

ABSTRACT

ANGELA BAKER: Environmental Indicator Utility for Environmental Decision Making: A Multiple Case Study Analysis
(Under the direction of Dr. Louise M. Ball)

An environmental indicator is a scientific measurement that tracks environmental conditions over time. Indicators can be a powerful tool in performance-based management/measurement systems. Performance indicators focus attention on outcomes of programs and can be used for strategic planning, priority setting, resource allocation, and other decision-making processes. Many agencies (governmental and non-governmental) are using program results to improve performance and ensure accountability. There are numerous frameworks around which indicators are structured for utilization and a range of performance measures spanning the spectrum of indicator measures. The various frameworks and performance measures clarify the type of environmental information generated by measurement systems and its value to inform decision making. Outcome measures positioned at the higher end of the indicator hierarchy, those that address reduction of environmental risk or impacts to the ecology and human health, are the most desirable for informing decision making.

The goal of this investigation is to evaluate how environmental indicators are used inside performance based management/measurement systems and assess the logic linking environmental information to planning, resources allocation and performance review to describe environmental progress and inform environmental decision-making.

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CHAPTER I INTRODUCTION

An environmental indicator is a scientific measurement that tracks environmental conditions over time. Indicators can be a powerful tool in results-based management systems. Performance indicators focus attention on outcomes of programs and can be used for strategic planning, priority setting, resource allocation, and other decision-making processes. Many agencies (governmental and non-governmental) are using program results to improve performance and ensure accountability. There are numerous frameworks around which indicators are structured and a range of performance measures spanning the spectrum of indicator measures. The various frameworks and performance measures clarify the type of environmental information generated by measurement systems and its value to inform decision making.

Inputs measure resources used in producing an output or outcome. Outputs measure completed activity and refer to the amount of work completed by the organization. Outcomes measure events, occurrences or conditions outside the activity itself and are of direct import to the stakeholder. Ideally we would like to focus on indicators that relate to outcomes rather than activities. There are two kinds of outcomes: intermediate outcomes and final outcomes. Final outcomes measure anticipated or desired end results while intermediate outcomes are expected to lead to a desired outcome. Outcome measures positioned at the higher end of the indicator hierarchy, those that address reduction of environmental risk or impacts to the ecology and human health, are the most desirable.

Research Problem

The Government Performance and Results Act of 1993 (GPRA) seeks to shift the focus of government decision making and accountability away from a preoccupation with the activities that are undertaken - such as grants dispensed or inspections made - to a focus on the results of those activities, such as real gains in responsiveness or program quality. Under the Act, federal agencies are to develop multiyear strategic plans, annual performance plans, and annual performance reports.

The United States Environmental Protection Agency (EPA) is going a step further and moving beyond program quality to program impacts. The EPA is moving in the direction of measuring and assessing human health and ecological outcomes, requiring a huge shift in how the agency frames questions. Traditionally, EPA has used indicators such as decreases in emissions/discharges or decreases in ambient pollutant levels to measure environmental improvement. Health outcome measures complement these traditional measures by reflecting the actual public health or ecological impacts that result from environmental pollution. By providing a quantitative assessment of these impacts, outcome indicators can strengthen environmental decision-making and enhance the EPA's ability to evaluate, prospectively or retrospectively, the success of those decisions. This is the foundation for the EPA's "Environmental Indicators Initiative". The Indicators Initiative improves the agency's ability to report on the status of and trends in environmental conditions and their impacts on human health and the nation's natural resources.

In June 2003, the EPA published its first national report on the environment (ROE). The publication consisted of two separate, but related documents- the Draft Report on the

Environment 2003 Technical Document (referred to as the "Technical Report"), developed for a scientific audience, and the Draft Report on the Environmental 2003, referred to as the "Public Report", developed for environmental decision-makers and the general public.

There are 143 indicators identified and used in the Technical Report, addressing various aspects of health and the environment. The indicators were based on already published or publicly available data, and were peer reviewed. The Public Report was derived from a selection of the indicators in the Technical Report, with some additional information added for clarity and readability by a more general audience.

The offices responsible for producing the reports initiated a process to gain feedback on the ROE documents through a series of six public meetings in the fall of 2003. During each of those sessions the question of function and purpose arose as to how the ROE would be used. A similar question arose during the question and discussion session for the Future of EPA's Environmental Indicators Concurrent Session at the 2004 EPA Science Forum- will policy makers accept the new data and how will we begin to use these data- which brought to mind this initial set of questions reflecting my train of thought on the issue of using environmental indicators.

- Which states/organizations have indicator projects;
- What do these agencies believe they have to gain from using indicators;
- How are environmental indicators being used;
- How have agencies instituted environmental indicator projects;
- What have been the effects;

- How do staff /management/administration/policy makers perceive the use of indicators (operational and implementation);
- How do these agencies view the future of environmental indicators, including how it will change?

Research Goal

The goal of this investigation is to evaluate how environmental indicators are used inside performance based management/measurement systems and assess the logic linking environmental information to planning, resources allocation and performance review to describe environmental progress and inform environmental decision-making.

This report presents information in three areas 1) use of indicators or environmental information for planning and measurement as demonstrated by New Jersey's Environmental Results Management Systems (ERMS), 2) reporting and resource allocation as demonstrated by Florida Department of Environmental Protection's Secretary's Quarterly Performance Report (SQPR) and Performance based Budgeting, and 3) performance review as demonstrated by Organization of Economic Co-operation and Development's Environmental Indicators.

The report will close with a cross case analysis describing the precursors/drivers for instituting use of environmental indicators, the processes employed in the use of environmental indicators, the organizational climate present in their use, and the final products and outcomes of their use.

CHAPTER II LITERATURE REVIEW

Indicator Terminology

When initiating discussion about environmental indicators and how they are used it is first necessary to explain what an indicator is and then how these measures are applicable and applied in public service. Performance measurement has many meanings, but it is defined by Hatry as measurement on a regular basis of the results (outcomes) and efficiency of services or programs- emphasis being regular (Hatry 1999). Hatry used the example of managers of any sports team need to know the running score so they can assess whether changes are needed for the team to win. Managers of public agencies and private non-profit organizations need similar information. Measuring the running score and using it to improve performance are the subject popularly defined as performance measurement. Tracking expenditures and physical outputs of program activities has been done for decades. Though useful to program personnel these elements say very little about what resulted. They do little to answer how the public benefited and how internal services have affected outcomes.

The central function of any performance measurement process is to provide regular, valid data on indicators of performance outcomes as well as span the spectrum of indicators to include information that helps managers measure the incoming workload and gain insight into the causes of the outcomes. Hatry states that a consistent set of definitions categorizing various types of performance information is the cornerstone of any performance measurement system. Definitions perform the crucial function of enabling users of performance information to distinguish reliably among categories of

data that have different applications and different users (Hatry 1999). Data on the amount of resources expended for particular programs (inputs) are different from internal information that indicates the amount of activity a program is undertaking (process). These data in turn, are quite different from the products and services a program has completed (outputs), which should be distinguished from results-based information (outcomes). Performance indicators are specific numerical measurement for each aspect of performance under consideration. They are outputs and outcomes. Outputs as defined above are products and services delivered; completed products of internal activity. Outcomes however are an event, occurrence, or condition that is beyond the activity or program itself and of direct importance to the general public. An outcome indicator is a measure of the amount and/or frequency of such occurrences. They indicate progress toward achievement of the mission and objectives of the programs.

The field of performance measurement of public services makes a sharp distinction between outputs and outcomes. Hatry also makes a point to state outcomes or all outcomes may not be explicitly identified in the program's mission and objectives statements; that formal program mission and objective statements seldom include all the outcomes an agency needs to track (Hatry 1999). Hatry goes a step further to say it is not the function of such an objective statement to itemize all the outcomes the program should seek, just the central, most vital ones (Hatry 1999).

In discussing outcomes Hatry makes the distinction between intermediate and end outcomes. The author states this will help programs differentiate between the ends ultimately desired from a program and interim accomplishments, which are expected (but may or may not) to lead to those end results (Hatry 1999). There may be multiple

intermediate and end outcomes. Intermediate outcomes are important to program managers and usually provide more timely information than end outcomes. It is of significance to program staff and managers to be able to collect, analyze and report information about intermediate outcomes such as reduction of nutrient enrichment, reduction of toxic impacts, or protection and enhancement of living resources considering it may be several years before they can actually observe a change such as restoration of living resources in a watershed or water quality improve, both end outcomes.

Intermediate outcomes permit the program managers and staff to gauge some level of impact of their programs activities and outputs towards the performance goal of living resources restoration. Hatry cautions that outcome indicators are not the same as outcomes. Each outcome tracked needs to be translated into one or more outcome indicators (Hatry 1999). As defined an outcome indicator identifies a specific numerical measurement that indicates progress toward achieving an outcome. Using the previous example some possible outcome indicators are stream miles opened to migratory fish, acres of bay grasses recovered, nitrogen and phosphorus loads delivered to the bay, concentrations of kepone in fish tissue, industry reported transfers of chemical contaminants.

In discussing the multiple uses of performance information, Hatry states performance measures look backwards (Hatry 1999). They attempt to provide the best possible data on what happened in the past. Past outcome data provide important information for projections but making estimates about future outcomes is radically different from assessing past performance. Past trends are only one of many influences on future outcomes. Hatry goes further to state a critical step in analyzing performance information

is to link inputs to outputs to outcomes (Hatry 1999). Outcomes flow from outputs. And the key to making linkages is to be able to make plausible connections. (See Appendix A for example.) These connections can be based on past performance, as modified by information on changes expected in the coming year in internal and external factors.

In describing categories of performance indicators Hatry includes a discussion on explanatory information where he states programs should be encouraged to provide explanatory information to help readers of their performance reports properly interpret data. This could be information about internal factors or external factors influencing results (Hatry 1999).

Along the same lines as Hatry, the California Environmental Protection Agency defines several types of indicators used to assess organizational performance. A mission based indicator is a measure that can be used to assess status and trends associated with the agency's mission, whereas measures of achievement of the intended purpose of a program, expressed as either an environmental result or a program result is a program performance indicator. Examples of the program performance indicators could include number of hazardous waste sites under remediation, number of children tested for blood lead levels, or number of pesticide containers recycled. Policy indicators can measure either mission based or program achievements of an environmental result set in a broader social, economic, cultural or political context and that cuts across multiple mission-based issue areas such as indicators relating to environmental justice, sustainability or pollution prevention. Program activity and efficiency indicators measure the level of activity or efficiency of a program such as cost per permit issued; average time to process a permit or number of participants involved in pollution prevention programs. (CALEPA 2002)

Indicator Structure and Framework

The federal government's Government Performance and Results Act of 1993 (GPRA) has been applied broadly to every type of federal program. GPRA requires the Environmental Protection Agency and other federal agencies to prepare performance plans containing annual performance goals and measures to help move them toward managing for results. These performance goals and measures are used to assess an agency's progress toward achieving the results expected from its major functions. Under the act, a performance goal is a target level of performance expressed as a tangible, measurable objective against which actual achievement can be compared (Hatry 1999). Performance measures are the yardsticks to assess an agency's success in meeting its performance goals.

Performance goals and their associated measures are often expressed as end outcomes, intermediate outcomes, or outputs. End outcomes are the results of programs and activities compared to their intended purpose, such as ensuring that drinking water is safe. Intermediate outcomes show progress toward achieving end outcomes. They are often required for programs when end outcomes are not immediately clear, easily delivered, or quickly achieved. For example, convincing local communities to adopt higher water quality standards is an intermediate outcome leading to the end outcome of safe drinking water. Outputs are typically activities or products, such as the number of environmental regulations promulgated, and do not directly measure results.

Concerned about EPA's progress in developing goals and measures that focus on environmental results rather than on program activities, US General Accounting Office (USGAO) was asked to (1) determine the extent to which EPA's fiscal year 2000

performance goals and measures focus on end outcomes, intermediate outcomes, or outputs; (2) identify any challenges the agency faces in developing additional performance goals and measures that focus on end outcomes; and (3) describe the initiatives the agency is taking to address any identified challenges in the April 2000 report to Congress (USGAO 2000).

The report identified that in EPA's 2000 performance plan, 16 percent of the goals and 12 percent of the measures focused on end outcomes, targeting the environmental changes that EPA plans to achieve as a result of its activities. End outcomes generally entailed reductions in the amount of pollutants emitted or discharged into or concentrated in the environment. To a lesser extent, the end outcomes related to reductions in the amount of pollutants absorbed by living organisms and the adverse effects of the pollutants on ecology and human health and welfare (USGAO 2000).

The report also stated that EPA program managers identified the limited availability of data on environmental conditions and knowledge of the health effects of pollutants needed to measure EPA's performance as the major challenge to developing outcome goals and measures (USGAO 2000). Such data is needed to establish a direct cause-and-effect relationship between a program's activities and the resulting changes in the environment. This relationship is often difficult to establish because of factors beyond a program's control, such as changes in weather patterns and economic conditions. In October 1998, EPA announced plans to establish a central information office to, among other things, lead the agency's efforts toward obtaining the environmental information needed to measure the results of its programs' activities (USGAO 2000).

One key tool that comes out of the report is a framework to categorize performance goals and measures- a Hierarchy of Indicators. This framework ranks the performance goals and measures according to the direct impacts on improving the environment. According to the Chesapeake Bay Program report on using environmental goals and measures, the measures are characterized by their position in the hierarchy from level 1 through level six, ranging from indicators used to measure administration actions, such as issuing permits, to those that are indirect or direct measures of ecological or human health (USEPA 2001). Specifically, the six levels include:

Level 1: Actions by EPA/State Regulatory Agencies

Level 2: Responses of the Regulated and Non-regulated Community

Level 3: Changes in Discharge/Emission Quantities

Level 4: Changes in Ambient Conditions

Level 5: Changes in Uptake and/or Assimilation

Level 6: Changes in Health, Ecology, or Other Effects

The Chesapeake Bay Program states all information captured by this continuum has value for stakeholders and policy makers (USEPA 2001). Although the indicators toward the higher end of the continuum (levels 4 through 6) portray a clearer, more direct image of the environmental condition, indicators at the lower levels (levels 1 through 3) are needed to establish links between the actions taken and the effects observed. It is important to maintain indicators along a continuum in order to demonstrate the linkage between actions by man and responses in the natural system. According to the EPA's performance planning guidance, program offices should develop performance goals and

measures at the highest indicator level for which adequate data exist (USEPA 2001). Those indicators at levels 3 through 6 would be considered end outcomes; level 2 intermediate outcomes and level 1 outputs.

The Chesapeake Bay Hierarchy is one adaptation of earlier indicator frameworks. Most environmental indicator systems are built around the "pressure-state-response" (PSR) model developed by the OECD in 1991, or a variation thereof, such as the "pressure-state-effects-response" (PSER) model developed by the USEPA's Office of Policy, Planning and Evaluation in 1995.

The PSR model was initially developed by the OECD to structure its work on environmental policies and reporting. Its contentions are human activities exert pressures on the environment and affect its quality and the quantity of natural resources ("state"); society responds to these changes through environmental, general economic and sectoral policies and through changes in awareness and behavior ("societal response") (OECD 2003). The PSR model highlights these cause-effect relationships, and helps decision makers and the public see environmental, economic, and other issues as interconnected. It thus provides a means of selecting and organizing indicators (or state of the environment reports) in a way useful for decision-makers and the public, and of ensuring that nothing important has been overlooked.

Depending on the purpose for which the PSR model is to be used, it can be easily adjusted to account for greater detail or for specific features- as done with the EPA's PSER model. The PSR has been used as a format for organizing state of the environment reports in OECD member countries such as the Netherlands, for structuring OECD's

national environmental performance reviews, and for structuring possible sets of sustainable development indicators for the United Nations and World Bank.

The PSER model is also based on the concept of causality. Human activities (as well as natural phenomena) exert pressures on the environment. These pressures can change the quality and quantity of natural resources, the state. Changes on the state can then produce one or more adverse effects on human and ecological health. Society may then react to these changes by enacting new policies and regulations, the response (USEPA 1995). In principle, new policies or regulations should reduce the pressures on the state and, consequently, the effects. Certain responses may also be directed at the site, or at the effects. In some cases, the state may affect the pressure.

The principal authors of the conceptual framework document state while cause-effect relationships are difficult to establish, environmental decision making commonly relies on assumptions about (and plausible evidence for) such linkages in order to determine appropriate management responses. For example, the environment has the capacity to absorb or process some stress, and data showing the presence of pressures alone is not an assurance that a significant change in the state of the environment has occurred as a result of that pressure (USEPA 1995). Furthermore, a change in state does not necessarily mean that there is a problem; even when there is, without knowing what caused the change, it is difficult to decide on a proper management response. Thus, models and analyses that show relationships among variables generally have the most meaning for environmental decision makers.

The OECD states in their Development, Measurement and Use document their aim is to further strengthen countries capacity to monitor and assess environmental conditions

and trends so as to increase their accountability and to evaluate how well they are satisfying their domestic objectives and international commitments (OECD 2003). The OECD's purpose and scope states indicators can be used at international and national levels in state of the environment reporting, measurement of environmental performance and reporting on progress towards sustainable development (OECD 2003). They can further be used at the national level in planning, clarifying policy objectives and setting priorities. The OECD work on environmental indicators is designed to;

- Contribute to the harmonization of individual initiatives of OECD Member countries in the field of environmental indicators by developing a common approach and conceptual framework; assist in further development and use of environmental indicators in OECD Member countries; and promote the exchange of related experience with non members and other international organizations;
- Support the OECD's policy analysis and evaluation work by developing core sets of reliable, measurable and policy-relevant environmental indicators to:
 - Measure environmental progress and performance,
 - Monitor policy integration, and
 - Allow effective international comparisons; (OECD 2003)

The OECD work focuses mainly on indicators to be used in national, international and global decision making; yet the approach may also be used to develop indicators at sub-national or ecosystem level. The actual measurement of indicators at these levels is encouraged and lies within the responsibility of individual countries. Their approach is to develop "harmonized" international environmental indicators in close cooperation with OECD member countries. They use what they term a "pragmatic" approach, recognizing no universal set of indicators rather that several sets exist, serving several purposes and audiences.

The Development, Measurement and Use document outlines several categories of indicators, corresponding to a specific purpose and framework for their environmental indicator work. Three of relevance for the purposes of this report are core environmental

indicators, key environmental indicators and sectoral environmental indicators. Core environmental Indicators are designed to help track environmental progress and the factors involved in it, and analyze environmental policies (OECD 2003). The OECD Core Set is a set commonly agreed upon by OECD countries for OECD use. It is published regularly. The Core Set, of about 50 indicators, covers issues that reflect the main environmental concerns in OECD countries. It incorporates core indicators derived from sectoral sets and from environmental accounting. Indicators are classified following the PSR model: indicators of environmental pressures, both direct and indirect; indicators of environmental conditions; indicators of society's responses. An example of a core set of indicators for the climate change issue would be an index of green house gas emissions as a pressure indicator; atmospheric concentrations of green house gases or global mean temperature as a condition indicator; and energy efficiency as a response indicator. Each of these might have complimentary indicators such as carbon dioxide emissions, methane emissions, chlorofluorocarbon emissions, dinitrogen oxide emissions. Key environmental indicators, endorsed by OECD Environment Ministers, are a reduced set of core indicators, selected from the OECD Core Set, that serve wider communication purposes. They inform the general public and provide key signals to policymakers. The Key set comprises approximately 10 to 15 indicators. Using climate change as the issue again, a key indicator would be carbon dioxide emissions or greenhouse gas emissions index depending on the availability of data. Sectoral Environmental Indicators are designed to help integrate environmental concerns into sectoral policies (OECD 2003). Each set focuses on a specific sector (transport, energy, household consumption, tourism, agriculture). Indicators are classified following an adjusted PSR model reflecting:

sectoral trends of environmental significance; their interactions with the environment (including positive and negative effects); and related economic and policy considerations (OECD 2003). There is one set of indicators per each sector. Using household consumption as the sector, an example of a trend indicator would be ownership of selected household commodities or household consumption expenditure by good; an interaction indicator would be generation of household waste or waste recycling rates; and economic/policy indicator would be public expenditures on environmental information and education or pollution abatement and control expenditures.

The OECD cautions that the list of environmental issues on which a country chooses to focus as emerging issues or challenges or current preoccupations should not be seen as final or exhaustive (OECD 2003). It may change as scientific knowledge and policy concerns evolve. Furthermore, the issues are of varying relevance for different countries and different contexts. It is expected that each country will supplement the core set with additional indicators of particular interest, and that over time the list will be expanded with indicators of progress at the social-environment interface (OECD 2003). The OECD encourages disaggregation of core indicators at a territorial level to identify distributive issues and reveal sub-national differences that are hidden when national level indicators are used (OECD 2003).

CHAPTER III

METHODOLOGY

Study Design

The research design for this investigation is a case study method, more specifically a multiple case explanatory case design. This method was chosen based on the premise the research question was related to tracing operational links. How and why – drawing on a wide array of documentary information and qualitative interviewing. According to Yin, case studies are the preferred strategy when:

- How and why questions are being posed;
- When the investigator has little or no control over the events;
- When the focus is on a contemporary phenomena within some real-life context (Yin 1999).

Additionally, the belief is that this real-life context will be highly pertinent to the phenomena of study. A rich level of detail can be achieved by allowing informants to tell their stories and link implementation (use) with effect (Yin 1999).

Case Selection

In deciding which states to target or approach for the utility analysis, we first surveyed State Reports and identified those state environmental agencies that have indicators developed and presented in an Environmental Indicator Report, State of the Environment Report, an Annual Report or some other strategic document. The results of that work was 13 of 32 states have indicator projects with a reporting tool such as a State of

Environment report or an Annual Report. Five states have program compliance documents. Seven states had reports that discussed trends. I differentiated between the types of document and types of environmental information reported (indicators/outcomes, outputs, trends) because the types of information presented in the different documents answer different questions, serve different purposes and are of interest to different audiences. Trend discussions as most frequently used in state of the environment reporting are normally reported over a decade, are intended mostly for the general public, but are not clearly a defined and presented "suite of indicators" that would consistently or collectively present information on environmental issues. They are not necessarily linked to program objectives making them more descriptive indicators rather than performance indicators (OECD 2003). Whereas, some of the other forms of environmental information (outcomes, outputs, compliance rates) traditionally lend themselves to program performance reporting as would be represented in the Annual Reports or Environmental Indicator or Progress Reports, which makes these reports useful for managers, the regulated community, scientists, policy makers and the general public. Therefore, I make this distinction mainly to clarify the type of information used and the intended audience. However, this does lend credence to the concept of developing and using multiple indicators such as the OECD's core and key indicators- core indicators being those that are designed to help track environmental progress and performance and key being a reduced set to serve a wider communications purpose to inform the public and key signals for policy makers. After reviewing the web reports we were able to glean some idea of who had and was using various forms of environmental information. (See Appendix B for indicator report tables.)

Secondly, the Office of Congressional and Intergovernmental Relations (OCIR), was contacted to gather input on which states they thought would be open to discussion and meet the proposed criteria. OCIR acts as the EPA's lead office for performance partnerships. OCIR is responsible for advancing the Administration's goal to strengthen State-EPA partnerships and facilitate the resolution of policy and implementation issues associated with performance partnerships. OCIR accomplishes this through the National Environmental Performance Partnership System (NEPPS) program and its supporting performance agreements. The principal component of the NEPPS and results based management is use of environmental indicators to evaluate environmental quality and program effectiveness, and to plan future program activities.

Approximately one-half of the EPA's budget is awarded to States and Tribes or to educational, nonprofit and other organizations. To meet obligation under GPRA, EPA must be able to link the work performed with grant funds to the achievement of the goals and objectives in the EPA strategic plan. Performance Partnership Grants and categorical State and Tribal grants are among the primary mechanisms through which the nation's environmental programs are implemented (USEPA 2005). As a requirement of the performance partnership agreement (PPA), participating states are expected to develop and report on the results of indicators, goals, and strategies (based on information about environmental condition). Progress is evaluated based on results actually achieved in the environment. Performance partnerships are designed to help achieve better environmental results by taking full advantage of the unique capacities of EPA and States and leveraging the collective resources most efficiently and effectively to address the most pressing environmental problems.

NEPPS is also facilitating opportunities for State engagement in EPA's planning and budgeting processes to better align EPA and State planning and priority setting and have the results of this planning incorporated in the performance agreements. To fulfill its commitment to EPA Regions and States, OCIR is issuing national guidance on performance partnerships for the first time (USEPA 2005). Since performance partnerships are integral to planning and implementing national environmental programs, the guidance is being issued in conjunction with the Agency-wide process for production and review of national program guidance through the Office of the Chief Financial Officer (OCFO). OCFO's guidance for the FY05 national program- *Implementing Improvements to our Planning Processes: Developing National Program Guidance for FY2005* may be very helpful in the alignment process.

Staff in OCIR were presented with the following selection criteria: the states would have an indicator project well underway, strategic plan and /or State of Environment report that includes indicators, have completed a performance review, uses a performance based budgeting system, housed in an EPA region that has established a common set of performance measures, participation in NEPPS and have developed and used a reporting, measuring and evaluation tool. Based on their experience and the criteria provided, OCIR suggested the following environmental agencies or regions: Florida, New Jersey, Illinois, California, Region 1, and Region 3. The above agencies were contacted. Minnesota and the Environmental Public Health Tracking Network (EPHTN) were also contacted. California, New Jersey, Florida and EPHTN replied to the response. However, the EPHTN is a linkage project not of particular relevance as yet considering they are in the capacity building stages of developing networks across the states to

provide linked health outcome and environmental exposure data. California will also not be presented. They are in the process of transitioning their environmental information management system into a results based management system (RBMS) with the blessing and encouragement of State Legislature, Department of Finance, Governor and Legislative analyst office. They have completed a seven study pilot project assessing the use of a RBMS. California is scheduled to report and publish their findings in October 2004. New Jersey and Florida will be presented as state examples of how indicators/environmental information are being used in decision making. The international Organization for Economic Cooperation and Development (OECD) is being presented as an example of an organization that conducts environmental performance reviews for participating countries, however at the national level but in an international context. I received no response from Minnesota, Illinois, or EPA Regions 1 or 3.

In a multiple case design each unit of analysis is the subject of an individual case study, but the study as a whole covers several units of analysis and as such is considered a multiple case design. The advantage of the multiple case design is the evidence is considered more compelling, and the overall study is therefore regarded as being more robust. Every case/unit of analysis should serve a specific purpose within the overall scope of inquiry attempting to show replication logic, that is each case is carefully selected so that it predicts similar results (Yin 1999). In this case, predicting similar results of successful use of environmental indicators to inform decision making processes.

Data Collection

Interviews were conducted as guided conversations following an open-ended interview guide. (See Appendix C for interview guide). Informants offered facts about the phenomena of study (use of environmental indicators) and context. However, I was conscious to be aware that some opinion about events was also interjected. (See Appendix D for informant list). The interviews are considered verbal reports only. As such they are considered to be subject to the common problem of bias, poor recall, and poor or inaccurate articulation (Yin 1999). However, informants also suggested other informants and documentary evidence to corroborate interviews and events.

Initial and secondary emails describing the study and presenting interview questions were sent to all informants prior to the interview phone call. Conversations were not recorded however, all interview/conversation notes are apart of the case study notes and are stored in such a manner that other persons can retrieve them at a later date. Interviews are referenced in the appendix though not included the bibliography.

Data Analysis

In doing a case study, the goal is to expand and generalize theories (analytic generalization) and not to enumerate frequencies (statistical generalization). The most preferred strategy is to follow the theoretical propositions that led to the case study (Yin 1999). This would have been reflected in research questions, literature reviews and any new hypotheses. The propositions would have also shaped the data collection and in turn make this strategy relevant.

Explanation building is promoted as another analytical technique for case study research (Yin 1999). The goal is to analyze the case study by building an explanation

about the case. In this investigation, explanation building has occurred in a narrative form. The cases/units of analysis have been organized and presented as narratives reflecting the theoretically significant propositions- performance reporting, performance review, performance based budgeting, strategic planning and results based management- revealing a new part of the theoretical argument being made. A cross case analysis is performed of the individual cases to provide some synthesis of the cases. Conclusions and recommendations are also provided. These are presented in chapter five.

Data Quality

Because the case method is a form of empirical social research, generally four tests are used to establish quality- construct validity, internal validity, external validity and reliability (Yin 1999). To increase construct validity of operational measures, multiple sources of evidence were used during the data collection phase and key informants have reviewed a draft of the case study report for accuracy and corroboration. Their comments and corrections have been incorporated during the composition phase. To increase internal validity of causal relationships, explanation building was used as an analytical strategy in the data analysis phase. To increase external validity of generalizations, a “replication logic” innate to the multiple case design was used (Yin 1999). To increase reliability by minimizing bias and error, all procedures have been documented to make the study as operational as possible.

Additionally, please note that the case studies are my own interpretation and synthesis of the facts. Neither the interviews nor the case studies should be construed as official statements from the agencies.

CHAPTER IV

CASE STUDIES

Florida Department of Environmental Protection (FLDEP)

In a regulatory system, information is needed. Florida approaches the use of information in decision making from the standpoint of what information is needed, by whom, and for what purpose. Florida's focus is on performance indicators (numerical measurements of outcome and outputs) with the objective of implementing programs and activities that will help meet their goals. Performance indicators are direct or indirect measures of the achievement of the intended purpose of a program, expressed as either an environmental or program result. FLDEP strives to produce information that will demonstrate progress towards reduction in environmental risk or impact to ecology and human health- intermediate and final outcome measures.

The FLDEP began managing for results by building a performance measurement system that identified emerging problems as indicated by low or declining compliance rates and supplied the information needed to target resources and build collaborative partnerships with outside stakeholders to fix the problems. The combination of a quarterly report and a Focus-Watch designation system enabled program managers to reassess problems by using performance measures that attracted their attention. For example, after petroleum storage tanks in two or three districts registered relatively low compliance rates related to release detection in late 1997, the corresponding program was designated a Watch area by the Secretary. Following an analysis of noncompliance data, the Bureau of Petroleum Storage Systems improved its inspection staff training practices, clarified its rules, and launched a major industry education initiative. By September

1998, the watch designation was dropped as a result of the collaborative effort of agency officials and regulated facilities. The measurement system focused on outcomes they were striving to achieve and supplied the information needed to evaluate changes in observed outcomes.

The FLDEP moved from an activity driven management system to a performance outcome based system when it adopted its four-tier performance planning framework to be described later. The FLDEP utilizes a highly structured process called Environmental Problem Solving to clearly identify the important problems and fix them. The steps are to:

- Identify potential problem
- Define the problem precisely
- Determine how to measure impact
- Develop solutions (interventions)
- Implement the plan with periodic monitoring and review
- Case closure

They use this process to do root cause analysis to identify the factors having the largest impact on an identified problem and analyze what can be done to lessen the impact of each factor through enforcement, compliance assistance, collaborative partnerships, etc (NPRG 1999).

This measurement system and problem solving approach was embodied in the "Secretary's Quarterly Performance Report" (SQPR). This was not the traditional "balanced scorecard" but a mechanism to monitor program activity and effectiveness.

SQPR and Performance Based Budgeting

The Secretary's Quarterly Performance Report was a mechanism created by the Department of Environmental Protection Secretary as an action forcing reporting mechanism that linked to the program performance. The report triggered review by the secretary or deputy secretary or other key staff when a problem was identify (program not performing well based on compliance rates). Then based on that review problems may be designated as "watch" areas (like a tornado watch) or focus areas (tornado warning). Focus areas were determined based on trends over multiple quarters (NPRG 1999, Gormley 2000). For example, when shellfish plant compliance rates declined in 1998, the secretary designated the program as a focus area. Following an investigation, the Bureau of Marine Resources Regulation and Development sharpened the technical skills of its inspectors, arranged voluntary training sessions at the shellfish processing plants, and changed its inspection priorities, improving the safety of shellfish plants for the future. The focus area designation could also have budgetary impacts which will be discussed in the performance based budgeting section. This process ensured the indicator measures were being used. This report was novel however it was discontinued after administration changes but also because the report became too much to maintain. It was difficult to detect trends in data from quarter to quarter and the amount of effort required to publish it was too great.

The secretary's quarterly report was structured around a four tiered framework for performance information similar to the EPA indicator hierarchy but tailored to fit Florida's organizational structure and function that being regulatory enforcement. The framework's four tiers included: Tier 1: Environmental and Public Health Outcomes,

Tier 2: Behavioral and Cultural Measures, Tier 3: Departmental Outputs and Activities and Tier 4: Resource efficiency. Tier 1 information included measures that describe air and water quality improvements or preservation of critical habitat such as the percentage of public water systems providing service without significant health based water quality problems, Tier 2 information described changes in compliance rates and initiative participation rates such as the number of noncompliant oil and gas wells returned to compliance with or without regulatory enforcement; Tier 3 information described the traditional compliance or enforcement reporting such as the number of gas and oil operations inspected; and Tier 4 described efficiency measures such as least cost or best fit alternatives such as unit costing for funds and staff appropriated through legislation to perform activities. Indicator framework is important because the framework selected will influence and add value to the content of information collected and the findings of the information, which will influence decision making and operations (Hatry 1999, Pasquale 2002).

Each quarter, the data contained in the four tiers of information in the SQPR were analyzed and used to make management decisions by the identification of "Good", "Watch" and "Focus" designated program areas.

- "Good" areas were those in which an analysis of the tiered data indicated healthy or improving environmental conditions and high compliance rates. "Good" areas were distinguished by such characteristics as good air or water quality in Tier 1, high on-site inspection or monitoring compliance rates in Tier 2, and an appropriate number of inspections to verify compliance in Tier 3 (NPRG 1999).
- "Watch" areas were those in which the data show a moderate cause for concern. For example, the compliance rate for regulatory standards in a particular district may be lower than the statewide average or compliance rates may be low in a district but only minimal formal enforcement has been taken.

Such situations suggested the presence of an emerging trend or pattern and required further investigation prior to taking specific action (NPRG 1999).

- "Focus" areas were those that needed to be closely monitored due to concern about persistently low compliance rates or deteriorating environmental conditions. For example, if compliance rates were persistently low despite high enforcement, the agency may consider compliance assistance alternatives or implementation of best management practices. In "Focus" areas, it was essential that management have the flexibility and support to shift resources where they are most needed to resolve problems (NPRG 1999).

Once the "Good", "Watch" and "Focus" areas were identified, the FLDEP issued press releases detailing the Department's findings. The press releases significantly improved the FLDEP's relationship with the media and environmental groups. In conjunction with the press releases, over 1,500 copies of the SQPR were printed and distributed to the general public as well as placed on the FLDEP Internet site.

Florida further clarifies their information need and use (purpose) and audience by pairing the SQPR tiers with Montague's sphere of influence (Figure 1). Montague states data collection and reporting should be geared to the stakeholders' unique "sphere of influence for greatest benefit (Montague 2000). This logic also illustrates the flow of information being generated in the performance measurement system as relates to linking information and the Department's ability to influence progression or change. Each sphere or tier in this case has distinct limits of influence and interest. Circles represent different levels of control or influence around you. The innermost circle is the operational circle, the domain in which you have control over behavior. People in this domain share a common mission. Within the behavioral change circle, your operation has contact with this circle so there is the opportunity for direct influence. People in this domain may or may not share common mission but no control is exhibited. The state circle is the domain

of indirect influence- the nature of their business creates possibility of indirect influence. This concept is called the strategic terrain (Montague 2000, Pasquale 2002).

Figure 1- SQPR TIERS AND MONTAGUE'S SPHERE OF INFLUENCE



In using this logic, Florida translates their information need into a indicator framework as represented by the tiers and then identifies users of that information and what influence the agency has in relation to the user and the information (Figure 2). Based on this information the agency can start to discuss the purpose or value for each tier of information and making it useful for the user. Within the indicator framework, Tier 1 environmental and public health outcome indicators inform decision making by policy makers. The behavioral and cultural measures of Tier 2 promote environmentally sound choices by the citizens and organization. Tier 3 Departmental outputs and Activities enhance the effectiveness of program activities. The resource efficiency measures enhance efficiency of program operations (Pasquale 2002). The “whom” and “for what

purpose” have been answered. Florida then takes this information and demonstrates making it useful for the various parties.

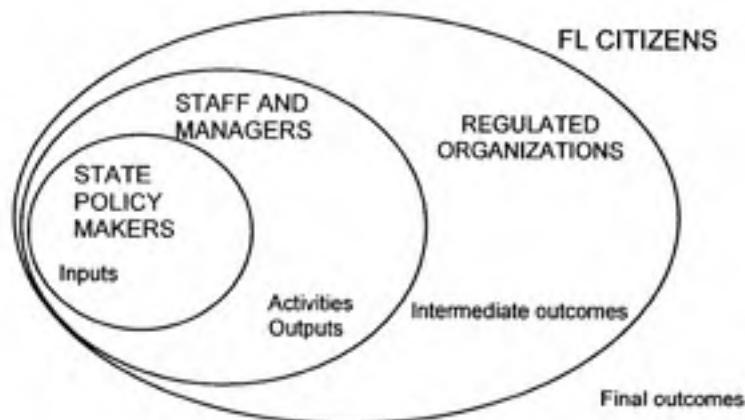
Figure 2- Florida’s Indicator Framework by Type and Purpose

Tier	Type	Purpose
1	Environmental and Public Health Outcome Indicators	Informed decisions by state policy makers
2	Behavioral and Cultural Measures	Promote environmentally sound choices by citizens and organizations
3	Departmental Outputs and Activities	Enhance effectiveness of program activities and services
4	Resource Efficiency	Enhance efficiency of program operations

They map out a performance pathway or behavioral logic for their indicator measures (Figure 3). The logic should flow from the operational circle through to the state circle (Montague 2000). They clearly identify who and what they expect to see change along the pathway over time demonstrating a linked set of information. They have linked their inputs and outputs to intended outcomes. Referring to the previous example from page 27 of providing safe public water supplies, if Tier 3 and 4 information relating funds, staff and inspection activities of the geologic survey program are in the operational circle; Tier 2 compliance information about gas and oil wells in the behavioral circle; and Tier 1 outcome information about public water supplies meeting health based standards in the state circle; we could expect that appropriately allocated funds, trained staff and proper inspection activity should affect oil and gas facilities to manage their operations in compliance with regulation and aid in public water supplies meeting health based standards. This logic provides the foundation for a performance plan and makes acceptable and sufficient use of the information in our performance

management/measurement system. This concept reinforces the continuing theme and rationale that with useful reports, sound indicator framework and valid data, value is added to the decision making process and day-to-day operations of agencies. The people, the information and the process for change are all interconnected. Even though this was an operational example, the fact still stands that data collection and reporting should be geared to stakeholders' unique "sphere of influence" for greatest benefit. Stakeholders will experience information overload and may ignore or reject data if the reports are not meaningful to them (Pasquale 2002).

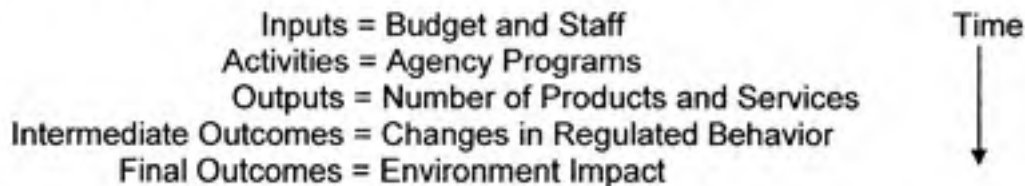
Figure 3 - FLDEP PERFORMANCE INDICATORS AND MONTAGUE'S SPHERES OF INFLUENCE



The logic model also translates into an easily understood action plan for managers (as evidenced by the previous example) by transposing the previous four tiers of SQPR outcomes demonstrating the contribution of a program to an environmental impact (Figure 4) (Hatry 1999, Pasquale 2002). Most important is the resulting development of

a linked set of information, which accommodates the discussion of progress from the input or output through to final outcomes.

Figure 4 – LOGIC MODEL TO ACTION PLANNING



However, one point Florida makes about the culture and attitude of the agency towards using information in results based management is centered on the idea of attribution and plausible association. Whether a “reasonable person”, knowing what has occurred in the program and that the intended outcomes actually occurred, agrees that the program contributed to those outcomes (Pasquale 2002). This effect is also demonstrated in Figure 3- Indicator/Montague Sphere of influence diagram. Note final outcomes fall completely outside the sphere of influence for the agency’s operations. Florida notes that being accountable for outputs has been much more acceptable to public servants than being accountable for outcomes. (Hatry 1999, Pasquale 2002). If the expected outcomes have not been accomplished, there may be several reasons, only one of which may be that the responsible manager has not done a good job... One major advantage for FLDEP was the very strong support of a Secretary and Deputy to initiate and contribute to making the performance measurement approach successful (Gormley 2000, NPRG 1999).

Performance based Budgeting

Florida uses the same logic of linked measures in their reporting for the performance based program budgeting. It includes a description of the program objectives, outcome measures with baseline and standards attached, and a table broken down by activity with appropriate output measure, standard, and unit costing. (See Appendix E for example.)

DEP has operated under performance based budgeting since 1998. The statewide program was initiated in 1994 by statute. Performance based budgeting was phased into all state agencies over a seven year period. An average of five agencies were designated to begin performance based budgeting every year until fiscal year 2001-2002. Required by statutory schedule, each agency was required to provide the Governor's office with a list of programs that it believed were conducive to performance based budgeting (State of Florida 1997, 2003). The following year, the agency submitted performance measures for each of these programs. These measures were to assess program outputs and outcomes. The agency submitted baseline data showing its past and current performance and proposed standards for performance on each measure for the coming year. The governor may approve, modify or reject the program measures and performance standards. Approved programs and measures are then included in the agencies legislative budget requests. The legislature considers the information provided and may reject, modify, or approve the program measures and standards offered. As outlined in the General Appropriations Act, the legislature then designates acceptable agency program performance measures, standards and resources appropriated to accomplish the standards. Agencies are provided a lump sum for each program (eliminating the line item concept). As part of subsequent years' appropriation process, the Legislature will

examine actual performance of these programs in comparison to their standard. The legislature may provide incentive or disincentives for meeting or not meeting the performance standard. Authorized incentives are additional flexibility in budget management; additional flexibility in salary rate and position management, retention of up to 50% unexpended and unencumbered appropriation balances, or additional funds. Disincentives could be mandatory quarterly reports and/or appearances to the Governor's Office and Legislature on progress, program elimination or restructuring, reduction of program positions, reduction or elimination of spending authority, or reduction of managerial salaries. (State of Florida 1997, 2003)

The idea was that this process provided greater flexibility to agencies in exchange for accountability. Resources are redirected to address problems identified by watch and focus designations. It also offers some incentive for actually using the measures. (State of Florida 1997)

The SQPR and performance based budgeting were formerly referred to as the parallel management systems. In 1999 the SQPR was discontinued. However, FLDEP continues to devote resources to the collection and reporting of data. The FLDEP kept the raw data integrating it into the Performance Management Data Collection System and during 2001 to 2003 timeframe the two systems were consolidated into a single system to include new measures. The agency also continues to produce the legislatively mandated annual reports to the legislature.

New Jersey Department of Environmental Protection (NJDEP)

New Jersey no longer has an indicator project however they have a very good planning framework for institutionalizing use of environmental information into a results

based management system using a plan-do-check-adapt (PDCA) system. Budget making and agency expenditures follow a plan, do, check, adapt cycle- a budget is proposed and approved, money is spent on programs, spending updates show spending rates and programs modify their spending and their budget. The Environmental Results Management System's approach is to incorporate environmental information into this PDCA system. The key concepts are to plan with measurable objectives, do to carry out action, check with structured measurement systems, and adapt based on measurement results (ERMS 2000, McGeorge 2001). ERMS, the product of a group of states who were very active in results based management and NEPPS, was to provide states a guide to implementing results based management. New Jersey's governor and commissioner at that time were very instrumental in promoting use of results in decision making. It was at the order of the Governor; the NJDEP indicator project came to fruition. New Jersey became a front-runner in the NEPPS program and was successful in integrating their entire department under a results based management system through their performance partnership agreement with USEPA (McGeorge 2001, NJDEP 2001).

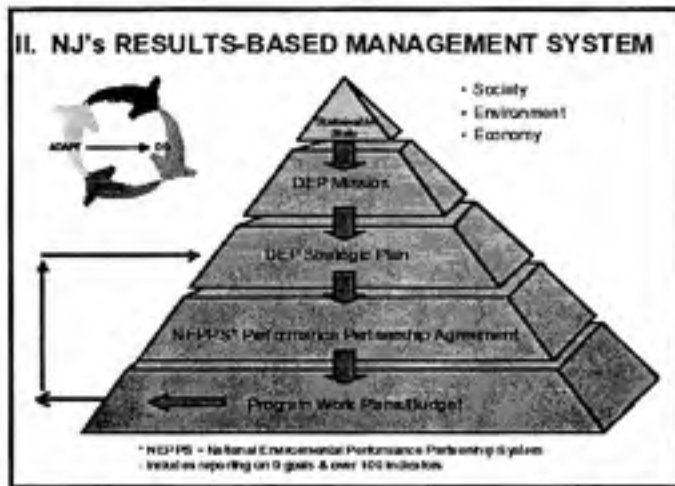
Environmental Results based Management System (ERMS)

In 1996 through integration of Quality Management principles into their day-to-day operations and participation in NEPPS, New Jersey transitioned into a result based management system. New Jersey functions under a system with their performance partnership agreement at the core and uses it as their planning document. Over the course of two years, they were able to establish goals and indicators to measure progress under NEPPS for 60% of their operational programs. Over the course of four years NJDEP was able to bring the entire department under NEPPS and ERMS; transitioning from media

specific programs to multi-media programs to sustainability initiatives (McGeorge 2001, NJDEP 2001). The Performance Partnership Agreement (PPA), developed under NEPPS, provides a detailed outline of the Department's goals and includes milestones, strategies, activities and indicators for each. The agreement is a comprehensive, cross-program planning document, providing more detail than the Strategic Plan (NJDEP 1998, 2001). The agreement also guides the relationship between the Department and EPA Region 2 in federally delegated programs. The Performance Partnership is geared toward an audience that is familiar with environmental management. The time frame for the NEPPS document (indicator technical report) is two years.

In 1998 NJDEP developed a strategic plan with six goals- clean air, clean and plentiful water, healthy ecosystems, safe and healthy communities, abundant open space and open and effective government. If the management/planning/measurement system were structured as a pyramid- program work plans and budgets are at the base, performance partnership agreements are directly above, then the DEP strategic plan, then DEP Mission document and at the top the Sustainable States document. Work plans cycle back into the strategic planning process and it into the NEPPS PPA and work plans and budgets drafted and completed based on indicators in NEPPS. (Figure 5)

Figure 5- NJDEP's Environmental Results Management System



As part of the NEPPS program states are required to develop goals, indicators and strategies. New Jersey's theory is that goals and objectives provide structure for agency action. In turn that structure can be used to organize the measurement system. Measurable objectives also provide concrete endpoints for evaluation which can be very helpful in discussions about adapting agency activities (ERMS 2000, Hatry 1999). So step one is to plan with measurable objectives. Measurable objectives can be even more useful when they include a specific target. For example, restore **x miles** of habitat in a watershed, reduce **non-point sources** of pollution to a river, educate **1000 farmers** about manure management technologies or use **0.5 FTE** to develop curriculum for a farmer education program. Each of these objectives can be part of a management system if the objectives are accompanied by work plans, the results measured, and those measures are part of deliberations on the success of management activities and strategies. Each objective has a different time frame for completion, different audiences for

implementation and a different sequence of events necessary to translate it into action.

And each objective in this example forms a link set.

A management system may include different levels of planning or decisions much like the indicator hierarchy. Agency leadership may establish broader, longer term objectives while program managers may decide upon the strategy and the resulting shorter term objectives. A clear recognition of where your plan's objective resides in the levels of planning is important when considering your measurement system and opportunities to adapt strategies and activities based on the measurement results (ERMS 2000). The other phenomena you can observe when considering measurable objectives for different levels of planning is the opportunity to observe linked sets of information. You can observe measures that span the range of the planning system. This will be discussed again later in the structured measurement system section.

The next key point emphasized falls under the concept of check with a structured measurement system. This point emphasizes structuring the measurement system to connect to the planning system. Measurement structures are the classification of different types of performance measure information. New Jersey utilizes the cause-condition-response (very similar to pressure-state-response) model in the development of its measures (ERMS 2000, McGeorge 2001). Each indicator measures progress toward a specific milestone/objective, which is associated with a particular sub goal. All sub goals are associated with an overall long term goal for each area. So once again they are able to present information as a linked set. Also observe how the measurement structure mimics the planning structure. (Figure 6)

Figure 6- Measurement Structures and Performance Measures



New Jersey's logic is that the application of the measurement structure helps make clear the linkage between different kinds of measures which are used for different functions/decisions within the agency (Figure 6). There may be budget measures, activity measures, behavior/response measures and environmental measures. In turn, linking measures of agency activity through behavioral or response measures to environmental measures makes more explicit the connections which often serve as the basis for environmental strategies. The take home points are 1) a structure is important (although the particular structure selected is not critical) and 2) measures are necessary to properly gauge progress and manage towards progress (ERMS 2000, McGeorge 2001). The other major point New Jersey makes in connecting the planning and measurement system is that the primary benefit of connecting planning and measurement is to build an information base that directly supports the evaluation and discussion of agency progress towards achieving goals and objectives. A secondary benefit is reference to goals and

objectives in the measurement system reinforces those goals and objectives thereby promoting and strengthening the use of your plan/planning system. (ERMS 2000)

The adaptation stage is the link in the chain that identifies the changes necessary to accomplish the objectives in the plan. The results of adaptation can require revisiting the plan (depending upon the planning cycle) or it can feed into the next set of "Do" actions. New Jersey's strategic plan is organized around six goals- clean air, clean and plentiful water, safe and healthy communities, healthy ecosystems, abundant open space, open and effective government. Each goal has a goal owner in upper management, usually at the assistant commissioner level reporting directly to the department commissioner and possessing programmatic decision making power, who was responsible for reporting on their assigned goal. Each owner provides a brief on the status of goals to the legislature annually. Reporting was conducted in multiple forms. Reporting sessions were held with programs several months in advance in order to have data reported in the form of the indicator. This was not a statutory requirement however but an administrative order by the administration in place at that time. The programs were also required to report internally every quarter to the commissioner. Quarterly reporting probably was not the most appropriate for intermediate to long term planning as stated by NJDEP. A two-year cycle would have been preferred. All budget requests were submitted based on strategic goals and performance indicators. Managing, reporting and collecting data based on performance results did take some time for the program managers to get acclimated. In addition to the internal quarterly strategic report and the Annual Performance report, two State of the Environment reports and a technical indicator report were published.

When adapting management processes based on measurement results New Jersey offers the suggestion of considering your intent carefully when designing and implementing adaptive deliberations. There is a range of deliberations possible and they are mostly described by the decisions you plan to affect and the measures you have chosen (ERMS 2000). Strategic deliberations focus on long-term decisions. The measures associated with long-term decisions reflect slowly changing environmental condition. Program deliberations focus on implementation of strategies which may or may not cause short term changes in environmental stressors. Activity management deliberations focus on things such as permit training and enforcement. The time frame, participants and the measure considered will vary under these different scenarios. The take home point here is to use the results from your measurement system to adapt strategies in planning or activities. Adaptation based on measurement results promotes utilization of your planning structure and your measurement system.

New Jersey officials offered the following suggestions for implementing use of results/indicators into a management system: continue to promote performance partnership agreements as a trigger and key to sustaining results based management, results based management systems can be effective as a budget development tool and also effect meaningful changes in data collection and agency strategies and leadership has to agree to use information and have lieutenants who are compassionate to the process.

Organization for Economic Co-operation and Development (OECD)

Demand for environmental indicators by OECD was originally expressed along two complementary lines. First, the OECD Ministerial Council in 1989 called for further

work to integrate environment and economic decision making. This was reiterated in further economic summits in Paris and Houston and led to the approval of an OECD Council Recommendation on Environmental Indicators and Information by OECD Governments in 1991. Second, in 1991 the OECD was entrusted by its Member countries to carry out environmental performance reviews with the principal aim of helping Member countries to improve their individual and collective performance in environmental management.

Created as an economic counterpart to the North Atlantic Treaty Organization (NATO), the OECD grew out of the Organization for European Economic Cooperation which was formed to administer and support American and Canadian aid under the Marshall Plan for the reconstruction of Europe after World War II. It is a forum where governments of 30 market democracies work together to address economic, social, and environmental and governance challenges of the globalizing world economy. The organization provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to coordinate domestic and international policies. Unlike the World Bank or International Monetary Fund, the OECD does not dispense money. Peer pressure acts as the incentive to improve policies and implement soft law (guidelines and multinational agreements) which can on occasion lead to formal agreement and treaties.

Over the years, the OECD has accumulated practical experience not only in developing, but also in using environmental indicators in its policy work. The indicators are used as a specific tool for evaluating environmental performance, and for monitoring

the implementation of the OECD Environmental Strategy for the first decade of the 21st century.

Guiding Principles

When using environmental indicators in analysis and evaluation, the OECD and its Member countries apply the following commonly agreed upon principles:

- Only One Tool** Indicators are not designed to provide a full picture of environmental issues, but rather to help reveal trends and draw attention to phenomena or changes that require further analyses and possible action. (OECD 2003)
- Indicators are thus only one tool for evaluation; scientific and policy-oriented interpretation is required for them to acquire their full meaning. They need to be supplemented by other qualitative and scientific information, particularly in explaining driving forces behind indicator changes which form the basis for an assessment. One should also note that some topics do not lend themselves to evaluation by quantitative measures or indicators such as prevention programs, basic research, long range planning activities and support services (OECD 2003, Hatry 1999, USGAO 2000).
- Appropriate Context** An indicators' relevance varies by country and by context. They must be reported and interpreted in the appropriate context, taking into account countries' different ecological, geographical, social, economic and institutional features (OECD 2003).
- Inter-Country Comparison and Standardization** Most OECD indicators focus on the national level and are designed to be used in an international context. This implies not only nationally aggregated indicators, but also an appropriate level of comparability among countries (OECD2003).
- There is no single method of standardization for the comparison of environmental indicators across countries. The outcome of the assessment depends on the chosen denominator (e.g. Gross Domestic Product (GDP), population, land area) as well as on national definitions and measurement methods. It is therefore appropriate for different denominators to be used in parallel to balance the message conveyed (OECD 2003).

Moreover, the choice of the initial level of an environmental pressure and of the time period considered can affect the interpretation of the results, because countries do operate according to different timetables (OECD 2003).

Level of Aggregation

Within a country a greater level of detail or breakdown may be needed, particularly when indicators are to support sub-national decision making. This is important, for example, when dealing with river basin or ecosystem management, when using indicators describing drivers which are relevant at the local level, or when national indicators hide major regional differences (OECD 2003).

The actual measurement of indicators at these levels is encouraged and lies within the responsibility of individual countries. At these levels, however, comparability problems may be further exacerbated. (OECD 2003)

Environmental Indicators and Performance Analysis

Environmental indicators support and illustrate the analysis made in the OECD Country Environmental Performance Reviews (conducted since 1992) and provide all reviews with a common denominator. This creates a synergy in which regular feedback is provided on the indicators' policy relevance and analytical soundness. To date, the environmental performances of all OECD countries and some non-members have been reviewed, and environmental information and indicators have been assembled for all OECD Member countries.

In the OECD environmental performance reviews, international indicators from the OECD indicator suite are used in combination with specific national indicators and data, and complemented by additional information (e.g. lists of laws and regulations, economic instruments of price indexes, tax and expenditure rates, and maps). Whenever possible, both state and trend data are presented for the indicators. Trends are shown over a decade for most indicators, and over two decades for selected topics to keep track of early policy measures and monitor changes over long periods. The presentation of most key and core

indicators is standardized over the reviews, though a certain amount of flexibility is allowed to adjust to the individual situation of the reviewed country and also to special topics.

Using environmental indicators in environmental performance reviews implies linking these indicators to the measurement and analysis of achievements, as well as to underlying driving forces and to the country's specific conditions (Figure 7). OECD identifies three broad categories of indicators:

Performance indicators linked to quantitative objectives (targets, commitments)

Examples of such indicators include e.g. air emission trends relating to national or international targets, urban air quality relating to national standards;

Performance indicators linked to qualitative objectives (aims, goals)

These indicators generally address the concept of performance in two ways:

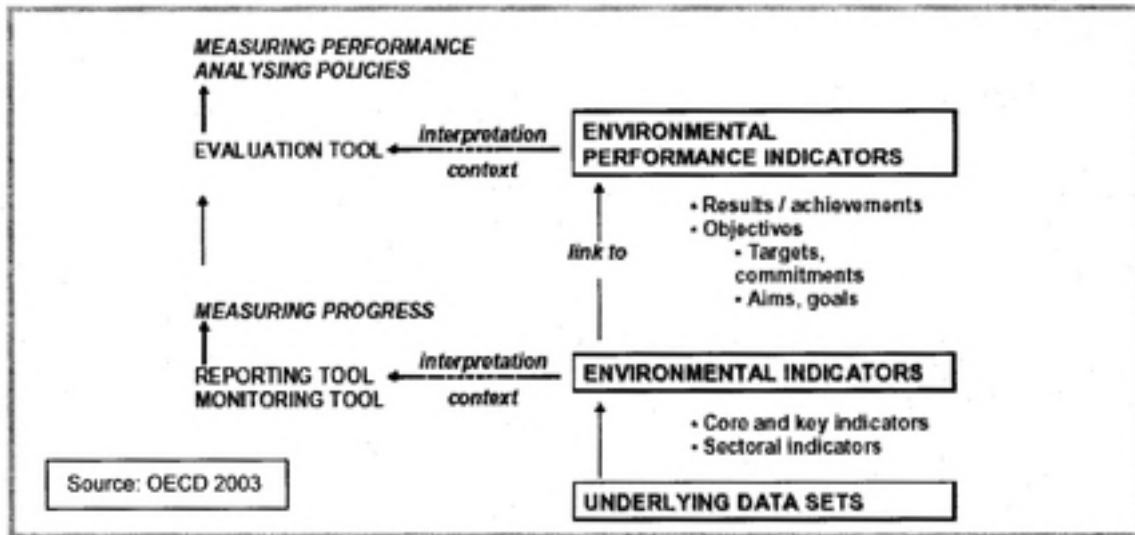
- with respect to the eco-efficiency of human activities, linked to the notions of de-coupling, elasticities: e.g. emissions per unit of GDP, relative trends of waste generation and GDP growth; and
- with respect to the sustainability of natural resource use: e.g. intensity of the use of forest resources, intensity of the use of water resources;

Descriptive indicators

These indicators are not linked to explicit national objectives; they describe major conditions and trends and are close to the concept of "state of the environment" reporting: e.g. population connected to waste water treatment plants, river quality, and share of threatened species. (OECD 2003)

Figure 7- Linking Environmental Indicators to Achievement

Environmental indicators and performance analysis



CHAPTER V CONCLUSIONS

Cross-Case Analysis

The cross case analysis will attempt to highlight collectively the precursors/drivers for instituting use of environmental indicators, the processes employed in the use of environmental indicators, the organizational climate present in their use, and the final products and outcomes of their use.

Precursors/Drivers

An infrastructure, leadership and ideally a statute that supports indicator work is the key to the survival and usefulness of environmental indicators. In both Florida and New Jersey, upper level leadership initiated, supported and ensured the use of outcome-based environmental information.

The move to using environmental indicators in FLDEP began when its Secretary said- where do we put our resources, what are our outcomes, what are we looking for? The SQPR triggered review by the secretary or deputy secretary and key staff members and based on that review watch and focus areas were designated. Not to mention even further involvement by the state legislature and the governor during the budget appropriations process through its mandated authority to approve, modify or reject program measures, performance standards and proffer incentives and disincentives based on performance.

The New Jersey governor and NJDEP commissioner were also instrumental in promoting use of results based information in decision-making. It was at the order of the governor; the NJDEP indicator project came to fruition. Goal owners were required to

report annually to legislature (quarterly reporting to commissioner). All reporting and budget request were submitted in relation to the strategic goals and outcomes they would achieve. This was not a statutory requirement but was an administrative order by the administration in place at that time.

However, both of these programs as governmental entities have gone through several administration changes and as such agenda's have changed and only remnants of their original programs remain. SQPR is no longer in place but the legislatively mandated performance based budgeting system still exists in Florida. NJDEP's larger indicator team and project are no longer in place but their NEPPS PPA is still active therefore, their indicators work does still continue in some essence. The OECD as a non-governmental entity however, deeply rooted and experienced in developing and using environmental indicators in its policy work should not have this issue.

The NEPPS PPA was a huge boost in getting NJDEP on track to Department wide performance measurement. Working with EPA, NJDEP developed and integrated goals, milestones, indicators and strategies into a performance partnership agreement. This agreement, and the progress NJDEP made in relation to those goals, is strongly related to the Performance Partners Grant that NJDEP receives for the federal environmental programs conducted by NJDEP.

FLDEP's interest in being able to 1) move beyond the traditional approach of required action through a permit-inspect-comply system, 2) to better manage resources in the midst of a growing number of regulated facilities, 3) to better address unregulated impacts, and 4) to better answer questions as related to enforcement-compliance-performance, was a critical driving force.

Process

All three agencies focused on measurable outcomes as the information needed to evaluate and report change and progress in their environmental decision making strategies and/or programs. All agencies discussed the capability of describing performance with environmental indicators and translating performance measures into action plans as a result of their larger management, planning, budget, measurement systems (i.e. ERMS for NJDEP, Parallel Management System for FLDEP). All agencies described initiatives to make the information useful and using it through the logic of linked information organized around variations of the pressure-state-response model as a means to relate progress toward goals. In each of their unique systems, whether operating inside the Four Tiered framework of FLDEP or the Cause-Condition-Response framework of NJDEP or OECD's Pressure-State-Response Core, Key, Sectoral performance indicator framework, all emphasized the importance of using performance measures- outcomes and outputs in evaluating and reporting progress and performance. They each emphasized having measures that spanned the continuum of the indicator hierarchy as a means to demonstrate linkages between actions by man and responses in natural system (human and ecological). It is from these linkages they are able to relay information to decision-makers and the public about performance and make appropriate adaptations. It is also through this process they are able to identify users of specific environmental information and tailor their reporting and strategies accordingly.

Organizational Climate

In moving from an activity to an outcome based management system, culture change is difficult. A major lesson to be learned from FLDEP was that culture change management efforts need to begin as soon as or before the effort to develop new performance measures. NJDEP also identified this as a barrier to overcome.

The accountability factor is not popular. Managers and staff strongly question how they can be held accountable to “produce” end outcomes (level 5 and 6 information on indicator hierarchy) when it is outside their realm of control and more often influenced by external factors. The goal is to help public officials ask better questions as they seek to pinpoint problems, innovate solution and interventions and discuss the impacts of their solutions. Hatry offers some discussion on this very issue. What should managers be held accountable for? Hatry states the government of New Zealand has taken the view that responsibility for program outcomes rests solely on officials at the policy making level, thus removing all accountability for outcomes from the operating departments (Hatry 1999). Although important, outcomes are seldom, if ever, fully under the control of a particular agency, the agency and its personnel do share responsibility for producing those outcomes. As long as a program has any role in delivering a service intended to help produce particular outcomes, the managers of that program (and their personnel) have a responsibility to track the relevant outcomes and use that information to help improve them. This goes back to having leadership that is supportive of the performance measurement and NJDEP’s idea of “lieutenants who are compassionate” to the climate and process.

All agencies had structured management, planning, measurement systems that incorporated the use of performance indicators in addition to political/administrative infrastructure support for the environmental indicator initiatives. However, as observed in NJDEP and FLDEP when political/administrative infrastructure does not make the use of indicators a priority (as sometimes happens with administration changes)- those initiatives may fall by the wayside. Though not in existence as in the 1990s, both of these agencies continue to devote resources to collection and reporting of environmental information through either legislatively mandated annual reports or the NEPPS PPA technical report. Alternatively, when supportive infrastructure is in place, it was apparent action-forcing mechanisms like the Watch-Focus area designation, incentives and disincentives, mandatory legislative reports, performance reviews and appropriation hearings were an added push. NJDEP discussed the incentive of "flexibility of funding" for performance in the NEPPS PPA as the catalyst in integrating performance indicators beyond the EPA funded programs to their Department wide programs.

It does not appear the OECD has the issue of creating an environment to institutionalize use of indicators among its member countries since its member countries share in a mutually mandated agreement and shared goals to use environmental indicators. However, in a 1995 performance review of the United States, OECD encouraged the US to promote wider public support for activities aimed at solving regional or global environmental issues, strengthen federal, state and local coordination, and consider making the national environmental goal setting program an interagency responsibility. Note however, that OECD is an advisory not a legislative or regulatory entity, therefore they possess no operational power.

Final Products and Outcomes

Environmental indicators in conjunction with explanatory information are a tool used for multiple purposes in the strategic process from environmental reporting to performance measurement to performance review to strategic planning to resource allocation. Both Hatry and the OECD iterate indicators are not designed to provide a full picture of environmental issues but reveal trends and draw attention to phenomena or changes that require further analyses. Indicators should be used in conjunction with other sources of environmental information and one source should inform the other (i.e. performance measurement system informing strategic planning and vice versa).

In describing the benefits of using environmental indicators the agencies all agree using environmental information will produce better informed managers and management decisions, improve linkages between strategic and short-term planning, increase focus on outcomes, effect meaningful change in data collection and agency strategies, and simplify communication processes of results to varied user. Government should be able to measure progress towards certain goals and those measures should be used to guide policy-makers and managers in their decision making.

Conclusions and Recommendation

Conclusions

In closing, the key findings of this case analysis are as follows:

- An infrastructure, leadership and ideally a statute that support indicator work are the key to the survival and usefulness of indicators.
- All agencies presented in this report focused on measurable outcomes as the information needed;

- All agencies discussed performance and translating performance measures into action plans as a result of its planning and measurement systems' structure;
- All agencies discussed linked information as a means to relate progress toward goals;
- All agencies focused on making information useful and using it;
- The goal is to help public officials ask better questions as they seek to pin point problems, find solutions and discuss if the solutions have been effective.
- Government should be able to measure progress towards certain goals and that those measures should be used to guide policy makers and managers in their resource allocation and program implementation strategies.

Recommendations for EPA

- Consider consulting with the Inspector General's Office from the performance review perspective as an objective party to get further "buy in" for indicator use in planning, budget allocation, and performance review
- Consider offering incentives as performance improves
- Consider adopting mechanisms that force action to ensure measures are used and taken seriously
- Maintain collaborative efforts with NEPPS and OCFO, anticipating the release and review of the alignment guidance document *Implementing Improvements to our Planning Processes: Developing National Program Guidance for FY2005*

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- B. Indicator Reports
- C. Interview Guide for Informant Conversation
- D. Key Informants List
- E. Performance Measurement Information as Budgeting Tool

Appendix A

Environmental Indicator Utility Example

Environmental Pollution and Disease Indicator: Childhood Blood Lead Levels

Problem

One of the indicators identified in the Human Health chapter of the 2003 Draft ROE specifically linking environmental pollution and disease was blood lead level. The level of lead in blood has long been used as an indicator of exposure to lead. And, because the linkage between lead exposure and health effects is so strong, blood lead is also used as an indicator of adverse effects on the nervous system. These effects range from a series of mechanisms resulting in lower intelligence and has been associated with behavioral and attention problems.

For many years, the largest source of lead in the US environment came from leaded gasoline. Elemental lead was emitted in the exhaust and settled on the ground and in homes. Lead enters the body through ingestion or inhalation, after which it is absorbed into the blood stream. Lead can also cross the placenta in pregnant females exposing fetuses to lead. Infants, children and fetuses are more vulnerable to the effects of lead because their blood brain barrier is not fully developed. As such, in children, three major organ systems are affected by lead: the nervous system (the brain), the kidney, and the blood-forming organs.

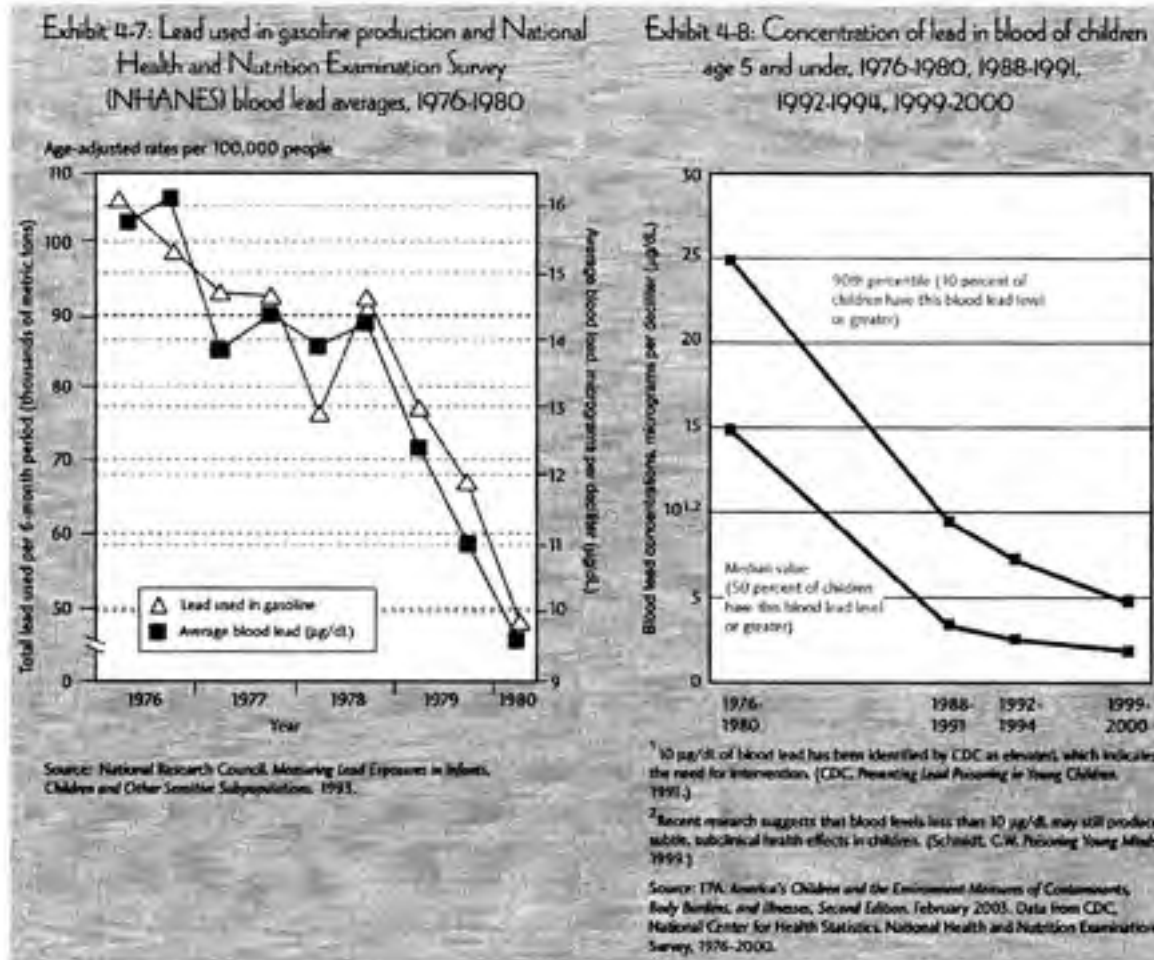
Management Response

As awareness of the health effects of lead increased in the 1970s, lead poisoning was occurring increasingly in children who did not live in dwellings with lead-based paint, suggesting another source or sources of lead exposure. Research found that combustion of leaded gasoline was the primary source of lead in the environment. EPA promulgated two regulations in 1973 and 1986. One required the availability of unleaded fuel for automobiles designed to meet federal emissions standards. The second required a reduction of the lead content in leaded gasoline. Over the next decade, peak outdoor-air lead concentrations decreased as a result of these controls and at the same time children's blood lead levels. The Center for Disease Control and Prevention would implement interventions in cooperation with state and local environmental health agencies to screen children for elevated blood lead levels and assess and remediate their sources of exposure.

Impact

The National Center of Health Statistics' National Health and Nutrition Examination Survey (NHANES) is a national survey of the health status of the US population that has reported blood lead levels since the early 1970's. In NHANES III (1988-1994), the mean

blood lead levels for children ages 1 to 5 declined from 3.6 ug/dL in Phase 1 (1988 to 1991) to 2.7 ug/dL in Phase 2 (1991 to 1994). Over the same time interval, the percentage of children aged 1 to 5 years with elevated blood lead levels decreased from 8.6 percent to 4.4 percent. In NHANES 1999-2000, the geometric median blood lead level for children 1 to 5 years old is 2.2 ug/dL. The median blood lead level for children 6 to 11 years old is 1.5 ug/dL.



Environmental Health Progress

Keep in mind, the PSER model is based on a concept of causality. Human activities (and natural phenomena) exert pressures on the environment. For example, the use of lead gasoline in vehicles until the 1970's resulted in lead emissions from vehicle exhaust. These pressures can change the quality and quantity of natural resources, the state. For this example, the lead emissions resulted in increased concentrations of lead in air and soil, which

can result in elevated human blood lead levels. Changes in the state can then produce one or more adverse effects on human and ecological health, i.e. reduced IQ in children, in the case of lead. Society/government then respond to these changes by enacting new policies and regulations, the response. The banning of lead as a gasoline additive is an example. In principle, new policies or regulations should reduce the pressure on the state and, consequently, the effects. Certain responses may also be directed at the state, such as efforts to clean up soils contaminated with lead, or at the effects level, such as screening to identify and treat children with elevated blood levels.

Indicators along the spectrum of the indicator hierarchy can and have been identified to answer the question of what role the environment plays in childhood lead poisoning, which can result in lowered IQ, behavioral and attention problems as well as kidney and blood forming organ affects.

Indicator Hierarchy

- Level 1: Implemented policies to supply unleaded gasoline and reduce lead concentration in gasoline
- Level 2: Implementation of lead screening programs for blood and soil lead contamination
- Level 3: Reduction of lead concentrations in vehicle exhaust
- Level 4: Reduction of lead concentrations in air and soil
- Level 5: Reductions in average blood lead concentrations
- Level 6: Improved IQ in exposed populations or high-risk areas or Improved brain function, or Improvements in learning deficits

Even with the progress made at the national level in lowering blood lead levels, blood lead levels on some regional levels still exceed national averages, especially in areas where old housing stock with lead based paint is prominent such as St. Louis, Chicago, or Detroit. This is an example of a situation where a national level and regional level indicators would be appropriate and more informative. Additionally, this example also offers the opportunity to investigate the impact regulatory efforts across program and agency lines (i.e. lead monitoring as an ambient air standard for the air program; lead monitoring in the safe drinking water program, lead based paint assessment and removal by Housing and Urban Development programs; Health-based standards and interventions by Center for Disease Control programs).

Of course this is a historically significant environmental health problem which has been monitored and documented for decades (and now falls along the lines of a trend at this point) so it is quite simple to fit to the model. However, examples with far less historical monitoring (biological and ambient environment) data to support indicator development are a much more difficult endeavor. In any event, this is a perfect example of how linked information along the hierarchy comes together to demonstrate environmental progress through regulatory efforts to control exposure and improve health.

Appendix B - Indicator Reports

State Environmental Indicator Reports

State	Report name	Sponsor	URL	Latest Frequency	Comments
Alabama	Environmental Perspective	ADEM	http://www.adem.state.al.us/Publications/EnvironmentalPerspective2002.pdf	2003	
Alaska	none available	none available	none available	none available	
Arizona	FY 2003 Annual Report	ADEQ	http://www.azdes.state.az.us/indicators/annual2003/summary.pdf	annual 2003	
Arkansas	ADEQ 2003 Report	ADEQ	http://www.ades.state.ar.us/indicators/ades_2003.htm	annual 2003	
California	EPIC	CEQA	http://www.pcfm.ca.gov/indicators/epic/epic02.pdf	2002	Indicator
Colorado	Environmental Indicators Protecting and Restoring our Environment	CDPHE	http://www.ades.state.co.us/indicators_environmentalindicatorsreport.pdf	2003	Indicator
Connecticut		DEP	?	2002	not indicator focused, but compliance
DC		DNREC (Delaware Dept of Natural Resources and Env Control)	http://www.dnrec.state.de.us/DNREC2000/ELBrry.asp		Publications are specific to different media (i.e. air, water, wastewater etc)
Delaware	Florida and the Environment: Naturally	FDOP	http://www.dep.state.fl.us/natural/indicators/annual_report.pdf	2001	trails/status discussion
Florida	Georgia's Environment, Decades of Change	GDWR EPO	http://www.gawet.org/delimiton/	2002	trails/progress report discussion by program
Georgia	Indicators of Environmental Quality	State of Hawaii, Department of Health	http://www.hawaii.gov/doh/indicators/indicators2004.pdf	2004	Indicators with implications and data quality discussion
Hawaii	Environmental Report Card 2003-Annual Report	State of Hawaii, Department of Health	http://www.hawaii.gov/doh/indicators/annualreport2003.pdf	2003	Indicators, progress report, grades, goals
Hawaii	Progress Report	Iowa DEQ	http://www.deq.state.iowa.gov/DEQ/Progress_Report_10_21_01.pdf	2001	outcome measures
Iowa	Annual Environmental Conditions Report	Iowa Environmental Protection Agency	http://www.epa.state.iowa.gov/indicators/annualreport2002.pdf	2003	indicator info linked to strategic issues in plan
Illinois	Annual State of the Environment Report	IDEM	http://www.in.gov/indicators2003/index.html	2003	Electronic (no PDF)
Indiana					
Iowa	State of Kentucky's Environment	KY Environmental Quality Commission	http://www.eco.ky.gov/indicators/	2001	Indicators
Kentucky	Maine's Environment, 2002	WDEP	http://www.maine.gov/dep/publications/environment2002.pdf	2002	trails discussion
Maine	Site listing indicators and Strat Reports	MDA	http://www.mda.state.md.us/indicators/indicators.asp	2000-2001	goals/trails/indicators/indicator
Maryland					
Massachusetts	State of Michigan's Environment Indicators Initiative	DEQ/DNR	http://www.michigan.gov/dep/0,1807,7-135-3307_7255-11848--00.html	2003	indicator/trails discussion
Michigan	Michigan's Environment Indicators Initiative	MDNR	http://www.dnr.state.mn.us/indicators.html	up to 2001	this site has links to multiple parts of MN's indicators initiative
Minnesota	Fiscal Year Annual Report	MDEQ	http://www.state.mo.us/fy02/annualreport/fy02URL.htm	2003	compliance centered
Missouri	Integrated Strategic Plan	MDNR	http://www.mdnr.gov/indicators	FY2003	outcome centered with some trails analysis
Montana					
Nebraska					
Nevada					
New Hampshire	New Jersey's Environment 2000	NJDEP	http://www.state.nj.us/dep/indicators2000/	2000	Indicator
New Jersey	Sustainable State Project Report	NJDEP	http://www.state.nj.us/dep/indicators2000/	2000	Indicator
New Mexico					
New York					
North Carolina	NC State of Environment Report	NCDEMR	http://www.enr.state.nc.us/docs/environ.htm	2000	trails discussion
North Dakota					
Ohio	Annual Report	OKDEQ	http://www.deq.state.ok.us/indicators/reports.html	2003	compliance, outputs focused
Oklahoma					
Oregon	Annual Report	PA DEP	http://www.dep.state.pa.us/indicators/indicators.html	2000	compliance/outputs
Pennsylvania	Annual Report	RI DEM	http://www.state.ri.us/indicators/indicators03.pdf	2003	compliance
Rhode Island	Quality of Environment Report	SC DHEC	http://www.sc.thec.gov/indicators/indicators03.pdf	1999	trails/actions/challenges discussion
South Carolina					
South Dakota					
Tennessee	State of Texas Environment	TCEQ	http://www.tceq.state.tx.us/indicators/indicators2003-07	2003-07	
Texas					
Utah	Annual Environment Report	VANR	http://www.enr.state.vt.us/indicators.html	1997-2003	Indicators
Vermont					
Virginia	WA Environmental Health 2000	WA DE	http://www.ecy.wa.gov/indicators/indicators2000.htm	2000	Indicators
Washington	West Virginia State of Environment Report	WV DEP	http://www.dep.state.wv.us/Docs/S216_State_of_the_Environment.pdf	2003	Indicators
West Virginia	State of Natural Resources	WI DNR	http://www.wisconsin.gov/indicators/indicatorsreport/indicators	2001	Indicators and trail discussion
Wisconsin					
Wyoming					

Strategic Documents

State	Report name	Sponsor	URL	Latest Frequency	Comments
Alabama	Final Strategic Plan	AEMC/ADEM	http://www.adem.state.al.us/Final%20Strategic%20Plan.pdf	4/20/2004	goals & strategies
Alaska					
Arizona	Strategic Plan	ADEQ	http://www.adeq.state.az.us/function/about/download/plan04.pdf	2003	goals & strategies
Arkansas	10 Year Strategic Plan	ADEQ	http://www.adeq.state.ar.us/custserv/pdfs/adeq_2003_strategic_plan_performance_report_040427.pdf	2003	inputs/outcomes/indicators
California	Performance Report Strategic Vision Challenges and Opportunities for a New Century	ADEQ CEPA	http://www.calepa.ca.gov/Publications/Reports/StratPlans/2000/default.htm	2000	goals/objectives
Colorado		CDPHE	http://www.cdphe.state.co.us/c/newchc05.pdf	1999	goals/strategies
Connecticut	Environmental Quality Branch Strategic Plan		http://dep.state.ct.us/cmr/pdfs/stateplan/strategicplan02.pdf	2004	strategies/objectives
DC					
Delaware	Strategic Plan	DNREC	http://www.dnrec.state.de.us/dnrec2000/Admin/StrategicPlan.pdf	2003-2005	objectives/activities
Florida	Strategic Planning Site	FDEP	http://www.dep.state.fl.us/admin/ssp/index.htm	up to 2006	outcomes/outputs
Georgia	Strategic Plan	GDNR	http://www.gdnr.org/dnr/ndmtrn/	2001-2003	goals/action items/outcomes with linkages description to statewide plan
Hawaii	Strategic Plan for Hawaii	Hawaii DCH	http://www.hawaii.gov/health/environmental/ten-year-planning/goals/objectives/update.pdf	2001	objectives/performance measures
Idaho	Strategic Plan	Idaho DEQ	http://www.deq.state.id.us/AboutDEQ/StratPlan_2004.pdf	2004-08	strategy/activity
Illinois	Illinois Strategic Plan	IEPA	http://www.epa.state.il.us/strategic-planning/strategic-plan.pdf	2001	goals/objective/outcome measure
Indiana	Strategic Course for IDEM	IDEM	http://www.in.gov/idem/encopa/strategicplan/strategicplan1994.html#_Toc71701915	2004	strategies/outcomes
Iowa					
Kansas					
Kentucky	Kentucky's Environmental Future: Will We See Progress in the Years Ahead		http://www.epc.ky.gov/NR/rdonlyres/3D664961-426F-4852-986F-E9A30FE17A830/Mv0meeting.pdf		Work in Progress
Louisiana	Five Year Strategic Plan	LOEQ	http://www.dep.state.la.us/planning/strategic2001-2006/index.htm	2001-2006	strategy/performance measure
Maine	Strategic Plan Managing for Results, Fiscal Year 2004 Work Plan	MDEP	http://www.state.me.us/dep/pubs/2002srpn.pdf	2002	
Maryland		MDE	http://www.mde.state.md.us/assets/document/AboutMDE/mfr2004.pdf	2004	goal/objective/strategy/performance measure/indicator
Massachusetts					
Michigan	Fiscal/Planning Report	MDEQ	http://www.michigan.gov/dep0,1607,7-135-3309_3338_3391---00.html	2004	
Minnesota	Strategic Conservation Agenda	MDNR	http://files.dnr.state.mn.us/about/dnr/conservationagenda/fuldoc.pdf	2003-2007	indicators
Mississippi	NA	NA	NA	NA	NA
Missouri	Integrated Strategic Plan	MDNR	http://dtr.missouri.gov/is_plan/	FY2000-03	outcome centered with some trends analysis
Montana	NA	NA	NA	NA	NA
Nebraska	NA	NA	NA	NA	NA
Nevada	Strategic Plan objectives	NDCNR	http://ndcp.nv.gov/ADMIN/objectiv.htm	NA	objectives & strategies
New Hampshire	NA	NA	NA	NA	NA
New Jersey	Strategic Plan	NJ DEP	http://www.scc.rutgers.edu/col/about/PDF%20files/SP%2099_01.pdf	1998-2001	
New Mexico					
New York					
North Dakota					
North Carolina					
Ohio	Performance Partnership Plan	Ohio EPA	http://www.epa.state.oh.us/dn/ppa/ppaframe.html	1999	outcomes and indicators
Oklahoma					
Oregon	Annual Performance Progress Report	OR DEQ	http://www.deq.state.or.us/about/PerformanceMeasures/APMProgressReport.pdf	2003	outputs
Oregon	Performance Partnership Plan	OR DEQ	http://www.deq.state.or.us/about/ppa/ppa.pdf	2004	outputs and outcomes
Pennsylvania					
Rhode Island	Strategic Work Plan	RI DEM	http://www.state.ri.us/dem/pubs/plan2003/pdf/swp0405.pdf	2004	indicators and outcomes
Rhode Island	Performance Partnership Plan/RI DEM	RI DEM	http://www.state.ri.us/dem/pubs/plan2003/pdf/swp0405.pdf	2004	indicators and outcomes
South Carolina	Strategic Plan	SC DHEC	http://www.scdhec.net/news/releases/pdf_files/Stratplan.pdf	2000-05	outcomes
South Dakota					
Tennessee	strategic plan	TDEC	http://www.scdhec.net/news/releases/pdf_files/Stratplan.pdf	2000-03	outcomes (performance)
Texas	strategic plan	TCEQ	http://www.trec.state.tx.us/admin/topdoc/str035_02/035_02_vol1.html	2003-07	outcomes
Utah	Performance Partnership Plan	UDEQ	http://www.eq.state.ut.us/references/planning/PPA/2003%20Final%20PPA.pdf	2003	outcomes and indicators
Vermont	Strategic Plan	VAAR	http://www.anr.state.vt.us/stratpin/index.html	2000-05	outcomes
Virginia					
Washington	Strategic Plan	WA DE	http://www.ecy.wa.gov/pubs/0401006.pdf	2005-07	outcomes/ indicators
West Virginia					
Wisconsin	strategic plan	WI DNR	http://dnr.wi.gov/about/dnrlinks/	2003	strategies
Wyoming					

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State Environmental Indicator Reports

State	Report name	Sponsor	URL	Latest Frequency	Comments
Alabama	Environmental Perspective	ADEM	http://www.adem.state.al.us/Publications/EnvSummary/EnvPerspective2001.pdf	2001	
Alaska	none available	none available	none available	none available	
Arizona	FY 2003 Annual Report	ADEQ	http://www.ades.state.az.us/section/forms/indicators2003/summary.pdf	annual, 2003	
Arkansas	ADEQ 2003 Report	ADEQ	http://www.ades.state.ar.us/section/rootfs_2003.htm	annual, 2003	
California	EPIC	CEPA	http://www.cepa.ca.gov/multimedia/epic/pdf/EPIC20.pdf	2002	Indicator
Colorado	Environmental Indicators Protecting and Restoring our Environment	CDPHE	http://www.cdphe.state.co.us/section_media/environmentalindicatorsreport.pdf	2003	Indicator
Connecticut DC		DEP	http://www.dep.state.ct.us/efp/090201.pdf	2002	not indicator focused, but compliance
Delaware	did not find SoE for entire state, but more individualized assessments	DWREG (Delaware Dept of Natural Resources and Env Control)	http://www.dnrec.state.de.us/DNREC2000/01/Brwy.asp		Publications are specific to different media (e-air, water, wastewater etc)
Florida	Florida and the Environment: Naturally	FDEP	http://www.dep.state.fl.us/section/info/pubs/lanwsl_report.pdf	2001	trends/status discussion
Georgia	Georgia's Environment, Decades of Change	GDNR EPD	http://www.epd.gsa.gov/epd/ind/	2002	trends/progress report discussion by program
Hawaii	Indicators of Environmental Quality	State of Hawaii, Department of Health	http://www.hawaii.gov/doh/hh/epo/soe/indtr/2004.pdf	2004	indicators with implications and data quality discussion
Hawaii	Environmental Report Card 2001-Annual Report	State of Hawaii, Department of Health	http://www.hawaii.gov/doh/hh/epo/soe/indtr/2001.pdf	2001	indicators, progress report, grades, goals
Idaho	Progress Report	Idaho DEQ	http://www.deq.state.id.us/AboutDEQ/Progress_Report_10_01_01.pdf	2001	outcome measures
Illinois	Annual Environmental Conditions Report	Illinois Environmental Protection Agency	http://www.epa.state.il.gov/environmental/conditions/2002/environmental-conditions-report-2002.pdf	2003	indicator info linked to strategic issues in plan
Indiana	Annual State of the Environment Report	IDEM	http://www.in.gov/idem/soe2003/index.html	2003	Electronic (no PDF)
Iowa					
Kansas					
Kentucky	State of Kentucky's Environment	KY Environmental Quality Commission	http://www.epc.ky.gov/pubs/books/	2001	indicators
Louisiana					
Maine	Maine's Environment, 2002 Site Being indicators and State Reports	MDEP	http://www.maine.gov/dep/pubs/env/2002/002.pdf	2002	trends discussion
Maryland					
Massachusetts					
Michigan	State of Michigan's Environment Indicators Initiative	DEQ/DNR	http://www.michigan.gov/dep/0,1601,7-135-3307_7295-11048--00.html	2003	indicator/trends discussion
Minnesota	Annual Report	MDEQ	http://www.dnr.state.mn.us/indicators.htm	up to 2001	this site has links to multiple parts of MN's indicators initiative
Mississippi	Fiscal Year Annual Report	MDEQ	http://www.state.ms.us/fyameet/ppt/URL.htm	2003	compliance centered
Missouri	Integrated Strategic Plan	MDEQ	http://dnr.missouri.gov/isp_plan/	FY2003	outcome centered with some trends analysis
Montana					
Nebraska					
Nevada					
New Hampshire					
New Jersey	New Jersey's Environment 2000	NJDEP	http://www.state.nj.us/dep/indicators2000/	2000	indicator
New Jersey	Sustainable State Project Report	NJDEP	http://www.state.nj.us/dep/dep/sustainable-sta	2000	indicator
New Mexico					
New York					
North Dakota					
North Carolina	NC State of Environment Report	NCDENR	http://www.enr.state.nc.us/soe/indicators.htm	2000	trend discussion
Ohio	Annual Report	ODEQ	http://www.deq.state.oh.us/multi/indicators/2003/	2003	compliance, outputs focused
Oregon	Annual Report	PA DEP	http://www.dep.state.pa.us/dep/indicators/2003/	2000	compliance/outputs
Pennsylvania	Annual Report	RI DEQ	http://www.state.n.us/dep/pubs/strategic03.pdf	2003	compliance
Rhode Island	Quality of Environment Report	SC DHEC	http://www.scdhec.gov/epa/indicators/pubs/qor03/	1999	trends/soe/challenges discussion
South Carolina					
South Dakota					
Tennessee					
Texas	State of Texas Environment	TCEQ	http://www.trec.state.tx.us/admin/epo/soe/2003-07	2003-07	
Utah					
Vermont	Annual Environment Report	VANR	http://www.enr.state.vt.us/me2.html	1997-2003	indicators
Virginia					
Washington	WA Environmental Health 2000	WA DE	http://www.ecy.wa.gov/pubs/0001003/index.htm	2000	indicators
West Virginia	West Virginia State of Environment Report	WV DEP	http://www.dep.state.wv.us/Docs/2016_State_of_The_Environment.pdf	2003	indicators
Wisconsin	State of Natural Resources	WI DNR	http://dnr.wi.gov/bod/dnr/specialreports/soeu	2001	indicators and trend discussion
Wyoming					

State of Environment Reports

Report name	Sponsor	Audience	Use	URL	Coverage	Latest, Frequency	Comments
State of the Nation's Ecosystems	Heinz Center			http://www.heinzctr.org/ecosystems/pdf_files/soe_compiled.pdf - http://www.heinzctr.org/ecosystems/report.html	National, ecosystem	2002, 5 years	
Draft Report on the Environment	US EPA	Public, policy makers		http://www.epa.gov/indicators/hoeh/index.htm		2003, 3 years	
DROE Technical Document	US EPA US Forest Service	Environmental professionals		http://www.epa.gov/indicators/hoeh/ind/tad/index.htm	Forest ecosystem	2003, 3 years 2002?, ?	
2004 Index of Leading Environmental Indicators Coastal ...	CEQ Pacific Research Institute, American Enterprise Institute US EPA, USGS, NOAA, others?	Public? Policy makers?			National	1995? annual 2004, annual	Stopped producing it
Care 2 (Make a Difference)	Env Defense, TNC, Defenders of Wildlife, ASPCA, WWF, Wildlife Conservation Society, League of Conservation Voters	PUBLIC		http://www.care2.com/learn_home/local_list_all.html	National, access to region specific info Urban, non-US, International (Europe and Africa)	2004	
United Nations Environment Programme Cities Environment Reports on the Internet	UNEP, GRID, Arendal UNEP, GRID			http://www.grida.no/soer/ http://cepi.net/ind/matrix.asp		2001? 2002, recent updates in process	
Region of Peel, SoE British Columbia, SoE State of the Environment Reporting	Regional Gov't with Ontario, Canada Gov't of British Columbia European Environment Agency Transboundary Georgia Basin-Puget Sound Environmental Indicators Working Group Interagency Workgroup (a large number of participants)	Public?		http://www.region.peel.on.ca/planning/soe/index.htm http://wlapwww.gov.bc.ca/soer/ http://countries.eea.eu.int/SERIS	Local env quality including sources of stressors Province International	2002	
Georgia Basin -Puget Sound Environment Indicators Sustainable Development Indicators	Puget Sound Environmental Indicators Working Group			http://wlapwww.gov.bc.ca/gpbi/gbsei/documents/gbsei.pdf	Georgia Basin/Puget Sound	2001	
State of the Beach Environment Canada	Surfrider Foundation Environment Canada	Decision Makers? Beach goers Policymakers, citizens General public, civic/community-based institutions, media, business and government		http://www.sdf.org/ http://beach.com/startofthebeach/6.state/index.asp http://www.ec.gc.ca/soer-ree/English/SOER/	US Canada	2004 2003 1996-2003	Links to State summary of conditions, similar to report card
Boston Indicators Report Organisation and Development State of New England Environment 2002	The Boston Foundation OECD Environmental Indicators	Policy makers?		http://www.bf.org/indicators/environment/index.asp http://www.oecd.org/department/0,2686,en_2649_34283_1_1_1_1_1_00.html	Boston Region International NH, VT, ME, MA, RI, CT	2002 2004 2002, annually	
1999 Environmental Index	USEPA Region 1 Silicon Valley Environmental Partnership	citizen, elected officials, company owner policymakers, citizen, business		http://www.epa.gov/region1/na/soer02/ http://www.svvp.org	Santa Clara County & Northern California	2003	
Environmental Indicators Links	Florida State University Program for Environmental Policy and Planning Systems	website provides links to US, NGO and international Indicator reports		http://www.pepps.fsu.edu/EI_links.html	US, NGOs, International		
State of Environment Report 2001	Australia			http://www.deh.gov.au/soe/index.html	Australia	2001, every 5 years	

Appendix C

Interview Guide for Informant Conversation

How are environmental indicators used? (budget allocation, strategic planning, performance review, progress reporting)

What is the general criterion for environmental indicator selection?

What is/was the agencies level of willingness to adopt environmental indicators for decision making?

Is a report published to describe progress or lack of? How frequently?

Who is the customer or target audience? (citizens, policy makers, staff)

Do you solicit public comment?

Do you have an evaluation tool, reporting measurement tool? Describe.

How are progress reporting, strategic planning, performance review and budget allocation aligned?

Do you have a Performance Partnership Agreement with USEPA? Does it include indicator measures?

Appendix D
Key Informants List for Case Study

<u>Name</u>	<u>Date Interviewed</u>
Michael Ausotto New Jersey Department of Environmental Protection Division of Science, Research, Technology	July 7, 2004
Steve Adams Florida Department of Environmental Protection Office of Strategic Projects and Planning	July 14, 2004
Bill Crews USEPA, OCIR	June 30, 2004
Christine Eppstein Environmental Council of States	July 9, 2004
Michelle Hiller-Purvis USEPA, OCIR	June 30, 2004
Leslie McGeorge (ESE graduate) New Jersey Department of Environmental Protection Division of Science, Research, Technology	July 20, 2004
Laura Pasquale Florida Department of Environmental Protection Bureau of Budget and Planning	July 21, 2004

Appendix E

Performance Measurement Information as Budgeting Tool

NAME OF AGENCY: Department of Environmental Protection

Program: Recreation and Parks - 3760

Program Component: Land Resources - 1402

Program Objective: Management of submerged lands

Program Objective: Management of coastal uplands

Service Category: Coastal and Aquatic Managed Areas - 020470

Service Outcome Table:

Service Outcome Measure	Baseline Measurement and	FY 1999-2000 GAA Standard	FY 2000-2001 Standard
Percent change in acres within state buffer preserves that have been enhanced or restored	7,324 acres - FY 1998-99	7,324	7,778 - 6.2% increase

* All estimates

Service Initiative Narrative: Protect and restore coastal and aquatic areas through maintenance, resource management, education and research.

Major Activity Table:

Major Activity	Output Measure	GAA Standard		Cost for FY 2000-2001					
		FY 1999-2000	FY 2000-2001*	Est Exp \$	FTE	D-3A \$	FTE	Total \$	FTE
Conduct prescribed burns on public conservation uplands	Number of acres burned	4,000	4,000	\$462,736	5.0	\$184,141	0.0	\$646,877	5.0
Conduct control of exotic plants on public conservation uplands	Number of acres controlled	2,255	2,255	\$774,458	8.0	\$308,188	0.0	\$1,082,646	8.0
Conduct restoration of public conservation lands	Number of acres restored	724	724	\$848,085	9.0	\$337,488	0.0	\$1,185,573	9.0
Provide access to visitors	Number of visitors	71,252	71,252	\$2,549,764	27.0	\$0	0.0	\$2,549,764	27.0
Provide environmental education to students and resource user groups	Number of students contacted	21,261	21,261	\$1,352,221	15.0	\$0	0.0	\$1,352,221	15.0
Conduct research and monitoring studies of submerged lands	Number of studies in progress	106	106	\$1,352,221	15.0	\$0	0.0	\$1,352,221	15.0
Conduct restoration of submerged lands	Number of acres restored	111	111	\$1,352,221	14.0	\$0	0.0	\$1,352,221	14.0
Totals:				\$8,691,706	93.0	\$829,817	0.0	\$9,521,523	93.0

* All estimates

** Total dollar split out by activity is estimated