

## **Chapter 4**

# **Toxics Release Inventory Data for Original Reporting Industries**



# Chapter 4



## Toxics Release Inventory Data for Original Reporting Industries

This chapter provides an overview of 1998 TRI data by industry sector for the 20 industries that have been required to report to TRI since the program began in 1987. Analyses of TRI reporting by the industries added in 1998 appear in Chapter 3.

This chapter summarizes release and waste management data by industry for 1998 and for 1995 to 1998. Change in on- and off-site releases is also measured since 1988, and waste management data are similarly reviewed for 1991 to 1998. The discussion in **Making Year-to-Year Comparisons of**

**TRI Data** in Chapter 1 is important for accurate interpretation of these data because of the significant changes in TRI over time.

Box 4–1 lists the original TRI industries by Standard Industrial Classification (SIC) code. Tables in this chapter also present data submitted on TRI chemical forms that report more than one SIC code in the manufacturing sector. Box 4–2 explains EPA’s method for analyzing this “multiple-codes” group, as well as the “no-codes” group.

### Box 4–1. Standard Industrial Classification (SIC) Codes for the Original TRI Industries

#### Standard Industrial Classification (SIC) Codes for the Original TRI Industries

**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 broadwoven 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.

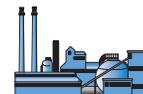
*(continued)*



Box 4-1. Standard Industrial Classification (SIC) Codes for the Original TRI Industries (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, platemaking, 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.

(continued)



Box 4-1. Standard Industrial Classification (SIC) Codes for the Original TRI Industries (continued)

**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.)

**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, handtools, 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

(continued)



Box 4-1. Standard Industrial Classification (SIC) Codes for the Original TRI Industries (continued)

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 and 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. Multiple SIC Codes and No SIC Codes

**Multiple SIC Codes and No SIC Codes**

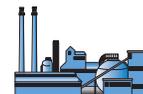
**Multiple Codes 20-39.** TRI facilities may report up to six four-digit SIC codes that describe their operations. They submit one Form R or Form A certification statement for each chemical they are reporting. If all the processes or operations that are associated with a facility's releases or other 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 within the manufacturing sector (SIC codes 20-39). 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.

Forms that have a SIC code within the manufacturing sector as well as a SIC code within the new industry sectors are included in the manufacturing sector SIC code if the facility has reported to TRI before 1998. If

(continued)

**Box 4-2. Multiple SIC Codes and No SIC Codes (continued)**

the facility reported for the first time for 1998 with both original and new industry SIC codes, it is not included in the analyses in this chapter, but is included in the analyses in Chapter 3 under the new industry code.

**No Codes 20–39.** Forms that report no SIC code within the manufacturing sector and have no SIC code belonging to a new industry group are included in these tables under the No codes 20–39 category. Examples of such forms may be from federal facilities, all of which are required to report regardless of the SIC code covering their operations.

## TRI Data by Industry, 1998

In 1998, a total of 21,517 facilities in the original TRI industries submitted 72,073 forms, as shown in Table 4-1. The chemical manufacturing industry submitted the largest number of forms, 21,111 forms. The fabricated metals industry ranked second with 7,507 forms, and the primary metals industry ranked third with 6,909 forms. Together, these three industries submitted half (49.3 percent) of the 1998 forms from the original industries covered by TRI.

## On- and Off-site Releases, 1998

On- and off-site releases by the original industries totaled 2.50 billion pounds in 1998, and two industries reported more than half of that total. As shown in Table 4-2, the chemical manufacturing industry reported 741.8 million pounds of total releases, and the primary metals industry reported 718.3 million pounds. These amounts represented 29.7 percent and 28.8 percent, respectively, of all on- and off-site releases reported by the original industries, 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 229.9 million pounds, or 9.2 percent of the total.

Three other industry groups reported more than 100 million pounds each: the multiple-codes group ranked fourth among original industries with 118.9 million pounds. Plastics manufacture ranked fifth with 109.8 million pounds, and the transportation equipment industry ranked sixth with 103.4 million pounds. These amounted to approximately 4 percent each of the total.

Figure 4-2 displays on- and off-site releases for the industries with the largest total releases. As shown in this figure, air emissions were the largest release type for all of these industries except primary metals. In the primary metals industry, off-site releases (transfers off-site to disposal) and on-site land releases outweighed other release types.

### On-site Releases

The chemicals, primary metals, and paper products industries, which reported the largest total on- and off-site releases in



Table 4-1. TRI Facilities and Forms, Original Industries, by Industry, 1998

SIC Code	Industry	Total Facilities Number	Total Forms Number	Form Rs Number	Form As Number
20	Food	1,995	3,711	2,492	1,219
21	Tobacco	21	65	64	1
22	Textiles	274	566	511	55
23	Apparel	19	37	32	5
24	Lumber	829	2,002	1,184	818
25	Furniture	377	907	840	67
26	Paper	474	2,597	2,439	158
27	Printing	227	446	434	12
28	Chemicals	3,847	21,111	17,151	3,960
29	Petroleum	414	3,489	3,078	411
30	Plastics	1,826	3,745	3,108	637
31	Leather	80	193	174	19
32	Stone/Clay/Glass	669	1,939	1,661	278
33	Primary Metals	1,926	6,909	6,121	788
34	Fabricated Metals	2,908	7,507	6,737	770
35	Machinery	1,119	2,915	2,544	371
36	Electrical Equip.	1,233	3,047	2,872	175
37	Transportation Equip.	1,301	4,580	4,246	334
38	Measure/Photo.	253	628	539	89
39	Miscellaneous	317	722	611	111
	Multiple codes 20-39	1,192	4,380	3,926	454
	No codes 20-39	216	577	469	108
	<b>Total</b>	<b>21,517</b>	<b>72,073</b>	<b>61,233</b>	<b>10,840</b>

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

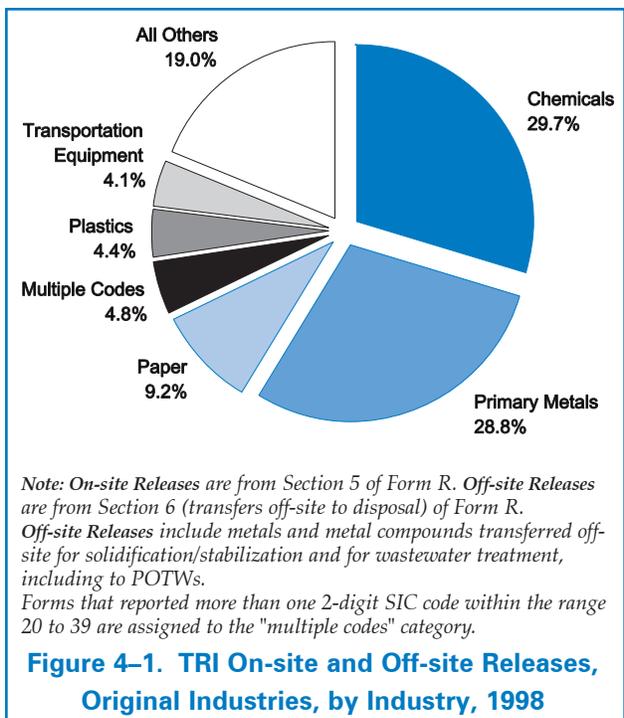
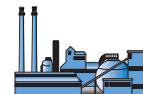
1998, also reported the largest on-site releases. Table 4-2 presents on-site releases by industry for the original reporting industries.

The chemical manufacturing industry ranked first for on-site releases with 697.4 million pounds. Chemical industry releases included 321.9 million pounds of air emissions, 95.5 million pounds of surface water discharges, and 206.7 million pounds of underground injection — the largest amounts in these categories. The primary metals industry ranked second for on-site releases with 421.6 million pounds. The primary metals industry reported 224.5 mil-

lion pounds of on-site land releases, more than any other industry. Most of the sector’s on-site land releases consisted of other disposal (130.4 million pounds). The paper products sector ranked third for on-site releases with 225.0 million pounds, principally in air emissions (186.0 million pounds).

### Top 20 Chemicals for On- and Off-site Releases

Table 4-3 lists the 20 TRI chemicals with the largest total releases in 1998 by the original industries. On- and off-site releases of these

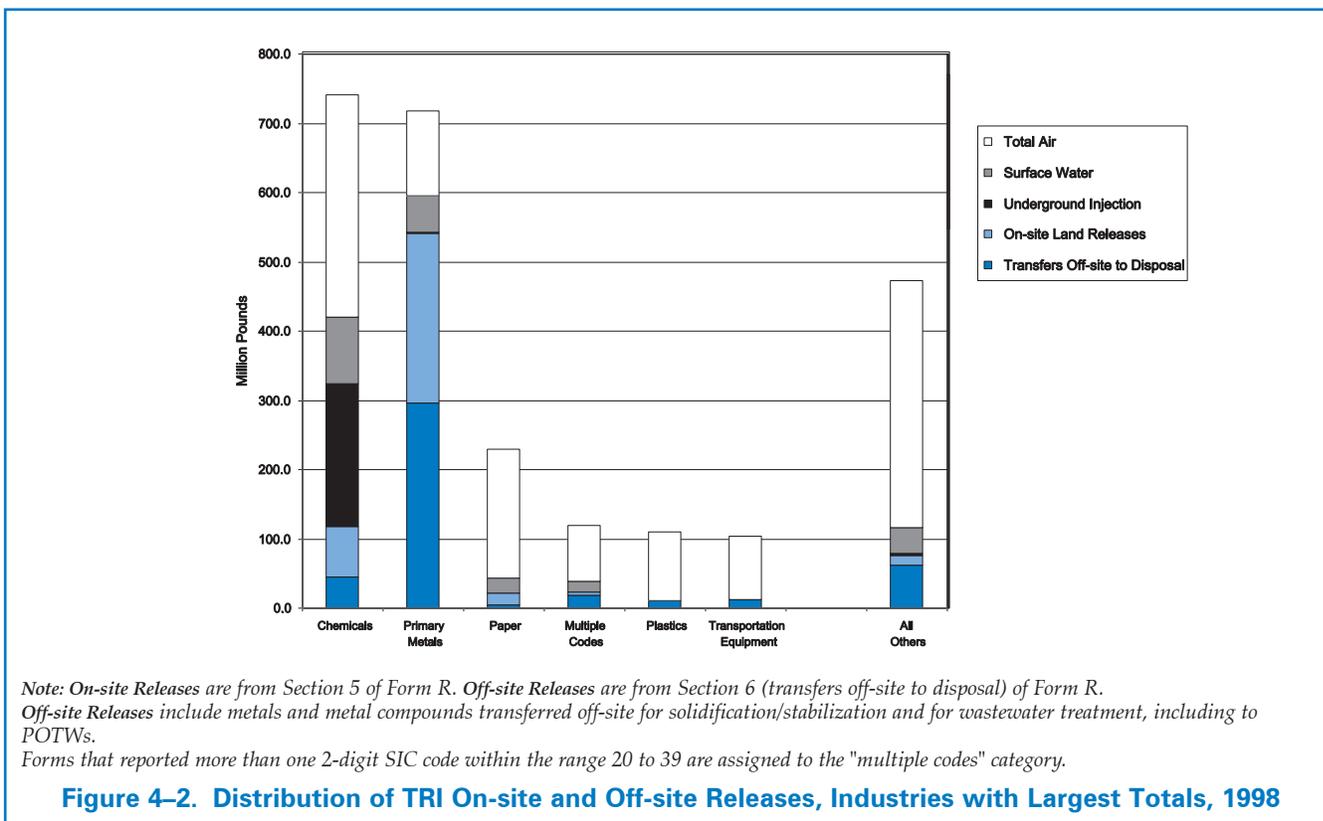


**Figure 4-1. TRI On-site and Off-site Releases, Original Industries, by Industry, 1998**

chemicals totaled 1.87 billion pounds of the 2.50-billion-pound total.

Zinc compounds led all TRI chemicals with releases totaling 300.3 million pounds. Off-site releases (transfers to disposal) contributed the majority (175.6 million pounds) of this total. As explained in Chapter 1 (Box 1-5), off-site releases of metals and their compounds include transfers to solidification/stabilization and to wastewater treatment including POTWs. Zinc compounds also had the largest on-site land releases with 116.4 million pounds. This amount included 68.5 million pounds of other disposal and 29.9 million pounds in landfills other than the RCRA subtitle C landfills.

Nitrate compounds ranked second with total releases of 226.7 million pounds. More nitrate compounds were discharged to surface waters than any other chemical, with



**Figure 4-2. Distribution of TRI On-site and Off-site Releases, Industries with Largest Totals, 1998**



## Chapter 4 — Toxics Release Inventory Data for Original Reporting Industries

Table 4-2. TRI On-site and Off-site Releases, Original Industries, by Industry, 1998

SIC Code	Industry	Air		Surface Water Discharges Pounds	Underground Injection	
		Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds		Class I Wells Pounds	Class II-V Wells Pounds
20	Food	21,998,818	41,630,139	17,136,151	760	5
21	Tobacco	38,215	3,089,853	160,366	0	0
22	Textiles	2,365,218	8,475,568	254,827	0	0
23	Apparel	59,919	401,589	0	0	0
24	Lumber	4,779,182	27,751,324	84,525	0	0
25	Furniture	2,662,837	14,487,390	797	0	0
26	Paper	14,164,613	171,816,757	21,880,578	29,100	0
27	Printing	10,506,657	11,794,936	598	0	0
28	Chemicals	79,723,668	242,221,900	95,452,686	206,649,154	8,256
29	Petroleum	25,215,032	28,764,125	13,554,646	2,827,139	85,754
30	Plastics	23,631,675	75,012,844	39,334	0	0
31	Leather	614,495	1,935,520	75,511	80	0
32	Stone/Clay/Glass	2,526,051	30,912,817	153,088	0	0
33	Primary Metals	28,000,851	94,149,928	53,924,429	1,022,076	0
34	Fabricated Metals	21,570,144	40,324,949	1,279,530	255	0
35	Machinery	5,058,020	9,524,672	51,939	0	0
36	Electrical Equip.	4,518,971	12,059,845	2,182,517	500	0
37	Transportation Equip.	19,152,445	71,360,783	168,114	0	0
38	Measure/Photo.	1,147,647	8,440,989	1,189,200	0	0
39	Miscellaneous	2,130,566	7,468,769	7,726	0	0
	Multiple codes 20-39	20,748,697	58,893,707	15,296,480	15,800	5
	No codes 20-39	1,889,238	3,928,448	472,719	0	505
	<b>Total</b>	<b>292,502,959</b>	<b>964,446,852</b>	<b>223,365,761</b>	<b>210,544,864</b>	<b>94,525</b>

Note: On-site Releases are 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 codes" category.

Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes" category.

170.7 million pounds. TRI facilities in the original industries also injected 48.7 million pounds of nitrate compounds to underground wells on-site, the largest amount for that type of release.

Methanol releases totaled 214.9 million pounds, the third-largest total for on- and off-site releases. Methanol ranked first for air emissions with a total of 189.1 million pounds, including 165.2 million pounds in stack or point source air emissions.

Other chemicals with the largest amounts in particular release types included ammonia, which ranked fourth overall (with 185.9 million pounds) and ranked second for air emissions (147.7 million pounds) and for underground injection (25.3 million pounds). Although total releases of phosphoric acid (55.4 million pounds) ranked 13th, this chemical ranked second for surface water discharges with 27.7 million pounds. Manganese compounds had the second-highest on-site releases to land with 52.8 million pounds, and copper compounds followed closely with 52.0 million

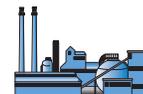


Table 4–2. TRI On-site and Off-site Releases, Original Industries, by Industry, 1998 (continued)

Industry	On-site Land Releases					Total On-site Releases Pounds	Off-site Releases	Total On- and Off-site Releases Pounds
	RCRA Subtitle C Landfills Pounds	Other Landfills Pounds	Land Treatment Pounds	Surface Impoundments Pounds	Other Disposal Pounds		Transfers Off-site to Disposal Pounds	
Food	292	15,841	3,406,911	211,114	2,563,602	86,963,633	2,325,147	89,288,780
Tobacco	0	0	0	0	0	3,288,434	304,195	3,592,629
Textiles	0	3,361	136,210	74,553	2,430	11,312,167	698,071	12,010,238
Apparel	0	0	0	0	5	461,513	41,045	502,558
Lumber	29,013	39,244	23,677	88,387	212,458	33,007,810	1,464,145	34,471,955
Furniture	0	11,789	0	0	31,044	17,193,857	124,204	17,318,061
Paper	956,008	12,373,673	305,468	3,084,549	402,118	225,012,864	4,856,081	229,868,945
Printing	0	0	0	0	250	22,302,441	153,413	22,455,854
Chemicals	744,092	23,890,688	421,237	40,716,878	7,528,895	697,357,454	44,454,978	741,812,432
Petroleum	3,384	90,114	100,108	293,736	72,036	71,006,074	3,648,251	74,654,325
Plastics	31,983	802,319	0	7,181	52,301	99,577,637	10,256,737	109,834,374
Leather	0	250	0	2,952	5	2,628,813	2,196,077	4,824,890
Stone/Clay/Glass	47,576	3,606,307	1,013	88,939	144,697	37,480,488	7,676,996	45,157,484
Primary Metals	13,034,455	56,206,560	274	44,840,258	130,446,105	421,624,936	296,635,873	718,260,809
Fabricated Metals	84,285	334,303	15	3,879	405,592	64,002,952	24,229,275	88,232,227
Machinery	13,504	166,171	23,055	5	53,864	14,891,230	4,849,857	19,741,087
Electrical Equip.	64,789	167,961	10	1,355	160,983	19,156,931	11,747,921	30,904,852
Transportation Equip.	17,343	368,070	478	323	21,682	91,089,238	12,284,329	103,373,567
Measure/Photo.	18	74,058	643	8	556	10,853,119	1,343,057	12,196,176
Miscellaneous	21,961	9,150	0	0	199,892	9,838,064	790,753	10,628,817
Multiple codes 20–39	264,467	1,569,488	209,474	754,815	2,727,577	100,480,510	18,378,782	118,859,292
No codes 20–39	26,324	1,000	582,030	68,539	130,867	7,099,670	562,422	7,662,092
<b>Total</b>	<b>15,339,494</b>	<b>99,730,347</b>	<b>5,210,603</b>	<b>90,237,471</b>	<b>145,156,959</b>	<b>2,046,629,835</b>	<b>449,021,609</b>	<b>2,495,651,444</b>

Note: On-site Releases are 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 codes” category. Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the “no codes” category.

pounds. Off-site releases of manganese compounds ranked second at 45.3 million pounds, although this was considerably below the 175.6 million pounds of zinc compounds released off-site.

### Waste Management Data, 1998

Facilities in the original TRI industries reported managing a total of 24.05 billion pounds of TRI chemicals in waste in 1998, as shown in Table 4–4. Figure 4–3 shows production-related waste reported by the

industries with the largest totals. Generally, on-site recycling and on-site treatment were the most common waste management methods for the original industries.

The chemical manufacturing industry reported managing 11.95 billion pounds of total production-related waste in 1998. The chemical manufacturing industry reported the largest quantities in all waste management categories except off-site recycling. Nearly half of the chemical manufacturing industry’s production-related waste was recycled on-site (5.62 billion pounds). On-



Table 4-3. Top 20 Chemicals with Largest Total On-site and Off-site Releases, Original Industries, 1998

CAS Number	Chemical	Air		Surface Water Discharges Pounds	Underground Injection	
		Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds		Class I Wells Pounds	Class II-V Wells Pounds
—	Zinc compounds	1,698,677	5,115,415	1,224,399	241,925	250
—	Nitrate compounds	354,145	284,299	170,668,882	48,677,319	250
67-56-1	Methanol	23,878,622	165,203,260	5,891,181	16,592,794	12,001
7664-41-7	Ammonia	33,281,613	114,422,916	7,136,859	25,247,154	40,854
—	Manganese compounds	606,797	959,555	4,471,582	7,755,610	0
108-88-3	Toluene	33,566,894	63,720,492	38,270	589,431	500
1330-20-7	Xylene (mixed isomers)	16,010,146	51,811,465	50,450	120,335	750
110-54-3	n-Hexane	24,005,960	42,859,301	13,904	26,006	500
—	Copper compounds	2,908,348	619,408	92,518	187,150	250
7782-50-5	Chlorine	1,051,794	58,698,778	232,817	61,632	5
100-42-5	Styrene	11,432,537	42,271,859	13,437	345,945	0
7647-01-0	Hydrochloric acid	2,300,649	51,679,491	2,575	100,099	0
7664-38-2	Phosphoric acid	240,649	979,865	27,703,308	14,201	0
—	Chromium compounds	96,025	255,813	112,325	874,795	0
78-93-3	Methyl ethyl ketone	19,112,003	27,252,257	54,800	343,413	5
—	Lead compounds	157,269	691,723	37,272	171,660	0
75-15-0	Carbon disulfide	951,859	42,490,604	4,687	16,599	0
75-09-2	Dichloromethane	13,230,726	26,698,144	15,489	456,962	0
—	Glycol ethers	8,713,977	28,543,883	192,191	1,370	0
7440-66-6	Zinc (fume or dust)	802,687	518,940	9,869	1	0
	<b>Subtotal</b>	<b>194,401,377</b>	<b>725,077,468</b>	<b>217,966,815</b>	<b>101,824,401</b>	<b>55,365</b>
	<b>Total</b>	<b>292,502,959</b>	<b>964,446,852</b>	<b>223,365,761</b>	<b>210,544,864</b>	<b>94,525</b>

Note: On-site Releases are 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.

site treatment by this industry totaled 3.34 billion pounds, and on-site energy recovery totaled 1.39 billion pounds. The chemical industry reported 730.2 million pounds released on- and off-site. The chemical industry's off-site energy recovery (385.9 million pounds) and off-site treatment (305.1 million pounds) were by far the largest quantities in these two categories.

The primary metals industry ranked second among original industries for total production-related waste managed with 3.64

billion pounds. On-site recycling accounted for the largest portion of this total, with 1.66 billion pounds (also ranking second). The primary metals industry reported the largest quantity of off-site recycling (714.3 million pounds) and the second-largest quantity released on- and off-site (685.3 million pounds).

The paper products industry reported the third-largest total production-related waste managed with 1.51 billion pounds, including 941.0 million pounds treated on-site.

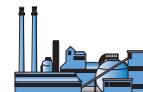


Table 4–3. Top 20 Chemicals with Largest Total On-site and Off-site Releases, Original Industries, 1998 (continued)

Chemical	On-site Land Releases					Total On-site Releases Pounds	Off-site Releases	Total On- and Off-site Releases Pounds
	RCRA Subtitle C Landfills Pounds	Other Landfills Pounds	Land Treatment Pounds	Surface Impoundments Pounds	Other Disposal Pounds		Transfers Off-site to Disposal Pounds	
Zinc compounds	7,525,224	29,868,772	112,634	10,419,837	68,461,893	124,669,026	175,586,997	300,256,023
Nitrate compounds	5	17,627	1,777,531	1,317,970	158,043	223,256,071	3,406,604	226,662,675
Methanol	16,718	362,419	47,152	412,018	960,368	213,376,533	1,498,545	214,875,078
Ammonia	4,156	174,173	1,813,271	844,782	470,825	183,436,603	2,448,774	185,885,377
Manganese compounds	3,708,736	29,251,720	226,425	15,924,724	3,708,973	66,614,122	45,269,882	111,884,004
Toluene	13,525	7,330	1,967	1,620	47,028	97,987,057	1,411,118	99,398,175
Xylene (mixed isomers)	645	1,905	1,168	2,580	33,581	68,033,025	884,811	68,917,836
n-Hexane	287	991	3,250	251	15,058	66,925,508	92,914	67,018,422
Copper compounds	88,468	4,368,663	1,566	8,556,666	39,008,746	55,831,783	10,516,895	66,348,678
Chlorine	5	5	41,451	10	14,651	60,101,148	27,073	60,128,221
Styrene	64,668	254,900	0	509	2,659	54,386,514	2,000,396	56,386,910
Hydrochloric acid	0	0	0	0	21,860	54,104,674	1,314,169	55,418,843
Phosphoric acid	15,819	7,231,799	79,406	9,140,154	4,662,611	50,067,812	5,337,600	55,405,412
Chromium compounds	439,441	1,437,468	12,869	27,086,721	1,293,249	31,608,706	16,186,117	47,794,823
Methyl ethyl ketone	9,150	2,900	2,113	798	65,720	46,843,159	916,043	47,759,202
Lead compounds	610,217	2,800,381	2,400	4,307,663	8,523,124	17,301,709	28,302,900	45,604,609
Carbon disulfide	0	1	0	0	1,650	43,465,400	5,801	43,471,201
Dichloromethane	167,615	2,176	10	0	3,967	40,575,089	257,771	40,832,860
Glycol ethers	16,705	11,174	4,968	571	11,653	37,496,492	834,841	38,331,333
Zinc (fume or dust)	858,548	666,919	0	39,907	6,112,526	9,009,397	23,657,422	32,666,819
<b>Subtotal</b>	<b>13,539,932</b>	<b>76,461,323</b>	<b>4,128,181</b>	<b>78,056,781</b>	<b>133,578,185</b>	<b>1,545,089,828</b>	<b>319,956,673</b>	<b>1,865,046,501</b>
<b>Total</b>	<b>15,339,494</b>	<b>99,730,347</b>	<b>5,210,603</b>	<b>90,237,471</b>	<b>145,156,959</b>	<b>2,046,629,835</b>	<b>449,021,609</b>	<b>2,495,651,444</b>

Note: On-site Releases are 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.

This was the second-largest quantity for on-site treatment.

Production-related waste exceeded 1 billion pounds in three other industry groups. The food processing industry reported a 1.16-billion-pound total, including 924.9 million pounds of on-site recycling. The multiple-codes group reported 1.07 billion pounds. On the multiple-codes reporting forms, on-site treatment totaled 365.7 million pounds and on-site recycling totaled 333.4 million pounds. The petroleum industry reported

1.06 billion pounds, of which 571.1 million pounds went to on-site energy recovery and 286.1 million pounds to on-site treatment.

### Economic Overview, by Industry

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, there are certain limitations that should be considered



Table 4-4. Quantities of TRI Chemicals in Waste Managed, Original Industries, by Industry, 1998

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	924,889,496	3,246,675	44,488	468,214	117,640,169	26,963,547	86,583,956	1,159,836,545	280,695
21	Tobacco	0	7,611	0	0	1,546,084	698,411	3,645,666	5,897,772	3,741
22	Textiles	14,366,930	1,760,722	5,608,790	1,892,379	12,605,895	2,184,621	11,741,109	50,160,446	1,597
23	Apparel	150,440	3,754	0	48,563	1,036,473	25,460	516,871	1,781,561	3
24	Lumber	11,652,645	1,456,547	4,060,356	2,219,236	7,175,142	1,213,855	33,698,999	61,476,780	565,624
25	Furniture	4,686,667	5,094,107	34,920	4,203,734	740,306	496,592	17,264,580	32,520,906	45,329
26	Paper	108,959,943	3,108,738	161,300,035	6,592,701	940,994,184	49,811,061	238,271,980	1,509,038,642	32,811
27	Printing	180,876,437	6,029,199	130,310	3,841,829	85,882,899	647,578	22,302,629	299,710,881	1,672
28	Chemicals	5,615,328,067	182,385,139	1,388,817,487	385,858,536	3,338,756,434	305,061,487	730,187,928	11,946,395,078	5,629,463
29	Petroleum	94,547,970	15,563,178	571,127,392	5,626,704	286,089,885	11,030,918	76,397,187	1,060,383,234	1,349,683
30	Plastics	51,031,835	19,308,408	19,129,042	8,312,457	45,436,655	9,117,925	109,915,575	262,251,897	85,569
31	Leather	1,440,875	304,702	0	69,734	3,742,712	695,249	4,912,715	11,165,987	904
32	Stone/Clay/ Glass	139,630,559	4,826,202	580,303,081	5,843,275	17,322,623	3,280,517	44,533,104	795,739,361	40,330
33	Primary Metals	1,661,434,365	714,346,560	43,671,802	3,603,057	489,307,819	38,487,375	685,323,872	3,636,174,850	16,885,502
34	Fabricated Metals	200,869,105	340,176,730	16,672,039	12,089,635	126,772,179	15,518,485	81,774,817	793,872,990	73,837
35	Machinery	20,442,315	85,050,621	240,579	2,445,835	6,403,449	3,932,915	19,629,189	138,144,903	61,786
36	Electrical Equip.	239,752,988	375,971,874	9,628,621	7,413,646	83,217,063	18,904,328	30,272,210	765,160,730	84,517
37	Transportation Equip.	18,861,958	113,089,470	872,110	12,164,513	31,445,550	15,895,482	104,454,711	296,783,794	51,395
38	Measure/ Photo.	2,921,762	12,024,579	800,535	1,785,886	41,202,519	4,321,567	11,411,247	74,468,095	7,949
39	Miscellaneous	9,263,725	14,391,490	4,189,482	3,383,848	4,966,507	2,161,788	10,792,040	49,148,880	778,154
	Multiple codes 20-39	333,432,473	158,091,791	43,950,494	17,233,696	365,672,898	34,968,822	117,008,661	1,070,358,835	680,408
	No codes 20-39	12,030,482	3,100,597	907,866	276,245	5,033,605	1,937,048	7,790,491	31,076,334	51,378
	<b>Total</b>	<b>9,646,571,037</b>	<b>2,059,338,694</b>	<b>2,851,489,429</b>	<b>485,373,723</b>	<b>6,012,991,050</b>	<b>547,355,031</b>	<b>2,448,429,537</b>	<b>24,051,548,501</b>	<b>26,712,347</b>

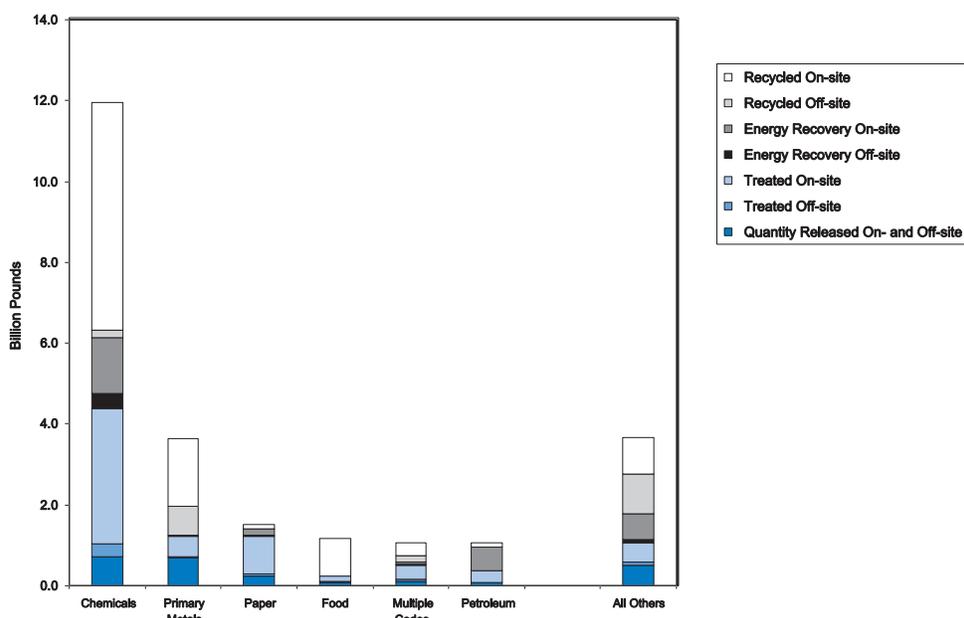
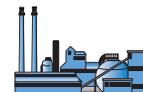
Note: Data are from Section 8 of Form R.

Forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple codes" category.

Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes" category.

(as described in Chapter 1). One such limitation is that TRI data alone do not distinguish industry-specific factors that influence the chemicals, amounts, and types of releases and waste management facilities report. Table 4-5 presents two basic economic measures (employment and dollar value of sales, receipts, shipments, or revenue) that suggest the relative size of the original industries that report to TRI.

Economic analyses make use of data on the value of production (sales, receipts, shipments, or revenue) as one way to indicate the size of industrial sectors, because no direct comparison can be drawn among products of the sectors. Economic data in Table 4-5 are from the 1997 Economic Census, the latest consistent data available across all TRI industries, original and new.



Note: Data are 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 codes" category.

**Figure 4-3. Distribution of Quantities of TRI Chemicals in Waste Managed, Original Industries, by Industry, 1998**

Table 4-5 also includes total production-related waste managed by TRI facilities in 1998, with approximate comparisons to their economic activity. 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, shipments, or revenue), in the last column, compares the 1998 TRI quantities reported by each industry with that industry's production level for 1997. Many factors influence the differences in TRI reporting among industries. Relating TRI quantities to the dollar value of each industry's products creates a measure of waste managed that takes into account differences in size among industries.

As shown in Table 4-5, the chemical industry accounted for 4.8 percent of manufacturing employment in 1997, 10.2 percent of the value of manufacturing production (sales, receipts, shipments, or revenue) in 1997, and 52.1 percent of TRI total production-related waste managed in 1998. The chemical industry managed 29,541 pounds of total production-related waste for each \$1 million value of shipments. This was the largest ratio among the original TRI industries. The primary metals industry ranked second with 18,848 pounds per \$1 million value, and the paper products industry ranked third with 9,434 pounds per \$1 million value. These three industries had the largest total production-related waste managed in 1998.



Table 4-5. Employees and Sales (1997) and Total Production-related Waste (1998), by Industry

SIC Code	Industry	Paid Employees, 1997		Sales, Receipts, Shipments, or Revenue, 1997		TRI Total Production-related Waste Managed, 1998		Production-related Waste Managed per Sales, Receipts, Shipments, or Revenue
		Number	Percent	(\$000)	Percent	Pounds	Percent	Pounds per \$1,000,000
20	Food	1,567,155	8.9	480,299,707	12.1	1,159,836,545	5.1	2,415
21	Tobacco	34,464	0.2	36,328,974	0.9	5,897,772	0.0	162
22	Textiles	557,775	3.2	82,763,179	2.1	50,160,446	0.2	606
23	Apparel	840,498	4.8	81,023,419	2.0	1,781,561	0.0	22
24	Lumber	756,934	4.3	111,444,879	2.8	61,476,780	0.3	552
25	Furniture	522,893	3.0	62,388,884	1.6	32,520,906	0.1	521
26	Paper	623,799	3.5	159,954,824	4.0	1,509,038,642	6.6	9,434
27	Printing	1,519,824	8.6	206,396,046	5.2	299,710,881	1.3	1,452
28	Chemicals	843,469	4.8	404,400,164	10.2	11,946,395,078	52.1	29,541
29	Petroleum	106,863	0.6	173,414,651	4.4	1,060,383,234	4.6	6,115
30	Plastics	1,031,202	5.8	159,079,133	4.0	262,251,897	1.1	1,649
31	Leather	84,002	0.5	9,940,805	0.3	11,165,987	0.0	1,123
32	Stone/Clay/Glass	509,730	2.9	88,312,387	2.2	795,739,361	3.5	9,011
33	Primary Metals	692,943	3.9	192,924,973	4.9	3,636,174,850	15.8	18,848
34	Fabricated Metals	1,555,670	8.8	233,701,166	5.9	793,872,990	3.5	3,397
35	Machinery	2,001,684	11.4	407,720,628	10.3	138,144,903	0.6	339
36	Electrical Equip.	1,573,893	8.9	345,490,897	8.7	765,160,730	3.3	2,215
37	Transportation Equip.	1,587,091	9.0	520,505,442	13.1	296,783,794	1.3	570
38	Measure/Photo.	832,432	4.7	157,938,963	4.0	74,468,095	0.3	471
39	Miscellaneous	391,656	2.2	50,759,871	1.3	49,148,880	0.2	968
	<b>Total</b>	<b>17,633,977</b>	<b>100.0</b>	<b>3,964,788,992</b>	<b>100.0</b>	<b>22,950,113,332</b>	<b>100.0</b>	<b>5,788</b>

Note: Paid Employees and Sales, Receipts, Shipments or Revenue are from U.S. Census Bureau, 1997 Economic Census. <http://www.census.gov/epcd/www/econ97.html> [accessed June 4, 2000]. 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 is from Section 8 (total of 8.1 through 8.7, Column B) of TRI Form for 1998. Total Production-related Waste Managed in this table does not include forms reporting more than one 2-digit SIC code within SIC code 20-39 and forms reporting SIC codes outside the 20-39 range.

## Year-by-Year Comparisons, by Industry

Comparisons of TRI data across reporting years are made on the basis of 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.

Making Year-to-Year Comparisons of TRI Data in Chapter 1 explains these multi-year analyses; an understanding of these issues

is essential for accurate interpretation of the multi-year data presented in this chapter.

Progress in reducing releases and quantities of TRI chemicals in wastes in recent years is measured from 1995. Waste management data authorized under the federal Pollution Prevention Act of 1990, have been collected since 1991 and can be compared from that baseline. Comparisons of on-site and off-site releases can also be measured

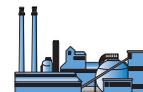


Table 4-6. Change in Total On-site and Off-site Releases, Original Industries, by Industry, 1995–1998

SIC Code	Industry	Total On-site and Off-site Releases				Change	
		1995	1996	1997	1998	1997–1998	1995–1998
		Pounds	Pounds	Pounds	Pounds	Percent	Percent
20	Food	104,744,079	94,523,382	95,923,602	89,288,780	-6.9	-14.8
21	Tobacco	2,047,068	4,202,622	4,278,228	3,592,629	-16.0	75.5
22	Textiles	18,798,686	17,120,644	16,894,313	12,010,238	-28.9	-36.1
23	Apparel	1,287,784	1,318,935	907,084	502,558	-44.6	-61.0
24	Lumber	35,739,782	38,074,789	30,100,193	34,471,955	14.5	-3.5
25	Furniture	42,674,795	36,351,768	25,428,924	17,318,061	-31.9	-59.4
26	Paper	239,708,477	233,552,271	233,141,147	229,868,945	-1.4	-4.1
27	Printing	31,289,653	27,497,915	24,755,525	22,455,854	-9.3	-28.2
28	Chemicals	852,333,037	798,206,110	795,399,063	741,812,432	-6.7	-13.0
29	Petroleum	65,698,942	69,379,692	70,180,443	74,654,325	6.4	13.6
30	Plastics	127,475,721	117,934,935	110,074,022	109,834,374	-0.2	-13.8
31	Leather	4,851,494	4,734,739	4,903,031	4,824,890	-1.6	-0.5
32	Stone/Clay/Glass	37,700,962	45,264,816	44,619,139	45,157,484	1.2	19.8
33	Primary Metals	567,143,497	622,212,203	695,334,469	718,260,809	3.3	26.6
34	Fabricated Metals	104,357,338	91,703,004	90,927,273	88,232,227	-3.0	-15.5
35	Machinery	27,494,817	23,742,158	22,723,291	19,741,087	-13.1	-28.2
36	Electrical Equip.	41,841,436	38,130,216	35,028,711	30,904,852	-11.8	-26.1
37	Transportation Equip.	122,906,775	108,426,979	102,256,155	103,373,567	1.1	-15.9
38	Measure/Photo.	17,701,666	15,663,670	13,735,884	12,196,176	-11.2	-31.1
39	Miscellaneous	13,942,012	10,530,765	10,333,656	10,628,817	2.9	-23.8
	Multiple codes 20–39	162,279,567	131,079,129	138,817,252	118,859,292	-14.4	-26.8
	No codes 20–39	15,515,498	15,632,705	21,210,779	7,662,092	-63.9	-50.6
	<b>Total</b>	<b>2,637,533,086</b>	<b>2,545,283,447</b>	<b>2,586,972,184</b>	<b>2,495,651,444</b>	<b>-3.5</b>	<b>-5.4</b>

Note: On-site Releases are 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 codes" category.

Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes" category.

for chemicals that were reportable in all years from 1988 to 1998.

### On- and Off-site Releases, 1995–1998

Table 4-6 summarizes on- and off-site releases by TRI's original industries for 1995 through 1998. In this period, total on- and off-site releases decreased from 2.64 billion pounds to 2.50 billion pounds, a reduction of 5.4 percent.

The two industries with the largest 1998 total releases, the chemical manufacturing and primary metals industries, have exhibited contrasting trends since 1995. Although the chemical manufacturing industry has consistently ranked first for releases, this industry's total decreased steadily from 852.3 million pounds in 1995 to 741.8 million pounds in 1998. This was the largest reduction by any original industry, a decrease of 110.5 million pounds, or 13.0 percent.



## Chapter 4 — Toxics Release Inventory Data for Original Reporting Industries

At the same time, the primary metals industry, with the second-largest total each year, recorded annual increases amounting to 151.1 million pounds. The primary metals industry reported 567.1 million pounds of on- and off-site releases in 1995 and 718.3 million pounds in 1998. This increase amounted to 26.6 percent.

No other original TRI industry reported a reduction or an increase of comparable size

from 1995 to 1998. The second-largest absolute reduction occurred in the multiple-codes group, from 162.3 million pounds to 118.9 million pounds. The furniture industry ranked third with a reduction from 42.7 million pounds to 17.3 million pounds. In percentage terms, these represented decreases of 26.8 percent and 59.4 percent, respectively. In addition to the primary metals industry, three industries showed increases: petroleum refining, from

**Table 4-7. Change in Total TRI On-site and Off-site Releases, Original Industries, by Industry, 1988 and 1995-1998**

SIC Code	Industry	Total On-site and Off-site Releases					Change	
		1988 Pounds	1995 Pounds	1996 Pounds	1997 Pounds	1998 Pounds	1997-1998 Percent	1988-1998 Percent
20	Food	8,530,020	6,459,514	6,331,133	5,397,858	9,960,469	84.5	16.8
21	Tobacco	214,464	103,526	82,315	202,380	159,062	-21.4	-25.8
22	Textiles	36,801,004	16,010,269	15,099,099	14,625,492	10,266,524	-29.8	-72.1
23	Apparel	952,162	1,260,746	1,198,516	819,881	385,716	-53.0	-59.5
24	Lumber	32,916,416	31,143,449	28,661,790	25,550,786	31,401,763	22.9	-4.6
25	Furniture	62,187,189	42,414,206	36,102,365	25,206,404	16,993,306	-32.6	-72.7
26	Paper	205,229,477	180,608,750	179,415,100	181,202,195	176,051,839	-2.8	-14.2
27	Printing	56,539,627	31,029,174	27,325,251	24,596,240	22,246,252	-9.6	-60.7
28	Chemicals	1,053,173,774	551,042,019	523,169,308	519,481,906	455,485,840	-12.3	-56.8
29	Petroleum	74,471,749	42,924,695	43,961,872	43,269,664	42,072,240	-2.8	-43.5
30	Plastics	160,554,575	113,997,864	105,577,730	96,757,391	97,422,580	0.7	-39.3
31	Leather	10,089,024	4,418,342	4,305,621	4,377,171	4,256,040	-2.8	-57.8
32	Stone/Clay/Glass	38,002,387	22,107,137	27,905,101	28,645,653	28,843,406	0.7	-24.1
33	Primary Metals	647,573,699	496,510,139	553,079,505	616,902,761	635,893,287	3.1	-1.8
34	Fabricated Metals	162,792,170	95,089,498	82,879,982	82,397,303	80,231,371	-2.6	-50.7
35	Machinery	70,884,423	23,874,319	20,325,927	19,300,688	16,378,422	-15.1	-76.9
36	Electrical Equip.	128,928,366	31,502,040	28,576,164	26,260,453	23,483,358	-10.6	-81.8
37	Transportation Equip.	213,860,324	116,567,103	102,218,434	97,005,694	96,815,723	-0.2	-54.7
38	Measure/Photo.	56,806,089	12,821,184	10,500,815	8,015,417	6,803,147	-15.1	-88.0
39	Miscellaneous	31,804,682	13,358,780	10,103,591	9,860,932	10,115,466	2.6	-68.2
	Multiple codes 20-39	304,120,277	130,983,020	99,513,855	105,910,873	85,174,819	-19.6	-72.0
	No codes 20-39	39,951,585	12,946,706	12,187,960	18,192,112	5,386,140	-70.4	-86.5
	<b>Total</b>	<b>3,396,383,483</b>	<b>1,977,172,480</b>	<b>1,918,521,434</b>	<b>1,953,979,254</b>	<b>1,855,826,770</b>	<b>-5.0</b>	<b>-45.4</b>

*Note:* Does not include delisted chemicals, chemicals added in 1990, 1991, 1994 and 1995, aluminum oxide, ammonia, hydrochloric acid and sulfuric acid.

*On-site Releases* are 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 codes" category.

Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes" category.

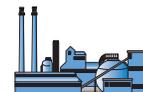


Table 4–8. Current Year and Projected Quantities of TRI Chemicals in Waste, Original Industries, by Industry 1998–2000

SIC Code	Industry	Current Year 1998 Pounds	Total Production-related Waste			
			Projected		Change	
			1999 Pounds	2000 Pounds	1998–1999 Percent	1998–2000 Percent
20	Food	1,159,836,545	1,229,005,689	1,233,137,516	6.0	6.3
21	Tobacco	5,897,772	6,193,086	6,425,352	5.0	8.9
22	Textiles	50,160,446	45,586,824	45,346,848	-9.1	-9.6
23	Apparel	1,781,561	1,785,538	1,791,242	0.2	0.5
24	Lumber	61,476,780	59,328,380	59,429,530	-3.5	-3.3
25	Furniture	32,520,906	30,603,637	31,268,680	-5.9	-3.9
26	Paper	1,509,038,642	1,529,065,406	1,444,389,852	1.3	-4.3
27	Printing	299,710,881	307,998,222	325,317,469	2.8	8.5
28	Chemicals	11,946,395,078	11,143,156,835	11,148,484,363	-6.7	-6.7
29	Petroleum	1,060,383,234	1,026,997,848	1,117,610,625	-3.1	5.4
30	Plastics	262,251,897	251,516,631	263,687,625	-4.1	0.5
31	Leather	11,165,987	10,573,142	10,435,337	-5.3	-6.5
32	Stone/Clay/Glass	795,739,361	774,293,001	806,214,746	-2.7	1.3
33	Primary Metals	3,636,174,850	3,566,837,679	3,558,317,270	-1.9	-2.1
34	Fabricated Metals	793,872,990	770,803,987	777,512,804	-2.9	-2.1
35	Machinery	138,144,903	132,453,279	135,836,373	-4.1	-1.7
36	Electrical Equip.	765,160,730	750,523,961	752,900,831	-1.9	-1.6
37	Transportation Equip.	296,783,794	297,922,865	296,534,596	0.4	-0.1
38	Measure/Photo.	74,468,095	74,493,295	74,425,020	0.0	-0.1
39	Miscellaneous	49,148,880	45,723,026	45,061,141	-7.0	-8.3
	Multiple codes 20–39	1,070,358,835	1,056,560,053	1,105,505,899	-1.3	3.3
	No codes 20–39	31,076,334	23,924,904	24,010,142	-23.0	-22.7
	<b>Total</b>	<b>24,051,548,501</b>	<b>23,135,347,288</b>	<b>23,263,643,261</b>	<b>-3.8</b>	<b>-3.3</b>

Note: Data are from Section 8 (Total of 8.1 through 8.7) of Form R for 1998. Current Year is Column B, 1999 is Column C and 2000 is Column D. Forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the "multiple codes" category. Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the "no codes" category.

65.7 million pounds to 74.7 million pounds (13.6 percent); stone, clay, glass and concrete products, from 37.7 million pounds to 45.2 million pounds (19.8 percent); and tobacco products, from 2.0 million pounds to 3.6 million pounds (75.5 percent).

### On- and Off-site Releases, 1988 and 1995–1998

Table 4–7 summarizes original-industry data for the chemicals that have been

reportable since 1988. From 1988 to 1998, total on- and off-site releases decreased from 3.40 billion pounds to 1.86 billion pounds, or 45.4 percent. Again, the chemical manufacturing industry showed the largest absolute reduction, from 1.05 billion pounds in 1988 to 455.5 million pounds in 1998. This amounted to a 56.8 percent reduction. Three other industry groups had reductions of more than 100 million pounds each: the multiple-codes group, from 304.1 million pounds to 85.2 million pounds; transportation equipment from



213.9 million pounds to 96.8 million pounds, and electrical equipment from 128.9 million pounds to 23.5 million pounds. These industry groups reduced their releases by substantial percentages — 72.0 percent, 54.7 percent, and 81.8 percent respectively.

All but one industry recorded a reduction over the 1988–1998 period. Total releases in the food products industry declined from 8.5 million pounds in 1988 to 5.4 million pounds in 1997, but rose to 10.0 million pounds in the last year.

### **TRI Chemicals Managed in Waste, 1998–2000 Projected, 1995–1998, and 1991–1998**

#### ***Projected Quantities of TRI Chemicals Managed in Waste, 1998–2000***

TRI facilities projected a 3.3 percent decrease from 24.05 billion pounds of total production-related waste managed in 1998 to 23.26 billion pounds in 2000, as shown in Table 4–8. (As described in **Waste Management** in Chapter 1, 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.) The three industries with the largest 1998 totals projected the largest absolute reductions by 2000.

The chemical manufacturing industry, reporting 11.95 billion pounds of production-related waste in 1998, projected the largest absolute reduction. By 2000, the chemical manufacturing industry expected to manage 11.15 billion pounds of production-related waste. This would amount to a 6.7 percent decrease. The industry expects

to achieve this projected reduction in 1999 with essentially no change in 2000.

The primary metals industry projected the second-largest absolute reduction, from 3.64 billion pounds in 1998 to 3.56 billion pounds in 2000. The paper products industry ranked third with a projected decrease from 1.51 billion pounds to 1.44 billion pounds. These expected reductions (less than 80 million pounds each) represented 2.1 percent and 4.3 percent projected decreases for the primary metals and paper products industries, respectively.

The food products industry projected the largest absolute increase in production-related waste managed, from 1.16 billion pounds in 1998 to 1.23 billion pounds in 2000, or 6.3 percent. The petroleum industry projected an increase from 1.06 billion pounds to 1.12 billion pounds, or 5.4 percent. Six other industry groups projected increases, all less than 40 million pounds.

In percentage terms, projected changes between 1998 and 2000 by the original industries in the quantities of production-related waste they manage ranged from decreases of as much as 10 percent (textiles) to increases of up to 9 percent (tobacco products and printing). The textiles industry projected a decrease from 50.2 million pounds to 45.3 million pounds. The tobacco industry's projected increase was from 5.9 million pounds reported in 1998 to 6.4 million pounds. For the printing industry, the projected increase was from 299.7 million pounds to 325.3 million pounds.

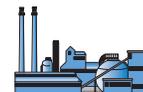


Table 4–9. Total Production-related Waste Managed, Original Industries, by Industry, 1995–1998

Code	Industry	Total Production-related Waste Managed				Change	
		1995	1996	1997	1998	1997–1998	1995–1998
		Pounds	Pounds	Pounds	Pounds	Percent	Percent
20	Food*	4,105,102,832	382,100,369	739,663,713	1,159,836,545	56.8	-71.7
21	Tobacco	2,815,101	5,826,328	6,036,774	5,897,772	-2.3	109.5
22	Textiles	57,443,512	49,705,357	67,208,810	50,160,446	-25.4	-12.7
23	Apparel	2,149,244	2,345,386	1,971,867	1,781,561	-9.7	-17.1
24	Lumber	112,151,149	93,193,491	207,606,428	61,476,780	-70.4	-45.2
25	Furniture	60,878,419	53,471,035	41,301,690	32,520,906	-21.3	-46.6
26	Paper	1,759,242,941	1,597,758,714	1,501,626,290	1,509,038,642	0.5	-14.2
27	Printing	294,277,269	265,817,477	289,221,266	299,710,881	3.6	1.8
28	Chemicals	10,034,828,325	10,001,972,021	10,851,877,342	11,946,395,078	10.1	19.0
29	Petroleum	946,918,911	1,102,723,724	913,110,704	1,060,383,234	16.1	12.0
30	Plastics	541,523,893	373,615,199	293,876,022	262,251,897	-10.8	-51.6
31	Leather	10,477,994	10,566,828	10,969,844	11,165,987	1.8	6.6
32	Stone/Clay/Glass	863,382,343	678,363,126	754,664,579	795,739,361	5.4	-7.8
33	Primary Metals	4,164,293,524	3,718,806,367	3,532,309,926	3,636,174,850	2.9	-12.7
34	Fabricated Metals	783,217,306	796,189,055	822,188,062	793,872,990	-3.4	1.4
35	Machinery	169,608,079	160,733,828	156,826,069	138,144,903	-11.9	-18.6
36	Electrical Equip.	693,988,984	684,008,353	658,304,629	765,160,730	16.2	10.3
37	Transportation Equip.	410,055,374	365,155,686	319,460,816	296,783,794	-7.1	-27.6
38	Measure/Photo.	81,848,614	79,414,662	79,789,553	74,468,095	-6.7	-9.0
39	Miscellaneous	51,730,378	49,177,183	50,419,563	49,148,880	-2.5	-5.0
	Multiple codes 20–39	1,917,753,275	1,375,488,740	1,385,759,846	1,070,358,835	-22.8	-44.2
	No codes 20–39	115,684,605	95,718,398	115,113,396	31,076,334	-73.0	-73.1
	<b>Total</b>	<b>27,179,372,072</b>	<b>21,942,151,327</b>	<b>22,799,307,189</b>	<b>24,051,548,501</b>	<b>5.5</b>	<b>-11.5</b>

Note: Data are 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 codes” category.

Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the “no codes” category.

\*Seven 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 of 4.00 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.

The percentage change for 1995 to 1998 for SIC code 20 changes to +1005.5 percent and for total production-related waste changes to +3.8 percent.

### Quantities of TRI Chemicals in Waste, 1995–1998

As shown in Table 4–9, facilities in the original TRI industries managed 27.18 billion pounds of production-related waste in 1995 and 24.05 billion pounds in 1998. However, in 1995, seven facilities in the food processing industry reported from 500 million pounds to 1 billion pounds each in on-site

recycling of n-hexane, for a total of 4.00 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. Removing their 1995 forms for n-hexane for purposes of this analysis would mean that the food industry’s production-related waste totaled 104.9 million pounds in 1995,



giving the industry an increase of more than 1,000 percent to its 1998 level of 1.16 billion pounds. Total production-related waste for all original industries would show an increase from 23.18 billion pounds in 1995 to 24.05 billion pounds in 1998, an increase of 3.8 percent.

Disregarding the apparent errors by the seven food industry facilities, the multiple-codes group (forms reporting more than one 2-digit SIC code) recorded the largest absolute reduction in total production-related waste from 1995 to 1998. The multiple-codes forms reported 1.92 billion pounds in 1995 and 1.07 billion pounds in 1998. The primary metals industry ranked second, reporting 4.16 billion pounds in 1995 and 3.63 billion pounds in 1998. In percentage terms, these represented decreases of 44.2 percent and 12.7 percent respectively. The plastics industry ranked third for absolute reductions in total production-related waste managed, with 541.5 million pounds in 1995 and 262.3 million pounds in 1998 (a 51.6 percent reduction).

The chemical manufacturing industry reported the largest absolute increase, from 10.03 billion pounds in 1995 to 11.95 billion pounds in 1998 (a 19.0 percent increase). The second-largest absolute increase occurred in the petroleum industry, from 946.9 million pounds in 1995 to 1.06 billion pounds in 1998 (a 12.0 percent increase), although the petroleum industry's production-related waste varied considerably year-by-year. The electrical equipment industry managed 694.0 million pounds of production-related waste in 1995 and 765.2 million pounds in 1998, the third largest increase. This increase occurred in 1998 after two years of reductions. In percentage terms, the electrical equipment industry's increase from 1995 to 1998 was 10.3 percent.

### **Quantities of TRI Chemicals in Waste, 1991 and 1995–1998**

As shown in Table 4–10, total production-related waste managed rose from 18.52 billion pounds in 1991 to 19.60 billion pounds in 1998, a 5.8 percent increase. This analysis addresses only the chemicals that were reportable in all years, 1991 to 1998.

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 in total production-related waste managed. These forms totaled 1.95 billion pounds of production-related waste in 1991 and 881.4 million pounds in 1998. In percentage terms, this represented a decrease of more than half (54.9 percent). The petroleum industry ranked second, decreasing from 1.17 billion pounds in 1991 to 874.4 million pounds in 1998. This amounted to a 25.2 percent reduction, despite a 15.2 percent increase in the last year. The plastics industry ranked third for absolute reductions, decreasing its production-related waste by half (50.4 percent) from 471.7 million pounds to 234.1 million pounds.

The largest absolute increase in production-related waste from 1991 to 1998 was reported by the chemical manufacturing industry, from 7.33 billion pounds to 9.76 billion pounds. The percentage increase was 33.1 percent. The primary metals industry had the second-largest increase, from 2.33 billion pounds to 3.30 billion pounds, or 41.8 percent. Notably, the bulk of the primary metals industry's increase occurred in the early 1990s. The fabricated metals industry reported 602.2 million pounds in 1991 and 753.4 million pounds in 1998, the third-

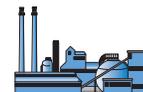


Table 4–10. Total Production-related Waste Managed, Original Industries, by Industry, 1991 and 1995–1998

SIC Code	Industry	Total Production-related Waste Managed					Change	
		1991	1995	1996	1997	1998	1997–1998	1991–1998
		Pounds	Pounds	Pounds	Pounds	Pounds	Percent	Percent
20	Food	64,717,565	75,339,454	73,716,447	73,335,891	87,227,489	18.9	34.8
21	Tobacco	51,405,093	158,896	116,515	216,179	193,470	-10.5	-99.6
22	Textiles	51,508,161	46,480,740	42,775,915	52,347,891	43,517,975	-16.9	-15.5
23	Apparel	2,284,692	2,118,876	2,168,256	1,773,358	1,612,483	-9.1	-29.4
24	Lumber	60,025,678	109,084,526	89,880,440	204,142,970	59,435,166	-70.9	-1.0
25	Furniture	61,302,804	60,162,585	52,714,236	40,596,305	32,008,109	-21.2	-47.8
26	Paper	1,405,002,221	1,318,407,149	1,326,793,507	1,298,000,628	1,291,376,038	-0.5	-8.1
27	Printing	258,847,784	291,345,177	264,883,857	288,456,100	299,081,460	3.7	15.5
28	Chemicals	7,333,148,227	7,821,512,739	7,939,516,510	8,672,349,114	9,763,121,108	12.6	33.1
29	Petroleum	1,169,176,762	816,039,129	888,501,391	759,030,413	874,407,025	15.2	-25.2
30	Plastics	471,727,442	497,711,730	339,165,715	265,260,236	234,125,718	-11.7	-50.4
31	Leather	17,963,968	7,171,578	6,402,629	6,551,846	6,786,724	3.6	-62.2
32	Stone/Clay/Glass	973,839,214	840,031,575	650,636,848	721,852,346	758,841,042	5.1	-22.1
33	Primary Metals	2,326,548,770	3,239,436,645	3,276,875,402	3,182,224,148	3,299,322,616	3.7	41.8
34	Fabricated Metals	602,245,039	704,343,010	753,459,547	783,746,726	753,419,634	-3.9	25.1
35	Machinery	262,640,696	156,788,904	150,296,904	146,381,892	128,133,382	-12.5	-51.2
36	Electrical Equip.	680,930,374	595,452,487	611,821,788	562,587,318	668,026,565	18.7	-1.9
37	Transportation Equip.	382,349,642	386,638,401	346,169,541	302,556,963	279,046,986	-7.8	-27.0
38	Measure/Photo.	117,543,840	72,704,206	69,850,508	69,877,443	62,938,286	-9.9	-46.5
39	Miscellaneous	67,933,418	49,698,748	47,503,843	48,710,447	46,859,949	-3.8	-31.0
	Multiple codes 20–39	1,954,619,963	1,368,128,547	1,184,646,914	1,188,684,158	881,418,778	-25.8	-54.9
	No codes 20–39	209,011,887	107,832,014	84,194,980	109,979,251	26,919,499	-75.5	-87.1
	<b>Total</b>	<b>18,524,773,240</b>	<b>18,566,587,116</b>	<b>18,202,091,693</b>	<b>18,778,661,623</b>	<b>19,597,819,502</b>	<b>4.4</b>	<b>5.8</b>

Note: Does not include delisted chemicals, chemicals added in 1994 and 1995, aluminum oxide, ammonia, hydrochloric acid and sulfuric acid. Data are 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 codes” category. Forms with no 2-digit SIC code within the range 20 to 39 are assigned to the “no codes” category.

largest absolute increase. This amounted to a 25.1 percent increase.

### Economic Overview, by Industry, Multi-Year Comparisons

U.S. economic expansion continued in 1998 with 4.6 percent real growth (adjusted for inflation) in gross domestic product (*Economic Report of the President*, February

2000). 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 1998. During this period, production increased 40.4 percent 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



## Chapter 4 — Toxics Release Inventory Data for Original Reporting Industries

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 40.4 percent, TRI facilities reported a decrease of 27.6 percent in quantity released on- and off-site. Although the total quantity of production-related waste that facilities managed rose, the overall increase was considerably smaller than the nation's increase in manufacturing pro-

duction. TRI production-related waste increased by 5.8 percent, compared to the 40.4 percent increase in manufacturing production over the same period. While manufacturing production steadily increased from 1991 to 1998, TRI production-related waste decreased in about half of the years. However, increases in 1994, 1997, and 1998 resulted in the overall increase for the period.

**Table 4–11. Industrial Production Indexes by Industry, 1991–1998**

	1991	1992	1993	1994	1995	1996	1997	1998
<b>Total Index</b>	100	103.1	106.7	112.5	117.9	123.2	130.7	135.5
<b>Manufacturing</b>	100	104.0	107.8	114.2	120.2	126.2	134.8	140.4
<b>SIC Code</b>								
<b>Industry</b>								
20 Food	100	101.6	103.7	105.4	107.5	107.1	109.8	111.3
21 Tobacco	100	101.1	85.0	105.6	113.0	114.8	112.1	107.2
22 Textiles	100	107.9	113.6	119.3	118.9	115.3	121.0	121.6
24 Lumber	100	105.8	106.7	112.1	114.2	116.8	120.8	123.7
25 Furniture	100	105.5	110.7	114.0	117.5	119.4	124.2	128.2
26 Paper	100	103.3	107.4	112.0	113.2	112.4	118.2	119.0
27 Printing	100	100.9	101.6	101.6	102.3	102.5	106.2	106.2
28 Chemicals	100	103.7	105.3	108.6	111.3	114.1	119.2	119.8
29 Petroleum	100	100.9	103.8	103.6	105.4	107.8	110.8	113.2
30 Plastics	100	110.3	117.9	128.4	132.0	135.9	141.3	146.2
31 Leather	100	101.6	102.6	95.1	88.3	88.7	83.2	76.5
32 Stone/clay/glass	100	102.9	105.0	110.9	114.1	121.7	125.8	129.5
33 Primary metals	100	103.4	109.3	117.3	120.8	123.9	129.6	128.0
34 Fabricated metals	100	104.0	108.5	116.6	121.0	124.9	129.6	132.2
35 Machinery	100	104.8	115.2	130.9	150.8	167.5	188.1	213.5
36 Electrical Equip.	100	111.6	122.3	146.7	185.6	229.9	282.8	325.3
37 Transportation Equip.	100	103.6	107.6	111.0	110.3	110.3	121.3	127.6
38 Measure/Photo.	100	100.2	101.0	100.0	103.8	107.9	110.5	113.3

*Note:* 1991=100. Data are not provided for apparel industry (SIC code 23) or Misc. Manufacturing (SIC code 39).

*From:* 1999 Statistical Abstract of the United States, No. 1240 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*.)

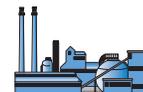


Table 4–12. Cumulative Change in Manufacturing Production and in TRI Quantities in Waste Managed, 1991–1998

	1991–1992	1991–1993	1991–1994	1991–1995	1991–1996	1991–1997	1991–1998
	Percent						
Manufacturing Production	4.0	7.8	14.2	20.2	26.2	34.8	40.4
TRI Quantity Released On- and Off-site	-6.7	-12.5	-19.7	-23.7	-26.2	-25.4	-27.6
TRI Total Production-related Waste Managed	-2.0	-2.5	3.4	0.2	-1.7	1.4	5.8

*Note:* Cumulative manufacturing production is based on 1999 Statistical Abstract of the United States, No. 1240 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, aluminum oxide, ammonia, hydrochloric acid and sulfuric acid.

TRI data are taken from Section 8 (Total of 8.1 through 8.7) of Form R (current year) of year indicated.

