P2 Measurement Tools

Methodologies Report

August 2009

National Pollution Prevention Roundtable

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I. Introduction

For years states focused their pollution prevention (P2) programs on technical assistance, educating industry on the implementation of P2. States then began to integrate P2 into regulatory programs to enhance compliance and compliance assistance initiatives, P2 programs use data to show how P2 assistance efforts benefit businesses, communities, and the environment. Data collection included measuring activities, such as, the number of training sessions performed, behavior changes like the number of facilities doing a P2 assessment or developing a P2 plan, and outcomes like the pounds of hazardous materials use prevented or pounds of pollution (air, water, or waste) prevented.

Historically, United State Environmental Protection Agency (US EPA) has begun to require states to measure the impact of EPA funded projects. Recently, this measurement requirement has become increasingly rigorous. Emphasis is placed on the effectiveness of P2 programs to prevent pollution. P2 programs across the country either had or are creating measurement systems that allow them to track and analyze differences in data. Variations among P2 programs measurement tools were found, due to regulations, available resources, and sectors measured. This report will examine some of the various techniques and tools used through the following stages of P2 measurement. These stages include Data Collection Tools, Data Calculators, and Data Management Systems.

A. Definitions of Key Terms

P2 Measurement Tools: Tools that are used for collecting, analyzing, and managing pollution prevention data.

Data Collection Tools: The methods and instruments a program/organization uses to gather P2 data. (Examples: surveys; data entry/collection forms; telephone interview questionnaires; site visit checklists, protocols for follow-up and data collection after site visit assistance; etc.).

Data Calculators: Data calculators are mathematical adjustments that convert the original data to a different parameter or issue of concern using certain assumptions. (Examples: converting kWh to reduced CO2 emissions, which assumes burning of fossil fuels to produce the electricity, level of efficiency of the burning carbon content of the fuel, and other parameters; or prorating the number of facilities that make a P2 change, based on a limited survey, to the total number of facilities in a geographic location, to estimate the total reduction in emissions).

Data Management Tools: Programs and systems used to store, analyze, and report data. (Examples: NEWMOA's Data Management tool; PPRC's Aggregation Tool; spreadsheets).

B. Project Background

The Data Measurement Tools project is part of a cooperative agreement between NPPR and US EPA. The objective of this agreement was to identify the various P2 Measurement Tools that are being used by state, local and tribal governments, and academia. The project aimed to address aspects of P2 results measurement dealing with data collection tools, data calculators, and data management systems.

Data collection for this project began in the summer of 2008 through e-mail surveys. Eight responses were received during this first round of data collection. The second round of data collection was conducted in early 2009. The second data collection round was conducted via telephone interviews with a new questionnaire tool, similar to the survey used in the first round but with new and modified questions and a clear definition of terms all participants prior to and during the interviews. During the second round of data collection fourteen organizations participated. Of the fourteen participants, six were original participants took part in the telephone interviews. Although, not previously done in the first round of data collection, in the second round the P2 measurement tools discussed were collected from participants whenever possible. Telephone interviews typically took around an hour.

This report provides in it examples of methods used by P2 programs around the country. P2 programs need to find the tools that work best for them based on their available resources and program priorities. There is no one size fits all when it comes to P2 Measurement Tools. This report is organized into seven parts including, introduction to the project, data collection tools, data calculators, data management systems, examples of programs that use all three types of tools, a summary of lessons learned and next steps, and a list of participants.

C. Participants

Potential participants were selected based on recommendations from their peers within the pollution prevention community. Potential participants were contacted via e-mail and telephone requesting their participation in this project. A total of twenty-five potential participants were contacted.

Between the two rounds of this project there were a total of nineteen participants that participated in the e-mailed survey, telephone interviews, or both. All of the participants actively work for an organization in the P2 community. Eleven of the participants are state government, six are from academia, one is a regional Pollution Prevention Resource Exchange (P2Rx) center, and one is a nonprofit. Participants either use the P2 measurement tools for technical assistance or regulatory reporting and/or an intern program.

Based on the early 2009 draft of the EPA strategic plan respondents were asked during the telephone interviews which sectors they primarily collected data from. The breakdown based on sector is in the table below (Figure 1). All participants indicated that they use P2 Measurement Tools in several different sectors. Other sectors that were indicated were health care, automotive body, cleaners, and printers.

Figure 1

Sector	Participants
Agriculture	4
Building & Construction	8
Chemical & Manufacturing Industries	12
Electronics	10
Hospitality	9
Municipalities & Institutions	11

Participant uses and needs for P2 Measurement Tools varied. For the state and to some extend the academia, respondents indicated state policies and regulations, as well as, EPA grant requirements determined the uses and needs for P2 measurement tools, as well as, EPA funded grant projects. Primarily respondents indicated that measurement tools were used for the purpose of showing results. Eight respondents indicated that measurement tools are used for reporting purposes. Four respondents indicated that measurement tools are used in a record keeping capacity form. Five respondents did not indicate their measurement tool's uses. A majority of programs indicated that they do not have any written protocol for their data collection process.

Barriers or hurdles to participant's data collection were similar among those participants that indicated them to be an issue. Most indicated that the barriers or hurdles prevent them from getting follow-up and actual data. The most prevalent response was with regard to resources. Participants indicated challenges within their own program's available resources when it came to data collection. Primarily those resources were staffing and financial. For some who indicated lack of resources, they also indicated that this kept them from collecting any metrics. Many who indicated staffing to be a barrier said that it was particularly a barrier when it came to getting follow up data from companies, or data from companies not reporting. The other prevalent response was companies or clients not providing requested information or the data not being accurate. Responses for how to get around these barriers or hurdles were also similar, including increased resources, capacity building with companies, and companies having a better understanding of how to collect the data.

II. Data Collection Tools

A. Background

There are a variety of methods and instruments that P2 programs use to gather P2 data. Some of those tools include surveys, data entry forms, questionnaires, and site visit checklist. The methods and instruments used to gather P2 data often determine the quality of that data. During NPPR's examination of the various P2 data collection tools in use, it was discovered that

programs generally did not have the same or even similar data collection practices. Those differences were mostly in the specifics of the tools. Differences in methods and instruments used for data collection primarily come from difference in available program resources, program focus, priorities, regulations, and sectors served. Differences in program focus and priorities were legislative or based upon needs for a particular state or region. NPPR was able to obtain P2 data collection tools used by several of the respondents.

Despite the varied of differences found between the programs three main similarities were found. During the telephone interviews three main similarities were found. Those three similarities were the use of site visits, increased role of information technologies in data collection, and logs of interactions.

Site visits for all programs required staffing to not only perform a site visit, but also to do some form of follow up after the visit. Nine of the programs perform some sort of site visit. Similarities in site visits can be further be broken down to P2 intern programs and state agencies. The P2 intern programs performed site visits by having the interns complete an assessment of their assigned facility and then compile their findings into a report for the facility. Since P2 intern programs are usually only conducted over the summer semester, follow-up for their recommendations tend to either be limited or non-existent. Site visits completed by state agencies are handled differently. Most state agencies perform follow up and it tends to be ongoing. State agencies usually have a sort of pre-survey or questionnaire type of tool they use prior to site visits. Some states use that tool to determine which facilities to visit, while others use it to obtain data necessary for their site visit report. Several programs indicated that during the actual site visit, all they bring is blank pieces of paper for notes, that there is no pre-designed form.

Information technology is becoming more common in data collection. Over half the respondents indicated that they have gone from traditional mail for surveys and other paper based tools to e-mails whenever paper tools were used. Several P2 programs indicated they are either currently using or will be within the next year using some form of an online reporting tool. With the online reporting tools, facility self report data on a designated website that is fed into the P2 programs Data Management System.

Logs are another similar tool used by many of the programs. Programs indicated the use of logs for tracking telephone interactions. This was especially true for technical assistance programs, which use telephone logs. Programs also indicated the use of logs during site visits.

B. Data Collection Tools – Example

Massachusetts Office of Technical Assistance

The Massachusetts Office of Technical Assistance (OTA) has had their data collection tool in use for 7 years. Data collection is part of a state reporting requirement. The primary tools that OTA uses are site visits and questionnaires. OTA performs two types of site visits, one is for energy efficiency and the other is for pollution prevention. Prior to site visits OTA provides

facilities with questionnaires to collect base line data, make sure general information is correct, and list permits that the facility has. The data collection for site visits is done in a five step process:
1. In preparation for site visits the facilities receive a two page Pre-Visit Questionnaire obtain background information about the facility.
2. A representative from OTA tours the facility with the appropriate questionnaire. After the tour, OTA explains the report that the facility will be receiving and that all Massachusetts Department of Environmental Protection (DEP) requirements will go into the report.
3. The representative that toured the facility writes up the report. The report takes about a month to put together, including further research that may need to be done in compiling the report. All recommendations from the report go into OTA's database. As necessary, further research may need to be done in compiling the report.
4. The report is hand delivered to the facility, so that the report and recommendations can be explained in person.
5. There is continual follow up after the final report is presented to the facility. All follow up goes into the database. Follow up is made 30, 60, and 90 days after the report is delivered to check on implementation of recommendations. Recommendations are placed in the database one-by-one to see if they are used or not, and it is reported in the database why they are or are not being followed upon.

The data that OTA receives from a facility is a combination of primary and secondary data. Most data is obtained from the facility during site visits or from DEP's reportable chemicals. Data is in actual amounts whenever possible. Some of the barriers that OTA faces with their data collection are businesses that use small quantities of chemicals, or there are no records or tracking, so OTA is unable to obtain that information from the facility.

III. Data Calculators

A. Background

Data calculators are mathematical conversions that translate the original data to a different parameter or units using certain assumptions. Data calculators can show reductions in pollution and mate the data more meaningful, understandable, and useful.

There is an issue that does arise when discussing data calculators, and that issue deals with the standardizing of coefficients in calculators. The question becomes: are the coefficients a national standard, a sector standard, a regional standard, a state standard, or some sort of combination. The P2 programs that took part in this project had different views on this specific issue, though none were asked directly for their feedback. Some programs discussed their need for a national standard, others discussed that standards should be specific to a sector or industry, and yet others say that the coefficients should be specific to both the sector and state of the facility in question. The decision on which coefficients to use could have a huge impact on the end product and the quality of data, this is an area that should be explored further. The other issue with data

calculators is the assumptions used in the conversions. Though, organizations were not asked about their assumptions many stated that if their assumptions are incorrect it can affect the quality of the data.

Data calculators provide a way of analyzing data, but they also for some P2 programs add a new element to their data measurement for some P2 programs. The most common similarities among the various program's data calculators is they are either not currently using them, they are looking into them, or they use them on a limited level. The programs that use them as part of their P2 intern programs do so as a learning tool for their students and some do not include them as part of their reporting.

P2 programs that are already using data calculators either have created their own calculators or are using national calculators. These calculators range in uses from measuring waste and water usage to energy and the cost of that energy. Figure 2 list some of the calculators that are currently being used by the P2 programs that are included in this report.

Figure 2

Name of Calculator	Use	Availability
EPA Warm Model	WAste Reduction Model (WARM) is used to help solid waste planners and organizations track and voluntarily report greenhouse gas emissions reductions from several different waste management practices.	http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html
DOE Plant Energy Profiler	The tool gives an overview of the energy that a plant purchases and the major energy-consuming systems.	http://www1.eere.energy.gov/industry/bestpractices/software.html
Life-Cycle Assessment – Carnegie Mellon	The model uses information about industry transactions, purchases of materials by one industry from other industries, and the information about direct environmental emissions of industries, to estimate the total emissions throughout the supply chain.	http://www.eiolca.net/
DOE PHAST	This tool helps industrial user's survey process heating equipment that consumes fuel, steam, or electricity, and identifies the most energy-intensive equipment. The tool compares performance of equipment under various operating conditions and test "what-if" scenarios.	http://www1.eere.energy.gov/industry/bestpractices/software.html
Green Cleaning Calculator	This calculator forecasts the environmental benefits of reducing chemical use by doing some or all pollution prevention measures typically involved in the routine interior cleaning of an office building.	http://www.ofee.gov/janitor/index.asp
Emissions	The calculator will display the emissions	http://www.cleanerandgreen

Reductions Calculator	prevented by your actions and the annual savings that result.	er.org/resources/calculators.htm
Emissions Calculator	Calculates how much pollution is caused by the energy used.	http://www.cleanerandgreener.org/resources/calculators.htm
Paper Calculator	The Paper Calculator shows the environmental impacts of different papers across their full lifecycle.	http://www.edf.org/papercalculator/
North American Electric Reliability Corporation (NERC)	Data is sent to them to calculate electricity usages.	http://www.nerc.com/
CO2 – Energy to Environment Calculator	Minnesota Technical Assistance Program calculator that estimates the lbs of emissions avoided resulting from electrical and thermal (gas) energy savings.	Available with NPPR
Hospitality Calculator	Created by Peter Cooke with the Maine Department of Environmental Protection.	Available with NPPR
Various	Nurtured World has various calculators that they have created.	www.nuturedworld.org
Calculator Fact Sheets		
Emissions Facts	Provides the emission rates for hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx) tables from EPA highway vehicle emission factor models.	http://www.epa.gov/otaq/consumer/f00013.htm
Energy Administration Information (EIA)	Provides information regarding fossil fuels.	http://www.eia.doe.gov/steo
Gas Buddy	Provides current gas prices and historical price charts across the U.S.	http://gasbuddy.com/

IV. Data Management Systems

A. Background

P2 Data Management Systems are programs and systems that are used to store, analyze, and report data. Data Management Systems provide a component for not only reporting results, but also showing whether the results can be attributed to pollution prevention efforts. It also allows for a comparison across industries and within sectors.

The types of Data Management Systems being used by P2 programs ranges from Microsoft Office software (Access, Excel, and Word programming) to individually designed software programs. The majority of programs use at least one of the Microsoft Office software programs as part of their management system, specifically Access or Excel. The Access databases are in many cases specifically designed for use by a particular P2 program. Most of the P2 programs said that they use a combination of different software programs, depending on the types of data they are collecting and how it is being reported. A few programs are either in the process of getting an individually and uniquely designed program or just started using one.

B. Data Management System – Examples

Kentucky Pollution Prevention Center

Kentucky Pollution Prevention Center (KPPC) is currently working on a new software data management tool. At the time of their telephone interview they indicated that there would be a prototype release the end of June 2009 for use by two other states. Currently this software tool is being used by KPPC. At the time of their interview the working title for the software was Technological Resource Assistance Knowledge Management (TRAK-M). The program uses an Access database as its foundation.

Colorado Department of Public Health and Environment

Colorado Department of Public Health and Environment will be implementing a new data management system in the next few months. The database will be designed not only to feed data into the P2Rx system, but also to generate a data collection form. This new management system is designed to be flexible, so that when a new metric become relevant to measure it can easily be added to the system. The system is in SQL Server, and is called the Outcomes Database. It connects to the Colorado National Environmental Information Exchange Network node to transfer data to the P2Rx node.

V. Example Programs

A. Background

The examples provided in this section are from P2 programs that use all three P2 Data Measurement Tools in some form. The examples are laid out in a way similar to the data process flow used by the specific program.

B. Kansas State University - Pollution Prevention Institute

Energy Efficiency (E2) and Pollution Prevention (P2) Intern Program

Kansas State University - Pollution Prevention Institute (PPI) offers several different services, including technical assistance, workshops, webinars, and the E2 and P2 Intern Program. Over ten weeks in the summer the E2 and P2 Intern Program links engineering and environmental sciences students with business and industry. The interns gain hands-on experience in an industrial setting, as well as an understanding of pollution prevention strategies. Businesses gain well developed and specific options for improved their operating efficiency, increased cost savings, reduced waste, and decreased regulatory burden. Both students and businesses apply to be apart of the program.

The interns begin the program with a week of training, before they go into their assigned industry. The training includes presentations on specifics of lighting and motors Environmental Management Systems (EMS) and P2 and the calculators the interns will be using for their reports. After the interns complete a week of comprehensive training they begin observations at their assigned industries. The interns conduct all the data collection and do all the necessary research.

The interns are expected to complete weekly reports and a final draft report. PPI staff reviews the reports. If there are any questions the interns are asked to go back and check calculations. The final reports are comprehensive, so that if anyone else wants to maintain or follow up on an intern's project they can do so by following the report. The report is something that the interns are continually working on throughout their project.

As part of the interns work they use PPRC's P2 Cost Calculator. The P2 Cost Calculator tool calculates the financial value for reducing/conserving the following: hazardous inputs and wastes, air emissions, waste discharges, water use, energy use, and non-hazardous inputs and solid waste. The interns also use the EPA's GHG calculator tool to show the causal link between P2 actions undertaken and GHG emission reductions, and to quantify those reductions based on established conversion factors. The students use the results of those calculations in their reporting.

Data from the project is stored. Case summaries are available on the web at www.sbeap.org/internships.php?reports=case. PPI has support staff enter the data into MS Word and MS Access software based systems.

After the completion of the intern's ten weeks, the businesses receive a follow-up site survey. Recently, PPI has hired an intern to follow-up on the recommendations made by summer interns. PPI has provided NPPR with the materials that they used as part of their training for the 2009 summer intern program. Those materials include calculators, equations, required reporting information, and presentations.

C. Minnesota Technical Assistance Program (MnTAP)

Minnesota Technical Assistance Program (MnTAP) like PPI offers both free technical assistance to businesses and also has a summer intern program. MnTAP is an outreach and assistance program at the University of Minnesota that helps Minnesota businesses develop and implement industry-tailored solutions that prevent pollution at the source, maximize efficient use of resources, and reduce energy use and cost to improve public health and the environment. MnTAP uses four types of data collection tools: phones calls by businesses with technical assistance questions, site visits completed by MnTAP, an intern program, and P2 Internal Team Facilitation within companies.

MnTAP tracks each interaction with a customer from phone calls to site visits and intern interactions. After telephone interactions an assessment is completed to determine if a site visit, intern, or team facilitation would be the best for the company in question. The technical assistance (TA) staff members, who are usually sector based, are responsible for their own technical assistance, follow up, and data entry flow. The flow may go: call - site visit - letter with suggestions – two week follow up – three to six month follow up – and 18 to 24 month follow up. Each step along the flow is recorded in the database. The suggestions made by the TA member are entered into a database, which include whether the business planned, implemented, or is not planning to follow through with the recommendations. Also, in the data base are the numbers for reductions and cost savings.

The data used by MnTAP comes directly from the company and some other sources. Those other sources include permits, monitoring reports, utility bills, and data loggers. MnTAP relies on exact data, based on gathered baseline data. This helps the company implement a change and provides for calculations of reductions based on new data. Data is collected during a TA members site visit.

MnTAP uses a calculator of Estimated Environmental Pollution from Energy Production. The calculator can estimate the emissions from consumption of electricity and natural gas or the avoided emissions from conservation of gas and electricity. After the calculations are made they are entered into the data collection tool.

For its Data Management System, MnTAP uses Inquiry an access-based database. The database is used to store contact information, reporting to sponsors, newsletter mailing lists, history of interactions with customers, and event invite list. The information on the history of interactions with customers is shared internally, so that one staff member knows if another staff member has had contact with the same company.

VI. Conclusion

A. Key Lessons Learned

There were many lessons learned during the progress of assimilating data on the various Data Measurement Tools. The key lesson learned is that there is no single best practice when it comes to Data Measurement Tools. While there may not be a single best practice, but pollution prevention programs can learn techniques and approaches from each other that allow them to find or create a practice that works best for them. There are several reasons for this including, differences in resources, priorities, regulations, industries, definitions of terms, and economic conditions are just a few reasons.

Each pollution prevention program, depending on its state or region faces a plethora of unique conditions. Those conditions include program resources, which can range from staffing issues to technical issues with computers and software, all of which are effected by economic conditions and finances. Programs also face differences within states when dealing with state regulations and mandates. Some programs may have mandatory reporting requirements of metrics that show cost saved with pollution prevention, other programs just need to show how many clients they served. Priorities of what is reported, Texas Commission on Environmental Quality for example, indicated that priorities are based partly on interaction and communication with regional offices. Massachusetts Office of Technical Assistance said that one of their focus areas on high focus chemicals defined by the Massachusetts Toxics Use Reduction Act (TURA). States and regions may have differences among industries and sectors with one state having a diverse set of industries and sectors and another may be more homogeneous.

Prior to a participant's scheduled telephone interview they were e-mailed the questions that they were going to be asked and included at the top of those questions was the definitions as they are presented in the Introduction of this report. Each participant was asked prior to the beginning of their telephone interview questionnaire if they had a chance to look over the document, and all stated they had. It was clear that many participants had either a different definition for the terms, Data Collection Tools, Data Calculators, and Data Management Tools, or they had different interpretations of how those terms fit into their Data Measurement Tools.

Some P2 programs, especially, those that function at the state level are still working on adding metrics to their reporting. Many of those metrics related to pollution prevention cost savings. As programs begin exploring those, as how they fit with their own states specific needs and the sectors they serve more will become available.

The key lesson learned through this process is that there is not a one size fits all related to Data Measurement Tools. This report should be used by organizations and pollution prevention programs as a reference guide when creating or modifying their Data Measurement Tools. This report should also be the beginnings of a conversation on Data Measurement Tools, particularly in the area of definitions where universality is possible.

B. Possible Next Steps

This report is only one resource for Data Measurement Tools. As more programs find measurement reporting necessary for funding and showing the value of their program, the need for references and examples of P2 Data Measurement Tools will become more important. Some

additional steps to follow up this report include, but are not limited to a Data Management Tools compendium, Data Management webinars, and additional research into the use and evolution of P2 Data Measurement Tools.

The Data Management Tools compendium would be an online resource publically available. The compendium would be updateable as new tools, calculators, and systems become available. A Data Management Tools compendium would provide users with detailed examples of tools being used, including the actual documents whenever possible. The compendium would also provide links to further resources.

Another resource would be webinars, which would provide interested parties with a description of how a program's P2 Data Measurement Tools work. Webinars would provide a resource for P2 programs to discuss what they are doing and what they are considering doing. This would provide a venue for questions and discussions and to share tools information.

There is also the need for more resources to further research P2 Data Management Tools. The tools that are offered in this report and eventually in the online compendium are just some of those that were found in talking to a limited number of sources. There are many other potential sources available and many tools that will become available in the next year or so.

VII. Participants

- Colorado Department of Public Health and Environment
- Connecticut Department of Environmental Protection
- Kansas State University – Pollution Prevention Institute
- Kentucky Pollution Prevention Center
- Maine Department of Environmental Protection
- Maryland Department of the Environment
- Massachusetts Office of Technical Assistance
- Michigan Retired Engineers Technical Assistance Program
- Minnesota Technical Assistance Program – University of Minnesota
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- Missouri Environmental Assistance Center

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- University of Wisconsin Extension Solid and Hazardous Waste Center

- Virginia Department of Environmental Quality

- Zero Waste Network