

Chapter 4



Industry Reporting to the Toxics Release Inventory

This chapter provides an overview of 1997 TRI data by industry sector, for the 20 manufacturing sectors required to report to TRI. As described in Chapter 1, TRI will expand to include seven additional industry sectors beginning with the 1998 reporting year. Box 4-1 lists the manufacturing industries by Standard Industrial Classification (SIC) code. Box 4-2 explains SIC codes and their use in TRI.

This chapter summarizes release and other waste management data by industry for 1997, comparable to the overviews presented in Chapter 2. It then compares the last three reporting years (1995, 1996, and 1997) and compares 1988 with the three recent years. Because some types of data were not collected in 1988, this chapter also reviews waste management data for 1991 and 1995-1997. These multiple-year analyses correspond to overviews presented in Chapter 3. The discussion of “core” chemical lists, in the “Introduction” to Chapter 3, is important for

accurate interpretation of these year-to-year comparisons because of the significant changes in TRI over time.

TRI Data by Industry, 1997

In 1997, across all industries, 21,490 facilities submitted 71,670 forms to TRI, as shown in Table 4-1. The chemical manufacturing industry submitted the largest number of forms, 21,044 forms or 29.4% of the total. The fabricated metals industry ranked second with 7,430 forms, and the primary metals industry ranked third with 6,777 forms, both approximately 10% of the total. Facilities that reported more than one SIC code to describe their operations and products (see Box 4-2) submitted the fourth-largest number of forms. This “multiple-codes” group submitted 4,552 forms, 6.4% of the total.

Box 4-1. Standard Industrial Classification (SIC) Codes

Standard Industrial Classification (SIC) Codes

- | | |
|-----------|---|
| 20 | Food and kindred products Manufacture or processing of foods and beverages for human consumption, and related products, such as manufactured ice, chewing gum, vegetable and animal fats and oils, and prepared feeds for animals and fowls. |
| 21 | Tobacco products Manufacture of cigarettes, cigars, smoking and chewing tobacco, snuff, and reconstituted tobacco. Stemming and redrying of tobacco. Manufacture of non-tobacco cigarettes. |
| 22 | Textile mill products Preparation of fiber and subsequent manufacture of yarn, thread, braids, twine, and cordage. Manufacture of broad woven fabrics, narrow woven fabrics, knit fabrics, and carpets and rugs from yarn. Dyeing and finishing of fiber, yarn, fabrics, and knit apparel. Coating, waterproofing or otherwise treating fabrics. Integrated manufacture of knit apparel and other finished articles from yarn. Manufacture of felt goods, lace goods, nonwoven fabrics, and miscellaneous textiles. |

Source: Executive Office of the President, Office of Management and Budget, *Standard Industrial Classification Manual*, 1987.

Box 4-1. Standard Industrial Classification (SIC) Codes, continued

- 23 Apparel and other finished products made from fabrics and similar materials**
Production of clothing. Fabrication of products by cutting and sewing purchased woven or knit textile fabrics and related materials, such as leather, rubberized fabrics, plastics, and furs. Manufacture of clothing by cutting and joining (e.g., by adhesives) material such as paper and nonwoven textiles.
- 24 Lumber and wood products, except furniture**
Cutting timber and pulpwood. Also, merchant sawmills, lath mills, shingle mills, cooperage stock mills, planing mills, and plywood mills and veneer mills engaged in producing lumber and wood basic materials. Manufacture of finished articles made entirely or mainly of wood or related materials.
- 25 Furniture and fixtures**
Manufacture of household, office, public building, and restaurant furniture, and office and store fixtures.
- 26 Paper and allied products**
Manufacture of pulps from wood and other cellulose fibers and from rags. Manufacture of paper and paperboard. Manufacture of paper and paperboard into converted products, such as paper coated off the paper machine, paper bags, paper boxes, and envelopes. Manufacture of bags from plastics film and sheet.
- 27 Printing, publishing, and allied industries**
Printing by one or more common processes, such as letterpress, lithography (including offset), gravure, or screen. Bookbinding, plate making, and other services performed for the printing trade. Publishing newspapers, books, and periodicals (whether or not the establishment also prints them).
- 28 Chemicals and allied products**
Production of basic chemicals. Manufacture of products by predominantly chemical processes. (Three general classes of products: 1) basic chemicals, such as acids, alkalis, salts, and organic chemicals; 2) chemical products to be used in further manufacture, such as synthetic fibers, plastics materials, dry colors, and pigments; 3) finished chemical products to be used for ultimate consumption, such as drugs, cosmetics, and soaps, or to be used as materials or supplies in other industries, such as paints, fertilizers, and explosives.)
- 29 Petroleum refining and related industries**
Production of gasoline, kerosene, distillate fuel oils, residual fuel oils, and lubricants, through fractionation or straight distillation of crude oil, redistillation of unfinished petroleum derivatives, cracking, or other processes. (Establishments also produce aliphatic and aromatic chemicals as byproducts.)
- 30 Rubber and miscellaneous plastics products**
Manufacture of products, not elsewhere classified, from plastics resins and from natural, synthetic, or reclaimed rubber, gutta percha, balata, or gutta siak. Includes manufacture of tires.
- 31 Leather and leather products**
Tanning, currying, and finishing hides and skins. Converting leather. Manufacture of finished leather and artificial leather products and some similar products made of other materials.
- 32 Stone, clay, glass, and concrete products**
Manufacture of flat glass and other glass products, cement, structural clay products, pottery, concrete and gypsum products, cut stone, abrasive and asbestos products, and other products from materials taken principally from the earth in the form of stone, clay, and sand. (May include mining and quarrying activities operated by manufacturing establishments in this group.)

Source: Executive Office of the President, Office of Management and Budget, *Standard Industrial Classification Manual*, 1987.



Box 4-1. Standard Industrial Classification (SIC) Codes, continued

- 33 Primary metal industries**
Smelting and refining ferrous and nonferrous metals from ore, pig, or scrap. Rolling, drawing, and alloying metals. Manufacture of castings and other basic metal products. Manufacture of nails, spikes, and insulated wire and cable. Includes production of coke.
- 34 Fabricated metal products, except machinery and transportation equipment**
Fabrication of ferrous and nonferrous metal products, such as metal cans, tinware, hand tools, cutlery, general hardware, non-electric heating apparatus, fabricated structural metal products, metal forgings, metal stampings, ordnance (except vehicles and guided missiles), and a variety of metal and wire products, not elsewhere classified.
- 35 Industrial and commercial machinery and computer equipment**
Manufacture of industrial and commercial machinery and equipment and computers. Manufacture of engines and turbines; farm and garden machinery; construction, mining, and oil field machinery; elevators and conveying equipment; hoists, cranes, monorails, and industrial trucks and tractors; metalworking machinery; special industry machinery; general industrial machinery; computer and peripheral equipment and office machinery; and refrigeration and service industry machinery.
- 36 Electronic and other electrical equipment and components, except computer equipment**
Manufacture of machinery, apparatus, and supplies for the generation, storage, transmission, transformation, and utilization of electrical energy. Manufacture of electricity distribution equipment, electrical industrial apparatus, household appliances, electrical lighting and wiring equipment, radio and television receiving equipment, communications equipment, electronic components and accessories, and other electrical equipment and supplies.
- 37 Transportation equipment**
Manufacture of equipment for transportation of passengers and cargo by land, air, and water. Includes motor vehicles, aircraft, guided missiles, and space vehicles, ships, boats, railroad equipment, and miscellaneous transportation equipment, such as motorcycles, bicycles, and snowmobiles.
- 38 Measuring, analyzing, and controlling instruments, photographic, medical, and optical goods; watches and clocks.**
Manufacture of instruments (including professional and scientific) for measuring, testing, analyzing, and controlling, and their associated sensors and accessories; optical instruments and lenses; surveying and drafting instruments; hydrological, hydrographic, meteorological, and geophysical equipment; search, detection, navigation, and guidance systems and equipment; surgical, medical, and dental instruments, equipment, and supplies; ophthalmic goods; photographic equipment and supplies; and watches and clocks.
- 39 Miscellaneous manufacturing industries**
Manufacture of products not classified in any other major manufacturing group. Includes jewelry, silverware, and plated ware; musical instruments; dolls, toys, games, and sporting athletic goods; pens, pencils, and artists' materials; buttons, costume novelties, and miscellaneous notions; brooms and brushes; caskets; and other miscellaneous products.

Source: Executive Office of the President, Office of Management and Budget, *Standard Industrial Classification Manual*, 1987.

Box 4-2. An Explanation of SIC Codes and TRI

An Explanation of SIC Codes and TRI

SIC codes are the Standard Industrial Classification codes used throughout the federal government to classify economic activity by industry. Facilities in the manufacturing sectors, that is, SIC codes 20 through 39, are required to report to TRI. (As explained in Chapter 1, additional industries will begin reporting with the 1998 reporting year.) Box 4-1 lists the two-digit SIC codes in manufacturing and the primary activities of the industry sectors they designate.

On TRI Form Rs and Form A certification statements, facilities report the four-digit SIC codes that define their operations. A facility might report, for example, SIC code 2873, nitrogenous fertilizers. These industries are grouped into broader categories at the three-digit and two-digit SIC code levels. For example, nitrogenous fertilizers falls into the agricultural chemicals group at the three-digit level (SIC code 287) and the chemicals and allied products major group (SIC code 28). Tables in this chapter present data aggregated at the two-digit level.

Multiple SIC Codes: TRI facilities may report up to six four-digit SIC codes that describe their operations. They submit one Form R or Form A certification statement for each chemical they are reporting. If all the processes or operations that are associated with a facility's releases or other waste management of a TRI chemical can be described by one SIC code, then only one SIC code is reported on the form. If several economic activities, designated by different SIC codes, describe the specific operations at a facility that are associated with releases or other waste management of a TRI chemical, then the facility will report those SIC codes (up to six) on the form it submits for that chemical.

Industrial facilities often conduct inter-related operations. They may, for example, manufacture distinct products using common or related feedstocks. Such products may be classified in similar but separate categories in the Standard Industrial Classification (SIC) system. Thus, many forms submitted to TRI contain more than one industrial classification. When TRI data are analyzed by industry—that is, by SIC code—forms that report more than one SIC code must be categorized separately because they do not fall into the individual industry groups.

The “multiple-codes” category represents forms that report in more than one two-digit SIC code. For example, a facility may refine petroleum (SIC code 29) and then use that feedstock in the manufacture of chemicals (SIC code 28); it will report SIC codes in both of these industries on its TRI forms (such as SIC codes 2911, petroleum refining, and 2869, industrial organic chemicals). On forms with more than one SIC code, any SIC code that is not within manufacturing (that is, not within the SIC code range 20 to 39) is ignored when assigning a form to an industry category. For example, a form with the SIC code 2642 (manufacture of envelopes) and SIC code 5112 (wholesale trade – stationery and office supplies) would be included in SIC code 26.

Federal Facilities: Federal facilities report the SIC codes that describe their activity; these may or may not fall within the manufacturing categories, SIC codes 20 to 39, that have reported to TRI since its inception. (As explained in Chapter 1, additional industries will begin reporting with the 1998 reporting year.) Tables in this chapter incorporate amounts submitted by federal facilities in the SIC codes they reported, just as is done for private sector facilities. In each table, a separate summary of federal facilities' data is presented as well, following the totals.



Table 4-1. TRI Facilities and Forms, by Industry, 1997

| SIC Code | Industry | Total Facilities Number | Total Forms Number | Form Rs Number | Form As Number |
|----------|-----------------------|-------------------------|--------------------|----------------|----------------|
| 20 | Food | 1,987 | 3,582 | 2,365 | 1,217 |
| 21 | Tobacco | 26 | 87 | 87 | 0 |
| 22 | Textiles | 299 | 661 | 576 | 85 |
| 23 | Apparel | 27 | 57 | 49 | 8 |
| 24 | Lumber | 784 | 1,879 | 1,240 | 639 |
| 25 | Furniture | 422 | 1,092 | 1,032 | 60 |
| 26 | Paper | 471 | 2,561 | 2,396 | 165 |
| 27 | Printing | 235 | 482 | 470 | 12 |
| 28 | Chemicals | 3,829 | 21,044 | 17,064 | 3,980 |
| 29 | Petroleum | 387 | 3,208 | 2,815 | 393 |
| 30 | Plastics | 1,813 | 3,675 | 3,103 | 572 |
| 31 | Leather | 82 | 208 | 191 | 17 |
| 32 | Stone/Clay/Glass | 641 | 1,773 | 1,469 | 304 |
| 33 | Primary Metals | 1,926 | 6,777 | 5,995 | 782 |
| 34 | Fabricated Metals | 2,872 | 7,430 | 6,647 | 783 |
| 35 | Machinery | 1,065 | 2,825 | 2,507 | 318 |
| 36 | Electrical Equip. | 1,263 | 3,119 | 2,970 | 149 |
| 37 | Transportation Equip. | 1,265 | 4,453 | 4,155 | 298 |
| 38 | Measure./Photo. | 263 | 647 | 566 | 81 |
| 39 | Miscellaneous | 347 | 744 | 637 | 107 |
| | Multiple codes 20-39 | 1,246 | 4,552 | 4,093 | 459 |
| | No codes 20-39 | 240 | 814 | 696 | 118 |
| | Total | 21,490 | 71,670 | 61,123 | 10,547 |
| | Federal Facilities | 124 | 346 | 312 | 34 |

Note: Facilities/forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple" category. Facilities/forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes 20-39" category.

On- and Off-site Releases, 1997

On- and off-site releases totaled 2.58 billion pounds in 1997, and two industries reported more than half of that total. As shown in Table 4-2, the chemical manufacturing industry reported 797.5 million pounds of total releases, and the primary metals industry reported 694.7 million pounds. These amounts represented 30.9% and 27.0%, respectively, of all on- and off-site releases reported to TRI, as illustrated in Figure 4-1. The paper products industry ranked third for total on- and off-site releases, behind chemicals and primary metals, with 233.5 million pounds, or 9.1% of the national total.

Three other industry groups reported more than 100 million pounds each: the multiple-codes group ranked

fourth among all industries with 137.6 million pounds (5.3%), plastics manufacture ranked fifth with 108.5 million pounds (4.2%), and the transportation equipment industry ranked sixth with 102.1 million pounds (4.0%).

Figure 4-2 displays on- and off-site releases for the industries with the largest total releases.

On-site Releases

The chemicals, primary metals, and paper products industries, which reported the largest total on- and off-site releases in 1997, also reported the largest on-site releases. Table 4-2 also presents on-site releases by industry.

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Table 4-2. TRI On-site and Off-site Releases, by Industry, 1997

| SIC Code | Industry | On Site Releases | | | | | | |
|----------|-----------------------|--|--|------------------------------------|-------------------------|----------------------------|-------------------------------------|---------------------------|
| | | Fugitive or Nonpoint Air Emissions Pounds | Stack or Point Air Emissions Pounds | Surface Water Discharges Pounds | Underground Injection | | On-site Land Releases | |
| | | | | | Class I Wells Pounds | Class II-V Wells Pounds | RCRA Subtitle C Landfills Pounds | Other Landfills Pounds |
| 20 | Food | 21,841,987 | 50,173,613 | 16,480,043 | 755 | 23,655 | 250 | 2,696 |
| 21 | Tobacco | 47,631 | 3,742,429 | 171,586 | 0 | 0 | 0 | 0 |
| 22 | Textiles | 3,272,547 | 14,996,366 | 349,218 | 0 | 0 | 0 | 12,139 |
| 23 | Apparel | 76,823 | 625,205 | 5,700 | 0 | 0 | 0 | 46,000 |
| 24 | Lumber | 4,463,041 | 22,339,485 | 79,628 | 0 | 0 | 39,070 | 8,795 |
| 25 | Furniture | 3,415,781 | 21,401,745 | 41 | 0 | 0 | 0 | 27,906 |
| 26 | Paper | 15,568,519 | 178,214,730 | 19,026,405 | 122,027 | 0 | 1,159,725 | 9,369,606 |
| 27 | Printing | 12,200,851 | 12,317,702 | 2,260 | 0 | 0 | 0 | 0 |
| 28 | Chemicals | 85,147,643 | 257,067,768 | 106,004,912 | 215,670,514 | 132,543 | 4,392,785 | 21,618,312 |
| 29 | Petroleum | 25,814,753 | 24,606,789 | 11,333,210 | 2,412,682 | 113,789 | 10 | 40,488 |
| 30 | Plastics | 25,001,040 | 73,180,951 | 13,262 | 1 | 0 | 17,766 | 700,056 |
| 31 | Leather | 695,246 | 1,971,833 | 26,338 | 0 | 0 | 0 | 250 |
| 32 | Stone/Clay/Glass | 2,363,974 | 29,047,702 | 51,509 | 0 | 0 | 73,233 | 2,485,752 |
| 33 | Primary Metals | 33,385,225 | 98,659,230 | 47,984,274 | 846,556 | 0 | 13,974,894 | 55,243,145 |
| 34 | Fabricated Metals | 23,226,751 | 40,822,562 | 1,418,490 | 0 | 6 | 155,309 | 174,081 |
| 35 | Machinery | 6,125,064 | 11,401,163 | 25,398 | 0 | 0 | 6,649 | 308,719 |
| 36 | Electrical Equip. | 5,196,405 | 13,884,897 | 1,894,465 | 3,100 | 0 | 293,304 | 154,717 |
| 37 | Transportation Equip. | 19,521,068 | 71,107,635 | 283,829 | 0 | 0 | 110,079 | 430,857 |
| 38 | Measure./Photo. | 1,211,293 | 9,675,807 | 1,343,783 | 0 | 0 | 46 | 153,395 |
| 39 | Miscellaneous | 2,107,684 | 7,297,312 | 1,542 | 5 | 0 | 12,767 | 3,806 |
| | Multiple codes 20-39 | 24,578,496 | 66,767,841 | 11,579,215 | 14,602 | 10 | 196,888 | 2,763,815 |
| | No codes 20-39 | 1,971,489 | 5,127,810 | 296,853 | 0 | 173,653 | 39,803 | 94,982 |
| | Total | 317,233,311 | 1,014,430,575 | 218,371,961 | 219,070,242 | 443,656 | 20,472,578 | 93,639,517 |
| | Federal Facilities | 2,182,989 | 1,833,350 | 1,176,773 | 0 | 173,653 | 702 | 72,716 |

Note: On-site Releases from Section 5 of Form R. Off-site Releases are from Section 6 (transfers off-site to disposal) of Form R. Off-site Releases include metals and metal compounds transferred off-site for solidification/stabilization and for wastewater treatment, including to POTWs. Forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple" category. Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes 20-39" category.

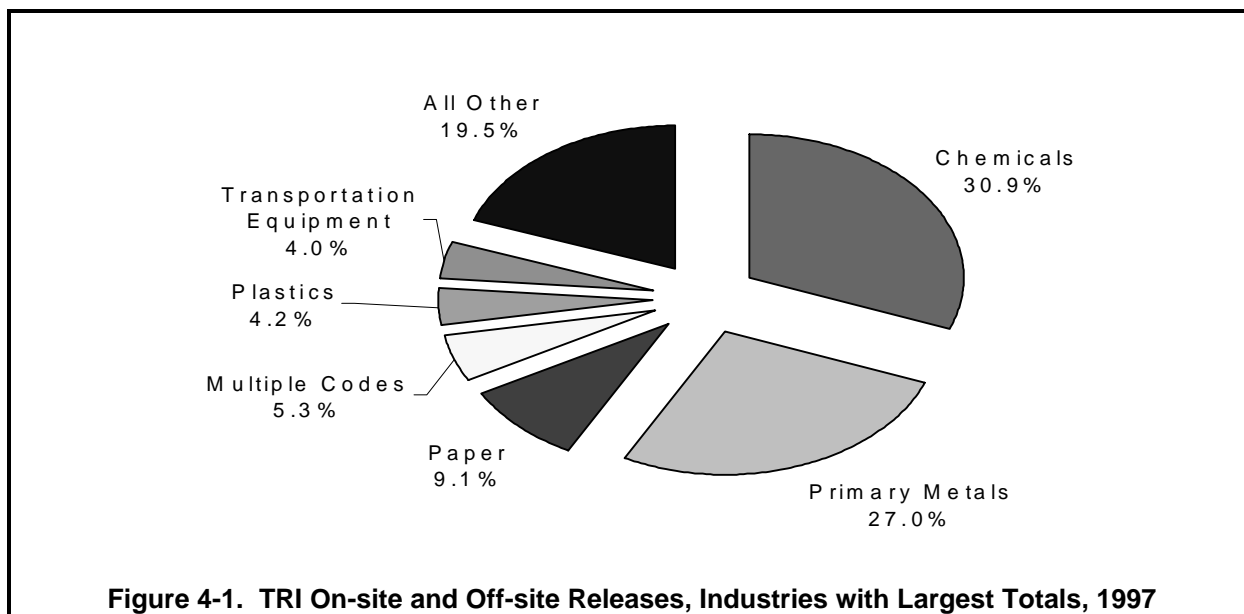


Figure 4-1. TRI On-site and Off-site Releases, Industries with Largest Totals, 1997

Note: On-site Releases from Section 5 of Form R. Off-site Releases are from Section 6 (transfers off-site to disposal) of Form R. Off-site Releases include metals and metal compounds transferred off-site for solidification/stabilization and for wastewater treatment, including to POTWs. Forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple" category.



Table 4-2. TRI On-site and Off-site Releases, by Industry, 1997, continued

| SIC Code | Industry | On Site-Releases | | | Total On-site Releases Pounds | Off-site Releases | Total On- and Off-site Releases Pounds |
|----------|-----------------------|--------------------------|--------------------------------|--|----------------------------------|--------------------------|---|
| | | On-site Land Releases | | Transfers Off-site to Disposal Pounds | | | |
| | | Land Treatment Pounds | Surface Impoundments Pounds | | | Other Disposal Pounds | |
| 20 | Food | 3,295,815 | 178,442 | 43,442 | 92,040,698 | 1,527,792 | 93,568,490 |
| 21 | Tobacco | 0 | 0 | 0 | 3,961,646 | 387,968 | 4,349,614 |
| 22 | Textiles | 122,524 | 67,734 | 2,088 | 18,822,616 | 613,643 | 19,436,259 |
| 23 | Apparel | 9,887 | 0 | 5 | 763,620 | 140,912 | 904,532 |
| 24 | Lumber | 57,461 | 535 | 2,125 | 26,990,140 | 2,669,283 | 29,659,423 |
| 25 | Furniture | 0 | 0 | 510 | 24,845,983 | 267,933 | 25,113,916 |
| 26 | Paper | 508,756 | 4,621,199 | 192,269 | 228,783,236 | 4,747,148 | 233,530,384 |
| 27 | Printing | 0 | 0 | 250 | 24,521,063 | 122,715 | 24,643,778 |
| 28 | Chemicals | 791,439 | 40,220,776 | 11,601,039 | 742,647,731 | 54,849,079 | 797,496,810 |
| 29 | Petroleum | 82,815 | 331,352 | 1,319,014 | 66,054,902 | 3,268,549 | 69,323,451 |
| 30 | Plastics | 750 | 6,249 | 170,451 | 99,090,526 | 9,375,097 | 108,465,623 |
| 31 | Leather | 0 | 10,042 | 5 | 2,703,714 | 2,030,230 | 4,733,944 |
| 32 | Stone/Clay/Glass | 772 | 85,010 | 1,109,708 | 35,217,660 | 8,003,691 | 43,221,351 |
| 33 | Primary Metals | 40,630 | 50,745,121 | 105,066,486 | 405,945,561 | 288,716,526 | 694,662,087 |
| 34 | Fabricated Metals | 796 | 2,804 | 537,249 | 66,338,048 | 29,198,597 | 95,536,645 |
| 35 | Machinery | 5 | 5 | 68,725 | 17,935,728 | 4,465,584 | 22,401,312 |
| 36 | Electrical Equip. | 17,108 | 434 | 26,340 | 21,470,770 | 12,674,200 | 34,144,970 |
| 37 | Transportation Equip. | 6 | 3,704 | 81,148 | 91,538,326 | 10,519,302 | 102,057,628 |
| 38 | Measure./Photo. | 924 | 0 | 57,332 | 12,442,580 | 799,306 | 13,241,886 |
| 39 | Miscellaneous | 0 | 0 | 469 | 9,423,585 | 818,874 | 10,242,459 |
| | Multiple codes 20-39 | 246,564 | 458,561 | 5,571,405 | 112,177,397 | 25,444,493 | 137,621,890 |
| | No codes 20-39 | 618,415 | 220,908 | 4,194,812 | 12,738,725 | 457,907 | 13,196,632 |
| | Total | 5,794,667 | 96,952,876 | 130,044,872 | 2,116,454,255 | 461,098,829 | 2,577,553,084 |
| | Federal Facilities | 618,452 | 1,476 | 176,546 | 6,236,657 | 336,688 | 6,573,345 |

Note: On-site Releases from Section 5 of Form R. Off-site Releases are from Section 6 (transfers off-site to disposal) of Form R. Off-site Releases include metals and metal compounds transferred off-site for solidification/stabilization and for wastewater treatment, including to POTWs. Forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple" category. Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes 20-39" category.

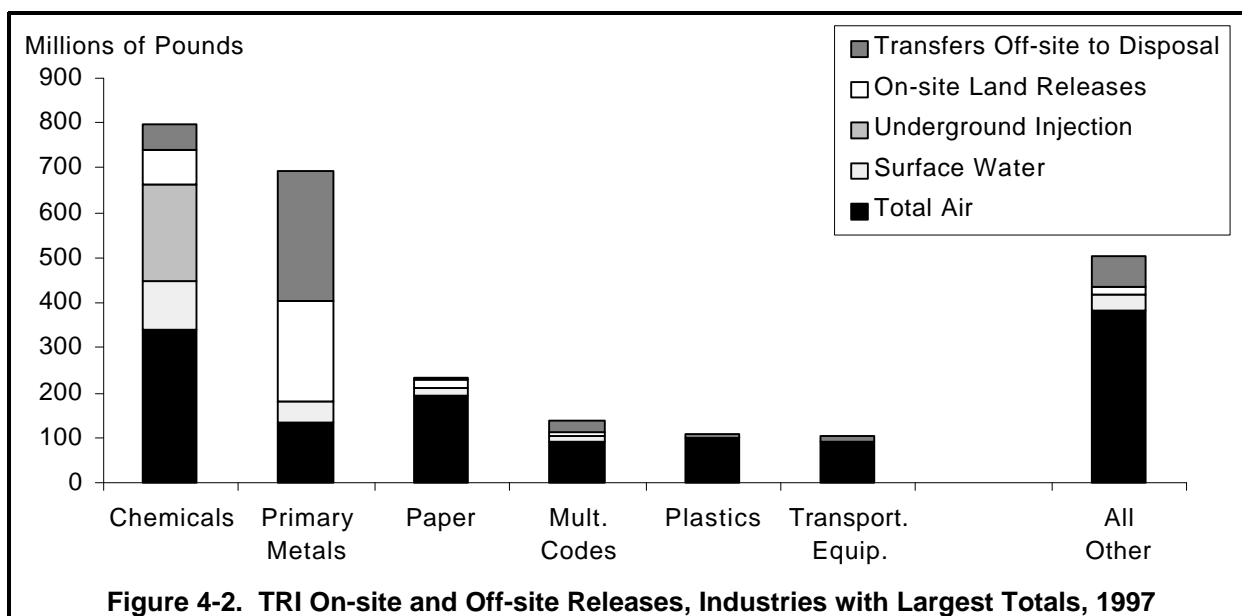


Figure 4-2. TRI On-site and Off-site Releases, Industries with Largest Totals, 1997

Note: On-site Releases from Section 5 of Form R. Off-site Releases are from Section 6 (transfers off-site to disposal) of Form R. Off-site Releases include metals and metal compounds transferred off-site for solidification/stabilization and for wastewater treatment, including to POTWs. Forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple" category.

Table 4-3. TRI Off-site Releases (Transfers Off-site to Disposal), 1997

| SIC Code | Industry | Storage Only ^a Pounds | Solidification / Stabilization Metals Only ^b Pounds | Wastewater Treatment (Excluding POTWs) Metals Only ^c Pounds | Transfers to POTWs Metals Only ^d Pounds | Underground Injection Pounds |
|----------|-----------------------|-------------------------------------|---|---|---|---------------------------------|
| 20 | Food | 37 | 0 | 44,155 | 15,479 | 6,875 |
| 21 | Tobacco | 0 | 0 | 0 | 279 | 0 |
| 22 | Textiles | 250 | 11,142 | 13,667 | 181,967 | 0 |
| 23 | Apparel | 250 | 0 | 0 | 5 | 0 |
| 24 | Lumber | 21,631 | 70,528 | 0 | 305 | 1,057 |
| 25 | Furniture | 860 | 31,985 | 0 | 2,585 | 37,700 |
| 26 | Paper | 91,017 | 21,949 | 213,681 | 148,914 | 0 |
| 27 | Printing | 3,004 | 7,844 | 1,776 | 4,434 | 0 |
| 28 | Chemicals | 538,308 | 6,743,384 | 3,111,984 | 450,944 | 8,948,834 |
| 29 | Petroleum | 1,190 | 101,242 | 326 | 73,576 | 222,174 |
| 30 | Plastics | 103,671 | 143,016 | 18,564 | 67,248 | 13,167 |
| 31 | Leather | 4,200 | 0 | 25 | 321,087 | 0 |
| 32 | Stone/Clay/Glass | 1,342 | 1,632,156 | 18,615 | 30,671 | 3 |
| 33 | Primary Metals | 3,648,396 | 120,337,808 | 544,484 | 172,507 | 1,269,373 |
| 34 | Fabricated Metals | 484,159 | 4,798,354 | 1,375,846 | 435,236 | 3,394,388 |
| 35 | Machinery | 81,397 | 398,779 | 38,493 | 48,453 | 135,952 |
| 36 | Electrical Equip. | 123,022 | 1,992,785 | 212,800 | 184,131 | 13,068 |
| 37 | Transportation Equip. | 98,494 | 828,677 | 332,468 | 119,854 | 82,608 |
| 38 | Measure./Photo. | 14,448 | 267,740 | 15,351 | 6,920 | 0 |
| 39 | Miscellaneous | 83,626 | 196,219 | 708 | 9,041 | 0 |
| | Multiple codes 20-39 | 1,308,918 | 6,708,373 | 122,535 | 122,698 | 125,729 |
| | No codes 20-39 | 18,637 | 33,132 | 9,080 | 3,596 | 14,828 |
| | Total | 6,626,857 | 144,325,113 | 6,074,558 | 2,399,930 | 14,265,756 |
| | Federal Facilities | 20,899 | 26,473 | 9,060 | 5,351 | 0 |

Note: Off-site Releases from Section 6 (off-site transfers to disposal) of Form R. **Off-site Releases** include metals and metal compounds transferred off-site for solidification/stabilization and for wastewater treatment, including to POTWs.

^a“Storage only” (disposal code M10) indicates that the toxic chemical is sent off-site for storage because there is no known disposal method. Amounts reported as transferred to “storage only” are included as a form of disposal (off-site release). See Box 2-2.

^bBeginning in reporting year 1997, transfers to solidification/stabilization of metals and metal compounds (waste management code M41) are reported separately from transfers to solidification/stabilization of non-metal TRI chemicals (waste management code M40). Because this treatment method prepares a metal for disposal, but does not destroy it, such transfers are included as a form of disposal (off-site release). See Box 2-3. Some facilities erroneously reported metals and metal compounds using waste management code M40; in this report, such amounts have been included in solidification/stabilization of metals and metal compounds.

^cBeginning in reporting year 1997, transfers to wastewater treatment (excluding POTWs) of metals and metal compounds (waste management code M62) are reported separately from transfers to wastewater treatment of non-metal TRI chemicals (waste management code M61). Because wastewater treatment does not destroy metals, such transfers are included as a form of disposal (off-site release). See Box 2-3. Some facilities erroneously reported metals and metal compounds using waste treatment code M61; in this report, such amounts have been included in transfers of metals and metal compounds to wastewater treatment.

^dReported as discharges to POTWs in Section 6.1 of Form R. EPA considers transfers of metals and metal compounds to POTWs as an off-site release because sewage treatment does not destroy the metal content of the waste material.

The chemical manufacturing industry ranked first for on-site releases with 742.6 million pounds. Chemical industry releases included 342.2 million pounds of air emissions, 106.0 million pounds of surface water discharges, and 215.8 million pounds of underground injection—the largest amounts in these categories.

The chemical manufacturing industry’s largest releases to air were point source emissions of 67.6 million pounds of ammonia, 37.4 million pounds of carbon disulfide, and 28.5 million pounds of methanol. The industry’s discharges to surface waters included 55.2

million pounds of nitrate compounds and 43.5 million pounds of phosphoric acid. The chemicals with the largest amounts of underground injection (to Class I wells) by chemical manufacturing facilities were nitrate compounds (40.6 million pounds) and ammonia (29.0 million pounds).

The primary metals industry ranked second for on-site releases with 405.9 million pounds. The primary metals industry reported 225.1 million pounds of on-site land releases, more than any other industry. Most



Table 4-3. TRI Off-site Releases (Transfers Off-site to Disposal), 1997, continued

| SIC Code | Industry | Landfills/ | Land | Other | Other | Transfers to | Unknown ^e | Total Off-site |
|----------|-----------------------|-------------------------------|-----------|---------------|---------------------|---------------------------|----------------------|--------------------------------|
| | | Disposal Surface Impoundments | Treatment | Land Disposal | Off-site Management | Waste Broker for Disposal | | Releases |
| | | Pounds | Pounds | Pounds | Pounds | Pounds | Pounds | Transfers Off-site to Disposal |
| | | | | | | | | Pounds |
| 20 | Food | 766,870 | 392,585 | 87,015 | 166,538 | 40,084 | 8,154 | 1,527,792 |
| 21 | Tobacco | 359,757 | 428 | 0 | 27,504 | 0 | 0 | 387,968 |
| 22 | Textiles | 357,446 | 6,778 | 6,564 | 19,151 | 3,707 | 12,971 | 613,643 |
| 23 | Apparel | 91,357 | 0 | 4,300 | 0 | 45,000 | 0 | 140,912 |
| 24 | Lumber | 1,899,404 | 17,234 | 588,294 | 7,336 | 22,744 | 40,750 | 2,669,283 |
| 25 | Furniture | 6,184 | 5,082 | 0 | 174,590 | 2,587 | 6,360 | 267,933 |
| 26 | Paper | 3,108,148 | 394,313 | 586,939 | 160,427 | 10,560 | 11,200 | 4,747,148 |
| 27 | Printing | 53,896 | 0 | 778 | 6,810 | 4,615 | 39,558 | 122,715 |
| 28 | Chemicals | 29,510,540 | 229,295 | 1,385,394 | 672,653 | 713,423 | 2,544,320 | 54,849,079 |
| 29 | Petroleum | 2,804,198 | 475 | 38,988 | 1,853 | 16,016 | 8,511 | 3,268,549 |
| 30 | Plastics | 8,102,877 | 61,702 | 271,340 | 269,320 | 214,333 | 109,859 | 9,375,097 |
| 31 | Leather | 1,133,125 | 23,399 | 250,610 | 297,700 | 84 | 0 | 2,030,230 |
| 32 | Stone/Clay/Glass | 4,960,160 | 8,900 | 26,693 | 378,999 | 53,318 | 892,834 | 8,003,691 |
| 33 | Primary Metals | 146,739,000 | 13,570 | 5,115,099 | 6,622,727 | 4,066,803 | 186,759 | 288,716,526 |
| 34 | Fabricated Metals | 17,293,884 | 4,838 | 223,686 | 75,820 | 933,864 | 178,522 | 29,198,597 |
| 35 | Machinery | 3,200,135 | 1,265 | 254,971 | 69,586 | 215,791 | 20,762 | 4,465,584 |
| 36 | Electrical Equip. | 7,668,385 | 10,048 | 113,763 | 1,669,165 | 455,563 | 231,470 | 12,674,200 |
| 37 | Transportation Equip. | 8,089,609 | 10,120 | 92,939 | 506,492 | 216,993 | 141,048 | 10,519,302 |
| 38 | Measure./Photo. | 410,159 | 0 | 1,217 | 40,463 | 39,003 | 4,005 | 799,306 |
| 39 | Miscellaneous | 360,878 | 503 | 58,124 | 2,154 | 97,121 | 10,500 | 818,874 |
| | Multiple codes 20-39 | 14,763,548 | 82,512 | 1,206,469 | 796,490 | 142,149 | 65,072 | 25,444,493 |
| | No codes 20-39 | 174,746 | 1,437 | 1,544 | 28,473 | 83,976 | 88,458 | 457,907 |
| | Total | 251,854,306 | 1,264,484 | 10,314,727 | 11,994,251 | 7,377,734 | 4,601,113 | 461,098,829 |
| | Federal Facilities | 120,750 | 1,437 | 1,544 | 8,304 | 85,275 | 57,595 | 336,688 |

Note: Off-site Releases from Section 6 (off-site transfers to disposal) of Form R. Off-site Releases include metals and metal compounds transferred off-site for solidification/stabilization and for wastewater treatment, including to POTWs.

^e“Unknown” (disposal code M99) indicates that a facility is not aware of the type of waste management used for the toxic chemical that is sent off-site. Amounts reported as “unknown” transfers are treated as a form of disposal (off-site release).

of the sector’s on-site land releases consisted of “other disposal” (105.1 million pounds, including 55.3 million pounds of zinc compounds and 25.1 million pounds of copper compounds). Among other on-site release types, the primary metals industry’s largest reported amount consisted of point source air emissions of 59.6 million pounds of chlorine.

The paper products sector ranked third for on-site releases with 228.8 million pounds, principally in air emissions (193.8 million pounds). This included point source emissions of 100.3 million pounds of methanol.

Off-site Releases

TRI facilities reported 461.1 million pounds of off-site releases (transfers to disposal) in 1997, also shown in Table 4-2. As explained in Chapter 2, these releases include transfers of metals to solidification/stabilization, to wastewater treatment (excluding POTWs), and to POTWs. Table 4-3 further examines off-site releases by industry in 1997.

The primary metals industry reported off-site releases totaling 288.7 million pounds, nearly one third (62.6%) of the total. This amount included 146.7 million pounds of listed TRI chemicals, primarily metals, transferred to landfills/disposal surface impoundments and 120.3 million pounds of metals

Table 4-4. Quantities of TRI Chemicals in Waste Managed, by Industry, 1997

| SIC Code | Industry | Recycled | | Energy Recovery | | Treated | | Quantity Released On- and Off-site Pounds | Total Production-related Waste Pounds | Non-Production-related Waste Pounds |
|----------|------------------------|----------------|-----------------|-----------------|-----------------|----------------|-----------------|---|---------------------------------------|-------------------------------------|
| | | On-site Pounds | Off-site Pounds | On-site Pounds | Off-site Pounds | On-site Pounds | Off-site Pounds | | | |
| 20 | Food | 325,729,480 | 5,335,875 | 95,061 | 602,320 | 78,147,090 | 27,851,681 | 93,471,906 | 531,233,413 | 388,615 |
| 21 | Tobacco | 0 | 93,600 | 0 | 0 | 1,445,850 | 325,178 | 4,304,637 | 6,169,265 | 14,000 |
| 22 | Textiles | 20,764,425 | 1,074,991 | 5,698,061 | 2,813,353 | 14,945,016 | 4,935,053 | 19,338,518 | 69,569,417 | 34,648 |
| 23 | Apparel | 214,617 | 46,495 | 0 | 180,551 | 622,967 | 10,033 | 894,652 | 1,969,315 | 2 |
| 24 | Lumber | 70,340,861 | 1,184,716 | 1,526,362 | 2,630,514 | 870,838,105 | 697,659 | 28,655,168 | 975,873,385 | 823,954 |
| 25 | Furniture | 3,828,213 | 5,923,061 | 88,403 | 4,836,849 | 994,000 | 685,246 | 24,573,888 | 40,929,660 | 2,829 |
| 26 | Paper | 111,023,736 | 2,807,269 | 184,583,363 | 7,567,597 | 921,427,552 | 53,404,981 | 231,816,069 | 1,512,630,567 | 143,175 |
| 27 | Printing | 180,197,708 | 5,737,458 | 191,438 | 3,969,378 | 74,494,504 | 541,655 | 22,828,260 | 287,960,401 | 14,644 |
| 28 | Chemicals ^a | 4,564,908,831 | 231,777,236 | 1,711,463,218 | 374,160,776 | 3,421,351,732 | 294,683,871 | 769,274,353 | 11,367,620,017 | 14,387,065 |
| 29 | Petroleum ^b | 92,280,999 | 22,384,373 | 1,169,379,271 | 1,301,874 | 270,655,896 | 6,814,494 | 68,647,345 | 1,631,464,252 | 493,511 |
| 30 | Plastics | 98,331,322 | 15,205,892 | 19,733,069 | 7,766,282 | 34,557,194 | 6,955,267 | 108,195,710 | 290,744,736 | 192,504 |
| 31 | Leather | 1,137,241 | 302,430 | 0 | 72,541 | 3,561,061 | 877,610 | 4,910,980 | 10,861,863 | 0 |
| 32 | Stone/Clay/Glass | 126,959,736 | 3,857,490 | 547,756,945 | 11,106,216 | 17,077,405 | 3,490,715 | 40,066,966 | 750,315,473 | 1,414,178 |
| 33 | Primary Metals | 1,482,591,924 | 989,915,832 | 66,458,149 | 10,516,299 | 497,544,711 | 48,615,436 | 634,712,628 | 3,730,354,979 | 16,247,801 |
| 34 | Fabricated Metals | 187,808,828 | 352,920,026 | 15,569,010 | 13,567,667 | 112,630,939 | 15,164,130 | 83,138,228 | 780,798,828 | 355,969 |
| 35 | Machinery | 42,649,677 | 71,704,447 | 209,714 | 2,817,777 | 11,507,462 | 5,778,959 | 21,018,701 | 155,686,737 | 358,584 |
| 36 | Electrical Equip. | 134,986,711 | 341,191,944 | 12,344,827 | 7,939,447 | 81,364,321 | 17,064,501 | 33,925,319 | 628,817,070 | 1,024,851 |
| 37 | Transportation Equip. | 20,778,948 | 142,693,618 | 1,250,526 | 12,641,076 | 33,878,678 | 14,561,569 | 101,141,024 | 326,945,439 | 41,013 |
| 38 | Measure./Photo. | 2,860,670 | 10,627,777 | 794,000 | 1,470,647 | 45,345,819 | 3,056,387 | 13,320,353 | 77,475,653 | 2,054 |
| 39 | Miscellaneous | 11,094,491 | 15,245,255 | 3,860,960 | 3,192,911 | 5,192,715 | 1,213,492 | 10,445,676 | 50,245,500 | 31,510 |
| | Multiple codes 20-39 | 505,797,365 | 139,179,326 | 56,435,534 | 18,445,154 | 504,095,681 | 28,049,867 | 132,397,358 | 1,384,400,285 | 1,364,278 |
| | No codes 20-39 | 2,333,139 | 31,578,768 | 8,354,297 | 38,010,835 | 11,243,815 | 1,243,554 | 20,566,082 | 113,330,490 | 426,002 |
| | Total ^c | 7,986,618,922 | 2,390,787,879 | 3,805,792,208 | 525,610,064 | 7,012,922,513 | 536,021,338 | 2,467,643,821 | 24,725,396,745 | 37,761,187 |
| | Federal Facilities | 17,036,914 | 15,434,909 | 7,085 | 220,954 | 5,604,834 | 716,542 | 6,455,020 | 45,476,258 | 366,371 |

Note: Data from Section 8 of Form R. Forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple" category. Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes 20-39" category.

^aOne facility in SIC code 28, Shell Chemical Co. in Geismar, LA, reported on-site energy recovery of 193,830,000 pounds of ethylene in 1997. The facility has since revised this quantity to 13,000,000 pounds. In SIC code 28, Chemicals, on-site energy recovery changes to 1,530,633,218 pounds and total production-related waste changes to 11,186,790,017 pounds.

^bOne facility in SIC code 29, TPI Petroleum in Ardmore, OK, reported on-site energy recovery of 422,000,000 pounds of ethylene and 272,000,000 pounds of propylene in 1997. The facility has since revised these quantities to zero. In SIC code 29, Petroleum, on-site energy recovery changes to 475,379,271 pounds and total production-related waste changes to 937,464,252 pounds.

^cRevisions by two facilities (in SIC codes 28 and 29, respectively) change on-site energy recovery to 2,930,962,208 pounds and total production-related waste to 23,850,566,745 pounds.

and metal compounds transferred to solidification/stabilization. These two types of transfers constituted 92.5% of all off-site releases reported by the primary metals industry. The industry reported transferring 70.6 million pounds of zinc compounds and 22.3 million pounds of zinc (fume or dust) to solidification/stabilization. Zinc compounds was also the chemical with the primary metals industry's largest transfers to landfills/disposal surface impoundments—75.3 million pounds.

The chemical manufacturing industry ranked second for off-site releases in 1997, reporting 54.8 million pounds. This amount represented 11.9% of the total for all industries. The chemical manufacturing industry's largest off-site releases were transfers of 8.9 million pounds of manganese compounds and 3.9 million pounds of lead compounds to landfills/disposal surface impoundments.

Two other industry groups reported more than 25 million pounds each: fabricated metals with 29.2 million pounds (6.3% of the total) and the multiple-codes group with 25.4 million pounds (5.5%).

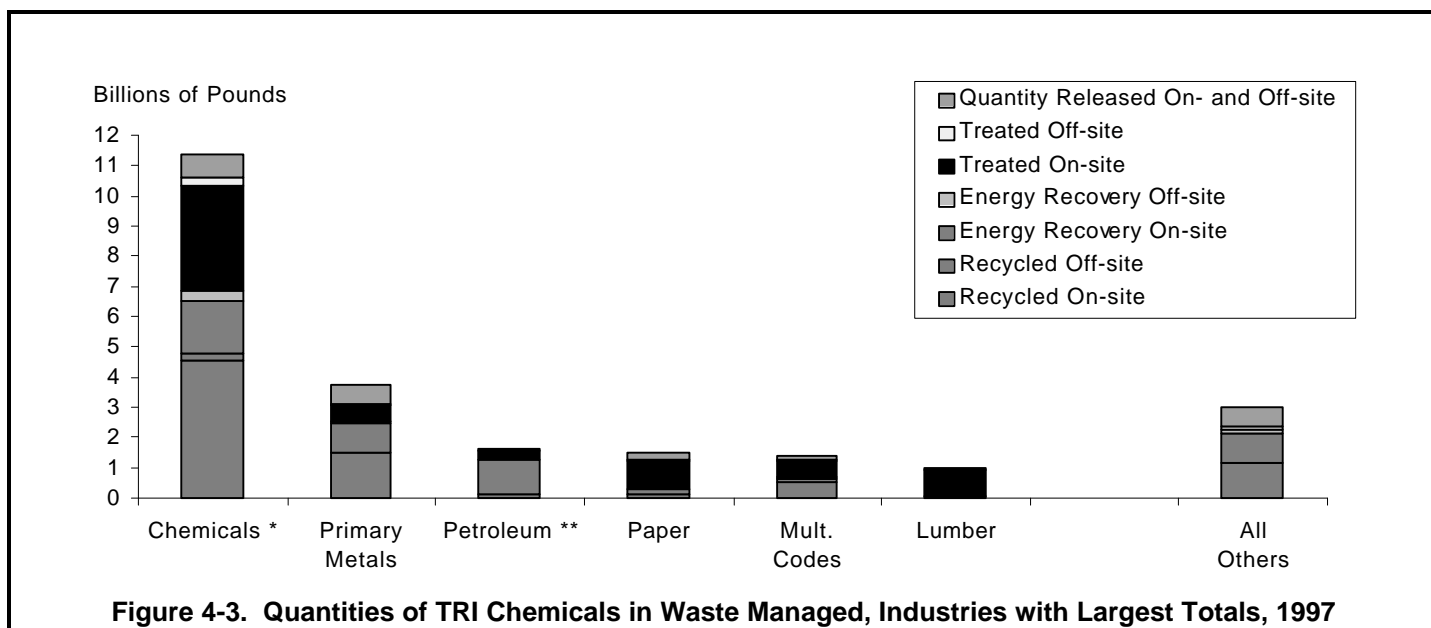


Figure 4-3. Quantities of TRI Chemicals in Waste Managed, Industries with Largest Totals, 1997

Note: Data from Section 8 of Form R. Forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple" category.

*One facility, Shell Chemical Co. in Geismar, LA, reported on-site energy recovery of 193,830,000 pounds of ethylene in 1997. The facility has since revised this quantity to 13,000,000 pounds. The rank of Chemicals (SIC code 28) remains unchanged.

**One facility, TPI Petroleum in Ardmore, OK, reported on-site energy recovery of 422,000,000 pounds of ethylene and 272,000,000 pounds of propylene in 1997. The facility has since revised these quantities to zero. Petroleum (SIC code 29) changes in rank from third to sixth.

In both industries, the largest type of transfer was to landfills/disposal surface impoundments: 17.3 million pounds in the fabricated metals industry and 14.8 million pounds on forms reporting multiple SIC codes.

TRI Chemicals Managed in Waste, 1997

Facilities reported managing a total of 24.73 billion pounds of TRI chemicals in waste in 1997, as shown in Table 4-4. Figure 4-3 shows production-related waste reported by the industries with the largest totals. However, two facilities made substantial revisions in reporting of on-site energy recovery after the TRI database was "frozen" for preparation of this report. One facility in SIC code 28 (the chemical manufacturing industry) reported 193.8 million pounds of on-site energy recovery of ethylene in 1997, but subsequently revised this quantity to 13.0 million pounds. A facility in SIC code 29 (the petroleum

industry) reported on-site energy recovery of 422.0 million pounds of ethylene and 272.0 million pounds of propylene in 1997. This facility has revised both quantities to zero. Taking these revisions into account, production-related waste managed would total 23.85 billion pounds in 1997.

The chemical manufacturing industry reported managing 11.37 billion pounds of total production-related waste in 1997. With the facility revision for on-site energy recovery of ethylene, the chemical manufacturing industry's total would change to 11.19 billion pounds, still the largest among all industries. The chemical manufacturing industry reported the largest quantities in all waste management categories except off-site recycling. Just over 40% of the chemical manufacturing industry's production-related waste was recycled on-site (4.56 billion pounds), and



approximately 30% was treated on-site (3.42 billion pounds). The revised report by one facility would change the on-site energy recovery total from 1.71 billion pounds to 1.53 billion pounds (approximately 14% of the total).

The primary metals industry ranked second for total production-related waste managed with 3.73 billion pounds (15.1% of the total). On-site recycling accounted for the largest portion of this total, with 1.48 billion pounds (second among all industries behind chemical manufacturing). The primary metals industry reported the largest quantity of off-site recycling (989.9 million pounds). It also reported the second-largest quantity released on- and off-site (634.7 million pounds).

The petroleum industry reported 1.63 billion pounds of production-related waste, third among all industries. The bulk of the petroleum industry's reporting consisted of 1.17 billion pounds of on-site energy recovery. However, as noted earlier, one facility in the petroleum industry reported 694.0 million pounds of on-site energy recovery of ethylene and propylene, but has since revised its forms to zero on-site energy recovery for these chemicals. Taking into account the revisions, the petroleum industry's on-site energy recovery would total 475.4 million pounds and its production-related waste would total 937.5 million pounds. With the revisions, the petroleum industry would rank sixth for total production-related waste managed in 1997.

The paper products industry reported 1.51 billion pounds of production-related waste managed. The majority of the paper products industry's reporting consisted of 921.4 million pounds of on-site treatment, the second-largest quantity reported for on-site treatment.

Production-related waste exceeded 1 billion pounds in one other industry group: the multiple-codes group reported 1.38 billion pounds. On these reporting

forms, on-site recycling totaled 505.8 million pounds and on-site treatment totaled 504.1 million pounds, the largest waste management quantities in the multiple-codes group.

Economic Overview, by Industry, 1997

Although TRI data present significant information about toxic chemicals that are released on- and off-site, managed in waste on- and off-site, and transferred off-site for further waste management, they also have limitations. Chapter 1 discusses some of these. One such limitation is that TRI data alone do not distinguish industry-specific factors that influence the chemicals, amounts, and types of releases and other waste management facilities report. Table 4-5 presents two basic economic measures (employment and dollar value of sales, receipts, or shipments) that suggest the relative size of the industrial sectors that report to TRI (additional sectors will begin reporting in 1999 for the 1998 reporting year). Economic analyses make use of data on the value of production (sales, receipts, or shipments) as one way to indicate the size of industrial sectors, because no direct comparison can be drawn among products of the sectors. This value provides a rough common measure between, say, production of 10,000 pairs of shoes and production of 500,000 loaves of bread.

Table 4-5 also includes total production-related waste managed that TRI facilities reported for 1997, to allow approximate comparisons with the economic activity of the industry sectors. Percentages indicate the relative contribution of each industry to total employment and production and to the total quantity of TRI chemicals in production-related waste managed. The ratio of total production-related waste managed to production value (sales, receipts, or shipments), in the last column, compares the reported TRI quantities for each industry with that industry's production level for 1997. Many factors influence the differences in TRI reporting among industries.



Table 4-5. Employees, Sales, and Total Production-related Waste, by Industry, 1997

| SIC Code | Industry | Paid Employees | | Sales, Receipts, or Shipments | | TRI Total Production-related Waste Managed | | Production-related Waste Managed per Sales, Receipts, or Shipments | |
|----------|------------------------|----------------|---------|-------------------------------|---------|--|---------|--|--------|
| | | Number | Percent | (\$000) | Percent | Pounds | Percent | Pounds per \$1,000,000 | |
| | | | | | | | | | |
| 20 | Food | 1,567,155 | 8.9 | 480,299,707 | 12.1 | 531,233,413 | 2.3 | | 1,106 |
| 21 | Tobacco | 34,464 | 0.2 | 36,328,974 | 0.9 | 6,169,265 | 0.0 | | 170 |
| 22 | Textiles | 557,775 | 3.2 | 82,763,179 | 2.1 | 69,569,417 | 0.3 | | 841 |
| 23 | Apparel | 840,498 | 4.8 | 81,023,419 | 2.0 | 1,969,315 | 0.0 | | 24 |
| 24 | Lumber | 756,934 | 4.3 | 111,444,879 | 2.8 | 975,873,385 | 4.2 | | 8,757 |
| 25 | Furniture | 522,893 | 3.0 | 62,388,884 | 1.6 | 40,929,660 | 0.2 | | 656 |
| 26 | Paper | 623,799 | 3.5 | 159,954,824 | 4.0 | 1,512,630,567 | 6.5 | | 9,457 |
| 27 | Printing | 1,519,824 | 8.6 | 206,396,046 | 5.2 | 287,960,401 | 1.2 | | 1,395 |
| 28 | Chemicals ^a | 843,469 | 4.8 | 404,400,164 | 10.2 | 11,367,620,017 | 48.9 | | 28,110 |
| 29 | Petroleum ^b | 106,863 | 0.6 | 173,414,651 | 4.4 | 1,631,464,252 | 7.0 | | 9,408 |
| 30 | Plastics | 1,031,202 | 5.8 | 159,079,133 | 4.0 | 290,744,736 | 1.3 | | 1,828 |
| 31 | Leather | 84,002 | 0.5 | 9,940,805 | 0.3 | 10,861,863 | 0.0 | | 1,093 |
| 32 | Stone/Clay/Glass | 509,730 | 2.9 | 88,312,387 | 2.2 | 750,315,473 | 3.2 | | 8,496 |
| 33 | Primary Metals | 692,943 | 3.9 | 192,924,973 | 4.9 | 3,730,354,979 | 16.1 | | 19,336 |
| 34 | Fabricated Metals | 1,555,670 | 8.8 | 233,701,166 | 5.9 | 780,798,828 | 3.4 | | 3,341 |
| 35 | Machinery | 2,001,684 | 11.4 | 407,720,628 | 10.3 | 155,686,737 | 0.7 | | 382 |
| 36 | Electrical Equip. | 1,573,893 | 8.9 | 345,490,897 | 8.7 | 628,817,070 | 2.7 | | 1,820 |
| 37 | Transportation Equip. | 1,587,091 | 9.0 | 520,505,442 | 13.1 | 326,945,439 | 1.4 | | 628 |
| 38 | Measure./Photo. | 832,432 | 4.7 | 157,938,963 | 4.0 | 77,475,653 | 0.3 | | 491 |
| 39 | Miscellaneous | 391,656 | 2.2 | 50,759,871 | 1.3 | 50,245,500 | 0.2 | | 990 |
| | Total ^c | 17,633,977 | 100.0 | 3,964,788,992 | 100.0 | 23,227,665,970 | 100.0 | | 5,858 |

Note: Paid Employees and Sales, Receipts or Shipments from U.S. Census Bureau, *1997 Annual Survey of Manufactures*: <http://www.census.gov/epcd/www/advanc2b.htm> [accessed March 26, 1999]. These data are preliminary and are subject to change; Includes only establishments with payroll. Data are in current dollars and have not been adjusted for inflation. **Total Production-related Waste Managed** from Section 8 (total of 8.1 through 8.7, Column B) of TRI Form for 1997. **Total Production-related Waste Managed** in this table does not include forms reporting more than one 2-digit SIC code and forms reporting SIC codes outside the 20-39 range. ^aOne facility in SIC code 28, Shell Chemical Co. in Geismar, LA, reported on-site energy recovery of 193,830,000 pounds of ethylene in 1997. The facility has since revised this quantity to 13,000,000 pounds. In SIC code 28, Chemicals, total production-related waste changes to 11,186,790,017 pounds. Production-related waste managed in SIC code 28 as a percentage of TRI total production-related waste changes to 50.0%. The ratio of production-related waste to sales, receipts, or shipments changes to 27,663 pounds per \$1,000,000. ^bOne facility in SIC code 29, TPI Petroleum in Ardmore, OK, reported on-site energy recovery of 422,000,000 pounds of ethylene and 272,000,000 pounds of propylene in 1997. The facility has since revised these quantities to zero. In SIC code 29, Petroleum, total production-related waste changes to 937,464,252 pounds. Production-related waste managed in SIC code 28 as a percentage of TRI total production-related waste changes to 4.2%. The ratio of production-related waste to sales, receipts, or shipments changes to 5,406 pounds per \$1,000,000. ^cRevisions by two facilities (in SIC codes 28 and 29, respectively) change total production-related waste to 22,352,835,970 pounds. The ratio of production-related waste to sales, receipts, or shipments changes to 5,638 pounds per \$1,000,000.

Relating TRI quantities to the dollar value of each industry’s products takes into account one measure of the differences among industries in their level of production in 1997.

In 1997, as shown in Table 4-5, chemical manufacturing accounted for 4.8% of manufacturing employment, 10.2% of the value of manufacturing production (sales, receipts, or shipments), and 48.9% of TRI total production-related waste managed. Chemical manufacturing also had the highest ratio of production-related waste managed to production

value (sales, receipts, or shipments), 28,110 pounds per \$1 million value. Revisions by one facility, described above, would change the 1997 production-related waste managed by the chemical manufacturing industry from 11.37 billion pounds to 11.19 billion pounds; this would also change the ratio to 27,663 pounds per \$1 million. The primary metals industry had the second largest ratio of production-related waste managed to production value, with 19,336 pounds per \$1 million, and the paper industry ranked third with 9,457 pounds per \$1 million.

Year-by-Year Comparisons, by Industry

Comparisons of TRI data across reporting years are made on the basis of “core” chemicals that were reportable in all years with the same reporting definitions. This assures that apparent increases or decreases from one year to another are not the result of changes in the list of TRI chemicals. Chapter 3 explains the multi-year comparisons; an understanding of these issues is essential for accurate interpretation of the multi-year data presented in this chapter.

Progress is measured from TRI’s designated baseline year, 1988, for on-site releases and off-site transfers for treatment and disposal. These are the types that have been collected since TRI began. Additional on- and off-site waste management data, authorized under the federal Pollution Prevention Act of 1990, have been collected since 1991, the baseline year for waste management data.

On- and Off-site Releases, 1995-1997

Table 4-6 summarizes on- and off-site releases by industry for 1995, 1996, and 1997. From 1995 to 1997, total on- and off-site releases decreased from 2.62 billion pounds to 2.58 billion pounds, a reduction of 1.5%. The chemical manufacturing industry, which reported the largest total releases in all three years, also reported the largest absolute reduction, from 846.6 million pounds to 797.5 million pounds. The multiple-codes group ranked second for absolute decreases, from 158.9 million pounds in 1995 to 137.6 million pounds in 1997. The transportation equipment industry reported the third-largest absolute decrease, from 122.6 million pounds to 102.1 million pounds. In percentage terms, the chemical industry reported a 5.8% reduction, the multiple-codes group reported a 13.4% reduction, and the transportation equipment industry reported a 16.8% reduction.

The primary metals industry, which reported the second-largest total in all three years, reported the largest absolute increase in total releases from 1995 to 1997. The primary metals industry reported releases totaling 565.1 million pounds in 1995 and 694.7 million pounds in 1997. The stone, clay, and glass industry ranked second for increases (behind primary metals), increasing from 36.8 million pounds in 1995 to 43.2 million pounds in 1997. The petroleum industry ranked third, increasing from 65.5 million pounds to 69.3 million pounds. In percentage terms, these changes represented a 22.9% increase by the primary metals industry, a 17.6% increase by the stone/clay/glass industry, and a 5.8% increase by the petroleum industry.

Industries recording large percentage changes, as shown in Table 4-6, were among those reporting smaller amounts of total on- and off-site releases. The furniture industry reported the largest percentage reduction—40.8%—from 42.4 million pounds in 1995 to 25.1 million pounds in 1997. The tobacco industry showed the largest percentage increase — 113.8% — from 2.0 million pounds in 1997 to 4.3 million pounds in 1999.

On- and Off-site Releases, 1988 and 1995-1997

From 1988 to 1997, total on- and off-site releases reported to TRI decreased from 3.40 billion pounds to 1.94 billion pounds (or 42.8%), as shown in Table 4-7. All industry sectors recorded reductions in total releases of the 1988-1997 core chemicals.

The chemical manufacturing industry reported 1.06 billion pounds in 1988 and 519.1 million pounds in 1997, the largest absolute reduction among all industries. This amounted to a 50.8% reduction by the chemical manufacturing industry. The multiple-codes group ranked second for absolute decreases, declining from 311.6 million pounds to 106.2 million pounds (a 65.9% reduction).



Table 4-6. Change in Total TRI On-site and Off-site Releases, by Industry, 1995-1997

| SIC Code | Industry | Total On-site and Off-site Releases | | | | | |
|----------|-----------------------|-------------------------------------|----------------|----------------|----------------------|----------------------|----------------------|
| | | 1995 Pounds | 1996 Pounds | 1997 Pounds | Change | | |
| | | | | | 1995-1996 Percent | 1996-1997 Percent | 1995-1997 Percent |
| 20 | Food | 101,364,802 | 92,316,738 | 93,568,490 | -8.9 | 1.4 | -7.7 |
| 21 | Tobacco | 2,034,129 | 4,238,197 | 4,349,614 | 108.4 | 2.6 | 113.8 |
| 22 | Textiles | 18,957,518 | 17,311,767 | 19,436,259 | -8.7 | 12.3 | 2.5 |
| 23 | Apparel | 1,287,784 | 1,315,708 | 904,532 | 2.2 | -31.3 | -29.8 |
| 24 | Lumber | 36,137,541 | 37,824,484 | 29,659,423 | 4.7 | -21.6 | -17.9 |
| 25 | Furniture | 42,425,566 | 36,049,016 | 25,113,916 | -15.0 | -30.3 | -40.8 |
| 26 | Paper | 239,262,595 | 229,049,021 | 233,530,384 | -4.3 | 2.0 | -2.4 |
| 27 | Printing | 31,227,811 | 27,329,846 | 24,643,778 | -12.5 | -9.8 | -21.1 |
| 28 | Chemicals | 846,556,455 | 791,685,362 | 797,496,810 | -6.5 | 0.7 | -5.8 |
| 29 | Petroleum | 65,514,109 | 68,977,064 | 69,323,451 | 5.3 | 0.5 | 5.8 |
| 30 | Plastics | 126,870,284 | 116,914,866 | 108,465,623 | -7.8 | -7.2 | -14.5 |
| 31 | Leather | 4,840,614 | 4,682,977 | 4,733,944 | -3.3 | 1.1 | -2.2 |
| 32 | Stone/Clay/Glass | 36,767,489 | 44,140,512 | 43,221,351 | 20.1 | -2.1 | 17.6 |
| 33 | Primary Metals | 565,057,273 | 620,016,346 | 694,662,087 | 9.7 | 12.0 | 22.9 |
| 34 | Fabricated Metals | 101,212,292 | 94,398,028 | 95,536,645 | -6.7 | 1.2 | -5.6 |
| 35 | Machinery | 27,174,238 | 23,299,740 | 22,401,312 | -14.3 | -3.9 | -17.6 |
| 36 | Electrical Equip. | 41,850,172 | 37,083,648 | 34,144,970 | -11.4 | -7.9 | -18.4 |
| 37 | Transportation Equip. | 122,648,556 | 107,706,539 | 102,057,628 | -12.2 | -5.2 | -16.8 |
| 38 | Measure./Photo. | 17,728,562 | 15,559,901 | 13,241,886 | -12.2 | -14.9 | -25.3 |
| 39 | Miscellaneous | 13,937,669 | 10,491,612 | 10,242,459 | -24.7 | -2.4 | -26.5 |
| | Multiple codes 20-39 | 158,921,133 | 125,642,654 | 137,621,890 | -20.9 | 9.5 | -13.4 |
| | No codes 20-39 | 14,586,113 | 15,416,790 | 13,196,632 | 5.7 | -14.4 | -9.5 |
| | Total | 2,616,362,705 | 2,521,450,816 | 2,577,553,084 | -3.6 | 2.2 | -1.5 |
| | Federal Facilities | 9,457,198 | 7,515,476 | 6,573,345 | -20.5 | -12.5 | -30.5 |

Note: On-site Releases from Section 5 of Form R. Off-site Releases are from Section 6 (transfers off-site to disposal) of Form R. Off-site Releases include metals and metal compounds transferred off-site for solidification/stabilization and for wastewater treatment, including to POTWs. Forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple" category. Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes 20-39" category.

Two other industries reported decreases of more than 100 million pounds each: The transportation equipment industry reported the third-largest decrease, from 215.0 million pounds to 96.8 million pounds, and the electrical equipment industry reported the fourth-largest decrease, from 134.0 million pounds to 26.2 million pounds. In percentage terms, the transportation equipment industry's total on- and off-site releases decreased 55.0% and the electrical equipment industry's total decreased 80.5%, which was the second largest percentage reduction. The largest percentage reduction (85.7%) was reported in the measuring instruments and photographic equipment industry, which reported 55.8 million pounds in 1988 and 8.0 million pounds in 1997.

TRI Chemicals Managed in Waste, 1991, 1995, 1997-1999

Projected Quantities of TRI Chemicals Managed in Waste, 1997-1999

TRI facilities projected a 1.2% decrease from 24.73 billion pounds of total production-related waste managed in 1997 to 24.43 billion pounds in 1999, as shown in Table 4-8. Revisions by two facilities, previously described, would change these totals to 23.85 billion pounds in 1997 and 23.47 billion pounds projected for 1999, and the percentage change projected for 1997 to 1999 would be a 1.6% reduction. (As described in Chapter 2, on each Form R that it submits, a facility reports actual waste management quantities for the current and prior years and projected quantities for the next two years.)

Table 4-7. Change in Total TRI On-site and Off-site Releases, by Industry, 1988 and 1995-1997

| SIC Code | Industry | Total On and Off-site Releases | | | | | Change | |
|----------|-----------------------|--------------------------------|---------------|---------------|---------------|-----------|-----------|--|
| | | 1988 | 1995 | 1996 | 1997 | 1995-1997 | 1988-1997 | |
| | | Pounds | Pounds | Pounds | Pounds | Percent | Percent | |
| 20 | Food | 8,414,635 | 5,224,392 | 5,187,430 | 5,213,000 | -0.2 | -38.0 | |
| 21 | Tobacco | 251,946 | 95,226 | 73,425 | 196,961 | 106.8 | -21.8 | |
| 22 | Textiles | 36,875,477 | 16,021,698 | 15,150,985 | 16,941,074 | 5.7 | -54.1 | |
| 23 | Apparel | 1,048,961 | 1,260,746 | 1,195,289 | 817,329 | -35.2 | -22.1 | |
| 24 | Lumber | 33,056,013 | 31,542,259 | 28,379,176 | 25,091,620 | -20.5 | -24.1 | |
| 25 | Furniture | 62,412,288 | 42,164,977 | 35,799,613 | 24,892,695 | -41.0 | -60.1 | |
| 26 | Paper | 207,840,633 | 179,640,320 | 174,420,174 | 181,559,981 | 1.1 | -12.6 | |
| 27 | Printing | 61,234,598 | 30,967,327 | 27,157,182 | 24,484,493 | -20.9 | -60.0 | |
| 28 | Chemicals | 1,055,611,740 | 546,643,304 | 517,845,766 | 519,129,158 | -5.0 | -50.8 | |
| 29 | Petroleum | 73,096,751 | 42,990,233 | 43,893,116 | 42,850,660 | -0.3 | -41.4 | |
| 30 | Plastics | 158,575,935 | 113,412,580 | 104,656,280 | 95,304,534 | -16.0 | -39.9 | |
| 31 | Leather | 13,699,921 | 4,407,246 | 4,253,859 | 4,208,084 | -4.5 | -69.3 | |
| 32 | Stone/Clay/Glass | 38,754,943 | 21,956,660 | 27,142,848 | 27,586,607 | 25.6 | -28.8 | |
| 33 | Primary Metals | 649,920,076 | 495,602,763 | 552,228,867 | 616,157,848 | 24.3 | -5.2 | |
| 34 | Fabricated Metals | 163,833,118 | 94,584,794 | 81,869,409 | 81,172,054 | -14.2 | -50.5 | |
| 35 | Machinery | 70,744,411 | 23,610,134 | 20,054,081 | 19,121,806 | -19.0 | -73.0 | |
| 36 | Electrical Equip. | 134,042,669 | 31,872,667 | 28,434,289 | 26,158,202 | -17.9 | -80.5 | |
| 37 | Transportation Equip. | 215,000,245 | 116,336,180 | 101,585,633 | 96,806,810 | -16.8 | -55.0 | |
| 38 | Measure./Photo. | 55,792,611 | 12,861,302 | 10,439,046 | 7,986,611 | -37.9 | -85.7 | |
| 39 | Miscellaneous | 32,750,257 | 13,354,606 | 10,064,702 | 9,804,514 | -26.6 | -70.1 | |
| | Multiple codes 20-39 | 311,613,892 | 128,408,482 | 95,540,801 | 106,195,233 | -17.3 | -65.9 | |
| | No codes 20-39 | 11,295,569 | 11,968,348 | 12,013,614 | 10,190,873 | -14.9 | -9.8 | |
| | Total | 3,395,866,689 | 1,964,926,244 | 1,897,385,585 | 1,941,870,147 | -1.2 | -42.8 | |
| | Federal Facilities | NA | 6,730,862 | 4,948,596 | 3,707,932 | -44.9 | NA | |

Note: On-site Releases from Section 5 of Form R. Off-site Releases are from Section 6 (transfers off-site to disposal) of Form R. Off-site Releases include metals and metal compounds transferred off-site for solidification/stabilization and for wastewater treatment, including to POTWs. Forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple" category. Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes 20-39" category. NA: Federal Facilities not required to report before 1994.

The chemical manufacturing industry, reporting 11.37 billion pounds of production-related waste in 1997, projected the largest absolute reduction. By 1999, the chemical manufacturing industry expected to manage 11.13 billion pounds of production-related waste, a 2.1% decrease. Although one facility in SIC code 28 revised its submission for ethylene after data were “frozen” for preparation of this report, as mentioned earlier in this chapter, the change would not affect the chemical manufacturing industry’s rank. The revised totals would be 11.19 billion pounds in 1997 and 10.93 billion pounds projected for 1999, a projected reduction of 2.3%.

The lumber industry projected the second-largest absolute reduction, from 975.9 million pounds in 1997 to 859.4 million pounds in 1999. The multiple-codes group ranked third with a projected decrease from 1.38 billion pounds to 1.34 billion pounds, and the

plastics industry ranked fourth, projecting a decrease from 290.7 million pounds to 250.2 million pounds. These represented projected reductions of 11.9% by the lumber industry, 3.1% by the multiple-codes group, and 13.9% by the plastics industry.

The food industry projected the largest absolute increase in production-related waste managed, from 531.2 million pounds in 1997 to 604.1 million pounds in 1999; this was also the largest projected percentage increase, 13.7%. The petroleum industry projected an increase from 1.63 billion pounds to 1.69 billion pounds, but this included projected increases by the facility that has since revised its 1997 submissions for ethylene and propylene, described earlier in this chapter. When this facility’s revisions are taken into account, the petroleum industry’s projection for production-related waste changes to a reduction from 937.5 million pounds in 1997 to 924.6 million pounds



Table 4-8. Actual and Projected Total Production-related Waste Managed, by Industry, 1997-1999

| SIC Code | Industry | Total Production-related Waste Managed | | | | |
|----------|------------------------|--|----------------|----------------|----------------------|----------------------|
| | | Current Year | Projected | | Change | |
| | | 1997 Pounds | 1998 Pounds | 1999 Pounds | 1997-1998 Percent | 1997-1999 Percent |
| 20 | Food | 531,233,413 | 606,170,821 | 604,063,414 | 14.1 | 13.7 |
| 21 | Tobacco | 6,169,265 | 6,064,073 | 6,319,100 | -1.7 | 2.4 |
| 22 | Textiles | 69,569,417 | 59,358,694 | 55,923,836 | -14.7 | -19.6 |
| 23 | Apparel | 1,969,315 | 1,523,946 | 1,473,373 | -22.6 | -25.2 |
| 24 | Lumber | 975,873,385 | 859,058,730 | 859,372,040 | -12.0 | -11.9 |
| 25 | Furniture | 40,929,660 | 38,530,508 | 39,463,039 | -5.9 | -3.6 |
| 26 | Paper | 1,512,630,567 | 1,630,911,269 | 1,523,721,674 | 7.8 | 0.7 |
| 27 | Printing | 287,960,401 | 264,926,907 | 287,564,112 | -8.0 | -0.1 |
| 28 | Chemicals ^a | 11,367,620,017 | 11,118,034,397 | 11,128,459,345 | -2.2 | -2.1 |
| 29 | Petroleum ^b | 1,631,464,252 | 1,648,150,884 | 1,689,749,139 | 1.0 | 3.6 |
| 30 | Plastics | 290,744,736 | 244,205,499 | 250,243,444 | -16.0 | -13.9 |
| 31 | Leather | 10,861,863 | 11,818,920 | 12,182,239 | 8.8 | 12.2 |
| 32 | Stone/Clay/Glass | 750,315,473 | 748,713,163 | 784,983,639 | -0.2 | 4.6 |
| 33 | Primary Metals | 3,730,354,979 | 3,688,078,922 | 3,765,018,476 | -1.1 | 0.9 |
| 34 | Fabricated Metals | 780,798,828 | 758,735,579 | 753,476,794 | -2.8 | -3.5 |
| 35 | Machinery | 155,686,737 | 128,185,417 | 126,039,857 | -17.7 | -19.0 |
| 36 | Electrical Equip. | 628,817,070 | 631,803,904 | 653,656,735 | 0.5 | 4.0 |
| 37 | Transportation Equip. | 326,945,439 | 316,804,714 | 317,835,153 | -3.1 | -2.8 |
| 38 | Measure./Photo. | 77,475,653 | 74,807,650 | 74,320,838 | -3.4 | -4.1 |
| 39 | Miscellaneous | 50,245,500 | 50,097,903 | 50,382,248 | -0.3 | 0.3 |
| | Multiple codes 20-39 | 1,384,400,285 | 1,342,335,171 | 1,341,753,393 | -3.0 | -3.1 |
| | No codes 20-39 | 113,330,490 | 104,317,439 | 107,398,674 | -8.0 | -5.2 |
| | Total ^c | 24,725,396,745 | 24,332,634,510 | 24,433,400,562 | -1.6 | -1.2 |
| | Federal Facilities | 45,476,258 | 43,598,666 | 43,830,639 | -4.1 | -3.6 |

Note: Data from Section 8 (Total of 8.1 through 8.7) of Form R for 1997. Current year is Column B, 1998 is Column C and 1999 is Column D. Forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple" category. Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes 20-39" category.

^aOne facility in SIC code 28, Shell Chemical Co. in Geismar, LA, reported on-site energy recovery for ethylene of 193,830,000 pounds in 1997 and projected 213,213,000 pounds for both 1998 and 1999. The facility has since revised these quantities to 13,000,000 pounds each. In SIC code 28, Chemicals, total production-related waste changes to 11,186,790,017 pounds in 1997, to 10,917,821,397 projected for 1998, and to 10,928,246,345 projected for 1999. In SIC code 28, the percentage change in total production-related waste changes to -2.4% for 1997-1998 and to -2.3% for 1997-1999.

^bOne facility in SIC code 29, TPI Petroleum in Ardmore, OK, reported on-site energy recovery for ethylene of 422,000,000 pounds in 1997 and projected 443,100,000 pounds for 1998 and 465,255,000 pounds for 1999. This facility also reported on-site energy recovery for propylene of 272,000,000 pounds in 1997 and projected 285,600,000 pounds for 1998 and 299,880,000 pounds for 1999. The facility has since revised these quantities to zero. In SIC code 29, Petroleum, total production-related waste changes to 937,464,252 pounds in 1997, to 919,450,884 pounds projected for 1998, and to 924,614,139 pounds projected for 1999. In SIC code 29, the percentage change in total production-related waste changes to -1.9% projected for 1997-1998 and to -1.4% projected for 1997-1999.

^cRevisions by two facilities (in SIC codes 28 and 29, respectively) change total production-related waste managed to 23,850,566,745 pounds in 1997, to 23,403,721,510 projected pounds for 1998, and to 23,468,052,562 pounds projected for 1999. The percentage change in total production-related waste changes to -1.9% for 1997-1998 and to -1.6% for 1997-1999.

in 1999 (a 1.4% projected reduction). With these revisions, the petroleum industry would have the eighth-largest decrease rather than the second-largest increase.

The stone, clay, and glass industry and the primary metals industry projected the next largest absolute increases. In the stone, clay, and glass industry, facilities projected an increase in production-related waste managed from 750.3 million pounds in 1997 to 785.0 million pounds in 1999. In the primary metals industry, the projected increase was from 3.73 billion

pounds in 1997 to 3.77 billion pounds in 1999. In percentage terms, these represented projected increases of 4.6% and 0.9%, respectively. Industries projecting large percentage reductions, as shown in Table 4-8, were among those with generally smaller quantities for total production-related waste. The apparel industry projected the largest relative decrease—25.2% (from 2.0 million pounds in 1995 to 1.5 million pounds in 1997), followed by the textiles industry with a projected decrease of 19.6% (from 69.6 million pounds to 55.9 million pounds).



Quantities of TRI Chemicals in Waste, 1995-1997

As shown in Table 4-9, facilities reported managing 27.49 billion pounds of production-related waste in 1995 and 24.73 billion pounds in 1997. However, facility errors and revisions would substantially change these totals. As noted above, two facilities revised their submissions after TRI data were "frozen" for preparation of this report. Another facility in the chemical manufacturing industry reported on-site recycling for vinyl chloride of 200,000 pounds in 1995 and 244,000 pounds in 1996. This facility has since revised these quantities to 200.0 million pounds and 244.0 million pounds, respectively (also revised after the TRI database was "frozen"). Furthermore, in 1995, seven food processing facilities (SIC code 20) reported on-site recycling of 500 million to 1 billion pounds each of n-hexane, a chemical added to TRI in the 1995 reporting year. Together, their 1995 on-site recycling of n-hexane totaled 4.00 billion pounds. In 1996 and 1997, these facilities reported no on-site recycling of n-hexane. TRI facilities report production-related waste quantities for both the prior year and current year (along with projections for the following two years). As noted in the *1996 TRI Data Release*¹ these facilities reported on their 1996 TRI Form Rs zero amounts of on-site recycling of n-hexane for the prior year (1995), but did not revise their 1995 submissions. Such changes generally indicate that facilities have revised their interpretation of on-site recycling. Currently, there are no TRI regulatory definitions of recycling, and facilities may use their own interpretations for purposes of reporting to TRI. Some facilities have chosen to restrict their interpretation of on-site recycling to cover a very limited set of activities. Therefore, quantities that may have been reported as amounts undergoing waste management activities in early years are not reported

on the Form R in subsequent years and are, thus, not in the TRI database. These changes in interpretations do not represent a change in guidance by EPA on how to report recycling. Because the seven food processing facilities did not revise their 1995 submissions, the large amounts of on-site recycling they reported in 1995 remain in the TRI data.

If the 4.00 billion pounds of n-hexane on-site recycling by food industry facilities are excluded from the amounts for 1995 and the facility revisions are incorporated into the data for 1996 and 1997, the totals for production-related waste managed would change to 23.59 billion pounds in 1995, 22.34 billion pounds in 1996, and 23.85 billion pounds in 1997, a 1.1% increase between 1995 and 1997 instead of the 10.0% reduction shown in Table 4-9.

While the food industry recorded the largest absolute reduction from 1995 to 1997, if the 4.00 billion pounds of n-hexane are excluded from the 1995 amounts, then the primary metals industry had the largest absolute reduction from 1995 to 1997 in total production-related waste managed. The primary metals industry reported 4.35 billion pounds of total production-related waste managed in 1995 and 3.73 billion pounds in 1997. The multiple-codes group ranked second, reporting 1.90 billion pounds in 1995 and 1.38 billion pounds in 1997. In percentage terms, these represented a 14.3% decrease by the primary metals industry and a 27.1% decrease by the multiple-codes group.

The plastics industry ranked third for absolute reductions in total production-related waste managed, with 540.5 million pounds in 1995 and 290.7 million pounds in 1997 (a 46.2% reduction). The paper industry ranked fourth, reporting 1.76 billion pounds in 1995 and 1.51 billion pounds in 1997 (a 14.0% reduction).

¹1996 Toxics Release Inventory Public Data Release-Ten Years of Right-to-Know: Industry Sector Analyses, US EPA, Office of Pollution Prevention and Toxics, EPA 745-R-98-018, December 1998.



Table 4-9. Total Production-related Waste Managed, by Industry, 1995-1997

| SIC Code | Industry | Total Production-related Waste Managed | | | | | |
|----------|------------------------|--|----------------|----------------|-----------|-----------|-----------|
| | | 1995 | 1996 | 1997 | Change | | |
| | | Pounds | Pounds | Pounds | 1995-1996 | 1996-1997 | 1995-1997 |
| | | | Percent | Percent | Percent | | |
| 20 | Food ^a | 4,096,727,212 | 373,432,121 | 531,233,413 | -90.9 | 42.3 | -87.0 |
| 21 | Tobacco | 2,871,737 | 6,007,909 | 6,169,265 | 109.2 | 2.7 | 114.8 |
| 22 | Textiles | 57,720,302 | 49,927,437 | 69,569,417 | -13.5 | 39.3 | 20.5 |
| 23 | Apparel | 2,149,244 | 2,342,159 | 1,969,315 | 9.0 | -15.9 | -8.4 |
| 24 | Lumber | 122,273,245 | 113,375,035 | 975,873,385 | -7.3 | 760.7 | 698.1 |
| 25 | Furniture | 60,529,386 | 53,148,903 | 40,929,660 | -12.2 | -23.0 | -32.4 |
| 26 | Paper | 1,759,386,960 | 1,596,811,808 | 1,512,630,567 | -9.2 | -5.3 | -14.0 |
| 27 | Printing | 294,319,163 | 265,264,493 | 287,960,401 | -9.9 | 8.6 | -2.2 |
| 28 | Chemicals ^b | 10,120,073,858 | 10,041,267,515 | 11,367,620,017 | -0.8 | 13.2 | 12.3 |
| 29 | Petroleum ^c | 1,047,153,152 | 1,141,329,979 | 1,631,464,252 | 9.0 | 42.9 | 55.8 |
| 30 | Plastics | 540,484,205 | 371,880,845 | 290,744,736 | -31.2 | -21.8 | -46.2 |
| 31 | Leather | 10,860,417 | 10,543,444 | 10,861,863 | -2.9 | 3.0 | 0.0 |
| 32 | Stone/Clay/Glass | 860,633,492 | 672,729,829 | 750,315,473 | -21.8 | 11.5 | -12.8 |
| 33 | Primary Metals | 4,352,773,017 | 3,913,992,119 | 3,730,354,979 | -10.1 | -4.7 | -14.3 |
| 34 | Fabricated Metals | 758,443,850 | 759,623,545 | 780,798,828 | 0.2 | 2.8 | 2.9 |
| 35 | Machinery | 171,365,119 | 159,147,884 | 155,686,737 | -7.1 | -2.2 | -9.1 |
| 36 | Electrical Equip. | 690,449,975 | 678,680,714 | 628,817,070 | -1.7 | -7.3 | -8.9 |
| 37 | Transportation Equip. | 408,933,268 | 364,187,802 | 326,945,439 | -10.9 | -10.2 | -20.0 |
| 38 | Measure./Photo. | 80,970,622 | 77,469,774 | 77,475,653 | -4.3 | 0.0 | -4.3 |
| 39 | Miscellaneous | 51,700,894 | 49,019,375 | 50,245,500 | -5.2 | 2.5 | -2.8 |
| | Multiple codes 20-39 | 1,899,432,059 | 1,347,935,813 | 1,384,400,285 | -29.0 | 2.7 | -27.1 |
| | No codes 20-39 | 98,104,395 | 96,362,618 | 113,330,490 | -1.8 | 17.6 | 15.5 |
| | Total ^d | 27,487,355,572 | 22,144,481,121 | 24,725,396,745 | -19.4 | 11.7 | -10.0 |
| | Federal Facilities | 44,587,407 | 41,474,566 | 45,476,258 | -7.0 | 9.6 | 2.0 |

Note: Data from Section 8 (Total of 8.1 through 8.7) of Form R of year indicated. Forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple" category. Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes 20-39" category.

^aSeven facilities in the food processing industry (SIC code 20) reported from 500 million pounds to 1 billion pounds each in on-site recycling of n-hexane in 1995, for a total 4,000,192,215 billion pounds. In 1996, these facilities reported no on-site recycling of n-hexane. On their 1996 Form Rs, these facilities also reported zero for on-site recycling of n-hexane for the prior year (1995). However, they have not revised their 1995 Form Rs. In SIC code 20, total production-related waste changes to 96,534,997 pounds in 1995. The percentage change in total production-related waste changes to 286.8% for 1995-1996, to 42.3% for 1996-1997, and to 450.3% for 1995-1997.

^bOne facility in SIC code 28, Shintech Inc. in Freeport, TX, reported on-site recycling for vinyl chloride of 200,000 pounds in 1995 and 244,000 pounds in 1996. The facility has since revised these quantities to 200,000,000 pounds in 1995 and 244,000,000 pounds in 1996. Another facility, Shell Chemical Co. in Geismar, LA, reported 193,830,000 pounds of on-site energy recovery of ethylene in 1997. The facility has since revised this quantity to 13,000,000 pounds. In SIC code 28, total production-related waste changes to 10,319,873,858 pounds in 1995, to 10,285,023,515 pounds in 1996, and to 11,186,790,017 pounds in 1997. The percentage change in total production-related waste changes to -0.3% for 1995-1996, to 8.8% for 1996-1997, and to 8.4% for 1995-1997.

^cOne facility in SIC code 29, TPI Petroleum in Ardmore, OK reported on-site energy recovery for ethylene of 82,500,000 pounds in 1995, 36,250,000 pounds in 1996, and 422,000,000 pounds in 1997. This facility also reported on-site energy recovery for propylene of 12,900,000 pounds in 1995, 16,300,000 pounds in 1996, and 272,000,000 pounds in 1997. The facility has since revised these quantities to zero. In SIC code 29, Petroleum, total production-related waste changes to 951,753,152 pounds in 1995, to 1,088,779,979 pounds in 1996, and to 937,464,252 pounds in 1997. The percentage change in total production-related waste changes to 14.4% for 1995-1996, to -13.9% for 1996-1997 and to -1.5% for 1991-1997.

^dApparent errors by seven facilities and revisions by three facilities change total production-related waste managed to 23,591,563,357 pounds in 1995, to 22,335,687,121 pounds in 1996, and to 23,850,566,745 pounds in 1997. The percentage change in total production-related waste changes to -5.3% for 1995-1996, to 6.8% for 1996-1997, and to 1.1% for 1995-1997.

The chemical manufacturing industry reported the largest absolute increase, from 10.12 billion pounds in 1995 to 11.37 billion pounds in 1997 (a 12.3% increase), as shown in Table 4-9. Facility revisions previously discussed would change the totals for the chemical manufacturing industry to 10.32 billion pounds in 1995 and 11.19 billion pounds in 1997 (an 8.4% increase), but would not alter the industry rankings.

The lumber industry reported the second-largest absolute increase in total production-related waste managed, with 122.3 million pounds in 1995 and 975.9 million pounds in 1997. This was also the largest percentage increase—698.1%. Four facilities in the lumber industry, owned by the same parent company, reported large increases in waste management, all involving creosote. Two of the facilities attributed their increases to increased production, one cited an increase in the quantity of wastewater at the facility but did not explain that change, and the fourth declined to explain its increased waste management quantities.

The largest of the facility reporting issues discussed above—on-site recycling of n-hexane reported in 1995 by seven food-processing facilities—would change the food industry’s apparent ranking as the industry with the largest absolute and relative reduction from 1995 to 1997 in total production-related waste managed. The food industry’s total production-related waste would change from 4.10 billion pounds, as shown in Table 4-9, to 96.5 million pounds in 1995, and the industry’s total would increase by 450.3% to 531.2 million pounds in 1997. This would rank as the third-largest absolute increase and the second-largest percentage increase among all industries. This increase was largely attributable to a food-processing facility that came on-line during 1996. This facility did not report for n-hexane in 1995, but reported 77.5 million pounds of on-site recycling of n-hexane in 1996 and 220.6 million pounds in 1997. The facility contact stated that the facility began operation in August 1996 and was in full operation during 1997.

Quantities of TRI Chemicals in Waste, 1991 and 1995-1997

As shown in Table 4-10, total production-related waste managed rose from 18.44 billion pounds in 1991 to 20.85 billion pounds in 1997, a 13.1% increase. Late revisions by reporting facilities, discussed above, would change these amounts. Taking these revisions into account, production-related waste managed for the 1991-1997 “core” chemicals would total 19.98 billion pounds in 1997, and the percentage increase from 1991 to 1997 would change to 8.3%. (Apparent errors in reporting of n-hexane by facilities in the food industry do not affect data presented in Table 4-10 because n-hexane was added to TRI in 1995.)

The multiple-codes group reported the largest absolute reduction from 1991 to 1997 in total production-related waste managed. These forms totaled 1.95 billion pounds of production-related waste in 1995 and 1.17 billion pounds in 1997. In percentage terms, this represented a 39.7% decrease. Although the petroleum industry appeared to have a large increase (from 1.17 billion pounds in 1991 to 1.48 billion pounds in 1997), revisions by one facility in this industry for on-site energy recovery of ethylene and propylene, noted above, would change the petroleum industry’s rank to second for absolute decreases. These revisions would change the petroleum industry’s 1997 total to 789.8 million pounds, and the percentage change from 1991 to 1997 would change from a 26.7% increase to a 32.6% decrease.

The stone, clay, and glass industry ranked third (following the multiple-codes group and the petroleum industry) for absolute decreases with 953.1 million pounds in 1991 and 717.9 million pounds in 1997. The plastics industry ranked fourth, decreasing from 457.2 million pounds to 263.0 million pounds. These represented percentage reductions of 24.7% and 42.5%, respectively.



Table 4-10. Total Production-related Waste Managed, by Industry, 1991 and 1995-1997

| SIC Code | Industry | Total Production-related Waste Managed | | | | | | |
|----------|------------------------|--|----------------|----------------|----------------|-----------|-----------|-----------|
| | | 1991 | 1995 | 1996 | 1997 | Change | | |
| | | Pounds | Pounds | Pounds | Pounds | 1996-1997 | 1995-1997 | 1991-1997 |
| | | | | | Percent | Percent | Percent | |
| 20 | Food | 63,027,707 | 71,936,694 | 70,532,406 | 70,843,378 | 0.4 | -1.5 | 12.4 |
| 21 | Tobacco | 51,405,093 | 150,596 | 108,156 | 210,791 | 94.9 | 40.0 | -99.6 |
| 22 | Textiles | 51,580,594 | 46,536,034 | 42,786,507 | 54,476,883 | 27.3 | 17.1 | 5.6 |
| 23 | Apparel | 2,340,880 | 2,118,876 | 2,165,029 | 1,770,806 | -18.2 | -16.4 | -24.4 |
| 24 | Lumber | 68,006,740 | 119,207,673 | 110,038,585 | 972,391,759 | 783.7 | 715.7 | 1,329.8 |
| 25 | Furniture | 60,883,209 | 59,813,552 | 52,392,104 | 40,256,052 | -23.2 | -32.7 | -33.9 |
| 26 | Paper | 1,401,175,507 | 1,317,592,594 | 1,325,535,955 | 1,291,608,906 | -2.6 | -2.0 | -7.8 |
| 27 | Printing | 259,904,658 | 291,280,441 | 264,220,588 | 287,090,072 | 8.7 | -1.4 | 10.5 |
| 28 | Chemicals ^a | 7,354,796,781 | 7,882,552,320 | 7,950,666,706 | 9,135,159,658 | 14.9 | 15.9 | 24.2 |
| 29 | Petroleum ^b | 1,171,403,907 | 911,968,773 | 930,689,371 | 1,483,803,949 | 59.4 | 62.7 | 26.7 |
| 30 | Plastics | 457,235,414 | 497,107,205 | 338,090,548 | 262,952,768 | -22.2 | -47.1 | -42.5 |
| 31 | Leather | 18,010,356 | 7,497,055 | 6,379,245 | 6,443,865 | 1.0 | -14.0 | -64.2 |
| 32 | Stone/Clay/Glass | 953,140,758 | 837,647,724 | 645,317,606 | 717,864,932 | 11.2 | -14.3 | -24.7 |
| 33 | Primary Metals | 2,318,851,086 | 3,420,511,273 | 3,462,785,991 | 3,365,553,638 | -2.8 | -1.6 | 45.1 |
| 34 | Fabricated Metals | 597,885,506 | 684,155,303 | 720,023,427 | 745,596,824 | 3.6 | 9.0 | 24.7 |
| 35 | Machinery | 261,821,641 | 158,602,984 | 148,765,091 | 145,106,755 | -2.5 | -8.5 | -44.6 |
| 36 | Electrical Equip. | 663,946,454 | 593,622,657 | 609,759,426 | 560,885,921 | -8.0 | -5.5 | -15.5 |
| 37 | Transportation Equip. | 384,413,509 | 385,439,477 | 345,353,778 | 309,978,967 | -10.2 | -19.6 | -19.4 |
| 38 | Measure./Photo. | 118,291,507 | 71,832,907 | 68,078,152 | 67,966,322 | -0.2 | -5.4 | -42.5 |
| 39 | Miscellaneous | 59,769,414 | 49,669,419 | 47,346,282 | 48,546,744 | 2.5 | -2.3 | -18.8 |
| | Multiple codes 20-39 | 1,948,675,205 | 1,371,257,172 | 1,183,045,458 | 1,174,119,010 | -0.8 | -14.4 | -39.7 |
| | No codes 20-39 | 172,065,448 | 93,034,071 | 84,480,702 | 109,172,368 | 29.2 | 17.3 | -36.6 |
| | Total ^c | 18,438,631,374 | 18,873,534,800 | 18,408,561,113 | 20,851,800,368 | 13.3 | 10.5 | 13.1 |
| | Federal Facilities | NA | 41,995,364 | 39,154,234 | 41,467,861 | 5.9 | -1.3 | NA |

Note: Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid. Data from Section 8 (Total of 8.1 through 8.7) of Form R in year indicated. Forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple" category. Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes 20-39" category.

^aOne facility in SIC code 28, Shintech Inc. in Freeport, TX, reported on-site recycling for vinyl chloride of 200,000 pounds in 1995 and 244,000 pounds in 1996. The facility has since revised these quantities to 200,000,000 pounds in 1995 and 244,000,000 in 1996. Another facility, Shell Chemical Co. in Geismar, LA, reported 193,830,000 pounds of on-site energy recovery of ethylene in 1997. The facility has since revised this quantity to 13,000,000 pounds. In SIC code 28, total production-related waste changes to 8,082,352,320 pounds in 1995, to 8,194,422,706 pounds in 1996, and to 8,954,329,658 pounds in 1997. The percentage change in total production-related waste changes to 9.3% for 1996-1997, to 10.8% for 1995-1997, and to 21.4% for 1991-1997.

^bOne facility in SIC code 29, TPI Petroleum in Ardmore, OK reported on-site energy recovery for ethylene of 82,500,000 pounds in 1995, 36,250,000 pounds in 1996, and 422,000,000 pounds in 1997. This facility also reported on-site energy recovery for propylene of 12,900,000 pounds in 1995, 16,300,000 pounds in 1996, and 272,000,000 pounds in 1997. The facility has since revised these quantities to zero. In SIC code 29, Petroleum, total production-related waste changes to 816,568,773 pounds in 1995, to 878,139,371 pounds in 1996, and to 789,803,949 pounds in 1997. The percentage change in total production-related waste changes to -10.1% for 1996-1997, to -3.3 for 1995-1997, and to -32.6% for 1991-1997.

^cRevisions in three facilities (two in SIC code 28 and one in SIC code 29) change total production-related waste managed to 18,977,934,800 pounds in 1995, to 18,599,767,113 pounds in 1996, and to 19,976,970,368 pounds in 1997. The percentage change in total production-related waste changes to 7.4% for 1996-1997, to 5.3% for 1995-1997, and to 8.3% for 1991-1997.

NA: Federal facilities not required to report before 1994.

The largest percentage reductions involved industries with small totals. The tobacco industry reported 51.4 million pounds of total production-related waste in 1991 and 211,000 pounds in 1997, a reduction of 99.6%. The leather industry reported 18.0 million pounds in 1991 and 6.4 million pounds in 1997, a reduction of 64.2%.

The largest absolute increase in production-related waste from 1991 to 1997 was reported by the chemical manufacturing industry, from 7.35 billion pounds to 9.14 billion pounds. As noted earlier, one facility in this industry revised its quantity of on-site energy recovery of ethylene after the data were “frozen” for preparation of this report. In addition, another facility in SIC code 28 similarly revised its reports for on-site recycling of vinyl chloride (from 200,000 pounds to 200.0 million pounds in 1995 and from 244,000 pounds to 244.0 million pounds in 1996).

With these revisions, the chemical manufacturing industry’s production-related waste managed would increase from 7.35 billion pounds in 1991 to 8.95 billion pounds in 1997, still the largest absolute increase among all industries. The percentage increase for 1991 to 1997 would change from 24.2% to 21.7%.

The primary metals industry reported the second-largest absolute increase from 1991 to 1997 in total production-related waste managed, from 2.32 million pounds to 3.37 billion pounds. This was an increase of 45.1%. The lumber industry reported the third-largest increase, from 68.0 billion pounds in 1991 to 972.4 million pounds in 1997, or 904.4 million pounds. This amounted to a 1,329.8% increase by the lumber industry, by far the largest percentage increase among all industries. As noted earlier, four facilities in the lumber industry reported substantial increases in waste management of creosote.

Economic Overview, by Industry, Multi-Year Comparisons

U.S. economic expansion continued in 1997 with 3.9% real growth (adjusted for inflation) in gross domestic product, compared to growth of 2.8% in 1996 (*Economic Report of the President*, February 1998.) As shown in Table 4-11, manufacturing production also continued to increase.

Table 4-11 presents production indexes for each industrial sector from 1991 to 1997. During this period, production increased 32.0% for U.S. manufacturing overall. Table 4-12 compares the change in manufacturing production since 1991 with the change in TRI quantity released on- and off-site and in TRI total production-related waste managed. As shown in Table 4-12 the quantity released on- and off-site steadily decreased, even as manufacturing production expanded. Overall, while production rose 32.0%, TRI facilities reported a decrease of 25.5% in quantity released on- and off-site. Although the total quantity of production-related waste that facilities managed rose, the overall increase was still considerably smaller than the nation’s increase in manufacturing production. As noted earlier, three facilities’ revisions would change the total production-related waste managed for 1995, 1996, and 1997. The percentage changes also change, as follows: to 2.9% for 1991-1995, to 0.9% for 1991-1996 and to 8.3% for 1991-1997. Thus, taking into account these revisions, for 1991 to 1997, TRI production-related waste increased by 8.3%, roughly one-quarter the 32.0% increase in manufacturing production over the same period. While manufacturing production steadily increased from 1991 to 1997, TRI production-related waste decreased in most years. However, increases in 1994 and 1997 resulted in an overall increase for the period.



Table 4-11. Industrial Production Indexes by Industry, 1991-1997

| SIC Code | Industry | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|----------|-----------------------|-------|-------|-------|-------|-------|-------|-------|
| | Total Index | 100.0 | 103.1 | 106.8 | 112.6 | 118.0 | 122.2 | 128.4 |
| | Manufacturing | 100.0 | 104.0 | 107.9 | 114.3 | 120.6 | 124.9 | 132.0 |
| 20 | Food | 100.0 | 101.6 | 103.7 | 105.4 | 108.5 | 109.0 | 111.4 |
| 21 | Tobacco | 100.0 | 101.1 | 85.1 | 105.7 | 113.0 | 114.7 | 114.5 |
| 22 | Textiles | 100.0 | 107.9 | 113.5 | 119.3 | 118.6 | 115.1 | 118.2 |
| 24 | Lumber | 100.0 | 105.8 | 106.7 | 112.1 | 114.1 | 118.3 | 121.7 |
| 25 | Furniture | 100.0 | 105.5 | 110.7 | 114.0 | 117.8 | 122.4 | 129.4 |
| 26 | Paper | 100.0 | 103.3 | 107.4 | 112.0 | 113.3 | 111.5 | 116.6 |
| 27 | Printing | 100.0 | 100.9 | 101.5 | 101.6 | 102.4 | 102.4 | 105.9 |
| 28 | Chemicals | 100.0 | 103.7 | 105.2 | 108.6 | 111.5 | 114.6 | 119.5 |
| 29 | Petroleum | 100.0 | 100.9 | 103.8 | 103.6 | 105.4 | 107.5 | 110.5 |
| 30 | Plastics | 100.0 | 110.3 | 117.9 | 128.4 | 131.8 | 135.1 | 139.5 |
| 31 | Leather | 100.0 | 101.6 | 102.5 | 95.1 | 85.3 | 79.6 | 74.9 |
| 32 | Stone/Clay/Glass | 100.0 | 102.9 | 105.0 | 111.0 | 114.3 | 117.9 | 124.0 |
| 33 | Primary metals | 100.0 | 103.4 | 109.3 | 117.3 | 121.2 | 123.0 | 128.7 |
| 34 | Fabricated metals | 100.0 | 104.0 | 108.5 | 116.6 | 121.2 | 124.3 | 127.8 |
| 35 | Machinery | 100.0 | 104.8 | 115.2 | 130.8 | 149.6 | 162.8 | 179.6 |
| 36 | Electrical Equip. | 100.0 | 111.6 | 123.5 | 148.7 | 190.7 | 222.4 | 258.4 |
| 37 | Transportation Equip. | 100.0 | 103.6 | 107.6 | 111.0 | 109.5 | 110.4 | 119.7 |
| 38 | Measure/Photo. | 100.0 | 100.2 | 101.0 | 99.9 | 100.8 | 105.3 | 108.2 |
| 39 | Miscellaneous | 100.0 | 101.6 | 107.4 | 111.8 | 115.5 | 120.7 | 127.9 |

Note: 1991=100. Data not provided for apparel industry (SIC code 23). From: 1998 Statistical Abstract of the United States, No. 1241. Industrial Production Indexes, by Industry (Source: Board of Governors of the Federal Reserve System, Federal Reserve Bulletin, monthly, and Industrial Production Capacity Utilization, Statistical Release G.17, monthly.)

Table 4-12. Cumulative Change in Manufacturing Production and in TRI Quantities in Waste Managed, 1991-1997

| | 1991-1992 | 1991-1993 | 1991-1994 | 1991-1995 | 1991-1996 | 1991-1997 |
|---|-----------|-----------|-----------|-----------|-----------|-----------|
| | Percent | Percent | Percent | Percent | Percent | Percent |
| Manufacturing Production | 4.0 | 7.9 | 14.3 | 20.6 | 24.9 | 32.0 |
| TRI Quantity Released On- and Off-site | -6.0 | -12.0 | -19.4 | -23.6 | -25.7 | -25.5 |
| TRI Total Production-related Waste Managed* | -1.4 | -1.9 | 3.7 | 2.4 | -0.2 | 13.1 |

Note: Cumulative change in manufacturing production based on 1998 Statistical Abstract of the United States, No. 1241. Industrial Production Indexes, by Industry (Source: Board of Governors of the Federal Reserve System, Federal Reserve Bulletin, monthly, and Industrial Production Capacity Utilization, Statistical Release G.17, monthly.) TRI quantities do not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid. TRI data taken from Section 8 (Current Year) of Form R for year indicated.

*One facility, Shintech Inc. in Freeport, TX, reported on-site recycling of vinyl chloride of 200,000 pounds in 1995 and 244,000 pounds in 1996. The facility has since revised these quantities to 200,000,000 pounds in 1995 and 244,000,000 pounds in 1996. Another facility, TPI Petroleum in Ardmore, OK, reported on-site energy recovery for ethylene of 82,500,000 pounds in 1995, 36,250,000 pounds in 1996, and 422,000,000 pounds in 1997. The facility also reported on-site energy recovery for propylene of 12,900,000 pounds in 1995, 16,300,000 pounds in 1996, and 272,000,000 pounds in 1997. The facility has since revised these quantities to zero. Another facility, Shell Chemical Co. in Geismar, LA, reported on-site energy recovery for ethylene of 193,830,000 pounds in 1997. The facility has since revised this quantity to 13,000,000 pounds. Revisions by the three facilities change total production-related waste to 18,977,934,800 pounds in 1995, to 18,599,767,113 pounds in 1996, and to 19,976,970,368 pounds in 1997. The percentage change in total production-related waste changes to 2.9% for 1991-1995, to 0.9% for 1991-1996, and to 8.3% for 1991-1997.