, and professional communicators-- involved in making air quality management decisions. They maintain that each group has a distinctive role and responsibility as follows:

1. scientists: discover and communicate the facts and uncertainties associated with the facts
2. policy analysts: consider the facts and associated uncertainties in the light of valued held dear by different sectors of society and provide advice and counsel to decision makers
3. decision makers (those charged by society to make policy decision): should refrain from asking scientists and policy analysts such questions as “what do you think our society or our agency or company ought to do” and instead ask if this is the option than what outcome?
4. professional communicators: needed as scientists and policy analysts are not necessarily good at communications. Thus professional communicators can help ensure that scientists, policy analysts and decision makers do not talk past each other. (after Ginsburg and Cowling 2003, 133-134).

Health research dissemination provides useful information on the research – policy interface. Lomas (1997,1) notes that while evidence-based decision-making is now expected by many in decision-making, opportunities for exchange between researchers and decision-makers are few. Lomas (1997, 2) sums up the differences in processes between scientists and policy-makers as:

“researchers may come to understand that [decision-making]...is not an event, occurring at a specified time in a specified place, but is, rather, a diffuse process with difficult-to-identify participants and locations, and a good sousing of values, preferences and biases to spice the evidence. On the other side, decision-maker exposure to research may lead to an understanding that it is not a product to be purchased from the local research supermarket, but is also a process, wherein methodologies and subjects of study make take years to refine and complete.”

Lomas (1997, 3) identified three types of decision-makers with each using research differently. Legislative decision-makers are often non-experts and “tend to be interested in ideas, defensible policy assumptions to define a problem, or in justifications for or impacts of actions already taken” and prefer short memos or face-to-face meetings. Administrative decision-makers are more likely to have specialist knowledge and seek research to assist with difficult resources allocations or to

diagnose planning problems; they are better able to “digest longer (but still summarized) versions of research evidence” and are likely to attend conference and workshops (Lomas 1997, 3). Industry decision-makers are oriented towards marketable products and are often try to ‘pull’ findings from researchers. This categorization of decision-makers illustrates that researchers need to tailor their findings to each audience, i.e. there is no ‘one size fits all’.

Another analysis reviewing science communication and public attitudes to science in Britain found that the British public fell into six attitudinal groups for which science communication could be specifically written. The researcher’s conclusion is that science communication to the public mainly provides facts rather than highlighting ethical and policy issues raised by science (Trust 2000, 4). Furthermore, science communicated with some attitudinal groups better than others. One interesting finding was that 53% of the sample thought “that politicians are swayed by the media and that they should take more of a lead (Trust 2000, 5).”

Chess, Johnson and Gibson (2005) specifically assess how to communicate environmental indicators to policy makers and stakeholders in New Jersey. As their starting point they assume that risk or sustainability indicators developed largely by scientists do not meet communicative criteria. Six indicators were selected and analyzed at multi-stakeholder focus groups that included intermediaries such as journalists, environmental activists and legislative staff. Results for the criteria of communication effectiveness, truthfulness, informativeness, relevance and clarity show that indicators developed by the agency scientists were unclear thus requiring revision. One finding was of particular interest and concern, namely that of truthfulness. “Trust in the source of information can affect greatly perception of that information (Chess, Johnson and Gibson 2005, 73). Intermediaries, for example, frequently distrusted indicators reflecting positive trends and questioned the agency’s methods and standards (Chess, Johnson and Gibson 2005, 73). The authors concluded that agencies should point out the positive and negative implications of environmental data so that intermediaries will better transmit environmental information to the public. They advise that early participation in the development of indicators may reduce some communication problems, but note that community-based efforts that may be close to the ultimate audience do not necessarily translate into clearer and better communicated indicators (Chess, Johnson and Gibson 2005, 73). Specific recommendations to practitioners by the authors are:

4. spend time meeting with intermediary groups to solicit their input
5. develop key indicators in consultation with intermediary groups
6. pre-test indicators with intended audiences

(After Chess, Johnson and Gibson 2005, 74)

Other studies also considered the importance of trust. In one such study on the role of local newspapers in environmental risk communication, Wakefield and Elliott (2003, 225) note that while stakeholders primarily used newspapers as a source of risk communication, paradoxically they did not trust this information source or consider it credible. The authors conclusion based on

respondents replies was that “people—not print—are the most effective risk-communication tools (Wakefield and Elliott (2003, 225). Face-to-face communication with friends, neighbours and officials at public meetings were considered highly reliable.

Dorfman et al (2006, 405-407) investigated types of communication methods used and the extent of their use by local authorities for local air quality management. They suggest that this communication process is the space where science is translated into policy. Within the local authority and between tiers of government integrative collaborative methods (personal communication and meetings) were more effective than one way communication modes such as reports and bulletins. When communicating with local stakeholders, i.e. non-experts, however, local authorities mainly used one-way communication modes such as public meetings, information displays, internet sites, leaflets and so on (Dorfman et al 2006, 413). One case study “highlighted the virtue of presenting scientific data in a form that can be readily interpreted by all stakeholders”, thus allowing for questioning and refinement, something not possible if one-way communication modes are used.

The ability to tailor science communications to different audiences is one of the main characteristics of ‘boundary organizations’ that “sit between two different social worlds (like science and non-science) and can be used by individuals within each social world for specific purposes without losing their own identity (Rutgers University et al...1999, 2). Such boundary organizations bring science into the world of policy and vice versa, thus showing how the needs of the two audiences can be met while the integrity of each is maintained.

Achieving influence:

Community-based ecological monitoring in Canada, according to Pollock and Whitelaw (2005, 214), is multi-party and designed to include all interested stakeholders. The level of intersection with and influence on local-level policy decisions varies with some monitoring efforts being more closely integrated with local government activities than others and hence having more relevance at a particular point in time. While multi-stakeholder network approaches such as community-based ecological monitoring that involve stakeholders and citizens in planning and management are touted as a way to contribute to participatory community development and enhance citizen influence on policy, the methods by which this happens are difficult to assess (Pollock and Whitelaw 2005, 231; Whittaker et al 2004, 579).

Sutherland et al (2006) describe an exercise to initiate research that it is more aligned with issues that influence policy. They maintain that “the popular perception amongst many ecological practitioners and researchers is that policies are often developed without sound evidence derived from research and that the results are not used to the extent that they could be to inform decision-

making (Sutherland et al 2006, 618; Vaughan et al 2003, 400).” In this study, the aim of the exercise was to identify a list of 100 specific ecological questions identified and agreed to by policy makers, their advisors, lobbyists and members of the research community with the assumption that such a list would be highly relevant to policy. The authors conclude that due to a demonstrated mismatch between problem formulation by the scientists and policy makers there is a need for an analytical-deliberative process that would involve key stakeholders at early stages of the problem formulation process (Sutherland 2006, 625). Scientists, however, are integral to correct formulation of questions and problems and need to continue to provide the best evidence available, monitor how well current policies are working and provide solutions to unexpected events and policy failures (Sutherland 2006, 625).

Indeed, the value of government scientist – community partnerships is outlined by McNeil, Rousseau and Hildebrand (2006). They describe successful outcomes from this type of partnering in Atlantic Canada as being such things as: government scientists learned the value of working with local community groups to garner knowledge about local conditions; the government department was better able to achieve its environmental management goals; and trust was built between stakeholders and government leading to a Memorandum of Agreement. The same paper also outlines how the community monitoring program contributed to educating and influencing citizens through projects with homeowners and school-based educational programs.

The Evaluation Unit of the International Development Research Centre (IDRC) evaluated the public policy influence of IDRC-supported research and found that “the production of policy-relevant research and analysis was the principle activity through which projects sought to influence policy (Adamo 2002, iv). Indeed in many instances the participation of government agencies and individual decision-makers encouraged joint agenda setting and a greater probability that the research would feed into policy processes. Many other research dissemination tools were also used such as publications, newsletters, policy briefs, websites and databases, networking, workshops, seminars, policy roundtables and government outreach (Adamo 2002, v). Other mechanisms include training, mentoring and peer review and dialogue initiatives such as working groups and task forces.

Factors that facilitated policy influence:

- meaningful involvement of government officials and policymakers in the project,
- high quality and relevance of research to active policy processes;
- visibility, reputation and positioning of researchers and/or institutions in policy arenas;
- novelty of the approach or structure used by the project; and
- presence of a supportive policy environment.

Factors that inhibited policy influence

- poor relevance and usefulness of research outputs to current policy processes
- poorly targeted and structured activities that failed to reach and incorporate policymakers and their ideas into project activities

- project delays
 - resistance of powerful interest groups to policy reforms
 - deteriorating or lack of supportive policy environment and / or weak government structures; and
 - slow, complex and political nature of policy-making processes
- (after Adamo 2002, v-vi)

Interestingly, in the some areas of the U.S. environmental policies now include a requirement that decisions be based on 'best science' or 'best available science' (Francis et al 2005, 35). A case study in Washington State found that even though the use of science in policy-making is legislated the level of use in land-use planning policy varied (Francis et al 2005, 35). Small jurisdictions with populations of less than 30,000 conducted less direct analysis of scientific information partly due to financial constraints and related lack of scientific expertise. Medium-size jurisdiction with greater resources and knowledge along with larger staff allowed for on-going review and collection of scientific information, which was coupled with a greater influence of politics on policy processes. Large jurisdictions (including cities) with associated higher levels of population and resource base regularly reviewed scientific information, frequently updated their own scientific research and generated their own best available science that was often peer-reviewed and published. In this case the level of political influence was relatively low and scenarios were frequently developed and presented to decision-makers as a way to make decisions. Notable was the role the consultants played in the collection and use of scientific information in all jurisdictions. With or without consultants all jurisdictions relied heavily on state provided resources (Francis 2005, 35).

Bibliography

Adamo, Abra. *Strategic evaluation of policy influence: what evaluation reports tell us about public policy influence by IDRC supported research.* Ottawa: IDRC Evaluation Unit, 2002. vi, 46p.
Abstract: As part of the strategic evaluation, IDRC's Evaluation Unit commissioned a review of evaluation reports from Centre-supported research. This study was undertaken to determine what information could be drawn from evaluation reports regarding the experience of IDRC-supported research in influencing public policy in the countries and regions in which the Centre works. The increasing priority given to policy influence in IDRC programming and projects is reflected powerfully in the fact that ninety-four percent of evaluation reports reviewed for this study examine policy influence, in different ways and to varying degrees, as an indicator of project performance. The evaluation reports reviewed tell us a great deal about the intent of IDRC-supported research to influence policy, the approaches and activities used by projects to influence policymakers and policy processes, the extent and ways in which projects have influenced public policy or contributed to policy influence, and the factors that facilitated and/or hindered a project's policy influence potential.
URL: <http://www.idrc.ca/uploads/user-S/10359910880strategic.pdf>

Chess, Caron, Branden B. Johnson and Ginger Gibson. "Communicating about environmental indicators." *Journal of risk research* 8 (1, 2005) : 63-75.
Abstract: The challenge of designing risk or sustainability indicators that communicate effectively to non-technical audiences may be even greater than described by Gray and Wiedemann (1999) in this journal. To meet the objectives of the international community, which includes involving

stakeholders in policy discussions, indicators will need to fulfill communicative criteria articulated by Gray and Wiedemann. Yet our exploratory research of New Jersey indicators suggests that without substantial pre-testing and revision of indicators, efforts to communicate with stakeholders and members of the public may be frustrated.

Dorfman, Paul et al. "A conceptual model of the role of complex science in local authority consultations about air quality management." [Local Environment](#), Volume 11, Number 4, August 2006, pp. 399-419(21)

Abstract: There exists a clear imperative across the EU and within the UK towards the enhanced integration of community knowledge in environmental and health decision-making processes. The underlying social force that underpins this dynamic is the drive for a more accountable, transparent and publicly acceptable decision-making arena. However, relatively little research has been undertaken on the evaluation of local air quality management consultation in particular. In this context, the paper presents an evaluation of evidence resulting from questionnaire survey and case study research undertaken in the first round of the statutory process of local air quality management (LAQM), in which local authorities are required to consult on their air quality findings and intentions. We suggest that local authority perceptions of the relative abilities of differing stakeholders' grasp of air quality science, the process that translates that science into policy, and the institutional and organizational status of stakeholders (i.e. whether they are statutory or non-statutory stakeholders) may tend to transitively determine the choice of consultation methods used, the communication strategies chosen and the relative integration of stakeholder feedback into the LAQM decision-making process. In order to interrogate this potentially problematic chain of risk communication events, a preliminary conceptual model has been developed to enable the interrogation of the pathways through, and the obstacles to, the translation of air quality knowledge. The task is to unveil the sequential chains of association that comprise the LAQM risk communication process.

Francis, Tessa B. et al. « Incorporating science into the environmental policy process : a case study from Washington State." *Ecology and society* [Online] 10 (1, 2005).

Abstract: The incorporation of science into environmental policy is a key concern at many levels of decision making. Various institutions have sought to standardize the protection of natural resources by requiring that decisions be made based on the "best available science." Here we present empirical data describing the incorporation of best available science in the land-use policy process on a local scale. Results are based on interviews with planners and others who conducted scientific reviews associated with a Washington State Growth Management Act amendment that requires the inclusion of best available science in protecting critical areas. Our results show that jurisdictions varied with respect to how they included science in their land-use policies. Specifically, we found that smaller jurisdictions were very reliant on scientific information provided by state agencies, communicated frequently with other jurisdictions and agencies, and most often let scientific information guide the policy development process. Medium-sized jurisdictions, in contrast, were more inwardly focused, relied predominantly on local information, communicated little with outsiders, and more often looked to political influences to guide the policy process. Large jurisdictions, including most counties, often generated their own best science, communicated with and often informed state agencies and other jurisdictions, and more often considered science first during the policy development process. Jurisdictions also differed in terms of how best available science was defined, and how jurisdictions dealt with conflicting scientific information. Our results provide empirical evidence of the variation with which best available science is used in environmental policies.

URL: <http://www.ecologyandsociety.org/vol10/iss1/>

Garvin, Theresa¹. "Analytical Paradigms: The Epistemological Distances between Scientists, Policy Makers, and the Public." [Risk Analysis](#), Volume 21, Number 3, June 2001, pp. 443-456(14)

Abstract: The effective use of evidence and its resultant knowledge is increasingly recognized as critical in risk analysis. This, in turn, has led to a growing concern over issues of epistemology in risk communication, and, in particular, interest in how knowledge is constructed and employed by the key players in risk—scientists, policy makers, and the public. This article uses a critical theoretical approach to explore how evidence is recognized and validated, and how limits are

placed on knowledge by scientists, policy makers, and the public. It brings together developments in the sociology of science, policy and policy development, public understandings of science, and risk communication and analysis to explicate the differing forms of rationality employed by each group. The work concludes that each group employs different, although equally legitimate, forms of rationality when evaluating evidence and generating knowledge around risky environment and health issues. Scientists, policy makers, and the public employ scientific, political, and social rationality, respectively. These differing forms of rationality reflect underlying epistemological distances from which can develop considerable misunderstandings and misinterpretations.

Ginsburg Eric O (Reprint); Cowling Ellis B. "Future directions in air-quality science, policy, and education." *Environment International* 29 (2-3): p 125-135 June 2003.

Abstract: On February 12-15, 2001, more than 200 scientists, engineers, decision makers, and educators participated in a conference on the "Future Directions in Air Quality Research: Ecological , Atmospheric, Regulatory/Policy, and Educational Issues." Important perspectives are summarized from the keynote addresses of noted scientists and educators, as well as managers in government, industry, and public interest groups. Observations and recommendations are provided to stimulate further thought about how to increase opportunities to make greater use of scientific knowledge in air-quality decision making and to ensure that decisions are effective, economically viable, health and ecologically sound, and socially acceptable. Recommendations are given regarding ways in which communications between scientists and policy makers should be structured so as to make appropriate and effective use of scientists and the knowledge they can provide in policy-making fora.

Holden, Meg. "GIS in land use planning: lessons from critical theory and the Gulf Islands." *J Planning Educ and Research* 19:287-96 no 3 Spring 2000 , bibl(s); map(s)

World Wide Web: <URL:<http://www.uwm.edu/Org/acsp>> [cited 30 May 2001].

Abstract/Notes: Use of computerized geographic information systems by local governments and citizens as tools in land use planning; case study from British Columbia, Canada

Lomas, Jonathan. 1997. Improving research dissemination and uptake in the health sector: beyond the sound of one hand clapping. McMaster University Centre for Health Economics and Policy Analysis, 1997. 67p.

Improving Research Dissemination and Uptake in the Health Sector: Beyond the Sound of One Hand Clapping

Health policy researchers and policy-makers have to take a totally different view of how research into health concerns is conducted and how those results are translated into practice if research is to play a meaningful role in changing the Canadian healthcare system. Most importantly, all those involved in doing the research and applying the findings have to view research dissemination and uptake as a communication process between two sides.

These points emerge from a review of the current status of health research and the lack of progress in disseminating research results and changing practitioner behaviour. Much of this failure to apply research more effectively is attributable to a lack of communication between researchers and policy makers and a poor understanding on the one hand, of the environment in which research is generated, and on the other, of the realities facing policy-makers trying to interpret and implement research findings. In addition, there is an undue emphasis on trying to change the behaviour of clinical practitioners in health care to the exclusion of other potential audiences for research such as legislative, administrative and industry decision-makers.

Part of the cultural change required to make research dissemination more effective is already occurring in Canada with the funding of applied research centres both inside and outside the university setting and the widespread interest in evidence-based decision-making. These new bodies promote the needed multi-disciplinary approach to health research and provide opportunities for the two sides to gain a better understanding of each other's work. The most effective instances of health research being translated into practice occur when decision-makers are involved in the study process from the very beginning.

To speed the process of research dissemination and uptake, we need new structures to improve the opportunities for ongoing communication between researchers and policy-makers, new activities and processes to promote more effective research and dissemination of findings, and even the creation of new human resource positions which would bridge the research and decision-making communities.

http://www.chsrf.ca/knowledge_transfer/pdf/handclapping_e.pdf

Mayfield, Colin, Michelle Joliat and Donald Cowan. "The roles of community networks in environmental monitoring and environmental informatics." *Advances in environmental research* 5 (4, 2001): 385-393.

Abstract: The increasing complexity of gathering and using all kinds of environmental information, as well as the decreased funding for these activities, have led to examples where local communities and community groups are taking the lead or are cooperating with government agencies to gather such information. Some issues that have emerged from these activities are: the validity, the accuracy, and precision of measurements made by the groups; the ownership, legal status, and copyright status of the information; and the mechanisms for formatting, storage, backup, dissemination and use of this information in other applications. For the past 8 years, we have been designing and operating different types of community networks and environmental monitoring programs with community groups, high schools, volunteer professionals and government personnel. We have incorporated environmental information systems in Intranets for government use and in public sites available over the Internet. We have tested many different methods for data acquisition, storage, manipulation, and delivery. We have measured the statistical variations found between high school students' and professionals' monitoring activities. At the same time, one of us (C.I. Mayfield) has been involved with the design of environmental information systems for developing countries around the world. In this article, we present some of our results and general conclusions from that body of work

MCNEIL T Colleen et al. « Community - based environmental management in Atlantic Canada : The impacts and spheres of influence of the Atlantic coastal action program Canada 's ecosystem initiatives.» *Environmental monitoring and assessment* , 2006, 113 (1-3) 367-383
Abstract: The Atlantic Coastal Action Program (ACAP) is a unique, community - based program initiated by Environment Canada in 1991 to help Atlantic Canadians restore and sustain watersheds and adjacent coastal areas. ACAP is the eastern-most Environment Canada Ecosystem Initiative. The ACAP family is currently made up of 14 ecosystem-based organizations in the four Atlantic provinces. Each one of these non-profit organizations operates independently, but is formally linked under the umbrella of ACAP to represent a force stronger than the individual parts. In Environment Canada 's experience, the program consistently demonstrates the value of a community - based approach and produces results on an ecosystem basis. This paper will examine some of the impacts of ACAP in terms of economics, credible community science, and environmental results which most often align with Environment Canada 's objectives. It will explore the influences of the community - based approach to environmental management on multiple scales (local, regional, etc.). Through examples, the paper will demonstrate the effectiveness of ACAP in influencing some of the policies, programs and attitudes of various levels of government and industry in the region, as well as describe how the community - based model has been exported internationally. The paper will conclude with a discussion on a planned path forward for ACAP.

Norton, Bryan G. "Improving ecological communication: the role of ecologists in environmental policy formation." *Ecological Applications* 8 (2, 1998): 350-364.

Overdeest, Christine, Cailin Huyck Orr and Kristine Stepenuck. "Volunteer stream monitoring and local participation in natural resource issues." *Human ecology review* 11 (2, 2004) : 177-185.

Abstract: This research evaluates whether increased learning, local political participation, and more extensive social networks are related to participation in a volunteer stream monitoring project in Wisconsin. We hypothesize that participation in volunteer monitoring increases factual learning among experienced volunteers compared to inexperienced volunteers, that participation also is associated with increased community political participation in community natural resources management, and increased size of personal action networks. We find that participation does not significantly increase factual learning; rather, new volunteers and experienced volunteers were equally knowledgeable about stream-related topics. However, participation does significantly increase the political participation, personal networks, and feelings of community connectedness among volunteers. We consider our findings in light of the possibility of using volunteer monitoring to enhance local social capital and contribute to the adaptive management of water resources.

Pollock, Rebecca M. and Graham S. Whitelaw. "Community-Based Monitoring in Support of Local Sustainability." *Local Environment* 10 (3, June 2005): 211-228.

Abstract: Community-based monitoring (CBM) activities in Canada are increasing. A conceptual framework developed for and used to guide a pilot CBM project in 31 Canadian communities is evaluated. The framework provided the strategic direction necessary for successful implementation of the pilot and proved useful in the training of community coordinators hired for the project. Limitations of the framework include its inadequate attention to community diversity, its linearity, and insufficient expression of the adaptive and synergistic nature of its components. In order to support local sustainability, CBM appears to require an approach that is context-specific, iterative, and adaptive. Given these emergent characteristics, an enhanced conceptual framework for CBM in Canada is developed based on four dynamic themes: community mapping, participation assessment, capacity building, and information delivery.

Rutgers University -Environmental and Occupational Health Sciences Institute et al. Report of the Workshop on Boundary Organizations in Environmental Policy and Science. [s.l.] , : Rutgers University. Environmental and Occupational Health Sciences Institute, 1999, 34 p.
Conference/meeting: Workshop on Boundary Organizations in Environmental Policy and Science
New Brunswick, New Jersey US 9-10 December 1999

Sharp, Liz. "Public participation and policy: unpacking connection in one UK Local Agenda 21." *Local Environment* 7 (1, 2002): 7-22.

Abstract: Within Western cultures, the term 'public participation' has strong positive connotations, and is associated with the promotion of democracy. The contention of this paper is that these invocations of democracy--although not entirely inaccurate--obscure the varied and tangible effects of public participation on wider policy processes. This paper argues that participation should not be analysed in terms of the type of democracy it invokes, but rather in terms of the extent and nature of its influence on the policy process. In particular, the policy process is examined for conflict between participants over (1) the extent of participation, (2) the nature of participation and (3) the influence of the participation, as well as (4) the outcomes to which it leads. This approach to the analysis of participation is demonstrated through a study of one element of participation in a local authority's Local Agenda 21 process. The paper concludes that participation is inherently political and practitioners need to act strategically to manage participation in support of progressive agendas.

Sharpe Andy et al. 2006. "Community based ecological monitoring in Nova Scotia: Challenges and opportunities." *Environmental Monitoring and Assessment* 113 (1-3): p 395-409 FEB 2006

Abstract: This article examines community - based ecological monitoring in Nova Scotia, with an emphasis on watershed stewardship groups. It discusses successes to date and future challenges, drawing on examples from the Atlantic Coastal Action Program (ACAP) and other community groups. The barriers to the generation of robust monitoring datasets and effective participation in watershed management are examined. The article concludes with a discussion of issues to be addressed to ensure that community groups can both gather scientifically valid ecological data and have meaningful input into the management of their local natural resources

Sutherland, William J. et al. "The identification of 100 ecological questions of high policy relevance in the UK ." *Journal of Applied Ecology* 43 (4): p 617-627 AUG 2006

Abstract: 1. Evidence-based policy requires researchers to provide the answers to ecological questions that are of interest to policy makers. To find out what those questions are in the UK, representatives from 28 organizations involved in policy, together with scientists from 10 academic institutions, were asked to generate a list of questions from their organizations.2. During a 2-day workshop the initial list of 1003 questions generated from consulting at least 654 policy makers and academics was used as a basis for generating a short list of 100 questions of significant policy relevance. Short-listing was decided on the basis of the preferences of the representatives from the policy-led organizations.3. The areas covered included most major issues of environmental concern in the UK, including agriculture, marine fisheries, climate change, ecosystem function and land management.4. The most striking outcome was the preference for general questions rather than narrow ones. The reason is that policy is driven by broad issues rather than specific ones. In contrast, scientists are frequently best equipped to answer specific questions. This means that it may be necessary to extract the underpinning specific question before researchers can proceed.5. Synthesis and applications. Greater communication between policy makers and scientists is required in order to ensure that applied ecologists are dealing with issues in a way that can feed into policy. It is particularly important that applied ecologists emphasize the generic value of their work wherever possible.

Trust O.o.S.a.T.a.t.W "Science and the public: a review of science communication and public attitudes toward science in Britain." *Public Understanding of Science*, 2001, vol. 10, no. 3, pp. 315-330(16)

Abstract: The following excerpts are from a report that draws together the results from two pieces of research - an overview of science communication activities in Britain today and a detailed review of the public's attitude toward science. By combining the information from both studies, the report aims to inform future science communication strategies for both policy and practice. The full report is Office of Science and Technology and the Wellcome Trust, *Science and the Public: A Review of Science Communication and Public Attitudes to Science in Britain*(London, October

2000) and is available online at [A HREF="http://www.wellcome.ac.uk"] www.wellcome.ac.uk [/A]
http://www.wellcome.ac.uk/doc_WTD003420.html

Vaughan Hague, Brydges Tom; Fenech Adam; Lumb Ashok. "Monitoring long-term ecological changes through the ecological monitoring and assessment network: Science-based and policy relevant." *Environmental Monitoring and Assessment* 67 (1-2): p 3-28 February-March, 2001
Abstract: Ecological monitoring and its associated research programs have often provided answers to various environmental management issues. In the face of changing environmental conditions, ecological monitoring provides decision-makers with reliable information as they grapple with maintaining a sustainable economy and healthy environment. The Ecological Monitoring and Assessment Network (EMAN) is a national ecological monitoring network consisting of (1) about 100 case study sites across the country characterized by long-term multi-disciplinary environmental work conducted by a multitude of agencies (142 partners and counting); (2) a variety of less comprehensive yet more extensive monitoring sites; (3) a network where core monitoring variables of ecosystem change are measured; and (4) geo-referenced environmental observations. Environment Canada is the coordinating partner for the network through the EMAN Co-ordinating Office. EMAN's mission is to focus a scientifically-sound, policy-relevant ecosystem monitoring and research network based on (a) stabilizing a network of case-study sites operated by a variety of partners, and (b) developing a number of cooperative dispersed monitoring initiatives in order to deliver unique and needed goods and services. These goods and services include: (1) an efficient and cost-effective early warning system which detects, describes and reports on changes in Canadian ecosystems at a national or ecozone scale; and (2) cross-disciplinary and cross-jurisdictional assessments of ecosystem status, trends and processes. The early warning system and assessments of ecosystem status, trends and processes provide Environment Canada and partner organizations with timely information that facilitates increasingly adaptive policies and priority setting. Canadians are also informed of changes and trends occurring in Canadian ecosystems and, as a result, are better able to make decisions related to conservation and sustainability.

Vaughan, Hague et al.. "Linking Ecological Science to Decision-Making: Delivering Environmental Monitoring Information as Societal Feedback." *Environmental Monitoring and Assessment* v88, n1-3, p399(10)

Oct-Nov 03

(Full text available from Congressional Information Service at 1-800-227-2477. Article order code: K.)

Abstract: In Canada , the Ecological Monitoring and Assessment Network (EMAN) has been created to provide timely information to decision-makers and to help inform the public of ecosystem changes. To make the monitoring programs and products more demand-driven, EMAN has implemented pilot programs in engaging the public in monitoring key indicators and in making the results relevant to communities. The involvement of EMAN in three community-based initiatives-Biosphere Reserves, NatureWatch, and the Canadian Community Monitoring Network-is described.

Wakefield S.E.L.; Elliott S.J. "Constructing the news: The role of local newspapers in environmental risk communication." *Professional Geographer* , 55/2 (216-226) , 2003

Abstract: Effective risk communication is central to good environmental risk management. While studies have shown that newspapers are the primary source of information to the public regarding environmental issues, little is known about how environmental news is used as a risk-communication tool. This article explores the role of local information systems in risk communication, using newspaper content analysis as well as in-depth interviews with journalists and community residents to develop a case study of an environmental assessment process for a non-hazardous industrial-waste landfill. Results indicate that risk messages were chosen and shaped by journalists on the basis of their own exigencies. In addition, while newspapers were a major source of risk information, their impact was mitigated by resident distrust and access to other information sources, most notably their own personal information networks. These results

have implications for environmental policy , as decision makers often use-either passively or actively-print media as a risk-communication tool.

White, Dave D. and Troy E. Hall. "Public understanding of Science in Pacific Northwest salmon recovery policy." *Society & natural resources* 19 (4, 2006) : 305-320.

Abstract: In the arena of salmon recovery policy, stakeholders often propose that science should guide policy, frame their positions in scientific terms, and construct scientific arguments to support their positions. However, there are also appeals to involve citizens more thoroughly in policymaking. An important step in bringing science and citizens together is to investigate how citizens understand the processes, actors, institutions, and knowledge of science. Discourse analysis of the testimony of 51 non-scientist stakeholders to Congressional committees between 1998 and 2000 revealed that 14 used discourses of science. These understandings related to scientific process, scientific knowledge, and scientists as policy actors. Individual citizens employed multiple culturally available discourses based on a traditional, authoritative understanding of science to support their own positions, while others' views were invalidated based on a sceptical-realist understanding. Findings provide mixed comfort for policymakers and resource managers.

Whitelaw Graham (Reprint); Vaughan Hague; Craig Brian; Atkinson David . "Establishing the Canadian community monitoring network." *Environmental Monitoring and Assessment* 88 (1-3); p 409-418 October-November 2003

Abstract: Community - based ecosystem monitoring activities in Canada are increasing in response to a number of factors including: (I) the needs of decision-makers for timely information on local environmental changes; (ii) limited use of government monitoring data and information by decision makers; (iii) government cuts to monitoring programs; (iv) the increasingly recognized need to include stakeholders in planning and management processes; and (v) the desire of citizens to contribute to environmental protection. To date there has been no network coordination of community based monitoring in Canada . This paper reports on the establishment of the Canadian Community Monitoring Network by Environment Canada 's Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation. Information on research prepared in support of network establishment is presented along with a discussion of the potential of the network.

Whittaker, Stella, Andrew Major and Patricia Geraghty. "Victoria's emerging framework of regional governance for sustainability: the case of catchment management authorities and regional catchment strategies." *Local environment* 9 (6, 2004) : 575-593

Abstract: The aim of this paper is to present a progress report on how a subnational jurisdiction, the Australian state of Victoria, is attempting to implement regional governance for sustainability through its catchment planning framework. The paper examines the lessons learnt from a best practice approach to the implementation of network governance to see whether there are actions that can be taken to improve regional governance for sustainability in Victoria.

Yarnell, P.; Gayton, D. V. "Community - based ecosystem monitoring in British Columbia: a survey and recommendations for extension." Kamloops: FORREX - Forest Research Extension Partnership, 2003. 37pp.

Abstract: Community - based ecosystem monitoring (CBEM) is a process whereby non-government organizations (NGOs), community groups, or individuals participate in long-term monitoring of selected species, habitats, or ecosystem processes with the ultimate goal of improving management of ecosystems and natural resources. With a focus on North America, and a particular emphasis on CBEM issues and institutions that are relevant to British Columbia, this exploratory study provides a review of the published literature, the "grey literature" of government agencies and NGOs, and information available on the Internet from these organizations. It also presents information obtained through interviews with practitioners of community - based ecosystem monitoring , including academics, NGO directors and staff, environmental consultants, and government agency staff. The concepts involved in community - based ecosystem monitoring are broadly examined and examples of existing approaches

discussed. The report concludes with recommendations on the potential roles that FORREX could play as an extension organization seeking to improve the use of citizen-collected ecological data.

(Forrex-Forest Research Extension Partnership, Suite 702, 235-1st Avenue, Kamloops, BC V2C 3J4, Canada).

MANUALS AND TOOLKITS

Australia. Land and Water Australia. Research meets policy: improving the uptake of your research. Canberra: Land and Water Australia, 2004. 12p.

http://www.lwa.gov.au/downloads/publications_pdf/PK040749.pdf

Barker, Donna, Andrea Cole and Amanda Gibbs. Getting the message out: a step by step communications guide for environmentalists. Toronto, ON: Sustainability Network / IMPACS, 2005, v, 174p.

Abstract: Getting the Message Out was a joint project of the Sustainability Network and IMPACS: the Institute for Media, Policy and Civil Society. The guide is designed to help environmental groups focus their communication efforts. The work that environmental groups do, preserving our natural heritage for future generations, is hard, time-consuming and often difficult to communicate. Groups struggle with limited resources, competition for media attention and the public's pre-occupation with other important and pressing issues of the economy, health, social welfare and education. Through exercises, worksheets and basic communications theory, this handbook will help any environmental group bring that focus to its communication efforts. We hope this handbook will help environmental groups and environmentalists tell the story about the critical work they do in preserving our natural heritage. It's an important story, and one that should be heard.

Canada. Natural Sciences and Engineering Research Council of Canada. Communicating science to the public: a handbook for researchers [html].

<http://www.nserc.gc.ca/seng/how1en.htm>

Overseas Development Institute. Research and policy in development: toolkits [html]

<http://www.odi.org.uk/RAPID/Tools/Toolkits/index.html>

SciDevNet. An e-guide to science communication [html].

http://www.scidev.net/ms/sci_comm/

CASE STUDIES: Leads and for lit review

Schaefer, Karl¹; Bielak, Alex. "Linking Water Science to Policy: Results from a Series of National Workshops on Water." [Environmental Monitoring and Assessment](#), Volume 113, Numbers 1-3, February 2006, pp. 431-442(12)

Abstract: To ensure science better informs the decision-making process, researchers and policy/program managers need to understand and respect each other's way of working, culture and operational timelines. However, there is little practical guidance on how this should be done and even less documented experience with specific mechanisms that better link these two groups. The published literature on information transfer has largely emphasized the dissemination of standard packages of information to ill-defined constituencies whose needs for scientific information are not well understood. Environment Canada's National Water Research Institute, on behalf of the Canadian Council of Ministers of the Environment, led a series of "Linking Water Science to Policy Workshops" as one such mechanism by which recent science could be delivered to practitioners, and practitioners could identify their research needs to scientists and research managers. There is a pressing need to explore and share experiences using creative mechanisms for sustained dialogue and networking between scientists and policy and program

managers. The lessons learned from the workshop series and the need for science to continually inform the decision-making process has particular relevance for Canada's Ecosystem Initiatives given their integrated, place-based focus on long-term restoration and protection, and the challenge of continually changing ecosystems.

Annex B: Case Study Research Selection and Protocol

Case Study Selection

The following criteria were used when selecting case studies for this research:

1. operational for more than 2 years
2. includes concrete examples of successful delivery of ecological monitoring data to decision makers that occurred recently
3. main mandate is to provide neural information
4. relationship between data users and data providers developed over time (not initially present)
5. process evolved over time, resulting in learning and troubleshooting
6. willingness to participate in interviews

Interview Protocol

Semi-structured interviews were conducted with 2-5 representatives of the community-based monitoring initiative and with relevant decision-makers. Interviewees were selected based on their direct involvement with the project and by referral. Interviews were conducted on the phone in a semi-structured format using the interview protocol below as a guideline. Interview notes were typed simultaneously. Interviews typically ranged between 45 minutes to 1.5 hours. All interviewees were told they would have an opportunity to review the draft report for correctness of information.

Communicating ecological information to decision-makers

Sections A - C: Interview and research of CBM and associated orgs involved

Section D: Interview and research of decision-makers involved

Perspective of CBM and associated orgs

A About the organization(s) involved:

	Research Question	Plain Language Question
A1	Organizational context and development (history)	(litt review)
A2	Organizational goals, motivations, underlying strategy and indicators of success	What are the main goals of your organization?
A3	Organizational activities, tools, and processes	What does your organization do?
A4	Role of interviewee	What is your role in the organization?

C About the case study example:

About the Project

C1	What was the project and what was the context?	What is the best example you can think of where your organization has delivered information to a decision maker (s) and it had some kind of tangible impact or influence on decision making (regulatory / policy)?
C2	What happened?	Could you describe the project?
C3	What make the project successful? <u>Probes:</u> Tools and Processes (i.e. communications) Strategic direction Historical context Power dynamics and governance Opportunity management Media and public opinion	What made the project successful? <u>Probes</u> Was there a process that you used that worked well? Was the timing right from a strategic perspective for local governance? Was there a culmination of other events that made this work more needed? How is your organization positioned in the community and was that instrumental in the success of the project? Was there an opportunity that was noticed and siezed? Was the media a key player?
C4	Who were key people that helped get information across? <u>Probes:</u> Internal champion Political/bureaucratic champions Community members / volunteers Multi-stakeholder (advisory) boards Umbrella organizations like EMAN Media	Who were the key people involved that helped get the information across? What are the organizational relationships with those people?

Identifying and communicating with target audiences

C5	Presence of a communications strategy?	Did you start with a formal strategy for getting information to key people?
C6	Capacity to implement strategy	Did your organization have the capacity to do the work of the communications strategy?
C7	Identifying target audience	Did you have a good idea of who you were trying to reach?
C8	Was there a need to build new relationships with target audiences?	Did you need to build new relationships with your target audience and how did you go about doing that?
C8	How were the information needs and desires of target audiences identified?	What steps did you take to better understand the perspectives and information needs of your target audiences?
C11	What were the challenges?	What were key challenges in delivering information to your target audiences? How were these challenges addressed?
C13	Learning and adaptation	Did you turn what you learned into a new communications strategy?

Delivery and Use of Information

C14	What efforts were made to deliver the information effectively?	How did you package your data?
C15	What specific communication tools were used / why and how?	How did you present your information in a way that key decision makers would find useful?
C16	What challenges were associated with information delivery? Probes: Validity Applicability Relevance Coherence Receptivity Uniqueness Language	What were some of the barriers you faced in getting the information across?
C17	How was information used by target audiences?	What kind of feedback did you receive from key decision makers about the data?
C18	How was impact / influence of information delivery identified and what was it?	Did you have a strategy for monitoring that feedback?
C19	Key learnings from experience	What was your take away message from this experience?
C20	Recommendations	What advice would you give to a community group if faced with a similar situation as yours?
C21	Improvement of practices	What practices (communications, relationships building, strategic) do you think could be improved upon in your organization?

D Perspective of Decision-Makers		
Context for use of environmental monitoring data		
D1	Organizational context	What does your organization do?
D5	Specific role in the process	What do you do in your organization?
D2	Context for using environmental monitoring data	Where do you get your data to manage your local resources from? Do you have a policy about the need for this sort of data?
D3	Process of identifying information needs	When do you decide when you need more data?
About the project		
About the Project		
D4	What was the project and what was the context?	We understand that you worked with org X on this project. We would like to understand what worked and what didn't work. How would you describe the project?
D5	What were the information needs in the project and how where they identified?	At what point was it identified in your organization that information was needed? Where did you look for this information?
D6	What was the process for obtaining data from the CBM	Did you initiate the request for data from the CBO?
D7	What challenges were associated with information delivery? <u>Probes:</u> Validity Applicability Relevance Coherence Uniqueness	Were there any issues with the data you received? <u>Probes:</u> Was the data valid? Was the data in a useful format? Was it relevant to your work? Was it presented in a way that was understandable? Did the data duplicate data you already had, or did it fill a gap? Have you asked the organization for any further data? And if yes, was that data in a useful format? How frequently do you interact with the CBO?
Impact of data		
D8	What was the impact of the data? <u>Probes:</u> awareness raising capacity building action regulatory change	Did the data that you received from the CBO result in any changes? <u>Probes:</u> Did you become more aware of issues Did you learn something new Did the data result in action Did the data result in regulatory changes Why did the data have the impact that it did?
Learning and Reflection		
D9	Key learnings from experience	What was your take away message from this experience?
D10	Recommendations	What advice would you give to a community group if faced with a similar situation as this one?

**Annex C: Worksheets from EMAN National Science Meeting,
November 2006**

Delivering Ecological Monitoring Information to Decision Makers:

A Draft Strategy for Effecting Change

Worksheets

Piloted at the National Science Meeting for the Ecological
Monitoring and Assessment Network (EMAN)
November 24, 2006

Prepared by Carissa Wieler

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Introduction

The Ecological Monitoring and Assessment Network (EMAN) contracted research to identify practices for effective information delivery by community based monitoring organizations to policy and decision-makers. At the core of this work is the desire to build capacity in monitoring organizations to better understand the “pull” for data about the environment by those they are trying to influence with their data, in addition to continuing to refine practices on the “push” side of the equation. Effective information delivery involves a number of key principles, which can be summarized as ensuring information is needed, desired, useable, accessible and timely.

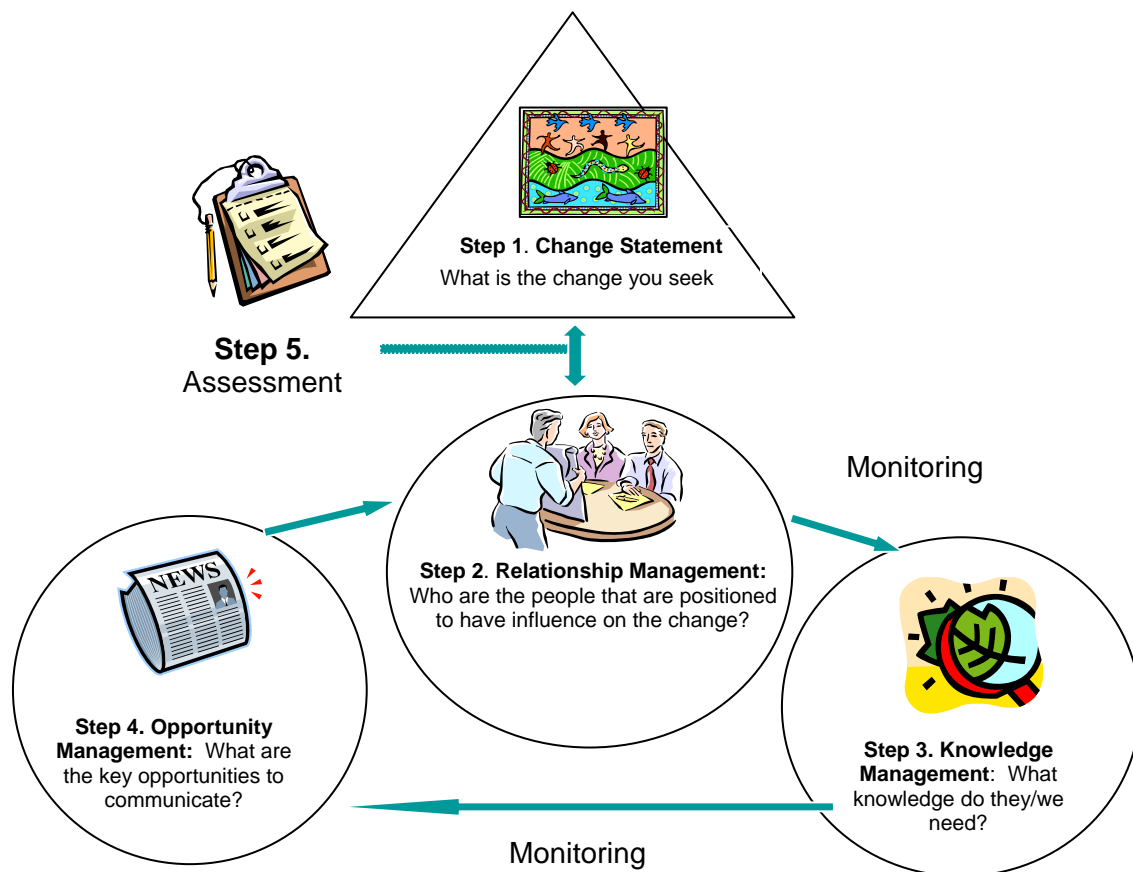
This research undertook to identify good practices that monitoring organizations are already using to effectively deliver their data. Case study research was conducted with 5 community based monitoring groups and over 15 interviews were conducted. In addition a literature review identified relevant issues and additional practices. The outputs of this research will include training worksheets and a paper with full results.

In the process of conducting this research, it became apparent that by understanding the “pull” for environmental data, community organizations are able to be increasingly strategic about how they deliver their monitoring data. The development of strategies to better target decision-makers with monitoring and assessment information is occurring in other assessment contexts as well, at national and international levels. To this end, the International Institute for Sustainable Development (IISD) has been working on a strategic framework to influence decision making with assessment information for a number of years. Recently, the framework developed by IISD was adopted by the United Nations Environmental Program in relation to the Global Environmental Outlook (GEO). The work is being published as a training module in the GEO Integrated Environmental Assessment Resource Book, currently in press⁵⁹.

The following worksheets are a first attempt to integrate aspects of the case study research with IISD’s Impact Strategy. The worksheets consist of descriptive information for each step of the strategy, a preliminary list of good practices identified during interviews, case study examples, and a series of exercises to assist with the development of a strategy. These exercises and some of the information have been adapted from the GEO Resource Book.

As shown on the following page, the strategy is made up of 5 main steps beginning with the identification of the change being sought along with barriers to effecting that change. This serves to anchor the rest of the strategy, enabling identification of who is in a position to influence that change and what information is needed by them and you. From there, opportunities for communication can be identified. At the heart of the strategy is a periodic impact of assessment that tells you whether you are on track with the change you are trying to influence.

⁵⁹ Creech, H., Jaeger, J., Lucas, N., Wasstol, M., Chenje, J. (2006) Training Module 3: Developing an Impact Strategy for your Integrated Environmental Assessment. UNEP GEO Resource Book, in press. United National Environment Program.



As these are draft worksheets, your input and feedback is critical to this work. Please feel free to contact Carissa Wieler cwieler@iisd.ca (204-958-7719) with your comments.

Step 1: Crafting a Change Statement



Key Message: A change statement is an articulation of the change you would like to influence. It is an adaptive statement that challenges you to better align the push and pull for your environmental monitoring information.

If you are already collecting monitoring data, you most likely have a good idea of the issue that you are addressing, and perhaps also what factors are causing the issue to happen as well as how your issue is impacting people and environment. Taking all of that into account, this step asks you to fine tune your statement about the change you would like to influence.

For example, at the beginning of a monitoring project, you might say that the change you would like to see is for the water quality to improve in your watershed or for certain species to be protected. You may also go one step further and say that for that to happen, decision makers will need to make better informed decisions, and ideally will use your data in their decision making processes. The more you can articulate the change you would like to influence, the more useful this impact strategy will become.

One way of fine tuning your change statement is to consider the broader context of your issue from as many perspectives as possible. As alluded at the beginning, there are a number of questions you can ask to place your issue into a broader context. Assuming you already have some information about the general state of your issue, you might ask:

- What other issues are related to your primary issue of concern?
- What are the pressures that are causing your issue(s) to occur?
- What are the main drivers in society that are resulting in those pressures?
- What are some of the impacts on people and the environment?
- How are decision-makers responding to the state of your issue, and related pressures and impacts? This could include relevant plans or policies that are already in place. It is also useful to understand how the public is responding to the issues and related pressures and impacts, and what kind of pressure is being placed on decision-makers.

By articulating how decision-makers are currently responding, you may be able to identify some general or specific processes that you could target with your data. This could require some preliminary research and interviewing, which could also have the added benefit of putting you in touch with potential audiences for your data at the beginning.

Part of being strategic about your change statement is finding a way to more closely align your “push” of information that reflects your interests with the “pull” for information from decision-makers.

These are a few examples of change statements that have been created based on EMAN case study research that point towards a balance between the push and the pull:

The municipality will use the information gathered from our monitoring when they assess the performance of a current water quality policy.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) will declare the species being monitored a Red Listed Species, as a result of the monitoring work.

The academic community will use our traditional ecological knowledge indicators to inform further research related to caribou herd migration and climate change.

A land use plan review process will incorporate our monitoring work to assist with identifying gaps and successes in the implementation of the plan.

Over the course of your monitoring work, you will likely find that as new information becomes available, you will modify your change statement and aspects of your strategy.



Good Practices

...when identifying goals and creating change statements

Develop a clear goal early on in your work and stay with it. This will bring the benefit of long term, consistent monitoring data and common understandings about what your monitoring work is trying to accomplish.

There may be external pressures that raise questions about whether you need to change the course of your monitoring work and adapt it. In some cases, it may be strategically in your benefit to do so. Ideally, this would involve collecting additional data to the data you are already collecting.

Developing a change statement does not necessarily mean you are shifting away from a neutral data provider to an advocate or lobbyist. What it does mean is that you have identified where you would like to have an impact with your work in long term, and who you would like to use your work.

If you are monitoring a number of different issues, you may choose to develop a series of change statements (and overall strategies), particularly if the target audiences who can influence the issues are different.



Crafting your Change Statement

1. What are the current goals of your monitoring work?

2. What specific changes you would like to see happen as a result of your work?

3. Given what you have heard today, could your change statement could be fine tuned or made more specific? If yes, consider describing the broader context of the issue you are trying to address, showing inter-linkages.

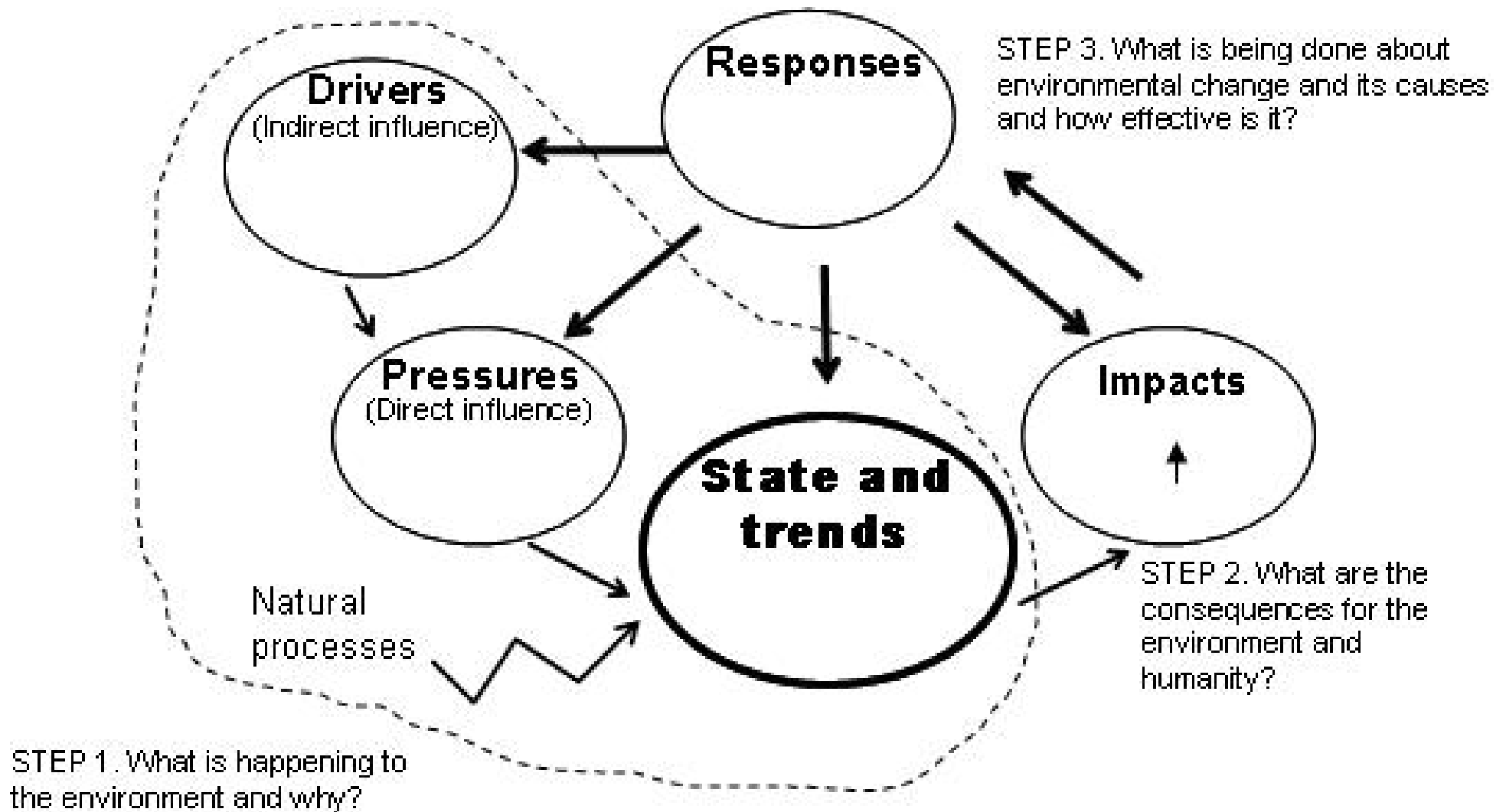
Option 1: Using the attached worksheet, identify the current state of your issue, as well as related pressures, societal drivers, impacts and responses.

Option 2: Write a paragraph that describes the broader context of your issue.

Option 3: Describe your issue and the broader context to a neighbour.

What is one way of writing your change statement in a way that is concise and targeted?

4. What are some of the constraints or barriers to achieving the change that you identified?



Step 2. Cultivating Relationships



Key Message: Delivering monitoring information to decision-makers involves ensuring you have the correct “address” for the information, that is, that your information is being delivered to people who are in a position to effect the change you are looking for.

If you are already an established monitoring organization, you likely have gone through the steps of identifying those people and organizations that can help you “push” your monitoring information forward. You may have also identified specifically who you most want to use your information in a meaningful way. This step confirms the need to identify and build relationship with key people, and challenges you to further get to know the perspectives of your target audiences as well as other potential audiences that are connected to your target audience.

In addition to decision-makers, related audiences might include people who “whisper in the ear” of decision-makers; those in civil society who can pressure decision-makers; those in the academic community who can support your recommendations; and those in the media who can reach the public and thereby also influence decision-makers.

One approach that seems to be working well for community-based monitoring groups in terms of relationship building is the formation of a multi-stakeholder forum. The role of the group can range from advisory to partnership, resulting in more or less direct influence in the process. Including stakeholders can provide a number of benefits to a monitoring program. This research identified a number of benefits, some of which are listed below.

1. Cultivate a collective understanding of “bigger picture” that includes economic and social considerations. This will help with placing your information into a broader context that can reach multiple levels of decision making.
2. Identify the goals of the stakeholders early in the process and from there, strive towards common ground, and identify potential knowledge gaps that could be filled by the monitoring work.
3. Begin long term trust building with stakeholders by including them in the decisions about what monitoring protocols to use and how the information will be analyzed.
4. Learn about how best to deliver your results to different decision making audiences by seeking input from stakeholders who are involved.
5. In some cases, develop a direct link to the decision-makers who are in a position to actually use the information and information being developed out of the process.
6. Develop a long term process that stakeholders want to partner in and support financially.



Notes from the Field

Monitoring the Moraine is a collaborative project between Citizens' Environment Watch (CEW), Save the Oak Ridges Moraine (STORM) Coalition, and Centre for Community Mapping (COMAP). The group engages community volunteers in areas of science, stewardship, monitoring and decision-making. During the start-up phase, a stakeholder advisory group was formed, and included volunteer champions, environmental and citizens' groups, provincial and regional government, conservation authorities and the private sector. By drawing on a diversity of expertise, the initiative has been able to tap into information about a variety of potential audiences for their work. In one instance, a municipal representative on the committee was able to provide insight into better linking the monitoring work to local policy at the conceptual level. For more information about the Monitoring the Moraine project, visit www.monitoringthemoraine.ca or the project partners websites at www.citizensenvironmentwatch.org, www.stormcoalition.org, or www.comap.ca.



Good Practices

...when identifying and building relationships

Building relationships can be challenging at the beginning. Here are some of the practices mentioned by community-based organizations in a series of interviews.

Spend time finding out who is who at the beginning. Talk with people who are well connected in the community and can tell you who the “opinion” leaders are. Ask those people to help you connect with others in the community.

Begin by cultivating a core group of key partnerships. Having support from local academia and a government agency will show that your group is striving to be both credible (by having scientifically sound information) and relevant to issues faced by policy makers.

Emphasize drawing linkages between your goals and issues, and the goals of other stakeholders who could potentially use your information and information.

Build your network by attending events held by your stakeholders and meeting with people one on one in both casual and formal settings.

Host workshops and invite the community and local decision makers to attend. The people who attend will likely be your “champions”.

When a new mayor and council are elected, set up a meeting with them. Provide succinct information about your group. Find out what the goals of the new municipality leadership are and look for linkages with your goals.

Additional Resource: The Social Network Analysis Survey assists with identifying monitoring initiatives in your area. Available through the Canadian Community Monitoring Network <http://www.ccmn.ca/english/tools.html#govanalysis>



Identifying and Building Relationships

This exercise is intended to help you identify people you would like to influence, and to consider the feasibility of developing relationships with those people, as well as with those people who are connected to those you would like to build relationships with.

1. Using the table provided on the other side of this worksheet, list the names of 5 people you most want to reach with your monitoring information. If you don't know their names, list their position titles. Avoid listing categories of people (e.g., members of parliament, private sector). It is important to be as specific as possible.

2. Why do you want to reach them?

3. How feasible is it that you can reach them?

4. Are there other people who can reach them better than you can? Who might they be?

5. Are there timing issues related to building the relationships (i.e. certain relationships need to be built sooner rather than later)?

6. What are possible next steps to building the relationships?

7. Are there broader categories of people such as reporters, influential NGOs, or university departments that are part of the broader community of interest who you may wish to work with your findings?

1. Who do you most want to reach (names and/or positions)?	2. What is your purpose for reaching them?	4. What is the feasibility of your group being able to reach them?	5. Who else may be able to assist you with reaching them?	Is there a timing issue related to building this relationship?	What are the next steps to building the relationship?

Additional organizations representing broader interests:

Step 3. Identifying the “Pulls” for Knowledge



Key Message: Ensuring that the information you are delivering is relevant to those you are delivering it to involves understanding their perspective on the situation, what knowledge they are looking for and where they are looking for it.

Many of you are likely already familiar with the broader context within which your goals and issues are taking place. Being able to articulate how your monitoring information fits within this broader story is an important part of delivering your information to decision makers. This is also where understanding the perspectives of your target audiences comes in handy. What part of the broader story are they most interested in? Are they focused on a larger social driver related to the local economy, or are they focused on certain pressures such as expanding development in the region? What linkages can be made between your goals and the topics that are receiving most attention in decision making? Essentially, this step is about understanding the pulls for monitoring information, as well as the larger context within which those pulls (and pushes) are occurring.

In addition to understanding what types of information your target audiences are interested in, it is useful to find out where your audiences typically look for data, and what kind of data they use when making their decisions. This type of information is embedded within the context of the decision making process, and finding it out is not always a straightforward task. It involves understanding the larger context within which your target audience operates, as well as long term relationship building processes that engender trust.



Notes from the Field

In St. John’s, Newfoundland, the lack of sewage treatment was a significant issue to the **Northeast Avalon Atlantic Coastal Action Program** in the early 1990’s. At the time, the issue ranked #40 on a list of priorities for the region. To effect change, the ACAP group decided to build a factual evidence base in favour of addressing the issue of sewage treatment. After a decade of awareness raising, water quality sampling, toxic contaminant measures, assessing biological impacts on biota, an irrefutable case was formed that the lack of sewage treatment was having significant ecological impacts. In addition, a socio-economic analysis was conducted showing that if \$93,000 were invested in a sewage treatment plant, positive impacts on housing prices, tourism, restaurant, and cruise ship industries were likely to result. The tipping point came when the issue priority went to the top of the list for the municipality. This was due to a combination of providing scientific information to decision makers, and awareness-raising. The end result was that all three levels of government, who had been involved in the ACAP process decided to cost share the new sewage plant. For more information about Northeast Avalon, ACAP, visit www.naacap.ca/index.htm.

H₂O Chelsea monitors water quality and quantity in the municipality of Chelsea. It was formed in 2003 as a partnership between the municipality of Chelsea, the University of Ottawa, and an environmental NGO Action Chelsea for the Respect of the Environment (ACRE). Because the municipality has been a partner in the initiative from the beginning, mechanisms were developed in early stages that enabled a two way communication between the municipality and H₂O Chelsea. For example, each year H₂O Chelsea produces an annual report highlighting their water quality and quantity monitoring findings. This report is developed in coordination with the Sustainable Development Coordinator for the municipality, who assists the group with identifying where the priority areas will be for council. The findings of the report are then presented to city council at an annual meeting, where the lead scientist working at the university delivers the data results, thus promoting credibility of the data. City Council then decides how they will respond to the report, and presents their response at a public meeting, along with a presentation of report findings. For more information about H₂O Chelsea, visit www.h2ochelsea.ca/.



Good Practices ***...when identifying the “pull” for information***

1. Identify people who can help you bridge with those you are trying to influence. They may assist with two-way communication and “translating” science to policy makers.
2. View change as a long term process. Credible data provided over several years may be what is needed to effect change.
3. Be willing to research and provide other types of information to key decision makers, in addition to environmental monitoring data. Consider, for example, conducting socio-economic analysis if you think it will more likely be the kind of information they are looking for.
4. There is a fine balance between ensuring your information is both neutral and policy relevant. If it is viewed as being too closely aligned with certain advocacy goals, there may be criticism that the data will be skewed. At the same time, efforts to align with policy relevance may lead to scepticism from the public that the data is not neutral.
5. Before collecting data, find out what other monitoring initiatives are occurring in an area. You may find that you need to start a new effort if previous efforts are carrying too much “baggage” such as politically-charged relationships. At the same time, you may want to join forces with other efforts, such as at academic institutions, as they may already be well linked to decision-making processes.
6. One approach is identifying knowledge needs of policy makers is to investigate whether there are certain policies or plans that are being implemented though not monitored (as may be the case due to lack of resources). A joint project could then be developed to assist the decision-making body with providing monitoring data related to that policy.



Placing Data into Context and Identifying the “Pulls”

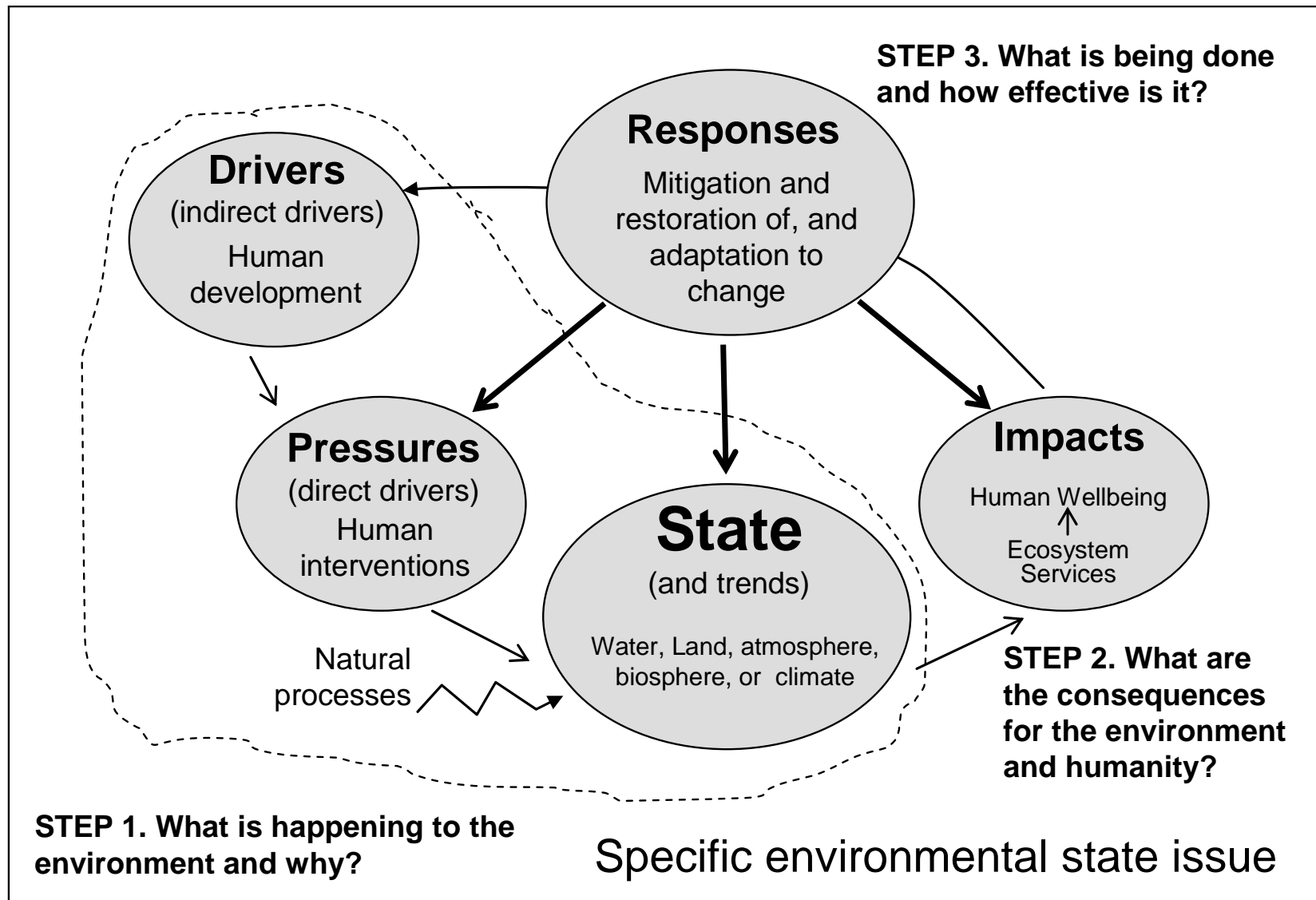
Now that you have identified who the key audiences are for your environmental monitoring information, you can take the next step of identifying their knowledge needs, that is, their “pull” for information.

1. Referring to the diagram shown below, identify the areas where you think the attention of key audiences are most focused at present. An example of how the Driver-Pressure-State-Impact-Response framework can be used to understand the broader context of an issue is shown on the reverse of this page.

2. What are potential linkages between the attention focus of your target audience is looking for and the change you would like to influence? What are the challenges in making those linkages?

3. What steps could you take to find out what specific knowledge your target audience is looking for?

4. What might be some of the timing issues related to the knowledge your audience may need?



Step 4. Opportunities to Deliver Information



Key Message: Finding the right opportunities to deliver your information is a creative process of both identifying those opportunities and creating them. Having a clear message, understanding of issue cycles and a strategy are tools to help you get there.

This step involves moving the knowledge you have developed as a result of your monitoring work into the hands of those you want to influence. There are many tools available to help you do this: reports and related projects to release, workshops to hold, as well as ways to amplify your communications with electronic mailing lists and websites that reach a much broader audience. At the heart of this step is the creative management of opportunities that allow you to take advantage of both windows of opportunity for delivering your information and creating opportunities directly.

A core element of this process is the development of “key messages”, a series of short, plain language statements that capture the essence of the work. Though it may seem trivial, it actually takes skill to draft statements that both capture what you want to say and expresses it in a way that is relevant to those you wish to influence and inform. To this end, be useful to test your key message with end users and focus groups. The following example of a key message is thought to have been very influential in a decision making process that eventually led to the UN Framework Convention on Climate Change in 1992;

The world is likely to see “a rate of increase of global mean temperature during the next century...that is greater than that seen over the past 10,000 years.”

Another aspect of identifying opportunities is to understand “issue cycles” as they will help you recognize the importance of timing as you try to position your findings in light of other competing or comparable public and political interests. Social attention to environmental risks appears to follow issue attention cycles as identified by the Social Learning Group⁶⁰.

The **first phase** consists of a gradual build-up of scientific and analytic capacity as research and monitoring activities take place. At this point, there is little widespread public attention. During this time, society’s capacity to address new issues accumulates gradually among a small group of institutions that, by historical circumstances, are collecting the information.

The **second phase** is a rapid rise in public and political attention for the issue. At this time, new leadership and institutions emerge to address the issue. It is also at this time that coalitions form to develop shared understanding of the issues and to push the issues forward. Usually in this phase, collective efforts become more prominent than increased participation by individuals.

⁶⁰ Social Learning Group (2001). *Learning to Manage Global Environmental Risks*. MIT Press, Cambridge, MA.

Follow a peak in public attention, the **third phase** involves increased flow between knowledge and action as knowledge is used to influence action and vice versa. The following graph shows the issue attention cycle.

In the **first phase**, it is likely that most attention to the issue is in the scientific and technical community. Those most interested in your information will likely be in this realm, and it will take more effort to get the attention of the general public, and private and political interests. During the **second phase**, when the public and political attention to the issue is on the rise, there may be a “window of opportunity” to reframe the issue and attract new actors to become involved. In the **third phase**, when the issue is already on the agendas of the scientific, public and political communities, it may be that your impact could be the most obvious and immediate. It is important to remember that an impact strategy developed in the third phase is much less effective than one developed early on in the process. One of the benefits of an impact strategy is that it helps to mitigate reduced public attention and to shorten the attention cycle by bringing the issue back into the public eye more frequently.

You can also manage opportunities through the development of scenarios based on your findings. Scenarios help decision-makers deal with uncertainty and identify options for action. In this type of process, you can walk through the implications of your monitoring findings with your target audience. You may choose to use mapping software that enables visualization of different scenarios.

Responding to opportunities to communicate your work may arise unexpectedly, requiring some amount of creativity in communicating your work. At the same time, you can prepare by having a communications strategy that includes a range of products and approaches.



Notes from the Field

Formed in 1996, the Arctic Borderlands Ecological Knowledge Co-op brings together science and local knowledge to monitor the ecological change in Northern Yukon, Alaska and the NWT. The group focuses on ecological monitoring positioned to address climate change, contaminants and regional development. An important factor of success for the co-op has been a communications approach that has focused on keeping messages “simple and...relevant. They should be clear and plain language for all audiences”. Their strategy, developed in 2002, set out to answer the questions⁶¹:

- Who needs to know about the Arctic Borderlands Co-op and its programs?
- What do people need to know?
- How would they like to learn it?

For each of their target audiences, they developed communications goals. An example of a communication goal for Academic and Research Institutions reads as follows:

⁶¹ Arctic Borderlands Ecological Knowledge Co-op (2002) Communications Strategy. <http://www.taiga.net/coop/business/CommunicationsStrategy.pdf>

Should have access to the results of monitoring done by the Co-op and have an awareness of the unique model used by the Co-op. This awareness may spur further research and aid in the sharing of information by researchers who work in the North.

The strategy then lists 16 different types of communication products targeting different audiences.

For more information about the Arctic Borderlands Ecological Knowledge Coop, visit www.taiga.net/coop/.



Good Practices

...when identifying opportunities to deliver your information

Provide annual reports to a target audience (like city council).

Have your report “translated” by someone working at city hall (i.e. a sustainability coordinator) to better reach policy makers.

Keep it simple, be relevant, and use clear and plain language for all audiences.

Follow issue cycles in the media and develop messages that “stick”.

Make use of in-kind donations from partnering organizations by asking them to print and distribute communications.

Use maps, photos and be aware of the possible need for language translation.

Pre-test products and messages where possible to ensure effectiveness.

Watch for issue cycles and timing of messages.

When hot topics related to your topic appear in the media, use it as an opportunity to highlight your work. Be “press ready” and build a rapport so they begin to come to you when looking for information on that topic.



Identifying Issue Cycles

1. How would you describe the attention cycle related to your issue? Consider browsing the media and reading about public opinion polls. Is awareness about your issue on the rise as momentum slowly starts to build in your community, or was it high for a while and has since dropped off?

2. How might you time your communications to help either help build momentum around your issue, or, if the attention cycle has already peaked, how might you keep consistently the public and politicians informed about your work?



Developing a Communications Strategy

Following the example set out by the Arctic Borderlands Ecological Knowledge Co-op, you may choose to develop a communications strategy with the following elements, as shown in the table below.

Product	What / How	Target Audiences (s)	When or how often should it be done?	Who will do it?

Step 5. Monitoring and Evaluation



Key Message: Monitoring and evaluating your impact through seemingly small and incremental changes in behaviours and actions provides you with feedback you can use to adjust your impact strategy over time.

Monitoring your impact on decision making can be challenging, especially when a direct impact, such as one's efforts having resulted directly in decision, is not obvious. One approach is to measure incremental changes that are pointing towards changes and decisions you are seeking with your work. Based on this monitoring, you can adjust your strategy over time.

The signals for understanding the whether your strategy is working may seem small and insignificant, and may appear as very incremental changes in attitudes, actions and behaviours that are a direct outcome of your work. Are people returning your phone calls? Are you being asked to participate in processes or sit on committees that were closed to you in the past? Are key people returning your phone calls? Are they coming to your meetings? Are more stories being published about your issue than before? Have people been asking to see your monitoring work?

Because monitoring can be a time intensive process, it is helpful to identify a few key indicators and to set up some easy ways to monitor those indicators over time. One approach might be to track your interactions with people including when you sent them information and when they requested information or accepted invitations.

There are a number of incremental behaviour changes of your target audiences you can monitor. The following is a checklist

- **Receiving information**
 - Information sent to target actors
 - Meetings are set up with target actors
- **Seeking and processing information**
 - Target actors seek information from others to verify information from monitoring report
 - Media reports messages that are consistent with monitoring information
- **Acting**
 - Target actors issue new policy briefs, white papers, frameworks, regulations, other responses
- **Demanding**

- Target actors ask for more work from monitoring group (e.g., follow-up investigations, additional monitoring parameters)

One way of tying together the previous four stages of this strategy are to consider the flow of activities and outputs into longer term outcomes, and to measure changes in each of those.

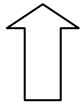
OUTCOMES

Changes in Decision-making

Measure changes in policies and decisions that are relevant to your monitoring work
Compare with the desired impacts of your strategy

Effective Relationship Management

Measure aspects of the relationships you have identified and engaged
Measure changes in actions and vocabulary of decision-makers



ACTIVITIES AND OUTPUTS

Timeliness of key activities and outputs

Measure completion of activities and outputs in a timely way

Effective Knowledge Management

Measure the policy relevance, scientific credibility and public legitimacy of the monitoring work being communicated

Effective Opportunity Management

Measure the identification and leveraging of opportunities to communicate your work

The following table provides an initial list of different measures that could be used for relationship management, as one example.

Possible Measures for Effective Relationship Management⁶²		
<i>Key Question</i>	<i>Possible Measures</i>	<i>Possible Targets</i>
Have key decision-makers and potential influencers been identified?	<p><i>An assessment and ranking</i> of the relative influencing power of identified key decision-makers and other influencers.</p> <p><i>Validated evidence</i> that you targeted the key decision-maker(s).</p> <p><i>Number of key persons identified for each relationship group</i>, including specific names from each of the potential audience categories identified.</p>	At least one key name for each target audience.
What important changes in the thinking and actions of key decision-makers have been observed?	<p><i>Receiving behaviour observed</i></p> <p>Number of decision-makers as subscribers (individuals and organizations) to list serve/e-mail newsletter.</p> <p>Receive and request monitoring reports.</p> <p><i>Seeking behaviour observed</i></p> <p>Number of targeted users attending new types of meetings and using your monitoring vocabulary in interviews with media.</p> <p><i>Acting behaviour observed</i></p> <p>Number of times monitoring experts are contacted by decision-makers for consultation on decision-making activities.</p> <p><i>Demanding behaviour observed</i></p> <p>Number of cases targeted users (i.e., decision-makers) contacts your monitoring group to request new information or process changes to be included in the next monitoring cycle.</p>	Increasing numbers of key decision-makers identified between

⁶² Adapted from: Creech, H., Jaeger, J., Lucas, N., Wasstol, M., Chenje, J. (2006) Training Module 3: Developing an Impact Strategy for your Integrated Environmental Assessment. UNEP GEO Resource Book, in press. United National Environment Program.



Monitoring and Evaluating your Impact

1. What steps could you take to ensure that monitoring and evaluating your impact is incorporated into a periodic review of your work?

2. What are possible indicators that you could use to monitor the impact of your work on decision-making? Consider both outcomes and outputs.

3. How might you collect and store information on those indicators in a way that is easy and straightforward?

Annex D: Feedback from EMAN National Science Meeting, November 2006

At the conclusion of a learning workshop on delivering environmental monitoring information to decision-makers, participants were asked:

“What is one thing you can take away with you from this training workshop?”

The following summarizes participant responses.

1. Overall strategy

- getting the right information to the right people takes time
- it was an overwhelming and eye opening session; re-doing outreach strategy for water
- the need to think more broadly than communications, towards impacts
- timeliness and uncertainty is not an exact science
- strategy helps with breaking work down into manageable pieces

2. Change Statement

- a need to focus the change statement
- the need to identify drivers for initiating the research and identifying initial outcomes
- the need for a planning stage and identifying what the change is

3. Relationship Management

- the importance of respecting the role of decision-makers as human beings and generating dialogue
- the need to identify who to focus on and what message to deliver
- a need to better understand how to bridge the gap when decision-makers move on
- a better understanding of how communication occurs within different sectors; and how to approach and make initial contact
- the importance of linking data to a decision-maker in government to ensure the data has value
- the need to communicate to decision-makers and circumvent people who are in-between the higher and lower levels that might prevent information flow
- the insight that different audiences speak different languages (science, policy)
- the importance of going out of way and making time for people and listening to them
- to begin with who rather than what
- to have a plan in place, there is a need to know the goals and understand the people
- there is a need to re-build relationships when people change their positions every 5 years

4. Knowledge Management

- the value of the DPSIR as a performance metric
- the importance of putting more effort into understanding what decision-makers need
- the need to know the context for the data
- the need to get information to decision makers and work with them and their context
- the need to understand where the gaps are
- the need to understand the context of the monitoring work and tying it in to what is being done