LEGEND

M **Matched Chemicals/Industries**

A **All Chemicals/Industries**

3 Overview of PRTR Data for *Taking Stock 1996*

Figures

Tables

Key Findings

- The NPRI and TRI databases must be "matched" in order to compare the PRTR data. The data reported on forms for chemicals and industry categories common to both NPRI and TRI represent 60 percent of the total releases and transfers in the NPRI database and 82 percent of those in TRI.
- This report analyzes publicly available data submitted by specific Canadian and US facilities on a selected list of chemicals whose use meets or exceeds specific thresholds.
- PRTR data are limited in what information they can provide. For example, information is not included on non-industrial and smaller industrial sources of the listed substances and on pollution from other substances of concern. In particular, nonpoint sources such as paints and solvents used in homes, offices and industry can be significant sources of these pollutants.
- Comparing year-to-year changes or the performance of facilities must also be done with due regard for the limitations of the PRTR databases. PRTRs do not fully explain why year-to-year changes in the data have occurred, and there is no general agreement on methods to "normalize" facility performance to take into account factors of size or operations or environmental conditions.
- An important point to remember in interpreting the analyses in this report is that PRTR data do not address exposure or risk from the releases and transfers of these substances.

3.1 Introduction

This chapter describes the NPRI and TRI data used to prepare this report and the methods applied to match comparable data from the two PRTR systems. Summary tables of the complete NPRI and TRI databases for 1996 and for the matched data sets are presented here, to make clear the differences in the data sets that are examined in various sections of the book. Analyses of these data appear in **Chapters 4, 5** and **6**. This chapter concludes with a description of the limitations of PRTR data and the context within which these data should be viewed.

3.2 Data Used in *Taking Stock 1996*

3.2.1 NPRI and TRI Databases

The data for Canada are based on NPRI data as released to the public on the Internet at <http://www.ec.gc.ca/pdb/npri/> in July 1998. The data for the United States are based on TRI data as released to the public in *1996 Toxics Release Inventory: Public Data Release,* US Environmental Protection Agency, Washington, DC, May 1998.

The 1996 TRI required reporting of a list of 608 chemicals and chemical categories, while NPRI covered 176. TRI applied only to manufacturing and federal facilities, while, with a few exceptions, NPRI covered facilities in any industry. These chemicals are listed in Appendix A.

North American PRTR Data—All Chemicals and Industries

In 1996, 23,482 facilities in North America submitted 78,135 reports to the Canadian National Pollutant Release Inventory or the US Toxics Release Inventory. Releases and transfers of pollutant substances listed on the respective inventories totaled 1.55 billion kilograms. Transfers to recycling/reuse and to energy recovery are not included in this total because reporting of these amounts was voluntary in Canada in 1996 (**Table 3–1**, p. 22).

The NPRI and TRI databases used in this report contain updated information for previous years. Facilities in both countries may revise their PRTR reporting at any time, for any year. A facility may, for example, discover errors in its previous submissions, or a facility may change its methods for estimating releases, revising data for prior years for consistency. Some facilities may also submit forms after the reporting deadline. Because of this, the 1995 totals presented in *Taking Stock 1996* differ from those in last year's report (**Table 3–2**, p. 22).

3.2.2 Matching Chemicals and Industries

To analyze NPRI and TRI reporting on a common basis requires matching the common elements in the two PRTRs. This means omitting from both databases the industrial groups and the pollutant substances that appear only in NPRI or TRI, but not both. One process of elimination removes all reporting forms submitted by non-manufacturing facilities (those that reported US SIC codes outside the range of 20 to 39) because through 1996 TRI covered only manufacturing (plus federal facilities). In contrast, NPRI requires any facility that handles an NPRI chemical (with a few exceptions) to report.

A second process of elimination is required to remove all reporting forms for chemicals that are on the NPRI list but not on that of TRI, and vice versa. In addition, there are four chemicals that are listed by both NPRI and TRI but in different forms or physical states. These are ammonia, hydrochloric acid, isopropyl alcohol, and sulfuric acid. Whereas any release or transfer of hydrochloric or sulfuric acid is reportable to NPRI, only air emissions of these acids are reportable to TRI; therefore, only air emissions of these substances are included in the matched data set. Isopropyl alcohol and ammonia are not included in the matched data set but for different reasons. For isopropyl alcohol, only the substance as manufactured by the strong acid method is included in TRI, while all forms are included in NPRI. It is thus not possible to know which records for isopropyl alcohol in NPRI would match those in TRI. For ammonia, total ammonia is reportable to NPRI while only 10 percent of aqueous forms, along with all forms of anhydrous ammonia, are reportable to TRI. TRI facilities with total ammonia wastestreams equivalent to those of NPRI facilities that do report, would not report to TRI because the "10 percent" rule would cause them to fall below the reporting threshold. Thus, ammonia is not included in the matched data set. A total of 165 "matched" chemicals appear on both lists in 1996. (See **Appendix A** for a list of these chemicals compared to the list of all chemicals on both the NPRI and TRI lists.)

Hydrochloric acid, sulfuric acid and ammonia are released in large quantities by US and Canadian facilities, and the exclusion of complete or partial reporting on these chemicals widens the differences between the matched data set analyzed for *Taking Stock 1996* and the complete NPRI and TRI databases. This methodology also differs from that used to derive the 1995 *Taking Stock* report.

North American PRTR Data for 1995 and 1996—Matched Chemicals and Industries

Both PRTRs have also made changes in their reporting requirements over time. Comparisons that cover more than one year must also take these changes into account. Because of reporting changes for 1993 and 1994 (the first two years of NPRI reporting) that are not easily taken into account by either removing an industrial sector or a chemical, this *Taking Stock* report uses the reporting year 1995 as a base year for multi-year comparisons. (See **Section 2.1.2** for a description of the reporting changes.) The matched set of industries and chemicals is the same for 1995 as for 1996.

For the chemicals and industries that are common to both NRPI and TRI, the matched data set for 1996 contains information from 62,225 forms, submitted by 20,534 facilities in North America. These 1996 data, based on comparable information from both PRTRs, are analyzed in **Chapters 4** and **5**. Neither Canada nor the United States made changes in the chemicals and industries covered in their respective PRTRs for 1996. Therefore, the matched data set for 1995–1996 reflects the same matched chemical list and the same reporting industries as the 1996 data set. The 1995–1996 data are analyzed in **Chapter 6**. Releases and transfers for this matched data set totaled 1.26 billion kilograms in 1995 and 1.23 billion kilograms in 1996 (**Table 3–3**, p. 23).

North American releases and transfers totaling 323 million kilograms were thus excluded in compiling the matched data set of comparable information from NPRI and TRI for 1996. The "matched" data set represents 60 percent of the total releases and transfers in the full NPRI database and 82 percent of those in TRI. Differences in the two PRTRs' chemical lists alone eliminated 22 percent of NPRI releases and transfers and 18 percent of TRI releases and transfers from the matched analyses. By far the greatest effect of the differing chemical list was the difference in how ammonia is reported. Excluding ammonia from the matched data set excluded 14 percent of NPRI releases and transfers and 7 percent of TRI releases and transfers (**Table 3–4**, p. 24 and **Figure 3–1**).

Industry differences have a greater effect on the matching of NPRI data because Canada collects data from all industries while the US collects data only from manufacturing industries. Almost 16 percent of NPRI total releases and transfers were reported by industries that do not report to TRI. TRI does have a small number of facilities reporting that are non-manufacturing facilities; they are primarily federal facilities Also excluded are all data for transfers to recycling/reuse and to energy recovery, categories that must be reported in the United States but were voluntary in Canada in 1996.

[Text continues on p. 25.]

Figure 3–1
M 1996

Effects of Matching NPRI and TRI for Chemicals and Industries

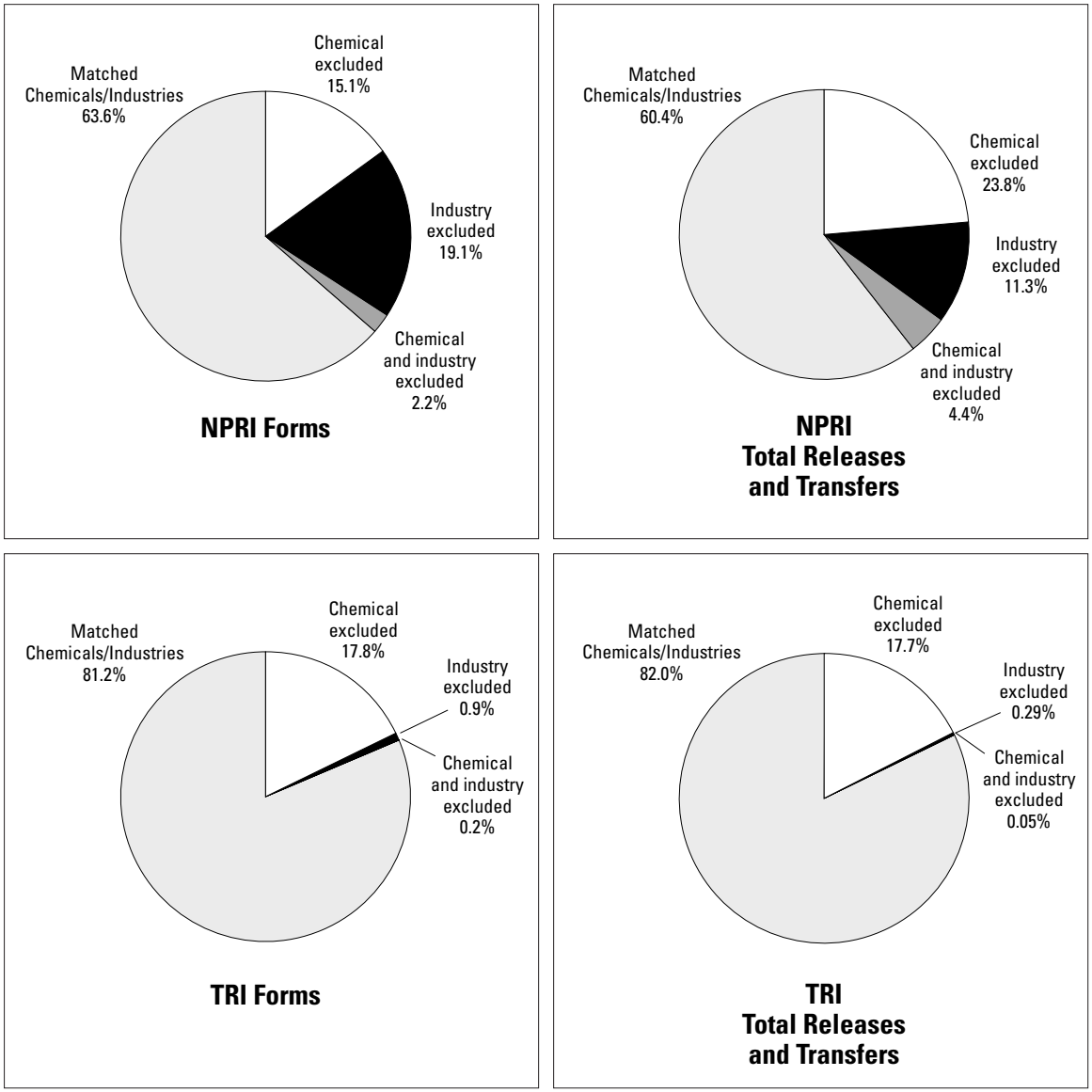


Table 3–1 A 1996 — North American Total Releases and Transfers, NPRI and TRI

	North America Number	Canadian NPRI Number	US TRI Number
Total Facilities	23,482	1,856	21,626
Total Forms	78,135	6,754	71,381
Releases	**kg**	**kg**	**kg**
Total Air Emissions	756,659,343	98,115,143	658,544,200
Surface Water Discharges	91,602,523	13,013,766	78,588,757
Underground Injection	110,487,006	17,820,743	92,666,263
On-site Land Releases	154,033,294	13,868,575	140,164,719
Total Releases	**1,112,989,534**	**143,025,595**	**969,963,939**
Transfers			
Treatment/Destruction	152,239,870	20,676,683	131,563,187
Sewage/POTWs	114,493,393	7,548,491	106,944,902
Disposal/Containment	169,304,015	34,137,359	135,166,656
Total Transfers	**436,037,278**	**62,362,533**	**373,674,745**
Total Releases and Transfers	**1,549,026,812**	**205,388,128**	**1,343,638,684**
Transfers to Recycling/Reuse*		98,492,683	975,326,074
Transfers to Energy Recovery*		4,262,115	216,352,186

* Optional reporting for NPRI, required for TRI.

➤ Canada and US data only. Mexico data not collected for 1996.

Table 3–2 A 1995 — North American Total Releases and Transfers, NPRI and TRI

	North America Number	Canadian NPRI Number	US TRI Number
1995 Data, Reported in Taking Stock 1995			
Total Facilities	23,709	1,758	21,951
Total Forms	79,605	6,294	73,311
Releases	**kg**	**kg**	**kg**
Total Air Emissions	811,073,607	102,537,501	708,536,106
Surface Water Discharges	96,230,607	34,409,462	61,821,145
Underground Injection	122,652,243	16,085,482	106,566,761
On-site Land Releases	140,598,536	15,822,135	124,776,401
Total Releases	**1,170,770,356**	**169,069,943**	**1,001,700,413**
Transfers			
Treatment/Destruction	146,968,533	16,548,187	130,420,346
Sewage/POTWs	114,894,506	6,125,111	108,769,395
Disposal/Containment	165,482,360	37,748,366	127,733,994
Total Transfers	**427,345,399**	**60,421,664**	**366,923,735**
Total Releases and Transfers	**1,598,115,755**	**229,491,607**	**1,368,624,148**
1995 Data, with Revisions Submitted since 1995 Report			
Total Facilities	23,415	1,789	21,626
Total Forms	77,768	6,387	71,381
Releases	**kg**	**kg**	**kg**
Total Air Emissions	759,121,530	100,577,330	658,544,200
Surface Water Discharges	112,918,221	34,329,464	78,588,757
Underground Injection	108,475,745	15,809,482	92,666,263
On-site Land Releases	154,130,258	13,965,539	140,164,719
Total Releases	**1,134,860,356**	**164,896,417**	**969,963,939**
Transfers			
Treatment/Destruction	148,113,711	16,550,524	131,563,187
Sewage/POTWs	113,234,409	6,289,507	106,944,902
Disposal/Containment	164,545,521	29,378,865	135,166,656
Total Transfers	**425,893,631**	**52,218,886**	**373,674,745**
Total Releases and Transfers	**1,560,753,987**	**217,115,303**	**1,343,638,684**

➤ Canada and US data only. Mexico data not collected for 1995 and 1996. These data are for all 1995 chemicals/industries reported in 1995 and revised since 1995 Taking Stock.

Table 3–3
M 1996

North American Releases and Transfers

	1995			1996		
	North America Number	**Canadian NPRI Number**	**US TRI Number**	**North America Number**	**Canadian NPRI Number**	**US TRI Number**
Total Facilities	21,063	1,302	19,761	20,534	1,344	19,190
Total Forms	64,221	4,164	60,057	62,225	4,298	57,927
	kg	**kg**	**kg**	**kg**	**kg**	**kg**
Total Air Emissions	603,803,814	67,039,370	536,764,444	563,269,177	63,590,706	499,678,471
Surface Water Discharges	79,560,902	12,330,846	67,230,056	78,742,497	5,128,134	73,614,363
Underground Injection	87,805,470	3,556,927	84,248,543	75,239,943	4,812,379	70,427,564
On-site Land Releases	133,857,666	9,607,743	124,249,923	145,838,045	8,936,491	136,901,554
Matched Releases	**905,164,732**	**92,671,766**	**812,492,966**	**863,218,412**	**82,596,460**	**780,621,952**
Treatment/Destruction	115,504,975	12,204,318	103,300,657	124,473,070	13,571,799	110,901,271
Sewage/POTWs	94,336,194	4,216,987	90,119,207	91,073,897	4,943,234	86,130,663
Disposal/Containment	139,019,418	21,327,700	117,691,718	147,065,311	23,017,654	124,047,657
Matched Transfers	**348,860,587**	**37,749,005**	**311,111,582**	**362,612,278**	**41,532,687**	**321,079,591**
Matched Releases and Transfers	**1,254,025,319**	**130,420,771**	**1,123,604,548**	**1,225,830,690**	**124,129,147**	**1,101,701,543**

➤ Does not include ammonia, isopropyl alcohol, non-air emissions of hydrochloric acid and sulfuric acid, and chemicals not reported to both NPRI and TRI.
➤ Canada and US data only. Mexico data not collected for 1995 and 1996. See **Chapter 6** for further analyses of 1995–1996 data.

Table 3–4
M 1996

Effects of Matching NPRI and TRI for Chemicals and Industries

	NPRI		TRI	
	Number of Forms	Total Releases and Transfers (kg)	Number of Forms	Total Releases and Transfers (kg)
All Chemicals and Industries	6,754	205,388,115	71,381	1,343,638,684
Excluded due to Industry	1,439	35,176,082	779	4,673,698
Excluded due to chemical and industry	146	9,032,416	153	728,117
Excluded to industry only	1,293	23,298,110	626	3,945,581
Excluded due to chemical only	1,017	48,928,455	12,675	237,263,443
Hydrochloric and sulfuric acid: non-air releases	390	10,856,897	661	2,779,099
Isopropyl alcohol	184	3,143,313	68	569,949
Ammonia	213	29,536,951	2,749	43,001,993
Other chemicals	230	5,391,294	9,197	190,912,402
Matched Chemicals/Industries	**4,298**	**124,129,134**	**57,927**	**1,101,701,543**
	%	%	%	%
All Chemicals and Industries	100.0	100.0	100.0	100.0
Excluded due to industry	21.3	17.1	1.1	0.3
Excluded due to chemical and industry	2.2	4.4	0.2	0.1
Excluded to industry only	19.1	11.3	0.9	0.3
Excluded due to chemical only	15.1	23.8	17.8	17.7
Hydrochloric and sulfuric acid: non-air releases	5.8	5.3	0.9	0.2
Isopropyl alcohol	2.7	1.5	0.1	0.0
Ammonia	3.2	14.4	3.9	3.2
Other chemicals	3.4	2.6	12.9	14.2
Matched Chemicals/Industries	**63.6**	**60.4**	**81.2**	**81.0**

3.3 Context of Report and Limitations of Data

Taking Stock 1996 analyzes publicly available data submitted by specific US and Canadian facilities on a selected list of chemicals or substances whose use meets or exceeds specific thresholds. Effective use of PRTR data—and therefore of this report—requires attention to context and limitations. PRTR data have many limitations, all of which influence this report. For one thing, important information often lies beyond the bounds of what can be known from existing PRTR data. Chemicals of concern may move into the environment from uses not addressed by PRTR reporting requirements, and no PRTR chemical list includes all the substances that may cause harm. PRTRs also offer no direct perspective on the ultimate environmental fate of chemical substances that reporting facilities release or ship off-site for disposal or other disposition. The North American PRTRs now in existence or in development do not cover:

- the full range of facilities that may manufacture, process or use listed chemicals;
- small sources (gasoline service stations, dry cleaners), mobile sources (motor vehicles), area sources (farms, parking lots) or natural sources;
- all releases and transfers from a facility; or
- all substances of concern.

These PRTRs also do not collect all the kinds of information that would improve the interpretation of facilities' reports. Such information would include:

- factors responsible for changes in releases and transfers from year to year,
- reliable basis for normalizing data from year to year,
- information on the health or environmental significance of the chemicals, and
- exposure to or risk from substances of concern.

While much can be learned directly from NPRI, TRI and the forthcoming RETC, each exhibits some or all of these limits. None supplies a complete view of any listed chemical within a country's borders. Similarly, a North American compilation of data reflects the limits of its constituent databases. This report therefore reflects these limitations, which are described in more detail in the following sections.

3.3.1 Accounting for Sources of Releases and Transfers

The North American PRTRs differ in the facilities they require to report. With few exceptions, Canada's NPRI covers all facilities that manufacture, process or use a listed pollutant above threshold limits. As established in 1987, the US TRI covered only manufacturing facilities. Federal facilities were added in 1994, and beginning in 1998, TRI coverage will expand to include mining, electrical utilities and other industries, as discussed above (in **Section 2.1.1**). The matched data set that forms a large part of this report includes only those industries that are common to both reporting systems.

PRTR data do not account for all sources of releases and transfers, an important limitation in considering information in this report. Threshold limits exempt small sources from reporting. Dry cleaning establishments and automotive service stations are typical examples. In a particular locale, one or more of these small sources may represent a large source of a listed chemical. Taken as a whole, they may also constitute a large source for particular substances. Also, nonpoint sources are not fully estimated in North American PRTRs. Among these, agricultural sources are important; pesticides from such sources, for example, may raise concerns both locally and globally. Mobile sources (such as automobiles, trucks, aircraft, and boats) are also particularly significant. Published TRI and NPRI reports supply an estimate of releases from some of these nonpoint sources, as part of the context for the PRTR data. Mexico plans to provide estimates of nonpoint sources (See **Section 3.3.2**, below, for a further discussion of nonpoint sources). Transfers of listed pollutants as (or in) products are not presently addressed by any of the North American PRTRs.

Individual PRTRs also may not require reporting of all types of releases and transfers. In Canada, for example, reporting of transfers off-site for recycling or energy recovery is optional. US facilities report not only the off-site transfers, but also the amounts treated or recycled on-site or used there for energy recovery. Because of the voluntary reporting of the recycling, reuse, recovery amounts in Canada, transfers to recycling, reuse, recovery are not included in the matched and multi-year matched chemical/industries data sets, and this may exclude large amounts of substances.

3.3.2 Nonpoint Sources

Some people commented during the development of the *Taking Stock* report on the need to provide readers with a sense that there are other sources of chemical releases, besides industry. Readers also need to understand clearly that not all sources of pollutants are covered in PRTR systems and, hence, in this report.

The CEC has begun an activity to define and estimate non-point sources of pollution in the three countries. Information from this activity is expected to be available to complement future *Taking Stock* reports.

In the interim, to demonstrate the role of other sources of chemical releases, the approach used in the NPRI and TRI summary reports was adapted for North America. The NPRI and TRI summary reports use emission estimates to quantify releases from other sources.

The 1996 NPRI summary report provides pollutant release information from other sources, including architectural surface coatings, commercial and consumer solvent use, dry cleaning and solvent degreasing. The 1995 NPRI summary report provided estimates on releases from dry cleaners, solvent degreasers, fuel distribution and mobile sources, and other emissions inventories of criteria air contaminants and greenhouse gases. The 1996 TRI report includes a new section on diffuse sources to " help the public understand the relative role of industrial releases (those reported to TRI) versus those releases not reported to TRI." Three sources are described: fertilizer use, pesticide use and VOCs (volatile organic compounds).

Two of these examples, architectural surface coatings (paints) and solvents, are based on EPA emission factors that were in use in all three countries. This permits a common factor to be used to calculate these emissions. These calculations should be seen as estimates designed to give a sense of other sources of PRTR substances only. Because of the many assumptions that have to be made, these estimates serve only to show relative proportions of these sources.

Surface Coatings for Architectural Structures (Paints)

Paints, stains and other coatings are applied to the inside and outside of buildings and can release VOCs. The amount and type of VOC released from paints is described in an EPA guidance manual (US EPA. *Emission Inventory Improvement Program. Preferred and Alternative Methods for Estimating Air Emissions,* Vol. III, **Chapter 3**, "Architectural Surface Coating," November 1995).

According to the 1996 NPRI summary report, the technology for processing paints that are used for protecting architectural structures is generally very similar in the United States and Canada, and thus the same [US] methodology for determining release estimates from these applications can be applied in Canada. These emission factors were applied to information provided by Statistics Canada on the quantity and types of coatings used in 1995 to yield pollutant data on a provincial and national basis. While this generated estimates for releases of 16 chemicals, only 12 of these were on the matched list of chemicals (**Table 3–5**, p. 31).

This example illustrates how one source, paints, can be a minor contributor for some pollutants, such as benzene and methanol, compared to industrial facilities reporting to NPRI and TRI. However, for other pollutants, such as ethylbenzene, paints can release amounts similar to industrial facilities reporting to NPRI (**Figure 3–2**).

Solvents

Solvents are found in numerous products used in the home, office and industry. Some of these products include adhesives and sealers, automotive after-market products (parts sold for vehicle repair rather than for their original manufacture), coatings and related products, household products, personal care products, and miscellaneous products such as arts and crafts supplies. The US EPA has developed emission factors per capita for each of these solvent categories (US EPA. *Emission Inventory Improvement Program. Preferred and Alternative Methods for Estimating Air Emissions*. Volume III, **Chapter 5**, "Consumer and Commercial Solvent Use." November 1995). In the 1996 NPRI summary report, Environment Canada combined these emission factors with population data to generate estimates of releases of 12 NPRI pollutants from these products (**Table 3–6**, p. 31). All of these chemicals are on the list of matched chemicals.

Commercial and consumer products can release significant amounts of some pollutants. For example, releases of toluene and tetrachloroethylene in commercial and consumer product solvents about equaled on-site releases reported by industrial facilities. However, for the other 10 pollutants, industrial facilities reported releasing more of these pollutants than are released though product use (**Figure 3–3**).

These two examples, paints and solvents, demonstrate how releases from these products can be a significant source of certain pollutants even though industrial facilities generally report larger releases to NPRI or TRI for the other pollutants examined. They also illustrate how additional data can provide information complementary to PRTR data.

3.3.3 Tracking Reductions in Releases and Transfers

Because North American PRTRs are built on annual reporting, their data reveal year-to-year changes and can be used to track long-term trends. Current PRTR reporting, however, does not explain these changes. Reductions in releases and transfers may result from source reduction (pollution prevention) activities, implementation of pollution control, changes in production level, and changes in estimation methods. A particular reduction may arise from a combination of these events, but PRTR data do not tell how much of the change was due to which factor. The benefits of reductions in releases are also difficult to quantify.

Several methods can be used to investigate changes, depending on the information a PRTR collects. TRI, for example, requires facilities to indicate whether they undertook source reduction activities during the year and, if so, what these activities were. Although no reduction amount can be attributed to a particular cause, TRI forms that indicate source reduction activities can be compared to those that do not to suggest the extent to which facilities' pollution prevention actions may be helping to reduce releases. In another example, meteorological records for a local area subject to flooding might be used with NPRI data to explore correlation between rainfall and surface water discharges. In TRI, facilities indicate this as the percentage of surface water discharges attributable to storm water run-off.

Some reductions in releases reported to PRTRs do not, in fact, represent smaller quantities of substances released to the environment. Generally, facilities estimate, rather than measure, their releases. PRTRs do not require precise measurement, as a way to reduce the cost to industry of preparing their PRTR reports. A facility may choose one of several reasonable methods for estimating its releases, basing them on monitoring data, materials balance calculations, or best engineering judgment. Changing from one estimation method to another may cause variation in the amounts reported without any change in actual releases. Facilities in a particular industry may rely on estimation methods (typically, "emission factors") supplied by a trade association or by manufacturers of equipment widely used in that industry. When these emission factors are revised, reported releases for an entire industry may change.

A recent study of TRI facilities that had reported large reductions in production-related waste found that just one type of "paper" change—that is, a reporting change that does not reflect any actual difference in amounts released, transferred or managed in waste—accounted for half of the apparent reductions. Facility decisions to redefine certain activities, especially on-site recycling, meant that the amounts associated with those activities were no longer reportable to TRI. (In other research, such as *Toxics Watch 1995* [INFORM, Inc. 1995], such redefinitions have also explained some of the large increases in TRI reporting.) However, when this study focused on TRI's release/disposal category rather than total production-related waste, reductions proved much more likely to be real. Facilities cited actual changes, including source reduction (pollution prevention) actions, as the reason for more than 90 percent of the reported decreases in release/disposal amounts. (See T.E. Natan, Jr. and C.G. Miller. "Are Toxics Release Inventory Reductions Real? Is Source Reduction the Cause?" *Environmental Science &Technology*, Vol. 32/15, 1 August 1998.)

NPRI does require facilities to report reasons for changes, using general categories: changes in production levels, changes in estimation methods, other (including accidents or spills), or no significant change. NPRI facilities indicate the appropriate category for change in total releases and again for change in total transfers. They can also provide a comment on the reason for year-to-year differences. TRI does not require facilities to identify reasons for changes, although facilities report the kind of estimation method used for each individual release and transfer amount; these can be compared from year to year. NPRI facilities also report the kind of estimation method used for each individual release and transfer amount. In addition, TRI requires facilities to calculate an index indicating changes in production levels. NPRI will add this on a voluntary basis in the 1997 reporting year. The proposed Mexican RETC would also include this information on a voluntary basis. The index can indicate relative production changes from year to year, but not the amount of reduction (or increase) in PRTR releases and transfers associated with changes in production.

Figure 3–2
M 1996

Releases of 12 Listed Substances in Canada and the United States: Uses in Surface Coatings versus Manufacturing

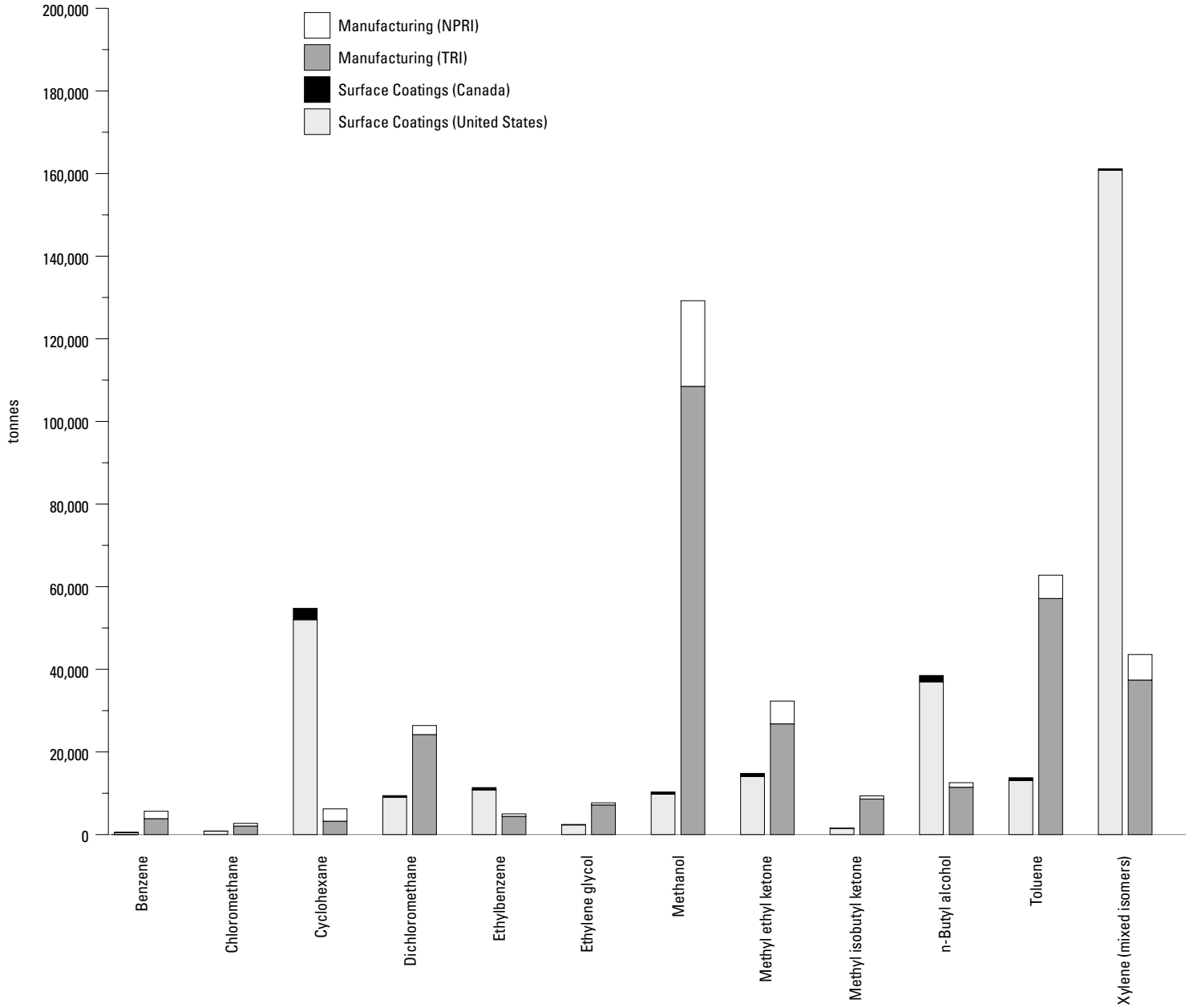
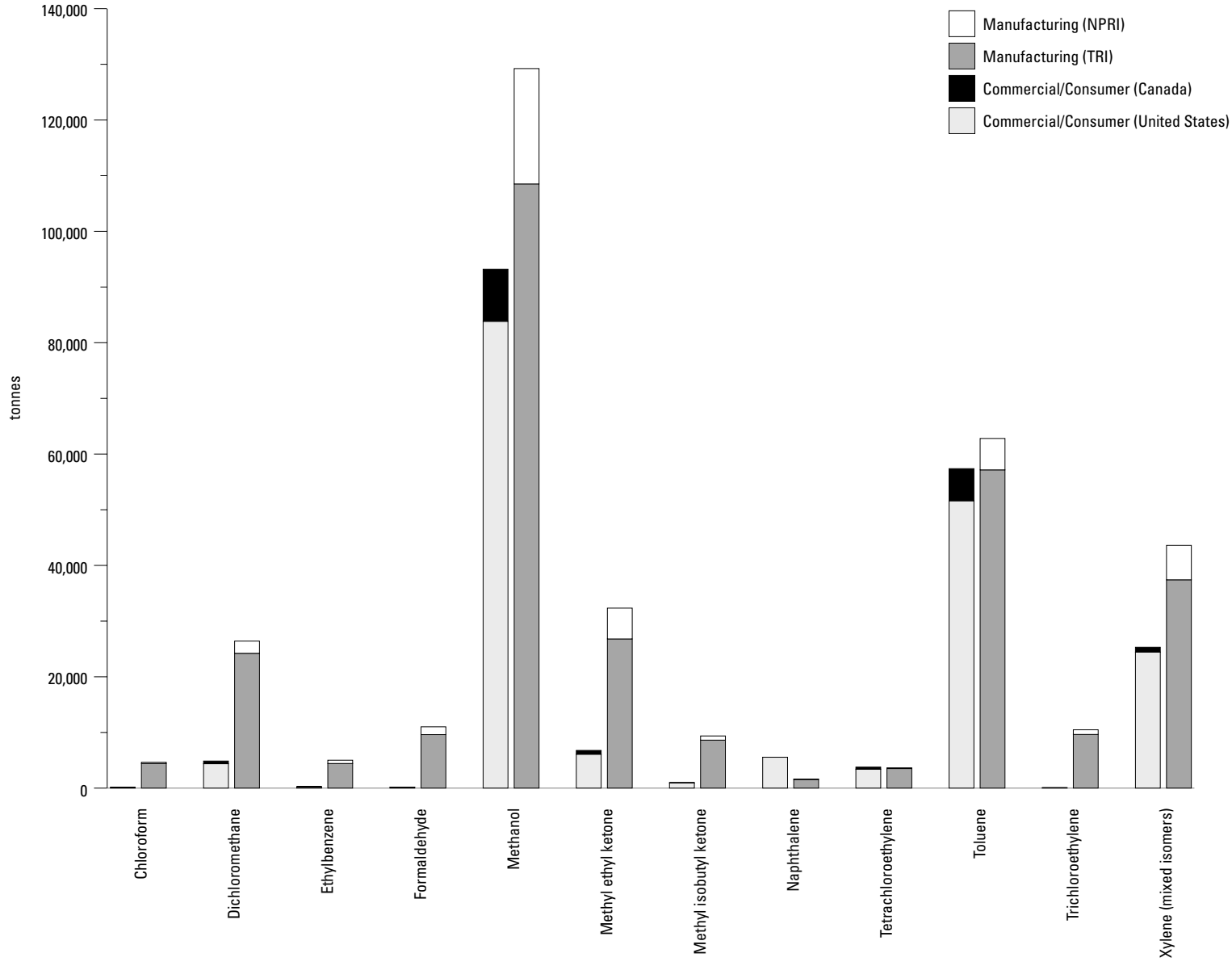


Figure 3–3
M 1996

Releases of 12 Solvents in Canada and the United States: Commercial/Consumer Sources versus Manufacturing Sources



3.3.4 Normalization

Some approaches have been suggested for normalizing PRTR data to account for conditions that vary among reporting facilities. Proposed normalizing measures include total amounts of chemicals per unit of production, per unit of energy consumption, or per job. Every normalization method has an underlying set of assumptions and limitations. For example, normalizing the release data on the basis of employees assumes that there is a relationship between the amount of releases and the number of employees, such that a facility that has more employees will have larger releases and a facility with fewer employees will have smaller releases. Many facilities do not find such a direct relationship. Releases may be smaller at one facility because of production processes used, differences in raw materials, or the installation of pollution control devices than at another facility in the same industrial sector with the same number of employees. In addition, factors influencing the size of the workforce at a facility from year to year are numerous, and therefore year-to-year comparisons based on normalizing by number of employees may not provide an accurate picture of releases. Other facilities note the difficulty in obtaining accurate employment figures on a per facility basis. If a facility has its head office and production staff at the same location, what is the appropriate number of employees to correspond to the release data? NPRI facilities report the number of employees, but TRI facilities do not. Other information sources can give an estimate of employees per TRI company, but this may not be accurate at the facility level. Because of these difficulties and likelihood of introducing errors, this report has not normalized NPRI and TRI data on the basis of employee size.

Other methods of normalization include normalizing releases on the basis of production level. The underlying assumption here is that as production increases, releases increase proportionately, and as production decreases, releases decrease. Again, production may increase without a corresponding increase in releases due to a host of reasons, such as raw material substitution, changes in production processes, improved spill management and pollution prevention activities. On the other hand, some industrial sectors, such as the chemical industry, have reported reductions in releases with increases in production. Another challenge is trying to define a measure of production that is appropriate to vastly different industrial sectors and applicable over time. Some observers argue that normalizing by production would provide a more accurate basis to compare facilities and jurisdictions, noting that if a facility is "bigger" than another, then it stands to reason that its releases and transfers would also be larger. Only TRI requires reporting of production-related information and that is an index of relative production from one year to the next. Such a measure, at best, is suited only to interpreting changes in PRTR data for a single facility from year to year. It cannot be used to compare across facilities.

Normalization could also be undertaken from the point of view of potential exposure. What is the population surrounding a facility? What are the uses of water bodies into which pollutants are discharged? Again, such data are not part of the PRTRs.

Some efforts have been made to establish methodologies for normalizing PRTR data. For example, the National Round Table on the Environment and Economy is an independent agency of the Canadian federal government set up to identify, explain and promote the principles and practices of sustainable development. One of the Round Table's program areas has been "Measuring Eco-Efficiency." In April 1997, experts in eco-efficiency indicators from around the world gathered to discuss the development of three eco-efficiency indicators, one for toxics, one for materials and one for energy. Eight multinational companies agreed to test the indicators. Two proposed pollutant dispersion or toxics indicators were: (1) mass of pollutant releases per unit of output, where unit of output is a unit of production measure or a unit of revenue, and (2) mass of pollutants common to NPRI and ARET per unit of output. The second indicator was developed to account for the environmental relevance of the pollutant release.

Indicators for materials and energy were refined but, despite intensive work, the multi-stakeholder subcommittee working on the development of a toxics indicator concluded that no such indicator could be developed. No agreement was reached on which chemicals to include, nor could any measure proposed be applicable to all industrial sectors. The committee agreed to refocus work into specific categories of chemicals and on specific environmental issues (See the Round Table's web site <http://www.nrtee-trnee.ca> for more information).

The Canadian Chemical Producers' Association, in its annual *Reducing Emissions Report*, summarizes releases of over 250 substances from their member companies (the report is available on the web at <http://www.ccpa.ca>). In addition to reporting releases by medium, by province, by carcinogen and by environmental issue, the report compares releases to value of shipments (in millions of constant dollars). The TRI annual summary report has also, in the past, included a table comparing total releases and transfers with value of shipments. Its summary report for 1996 (*1996 Toxics Release Inventory*, May 1998) includes a table of production level changes by industry sector and compares percent change in manufacturing production to the percent change in TRI releases and transfers since 1989. Neither of these reports uses the economic data as an index to normalize the PRTR data, however.

Normalizing data can provide additional perspectives on the environmental performance of reporting facilities. However, every normalization method has its own underlying sets of assumptions and limitations. Moreover, the TRI, NPRI and proposed RETC do not collect any common data for use in normalizing. This report adds only limited data on population and geographic area to the release-and-transfer data provided by the PRTRs.

3.3.5 Ranking Facilities, Provinces and States

In addition to normalization, another issue raised in comments on this series of reports relates to the ranking of facilities and provinces/states. Underlying these two interrelated topics is the problematic question of how best to measure environmental performance.

The CEC received comments relating concerns that the rankings in the report were simplistic and/or misleading. Other comments, however, supported the rankings used and pointed out that they were consistent with practices employed by the existing national PRTR programs. The CEC has attempted to respond to both views by providing different presentations of ranking as a way of balancing differing approaches.

This report includes rankings of facilities based upon their total on-site releases collectively for all listed substances. This approach aggregates releases to different environmental media, which may have different impacts. It also aggregates substances with differing chemical and toxicological properties. Finally, it does not take into account any differences in the proximity of people and sensitive environments to the releases. On the other hand, it aggregates only some chemicals of concern—and

these are just one percent of chemicals in commerce in Canada and the United States. In addition, some tables sum only carcinogens or only metals among the listed substances.

These rankings are done exclusively on the basis of reported quantities and are not risk-based. They present the largest sources of releases to the environment of the reported chemicals from the covered facilities and provinces/states. While crude, rankings of the largest polluters in PRTR databases provide some perspective and have served to stimulate actions by industry and government to reduce pollution of substances of concern.

None of the rankings is meant to imply that any facility is not living up to its environmental obligations under the law, nor that any province's or state's environmental program is inadequate. Such rankings, instead, document some of the largest sources of the listed pollutants to the environment.

Some tables include both on-site releases and off-site transfers and rank reporting facilities and provinces/states based upon their totals. Some transfers are sent for treatment, others for disposal. Some transfers are largely destroyed in treatment or managed at disposal sites. Other transfers result in large amounts of substances of concern entering the environment at off-site locations (at varying distances from the facility). As a result, such rankings are not based upon what enters the environment, particularly at the site of the facility. The combination of release and transfers, instead, sums the amounts of the listed pollutants being released to the environment on-site and sent off-site in wastes.

Other approaches suggested for environmental performance measurement include the "normalization" methods described above. The CEC welcomes such suggestions and continues to explore methods that can be included in its North American PRTR reports.

3.3.6 Data on Exposure and Risk

Substances listed in PRTRs differ in their toxicity, persistence and ability to accumulate in organisms such as fish and humans. Some chemicals reported to NPRI and TRI are known carcinogens; others break down rapidly in water. Chemicals can have different impacts in water or air or in mixtures.

There are notable differences of opinion on some of the health and environmental characteristics of chemicals on the NPRI and TRI lists. There is also a broad range of health endpoints (potentially measurable effects on human health) and an even broader range of factors that determine health and environmental impacts. For these reasons, *Taking Stock 1996* does not directly address the health and environmental characteristics of the releases and transfers analyzed here, although it does include a table of reported effects for substances reported in the largest amounts (see **Chapter 4**). To provide a full overview of effects for all chemicals would be too voluminous for the report. This report also presents data on releases and transfers of carcinogens and metals (see **Chapters 4, 5** and **6**).

Readers wishing to learn more about the health and environmental characteristics of the chemicals reported to NPRI, TRI and RETC can get information from these sources:

- Canadian Centre for Occupational Health and Safety—<http://www.ccohs.ca/oshanswers>; e-mail: inquiries@ccohs.ca
- US National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances, available from the National Library of Medicine—<http://www.nlm.nih. gov/pubs/factsheets/rtecsfs.html>
- National Library of Medicine's Hazardous Substances Data Bank (HSDB)—<http://www.nlm.nih. gov/pubs/factsheets/hsdbfs.html>
- State of New Jersey, Department of Health, Right-to-Know Hazardous Substances Fact Sheets—<http://www.state.nj.us/health/eoh/rtkweb/rtkhsfs.htm>
- National Safety Council, *Crossroads* on Chemical Databases and MSDSs—<http://www.nsc.org/xroads/chem.htm>
- Environmental Defense Fund's Chemical Scorecard—<http://www.scorecard.org> (See **Chapter 9** for a description of this web site).
- *Sistema Internacional de Monitoreo Ambiental,* which also supplies hourly information on Mexico City's air quality under the General Direction for Pollution Prevention and Control—<http://www.imeca.com.mx>
- *Sistema Nacional de Información Ambiental*—<http://www.ine.gob.mx/indicadores/espanol/i_ca6.htm>
- *Contaminación Industrial con Solventes Orgánicos como Causa de Teratogénesis* (*Salud Pública Mex 1996*), *Instituto Nacional de Salud Pública*—<http://www.insp.mx/salud/38/381-12s.html>

PRTRs do not collect data on exposure or risk associated with the releases they report. Exposure and risk assessment depend on site-specific geographic and population characteristics, and the data they require can range from prevailing wind patterns to inhalation rates of children playing in schoolyards. Toxicity indices, sometimes recommended for evaluating PRTR data, do not reflect these local details. On the other hand, PRTR data can contribute to estimates of local exposure or risk. Public health authorities, for example, can use release data from local facilities as one element needed to compile a profile of local exposure.

Taking Stock 1996 adds together information on chemicals that differ in their toxicity, persistence, and ability to bioaccumulate. The total amount of the substances released or transferred from a facility may not necessarily represent the environmental and health risks from this facility. Any evaluation of the relative health and environmental impacts of a facility's releases and transfers must take into account a wide range of factors, including the toxicity of the chemicals released, local climatic and environmental conditions, the proximity of people and the ecological sensitivity of the area.

Table 3–5
M 1996

Releases of Chemicals Used in Surface Coatings for Architectural Structures, Canada and United States

CAS Number	Chemical	Estimates of Releases from Surface Coatings: Canada, 1995 (tonnes)	Estimates of Releases from Surface Coatings: US, 1996 (tonnes)	Total On-site Releases from Facilities Reporting to: Canada NPRI, 1996 (tonnes)	Total On-site Releases from Facilities Reporting to: US TRI, 1996 (tonnes)
71-43-2	Benzene	21	493	1,797	3,849
74-87-3	Chloromethane	35	822	649	2,067
110-82-7	Cyclohexane	2,750	52,003	2,975	3,242
75-09-2	Dichloromethane	381	9,046	2,198	24,200
100-41-4	Ethylbenzene	571	10,803	591	4,416
107-21-1	Ethylene glycol	114	2,330	518	7,165
67-56-1	Methanol	517	9,798	20,729	108,499
78-93-3	Methyl ethyl ketone	743	14,068	5,527	26,795
108-10-1	Methyl isobutyl ketone	79	1,507	750	8,613
71-36-3	n-Butyl alcohol	1,597	36,916	1,108	11,452
108-88-3	Toluene	691	13,064	5,647	57,149
1330-20-7	Xylene (mixed isomers)	345	160,825	6,173	37,410

Table 3–6
M 1996

Releases of Chemicals Used as Solvents in Commercial and Consumer Products, Canada and United States

CAS Number	Chemical	Estimates of Releases of Solvents: Canada, 1995 (tonnes)	Estimates of Releases of Solvents: US, 1996 (tonnes)	Total On-site Releases from Facilities Reporting to: Canada NPRI, 1996 (tonnes)	Total On-site Releases from Facilities Reporting to: US TRI, 1996 (tonnes)
67-66-3	Chloroform	13	119	208	4,417
75-09-2	Dichloromethane	480	4,378	2,198	24,200
100-41-4	Ethylbenzene	10	249	591	4,416
50-00-0	Formaldehyde	12	152	1,399	9,607
67-56-1	Methanol	9,359	83,838	20,729	108,499
78-93-3	Methyl ethyl ketone	680	6,086	5,527	26,795
108-10-1	Methyl isobutyl ketone	101	911	750	8,613
91-20-3	Naphthalene	1	5,545	61	1,556
127-18-4	Tetrachloroethylene	377	3,392	132	3,508
108-88-3	Toluene	5,769	51,603	5,647	57,149
79-01-6	Trichloroethylene	7	58	838	9,634
1330-20-7	Xylene (mixed isomers)	887	24,418	6,173	37,410