

Endnotes

INTRODUCTION

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The Association of Higher Education Facilities Officers (APPA) is an international association dedicated to maintaining, protecting, and promoting the quality of educational facilities. The nearly 4,500 individuals who comprise APPA are facilities professionals from public and private, two-year and four-year, colleges and universities. Additional information is available at: www.appa.org.
The Campus, Safety, Health and Environmental Management Association (CSHEMA), a division of the National Safety Council, is dedicated to assisting its membership in advancing safety, health and environmental quality in institutions of higher education. Additional information is available at: www.cshema.org.
The Campus Consortium for Environmental Excellence (C2E2) is a college and university member supported not-for-profit organization. The mission of the C2E2 is to support the continued improvement of environmental performance in higher education. Additional information is available at: www.c2e2.org.
The Howard Hughes Medical Institute (HHMI) is a medical research organization whose principal mission is the conduct of biomedical research. Approximately 320 Hughes investigators lead medical research laboratories at 68 of the nation's leading research centers and universities. Additional information is available at: www.hhmi.org.
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- ¹⁴ For more about Region 1 (New England) Corporate Sponsor Program, see <http://www.epa.gov/region1/pr/2001/aug/010824.html>.
- ¹⁵ National Environmental Performance Track Program. See <http://www.epa.gov/performance/track/index.htm>. For more information about the 2002 Performance Track Annual Performance Report for New Hampshire Ball Bearings, Inc., see <https://yosemite.epa.gov/opei/ptrack.nsf/vAPRViewPrintView/5B510B9B608F432685256D3B006E57EE>.
- ¹⁶ Delawder, Tim. 2004. Personal interview with sector point-of-contact, March 15, 2004. Contact information: SWD, Inc., 910 Stiles Avenue, Addison, IL 60101-4913, 630-543-3003, tim@swdinc.com or <http://www.swdinc.com>.
- ¹⁷ Imagineering Finishing Technologies. See <http://www.strategicgoals.org/su14.cfm>.

PAINT & COATINGS

- ¹ U.S. Census Bureau. 2001. County Business Patterns. For the number of employees and number of establishments. See <http://www.census.gov/epcd/cbp/view/cbpview.html>. U.S. Census Bureau. 2001. Statistics for Industry Groups and Industries Annual Survey of Manufactures. For value of shipments. See <http://www.census.gov/prod/2003pubs/m01as-1.pdf>.
- ² Standard Industrial Classification (SIC) code used to define the economic activities of the industries or business establishments in this sector: 2851, and the corresponding North American Industry Classification System (NAICS) code: 325510.
- ³ Darling, David, National Paint and Coatings Association. 2004. Electronic communication to EPA sector point-of-contact, May 26, 2004.
- ⁴ U.S. Environmental Protection Agency. 2003. Toxics Release Inventory (TRI) Public Data Release, data freeze: March 7, 2003.
- ⁵ U.S. EPA, National Emission Inventory (NEI), Emission Factor and Inventory Group, OAQPS, data received: April 2004.

Note: State and local emissions inventories are submitted to EPA once every three years (e.g., 1996 and 1999) for most of the point sources contained in NEI. EPA estimated emissions for any jurisdiction that did not submit an emissions inventory. Similarly, emissions for the years in between submissions were estimated by EPA. These estimates may not reflect changes in the industry, such as pollution prevention or compliance efforts. The 2002 inventory is scheduled for release in 2005.

- ⁶ U.S. Environmental Protection Agency. 2003. Toxics Release Inventory (TRI) Public Data Release, data freeze: March 7, 2003.
- ⁷ Product Stewardship Institute. 2004. Paint Product Stewardship: A Background Report for the National Dialogue on Paint Product Stewardship. University of Massachusetts: Cowell, MA.
- ⁸ National Paint and Coatings Association. 2001. Coatings Care: Manufacturing Management Implementation Guide – Environmental Management (Pollution Prevention / Waste Management) Washington, DC. Also see Coatings Care®: Providing for a Cleaner, Safer, Coatings Industry at <http://www.paint.org/cc/index.cfm>.
- ⁹ National Environmental Performance Track Network Partner list is available at: <http://www.epa.gov/performance/track/particip/trade.htm>.
- ¹⁰ National Paint and Coatings Association. 2001. Coatings Care: Manufacturing Management Implementation Guide – Environmental Management (Pollution Prevention / Waste Management), Washington, DC. Also see: Coatings Care®: Providing for a Cleaner, Safer, Coatings Industry at: <http://www.paint.org/cc/index.cfm>.
- ¹¹ Darling, David, National Paint and Coatings Association. 2004. Electronic communication to EPA sector point-of-contact, February 6, 2004.

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- ¹ Chase, Tom, Director of Environmental Affairs, American Association of Port Authorities. 2004. Personal interview, January 2004.
- ² U.S. Census Bureau. 2001. County Business Patterns. For the number of employees and number of establishments. See <http://www.census.gov/epcd/cbp/view/cbpview.html>. U.S. Census Bureau. 1997. Economic Census. For value of shipments. See <http://www.census.gov/epcd/cbp/view/cbpview.html>.
- ³ Standard Industrial Classification (SIC) code used to define the economic activities of the industries or business establishments in this sector: 4491, and the corresponding North American Industry Classification System (NAICS) codes: 48831 and 48832.
- ⁴ U.S. Army Corps of Engineers Navigation Data Center, Waterborne Commerce Statistics Center. 2002. Waterborne Commerce of the United States. Accessed January, 2004. www.iwr.usace.army.mil/ndc/wcsc/wcsc.htm.
- ⁵ American Association of Port Authorities. 2004. U.S. Public Port Facts. Accessed May 2004. <http://www.aapa-ports.org/industryinfo/portfact.htm>.
- ⁶ U.S. Department of Transportation, Maritime Administration, Office of Ports and Domestic Shipping. October 1998. A Report to Congress on the Status of the Public Ports of the United States 1996-1997.
- ⁷ Chase, Tom, Director of Environmental Affairs, American Association of Port Authorities. 2004. Personal interview, January 2004.
- ⁸ American Association of Port Authorities (AAPA). See <http://www.aapa-ports.org/>.
- ⁹ Hopson, Coleen, Project Manager, Port Authority of New York and New Jersey. 2004. Telephone interview with Abt Associates, Inc., January 28, 2004.
- ¹⁰ Parsche, Dave, Director of Environmental Affairs, Port of Tampa. 2004. Telephone interview with Abt Associates, Inc., January 26, 2004.
- ¹¹ Environmental Technology Program. See <http://www.epa.gov/etv/index.html>.

PORTS *(continued)*

- ¹² Port of Portland, Environment. Fall 2003. Natural Resource Assessment and Management Program. Accessed January 2004. http://www.portofportland.com/SelfPost/A_20031251016551003NRAMP.pdf.
- ¹³ For additional information on the Sector Strategies Program with AAPA, see <http://www.epa.gov/sectors/ports/index.html>.
- ¹⁴ Fiffick, Laura, Environmental Affairs Manager, Port of Houston Authority. 2004. Telephone interview with Abt Associates, Inc., February 25, 2004. See <http://www.portofhouston.com/publicrelations/environment.html>.
- ¹⁵ Wetherall, Catherine, Chief of Environmental Management, and Jennifer Newcombe, Environmental Project Manager, Massport. 2004. Telephone interview with Abt Associates, Inc., January 29, 2004. See <http://www.massport.com/business/envir.html>.

SHIPBUILDING & SHIP REPAIR

- ¹ U.S. Census Bureau. 2001. County Business Patterns. For the number of employees and number of facilities. Available at: <http://www.census.gov/epcd/cbp/view/cbpview.html>. U.S. Census Bureau. 2001. Statistics for Industry Groups and Industries, Annual Survey of Manufactures, for value of shipments, available at: <http://www.census.gov/prod/2003pubs/m01as-1.pdf>.
- ² Standard Industrial Classification (SIC) code used to define the economic activities of the industries or business establishments in this sector: 3731, and the corresponding North American Industry Classification System (NAICS) code: 336611.
- ³ U.S. Environmental Protection Agency. 1997. Profile of the Shipbuilding and Repair Industry. P. 7.
- ⁴ "The Report on Survey of U.S. Shipbuilding and Repair Facilities". The Maritime Administration, 2003.
- ⁵ Ibid.
- ⁶ American Shipbuilding Association (ASA). See <http://www.americanshipbuilding.com>. Shipbuilders Council of America (SCA). See <http://www.shipbuilders.org/>.
- ⁷ U.S. Environmental Protection Agency. 2003. Toxics Release Inventory (TRI) Public Data Release: 2001, data freeze: March 7, 2003.
- ⁸ Killeen, Patrick, Manager, Environmental, Health and Safety, Signal International. 2004. Telephone interview with Dana Austin, Austin Environmental, January 30, 2004.
- ⁹ The National Shipbuilding Research Program. See <http://www.nsrp.org/>.
- ¹⁰ Dickinson, Vince, Environmental Manager, Bath Iron Works. 2003. Telephone interview with Stefanie Shull, ICF Consulting, June 5, 2003.
- ¹¹ The National Shipbuilding Research Program. See <http://www.nsrp.org/>, document ASE 006000.
- ¹² U.S. Environmental Protection Agency, Emission Factor & Inventory Group. 2004. Received data from Tom McMullen, received April 2004.
- Note: State and local emissions inventories are submitted to EPA once every three years (e.g., 1996 and 1999) for most of the point sources contained in NEI. EPA estimated emissions for any jurisdiction that did not submit an emissions inventory. Similarly, emissions for the years in between submissions were estimated by EPA. These estimates may not reflect changes in the industry, such as pollution prevention or compliance efforts. The 2002 inventory is scheduled for release in 2005.
- ¹³ U.S. Environmental Protection Agency. 2003. Toxics Release Inventory (TRI) Public Data Release: 2001, data freeze: March 7, 2003.
- ¹⁴ Sector Strategies Program, Shipyard Stormwater BMP Project, sector point-of-contact Shana Harbour - harbour.shana@epa.gov.
- ¹⁵ Sector Strategies Program EMS Implementation Guide for Shipbuilding Facilities. See http://www.epa.gov/sectors/shipbuilding/ship_ems.html#ems.
- ¹⁶ Dickinson, Vince, Environmental Manager, Bath Iron Works. 2003. Telephone interview with Stefanie Shull, ICF Consulting, June 5, 2003.
- ¹⁷ Morris, Jackie, Bender Shipbuilding & Repair Co. 2003. Telephone interview with Stefanie Shull, ICF Consulting, June 4, 2003.
- ¹⁸ Chee, Mike, Environmental Department Manager, NASSCO. 2002. Telephone interview with Will Gibson, ICF Consulting & Dana Austen, Austen Environmental, Summer of 2002.

SPECIALTY-BATCH CHEMICALS

- ¹ Facility, employee and value of shipment numbers from Synthetic Organic Chemical Manufacturers Association (SOCMA), 2002, please visit web site for additional information: <http://www.socma.com/about/index.htm>
- ² Due to overlapping operations, it is difficult to identify specific specialty batch facilities from the larger universe within chemical manufacturing – SIC 28. The Standard Industrial Classification (SIC) code used to define the economic activities of the industries or business establishments in SIC 28 correspond to North American Industry Classification System (NAICS) codes: 325110, 325120, 325131, 325132, 325181, 325182, 325188, 325191, 325192, 325193, 325199, 325211, 325212, 325221, 325222, 325311, 325312, 325314, 325320, 325411, 325412, 325413, 325414, 325510, 325520, 325611, 325612, 325613, 325620, 325910, 325920, 325991, 325992, and 325998.
- ³ Principal Findings: The U.S. Specialty Batch Chemical Industry, Draft Report, February, 2000, pg. 4; available at: http://www.epa.gov/sectors/sbchemical/sb_pdf/sbchem_PrincipalFindings.pdf
- ⁴ Ibid.
- ⁵ Responsible Care® Management System (RCMS), information available at: <http://www.socma.com/ResponsibleCare/rcms.htm>
- ⁶ Responsible Care metrics are available at: http://www.socma.com/PDFfiles/responsible_care/Metrics_Table.pdf
- ⁷ Melissa Hockstead, SOCMA, Responsible Care, e-mail communication with sector point-of-contact on April 29, 2004.
- ⁸ Performance Track Network Partner list is available at: <http://www.epa.gov/performance-track/particip/trade.htm>
- ⁹ EMS Implementation Guide for the specialty-batch chemicals is available at: http://www.epa.gov/sectors/sbchemical/sb_ems.html
- ¹⁰ Performance Track Annual Performance Report for Baker Petrolite - Rayne Blend Plant, Year 2, 2002, available at: <https://yosemite.epa.gov/oepi/ptrack.nsf/vAPRViewPrintView/FC81E1FD39CE946F85256DB4006F0640>; also see Baker Petrolite application at: <http://www.epa.gov/performance-track/apps/pdfs/A06-0016.pdf>
- ¹¹ 2001 TRI Public Data Release (PDR), data freeze: March 7, 2003, and includes facilities that report primary SIC code 28 on their Form R.

Environmental Data Sources

DATA SOURCE: Toxics Release Inventory (TRI)

Environmental Impact Indicators: Chemical releases, waste managed on- and off-site of toxic chemicals.

Period Analyzed for Trends: 1993-2001

Next Data Release: In 2004 for 2002 data

Partner sectors presenting data:

* *Agribusiness*

* *Forest Products*

* *Iron & Steel*

* *Metal Casting*

* *Metal Finishing*

* *Paint & Coatings*

* *Shipbuilding & Ship Repair*

* *Specialty-Batch Chemicals*

Data Source Description: The Toxics Release Inventory (TRI) was established under the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and expanded by the Pollution Prevention Act of 1990. Following expansions of the reporting requirements in the past ten years, TRI now includes facilities with 10 or more employees in the manufacturing sectors (SIC code 20 - 39); federal facilities; metal mines; coal mines; electrical utilities that combust coal or oil; commercial hazardous waste treatment facilities; chemical wholesalers; petroleum bulk terminals and plants; and solvent recovery services who use, process, or manufacture more than a threshold amount of over 600 toxic chemicals. Facilities must report to TRI if they exceed the reporting threshold for manufacture or process (>25,000 lbs), or for otherwise use (>10,000 lbs). Reporting thresholds for persistent bioaccumulative toxic chemicals (PBTs) are lower. In 2001, 22,359 facilities filed a Form R, reporting a total of 6.2 billion pounds of on- and off-site releases and 26.7 billion pounds of releases and on- and off-site waste management to TRI.

Data Source Considerations: Several aspects of TRI influence the use of these data for EPA's Sector Strategies Program.

- *Small businesses not included:* TRI excludes smaller facilities, those with fewer than 10 employees. However, for any given sector, this source does include larger facilities, which can be expected to have greater environmental impacts.
- *Toxicity:* TRI releases and waste management activities are reported in absolute pounds. This does not take into account relative toxicity of a chemical. For example, a pound of a substance like mercury is more toxic than methanol. A facilities' progress in reducing higher toxicity substances does not receive credit when trend analyses are presented for cumulative pounds. Several EPA tools are available to translate TRI pounds to toxicity-weighted values. This tool may be applied in future Reports.
- *Data accuracy:* Data are reported by individual facilities, making TRI the most reliable data source available for chemical releases and waste management practices. On the other hand, data quality may suffer from changes in personnel, misunderstanding of the TRI data elements, or other sources of error. However, sources of error are being reduced with dissemination of reporting guidance, on-site data quality reviews, enforcement actions, improved reporting software, and TRI training courses.

Data Processing Steps:

- TRI data for reporting years 1993-2001 were provided by the TRI program (Office of Environmental Information) *frozen* as of March 7, 2003. The *frozen* data were used to ensure reproducibility and to support later revisions of the analysis. Documentation of TRI and the program can be found at <http://www.epa.gov/tri>.

- Extracted data elements for this Report include:
Hazardous Air Pollutant (HAP) Releases to Air - stack and fugitive emissions of listed HAPs to air as reported in sections 5.1 and 5.2 of the TRI Form R.

Releases - emissions to air, discharges to bodies of water, releases to land and into underground injection wells. This includes releases, spills, and remedial actions occurring at the facility (on-site) and off-site releases resulting from wastes transferred for disposal to waste management facilities as reported in sections 8.1 and 8.8 of the TRI Form R.

Treatment - the quantity of chemicals destroyed in on- or off-site operations such as biological treatment, neutralization, incineration, and physical separation as reported in sections 8.6 and 8.7 of the TRI Form R.

Energy Recovery - the quantity of the toxic chemicals that was combusted in an energy recovery device, such as a boiler or industrial furnace. These amounts are reported in sections 8.2 and 8.3 of the TRI Form R.

Recycling - the quantity of the toxic chemical that was either recovered at the facility and made available for further use, or sent off-site for recycling and subsequently made available for use in commerce. These amounts are reported in sections 8.4 and 8.5 of the TRI Form R.

- Sector assignments were based on the facility's primary 4-digit SIC code reported on the Form R each year.
- Annual sector releases and waste managed totals were normalized using the sector's production, shipments, or value of shipments, with 1993 as the baseline year.
- Units of weight were converted for presentation purposes.

DATA SOURCE: National Emission Inventory (NEI)

Environmental Impact Indicators: Annual emissions of specific criteria air pollutants. Specific pollutants analyzed: Sulfur Dioxide; Nitrogen Oxides; Particulate Matter (<2.5 microns and <10 microns); and Volatile Organic Compounds.

Period Analyzed for Trends: 1996-2001

Next Data Release: In 2005 for years 2002-2004

Partner sectors presenting data:

* **Cement**

* **Paint & Coatings**

* **Shipbuilding & Ship Repair**

Data Source Description: EPA's Emission Factor and Inventory Group (EFIG) within the Office of Air and Radiation prepares a national database of the criteria air pollutant emissions based on input from numerous state, tribal, and local air pollution control agencies as well as industry-submitted data. State and local emissions inventories are submitted to EPA once every three years for most point sources contained in NEI. Through the 1999 NEI, EPA estimated emissions for any jurisdiction that did not submit an emissions inventory. Similarly, prior to 1999 NEI included emission projections for each intervening year based on year-to-year changes at the sector level. The emissions estimates maintained in NEI are in short tons per year.

Data Source Considerations: Several changes to NEI influence the appropriate use of these data for EPA's Sector Strategies Program.

- *Changes in NEI:* EFIG does not recommend comparing NEI 1996 and later years to years prior to 1996 due to changes in their compilation and data filling methods.
- *Addition of PM_{2.5}:* In 1997, EPA's Office of Air Quality Planning Standards established National Ambient Air Quality Standards for particulate matter less than 2.5 micrometers in diameter. As a consequence, NEI began to collect PM_{2.5} emissions estimates as of the 1999 inventory.
- *Improved methodology & regulatory amendments:* As a result of the Consolidated Emissions Reporting rule, the NEI updates for 2002 and beyond are expected to include data uploads from all jurisdictions. If so, EFIG's estimation of missing data emissions will not be necessary.

Data Processing Steps:

- NEI data obtained from EFIG staff (04/01/2004) and Trends1970_2001_toCHIEF082803.xls. Documentation available at: <http://www.epa.gov/ttn/chief/trends/>.
- Annual sector emission totals normalized using the sectors' production or value of shipments with 1996 as the baseline year.
- Units of weight were converted for presentation purposes.
- Paint and Coatings sector presents data based on 1996 and 2001 emission estimates.
- Shipbuilding and Ship Repair sector presents 1996 through 1999 and 2001 emission estimates. 2000 data are currently being processed by EPA.
- Cement sector presents 1999 through 2001 emission estimates. EPA projected 2000 emissions on inventories received in 1999 for the cement manufacturing sector.

Environmental Data Sources

DATA SOURCE: Effluent Data Statistics (EDS) System derivation of Permit Compliance System (PCS)

Environmental Impact Indicators: Annual direct wastewater discharges of Clean Water Act (CWA) conventional pollutants. Specific pollutants analyzed: Biochemical Oxygen Demand (BOD), Oil and Grease, and Total Suspended Solids (TSS).

Period Analyzed for Trends: 1994-2002

Next Data Release: In first quarter of 2005 for 2004 data

Partner sector presenting data:

**** Agribusiness***

Data Source Description: Under the Clean Water Act, all facilities discharging an aqueous waste stream directly into the waters of the United States are required to obtain a National Pollution Discharge Elimination System (NPDES) permit. Indirect dischargers, facilities discharging to a central treatment system (often called publicly owned treatment works, POTWs), are not typically included in PCS. PCS tracks permit data for approximately 50,000 active facilities, 6,500 of which are major dischargers. The PCS program's Effluent Data Statistics System process starts by extracting the reported DMR data that have been entered into PCS. These data are then processed through a software program to add the flow data to each record. This allows loadings to be calculated using flow and concentration whenever mass loading data have not been reported for a monitoring period. The effluent data are then converted into PCS standard units since the data can be reported in various units. After the data have been converted, they are processed by the EDS routines to calculate mass load totals.

Data Source Considerations: Limitations to PCS influence the use of these data for EPA's Sector Strategies Program.

- *Universe of reporting facilities:* Major facilities with a NPDES permit are required to submit monthly discharge monitoring reports to EPA or the authorized state or Regional office a facility's classification is based on several parameters, including amount of discharge per day, wastewater sources, and population affected by discharge). Minor facilities, however, are not required to submit these reports, although some states and Regional offices enter them anyway. Because inconsistencies in available data for minor facilities across states exist the trends analysis was limited to pollutant loadings from major NPDES permitted facilities.

Data Processing Steps:

- Obtained EDS file from Office of Compliance's Integrated Data for Enforcement Analysis (IDEA) system (12/12/2003 refresh). Contact U.S. EPA's PCS program for further information.
- Units of weight were converted for presentation purposes.

DATA SOURCE: Emissions of Greenhouse Gases in the United States Report

Environmental Impact Indicators: Annual emissions of carbon dioxide equivalents.

Period Analyzed for Trends: 1993-2001

Next Data Release: Preliminary 2002 data available.

Partner sector presenting data:

**** Cement***

Data Source Description: The Department of Energy's (DOE) Energy Information Administration (EIA) annually compiles and updates estimates for anthropogenic greenhouse gas emissions. Most greenhouse gases (GHGs) in the United States, including carbon dioxide, are emitted as the result of the combustion of fossil fuels. Global warming potentials (GWPs) are used to compare the abilities of different greenhouse gases to trap heat in the atmosphere. GWPs are based on the radiative efficiency (heat-absorbing ability) of each gas relative to that of carbon dioxide (CO₂), as well as the decay rate of each gas (the amount removed from the atmosphere over a given number of years) relative to that of CO₂. GHG emissions and energy use are highly correlated for most industry sectors. As a result, the Report develops emission estimates primarily from DOE's databases on energy use, the Manufacturing Energy Consumption Survey (MECS), and the Commercial Business Energy Consumption Survey (CBECS). A number of industrial sectors, including cement manufacturing, also emit significant quantities of GHGs from non-fuel combustion processes. For these sectors, which include just one of the partner sectors (cement manufacturing), the Report does include estimates of GHGs associated with non-fuel use.

Data Source Considerations: The methodology and level of data aggregation used in the Report influence the data available for EPA's Sector Strategies Program.

- *Availability of sector-level data:* GHG emissions are presented by general end use categories: residential, commercial, industrial, and transportation. GHG emissions are generally not available for individual industrial sectors with the exception of cement manufacture.

Data Processing Steps:

- GHG data were retrieved from EIA's Voluntary Reporting Program site at <http://www.eia.doe.gov/oiaf/1605/1605a.html>.
- Annual emission totals were normalized using cement production with 1993 as the baseline year.

DATA SOURCE: U.S. and Canadian Labor-Energy Input Survey: 2000 Survey (released March 2002), page 7, Portland Cement Association.

Environmental Impact Indicator: Energy consumed, in million Btus per equivalent ton.

Partner sector presenting data:

* *Cement*

DATA SOURCE: Cement Kiln Dust Surveys, memo: May 2004, Portland Cement Association.

Environmental Impact Indicator: Cement Kiln Dust managed, in metric tons.

Partner sector presenting data:

* *Cement*

DATA SOURCE: Environmental Health and Safety Verification Program Year 2000 Report: Issued 2002, American Forest & Paper Association.

Environmental Impact Indicators:

- Nitrogen Oxide and Sulfur Dioxide emissions from pulp and paper mills, in pounds per ton of production;
- Wastewater discharges (Biochemical Oxygen Demand, Total Suspended Solids, Absorbable Organic Halides) from pulp and paper mills, in pounds per ton of production; and
- Percents of Waste managed (beneficially reused and landfilled, lagooned, or burned for disposal) by pulp and paper and wood products mills.

Partner sector presenting data:

* *Forest Products*