



Topic Hub: Environmental Measurement Subsection : Opportunities

This section discusses actual measurement models, tools, and case studies to provide the reader with examples and opportunities for using measured information.

Depending on the reasons for measuring information, which should be addressed when developing or improving a measurement system, many strategies and examples are available for:

- Tracking Information
- Analyzing and Interpreting Information
- and
- Communicating and Presenting the Results

Some related strategies, models, tools, and examples follow.

Tracking Information

Data acquisition and tracking systems vary from a handwritten logsheet, to a fully automated, relational database with direct data input from monitoring equipment.

Several agencies and non-profits are designing and/or using custom systems they have developed to track and quantify effectiveness of environmental activities. The databases and tools cover a range of outcome and activity measures related to agency efforts, such as on-site assistance, training events, information requests, grants/contracts, awards, p2 staff training, inspections, and actual reductions in wastes and releases. Some also include sustainability measures. EPA Region 8 and 10 have web-based pilot systems currently being testing. The Northeast Waste Management Officials' Association (NEWMOA) collaborated on a menu of pollution prevention metrics that was then used to develop off-line software for states and local governments to gather data on their P2 activities and the outcomes of those activities. Version 1.0 of the software is available to any government agency, along with training on how to use the software.

Other government-based systems tracking agency and/or facility efforts, with publically available results include:

- National Environmental Performance Partnership System (NEPPS) - These are the core performance measures agreed upon by EPA and the States, under NEPPS - for air, waste, water, and enforcement & compliance. The package is intended to link goals, indicators, core performance measures, and planned outputs into one management and accountability system.
- Performance Track - an EPA sponsored, voluntary program to incentivise and motivate businesses by rewarding top environmental performance for organizations that have implemented environmental management and have shown measurable results./li>
- National Performance Measures Strategy (NPMS) developed and implemented a set of enhanced performance measures for EPA's enforcement and compliance assurance program. The Regional Compliance Assistance Tracking System (RCATS) is used by the EPA to tracks results from this compliance assistance program, and aggregates data annually to help describe environmental progress.

For industrial or other commercial facilities not developing a custom tracking and reporting system, there are a number of off-the-shelf software programs that allow tailoring of data and reports. Some software tools for purchase that may be useful in data tracking include:

- Greenware.com
- Caribou Systems
- Essential EH&S Software
- Green Suite
- GreenWare Greenhouse Gas Software
- GreenWare Perform Software
- opsEnvironmental
- Fingerprint Environmental Software

Note: This is not an endorsement of any of these products by PPRC or P2Rx.



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The periodical, *Environmental Protection*, published an [Environmental Software Guide](#) matrix in the April 2002 issue, which lists over 60 software producers and their software product capabilities with respect to environmental measurement. Capabilities include tracking compliance and regulatory performance, inventory management (materials, waste, chemical, etc.), ISO 9000 and 14000, and other.

Many of these software products also have analysis and reporting features.

Analyzing and Interpreting Information

Analysis or interpretation of the data and information can be as simple as comparing reduced environmental impacts over time. More sophisticated analysis options include:

Method	Discussion and Examples
Calculations of impacts based on monitored data	<p>A number of simple online calculators, and/or downloadable calculators can convert energy use, solid waste, and recycling into greenhouse gas emissions, carbon equivalents, or other environmental impacts. Other "downloadable" calculators cover combustion emissions, impacts of air and auto travel, costs associated with P2, water efficiency, life cycle impacts, and more.</p> <p>A few examples:</p> <p>EPA's Landfill Methane Outreach Program gives guidance for determining environmental and energy benefits of a landfill gas utilization project, including avoided emissions from coal, fuel oil, or natural gas energy production if methane from a landfill is used as an alternative.</p> <p>An EPA study of 10 types of recyclable materials, resulted in a formula for estimating greenhouse gases associated with recycling these materials.</p> <p>Bonneville Environmental Foundation's Online Carbon Calculator determines the carbon dioxide emissions (and CO2 equivalent), attributed to energy consumption, heating energy consumption, and auto and air travel, and the offset of carbon from purchasing green energy.</p> <p>Various guidance documents provide methodologies for calculating greenhouse gas emissions, particulate matter, and combustion emissions from various industrial processes.</p>
Normalization	<p>Normalization of data allows for adjustment of environmental information with respect to production. Normalized values are also useful in benchmarking, and comparing between diverse processes, businesses or industries, and large vs. small scale production. A useful resource on normalization methods applied to environmental impacts of production, this report is helpful. "Developing and Using Production-Adjusted Measurement of Pollution Prevention"(Document # EPA/600/R-97/048), is available from the EPA at 513-569-7562.</p>
Aggregation	<p>Aggregating same-unit data is a simple addition exercise. Combining metrics with different units, in a meaningful way, however, can be more difficult. Indexing is a method to aggregate data, where individual metrics are scored or converted to a unitless scale before aggregating. Often, metrics will be weighted by degree of risk or impact before aggregating in an index.</p> <p>Examples:</p> <p>Nortel's Environmental Performance Index (EPI), calculated annually, provides a single overall rating of the corporation's performance against its stated goals and involves measurement of twenty-five parameters. Each parameter is weighted according to criteria such as environmental impact and degree of risk.</p> <p>A number of New Mexico companies have met the Green Zia Environmental Excellence award, which bases its criteria on the Malcolm Baldrige Quality model. Applicants are rated on 18 different major criteria headings. The unitless scores for each criteria are combined into an overall quality rating for the company.</p>



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	<p>The Oregon Water Quality Index uses readings of several different water quality metrics, from statewide streams and rivers, to calculate an index that describes river water quality in Oregon.</p> <p>Finally, Endangered Ecosystems: A Status Report on America's Vanishing Habitat & Wildlife is a scientific discussion of risk indices to describe ecosystem health.</p>
Materials accounting and Mass balance	<p>These methods have a similar premise, in that they track specific chemical or input material quantities as they move through various steps and processes at a facility. The methods are based on the principle of "conservation of mass", where total weight of inputs equals total weight of outputs. Transformations of the inputs into other product, output and waste quantities are tracked.</p> <p>True mass balance requires more rigorous data collection and direct measures of quantities than materials accounting, and attempts to identify any degree of difference in the input vs. output quantities, including accumulations and losses (e.g. overspray, solvent evaporation, etc.).</p> <p>Further discussion or application can be found at: National Pollution Prevention Roundtable's Material Materials Accounting Project; Chapter 7 of EPA's Pollution Prevention 1997: A National Progress Report; and Tracking Toxic Substances at Industrial Facilities published by the National Academy Press.</p>
Risk assessment	<p>Risk assessment methodologies can be used to evaluate reductions in exposures, toxicity of materials used, and pollutants generated or released. This is often not an 'exact science' due to the relative risks of exposure amounts and different vulnerabilities of the exposed. An example case study is Environmental Risk Assessment for Chemicals, in which the National Institute for Environmental Studies is using atmospheric measurements to assess the risks of exposure on human health.</p>
Benchmarking	<p>"Benchmarking" is a term often used for the comparison of one organization against another, or one division or facility of an organization against another. Understanding your own environmental practices and operations through measured information can assist in effective benchmarking. It offers a path to performance improvement through adoption of practices already proven to be effective, often by peak-performers and innovators. Strategies and cautions for benchmarking with respect to environmental improvement are discussed in EPA's Implementation Guide for the Code of Environmental Management Principles for Federal Agencies (CEMP) - Measurement and Improvement (Principle 5).</p>
Integration with social and economic information	<p>Cost savings are important in justifying and driving environmental improvement. The Tellus Institute's Software Tool Library offers computer models to assist planning professionals in such an analyses. The Washington Department of Ecology's factsheet Calculating Cost/Benefit Ratio of P2 helps determine P2 project cost savings and return on investment, and can highlight instances when costs outweigh the benefits of an environmental project.</p> <p>Some voluntary standards, such as the Global Reporting Initiative's (GRI) Sustainability Reporting Guidelines on Economic, Environmental and Social Performance, require reporting of social and economic information to give an overall picture of sustainability of the reporting party.</p>

Communicating and Presenting the Results

Some voluntary and regulatory reporting standards leave little flexibility in how information is reported. When flexibility is an option, consider the following communication tips:

- Report or present information in a compelling manner, that tells a good story, and in terms that are meaningful to the target audience.
 - Business managers want to know whether changes will improve competitiveness and increase profits.
 - Agency managers want to be assured that programs are good investments of public dollars.
 - Technical assistance providers want to see that their efforts are leading to beneficial behavior changes.
 - Employees or citizens want to know how their participation is making a difference, and



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- how they should conduct future efforts.
- Orient the message(s) to drive future improvement.
- Include "behind the scenes" or background explanations where appropriate.
 - Why is this information being measured?
 - What goals, plans or objectives are driving the measurement activities and subsequent use of the information?
 - Are goals being addressed and accomplished by actions taken as a result of the findings?
 - How were the data analyzed and results computed?
- Use graphics - a powerful tool which offers quick, easy visual insight into what the information has to tell. Graphics are great for marketing, helping management understand the details of an operation, or non-technical audiences understand complicated environmental issues. Pictures, graphs, illustrations, statistical charts, layouts or process map, and other graphics always need a descriptive title and a short discussion of the message. Keep each graphic simple, and as self-explanatory as possible. The Energy Information Administration offers [Guidelines](#) for designing meaningful statistical graphs.
- Don't forget disclaimers or contingencies if deemed necessary. This may include limitations in data collection capabilities, multiple contributing factors to environmental improvements, etc.
- Media and public relations advise that messages to the general public should be presented at a level that high school students can understand.
- Integrate environmental results and successes into the annual financial report.

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