U.S. EPA
Toxic Release Inventory Program

TRI Communities

Catherine Callahan, Amanda Mardiney,
Pamela King and Rodrigue Kreilman

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Overview

The U.S. Environmental Protection Agency's (EPA) Toxics Release Inventory (TRI) was established in 1986 as part of the Emergency Planning and Community Right-to-Know Act (EPCRA). EPCRA was developed in response to a pair of events: an accidental release of methyl isocyanate that killed thousands of people in Bhopal, India, and a serious chemical release in West Virginia. These incidents prompted demand for more information about hazardous materials. EPCRA Section 313 requires EPA to collect data annually on releases and transfers of certain toxic chemicals from industrial facilities and make the data available to the public through TRI.[1]

Successes

TRI has largely been hailed as a successful effort for four main reasons. First, the inventory covers a wide variety of pollutants, giving users more complete information about potential chemical exposures. Second, EPA updates its data on a yearly basis.[2] While a year may seem like a big gap to some users, it is quite a rapid pace, considering the level of the quality checks EPA conducts on the reported information, and in fact most reputable data-collection organizations operate on a similar time frame. Third, TRI includes releases to air, land and water, giving a more complete picture of pollution in communities. Finally, TRI generally serves as a good starting point for individuals and community groups seeking information about toxic releases.

Project Goal

For this project, a team of students from George Washington University (GWU) set out to identify some areas in which TRI could improve. Since its inception, TRI has catered to the public, giving people access to information about the hazardous chemicals present around them. The GWU team's goal is to make TRI easier to use and more useful for communities. This report offers a number of ideas about the system's problem areas and, in its recommendations section, suggests projects that future student groups should undertake.

Report Organization

In order to make TRI easier to use and more useful for communities, the GWU team investigated what issues a hypothetical user might have when using TRI. The team identified three key steps to the TRI process and divided the issues identified based upon when they would occur during the user experience. The first step is making communities aware that TRI exists and getting them interested in what TRI data are telling them. From there, users would want to know if they should be concerned about toxic releases around them. The final step is to show users, if they are concerned, what they can do with TRI data and what the next steps are.

As a result, the paper is structured based on these three issue categories:

- What is TRI?
- What information does TRI provide, and should it give rise to concern?
- When communities are concerned, what can they do?

The report begins with a discussion of the research process, methodology and problem identification and structuring process. This is followed by sections focusing on the characterization of specific problems under each of the three established issue categories. Finally, the report concludes with recommendations for future student or consultant groups, including further investigations and possible projects to improve the TRI program.

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[1] "What is the Toxics Release Inventory?" U.S. EPA. 11 January 2012. <http://www.epa.gov/tri/triprogram/whatis.htm>.

[2] "Basics of TRI Reporting." U.S. EPA. 30 March 2012. <http://www.epa.gov/tri/triprogram/bussinesscycle/index.html>.

Executive Summary

What is TRI?

Due to a phenomenon known as the digital divide, some of TRI's key targeted audiences are unable to access the tool. These populations are often poor and do not have Internet access, which is problematic because TRI and its complementary tool sets are web-based programs. Some research shows that even when these people are directly presented with TRI data, they are still not motivated to act, perhaps because they do not understand the data they are viewing, or perhaps because they are skeptical that TRI does not provide the whole picture.

Another problem is TRI's narrow definition of community and its organization of its resources around this single characterization. An expansion of EPA's understanding of community beyond geographical units (i.e. area code) to types of user activity (i.e. health risk) could help it make TRI more user-friendly.

What information does TRI provide, and should it give rise to concern?

The GWU team found that the way TRI data are presented makes it difficult for citizens to know if they should be concerned. The team used the example of Texas City, TX's experience with benzene releases from BP PLC's local refinery to demonstrate how putting data into context with EPA's resources is possible but could be difficult for individuals without a scientific background. Another area for improvement is TRI's lack of consideration of chemical fate and transport, which can dramatically change the impact of a release. Through previous studies and conversations with TRI users, the team concluded that although many of the data interpretation tools communities need do exist, there is a lack of awareness among users of TRI's full suite of capabilities.

When communities are concerned, what can they do?

The success of TRI in reducing pollution and providing a means for communities to abate pollution depends in large part on the capacity and degree of public participation. However, there have been debates about whether information disclosure systems like TRI actually serve to empower citizens and promote environmental democracy. Providing data and information about toxic releases through TRI alone is not always sufficient to engender community action against polluters.

Public participation in environmental decisionmaking has lagged behind information disclosure and subsequently the factors that contribute to the lack of public participation and community engagement in environmental issues, particularly with TRI. These factors include inadequate information dissemination, publicity and usability of TRI, lack of awareness of a citizen's own rights under EPCRA, a lack of capacity for action, limited state and local government support and limited government resources for building capacity.

The GWU team identified other problems concerning a community's ability to act on TRI data. The first is how communities' common-sense knowledge, which is often critical in achieving a successful community campaign, is often suppressed by official data that is released by systems like TRI. The second is how TRI still needs work on incorporating and expanding on its environmental justice (EJ) program.

To address these issues, this report concludes with a list of recommendations for future TRI projects.

Methodology

The GWU team's research, conducted in collaboration with the EPA's TRI program, is focused on community use of TRI data. The bulk of the work for this report was set in the research stage. Once the research was complete and objectives were met, the GWU team proceeded to prioritize and sort the problems it identified in order to better direct and justify its recommendations. The team identified three questions users might ask during their experience with TRI. These three questions are: what is TRI, should I be concerned, and what can I do? Each issue category contains sub-categories with detailed explanations and examples to ensure clarity. The report closes with an introductory set of recommendations, stemming directly from issues identified in this document.

Research

The GWU team's research encompassed a combination of anecdotal and empirical research in order to identify TRI users, their needs and potential improvements in the TRI user experience. The team used the following approaches:

Review and analysis of public-facing TRI interfaces	Review and analysis of TRI publications	Research of peer-reviewed and organizational documents	Outreach to local NGOs and other TRI users

The scope and resources of this project did not allow for an extensive survey of communities and/or users. By employing this wide array of sources mentioned above, the GWU team was able to gain a broad, albeit shallow, understanding of how individuals and groups use TRI.

In order to maximize research efforts and avoid redundancy, the GWU team began by collecting insights directly from TRI employees and publications. Next, the team analyzed the TRI website and tools in the context of various likely user scenarios. For example, a researcher might choose a zip code and attempt to navigate the database and collect information a hypothetical community leader would need. This process helped the team uncover preliminary weaknesses and launching points for further research.

The GWU team then conducted a review of existing empirical research and reached out to relevant nongovernmental organizations in order to gain perspective on what those groups saw as the major problems and limitations of TRI. The groups included a number of national, state and community organizations that were identified in past research as likely TRI users. The first document that served as the team's reference was "An Agenda to Strengthen Our Right to Know, Empowering Citizens with Environmental, Health, and Safety Information" from OMB Watch.[3] The second was "How Are the Toxics Release Inventory Data Used?" from EPA.[4] Both

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[3] *"An Agenda to Strengthen Our Right to Know, Empowering Citizens with Environmental, Health, and Safety Information." (2011). OMB Watch. Web. <http://ombwatch.org/files/info/eiirecommendations.pdf>.*

[4] *Toxics Release Inventory Program Division. "How Are the Toxics Release Inventory Data Used? -- Government, Business, Academic and Citizen Uses." (2003). U.S. Environmental Protection Agency. Web. <http://www.epa.gov/tri/guide_docs/pdf/2003/2003_datausepaper.pdf>.*

reports included direct discussions of right-to-know policies and TRI. Ultimately, the GWU team's sample size was 45 groups, with nine respondents.

Using a combination of research and interviews, the GWU team substantiated anecdotal evidence and provided context for its findings. The team gave special attention to the publish date of each document it referenced in order to maximize relevance. Data uncertainty may result from sample collection, sample handling and results interpretation.

Problem identification

Once the GWU team completed the research phase, it compiled a list of all the problems it had identified. Some issues were redundant, others were linked by a root issue and some were beyond the scope of EPA's reach. In order to make this report a catalyst for future projects, the GWU team set out to organize and prioritize the problems it identified. This analytical process was based on three criteria:

- Solvability
- Severity
- Potential impact

Solvability describes the feasibility and level of difficulty of resolving or addressing the problem. The GWU team first determined whether EPA has the ability to resolve the issue. If it does, the team then asked how difficult and resource-intensive the solution would be. Factors considered include legality, administrative costs and maintenance. *Severity* aims to assess the extent to which the issue inhibits individuals' and groups' desired uses of TRI data. *Potential impact* analyzes the level of benefits that would be gained in the event the problem is solved.

Problems were evaluated against each of the three criteria and assigned a qualitative rating on an ordinal scale from 0 to 5. For solvability, a higher score means that the problem is easier to address. A higher score in potential impact represents a higher level of benefits obtained by resolving the problem. In the case of severity, a higher score was given to issues that cripple TRI users the most. For each criterion, a high score correlates with a higher priority. It is important to note that a low score in the solvability criterion excluded an identified problem from this report, regardless of how it is scored with respect to the other two criteria. The GWU team made this determination because its primary objective was to identify viable projects for future students to pursue. The report nevertheless makes note of the problems that were excluded from consideration because it is valuable to have a record of those issues. (*See Appendix A*.) The scoring process allowed the team to organize and prioritize the issues it wished to discuss in this report. It may also serve as a guiding tool for prioritizing future projects.

Following the completion of this process, three overarching categories were identified:

- Lack of awareness and interest in TRI
- Inability by those who are aware of TRI to interpret the data adequately
- Confusion by those who are able to interpret the data as to how to take action

Report Structure

The report opens with a discussion of awareness and interest issues surrounding TRI, followed by an exploration of the varied definitions of community and their role in the communication of TRI data. A brief description of the different TRI users and their varying objectives is provided. The report then delves into the issues surrounding TRI data interpretation and the challenges community groups face in applying the data to their various campaigns. The recommendations section at the close of this report

includes a number of suggestions the GWU team has provided for future TRI projects to improve aspects of the tool's community engagement features.

What is TRI?

Lack of public awareness

EPA instituted TRI as a tool to help interested parties gain access to information about pollutants in an effort to fulfill its duties under EPCRA.[5] The idea behind TRI is that concerned individuals and groups can log into the database, enter their geographic location and receive an output that describes toxic releases reported in their area.[6] TRI data have become an integral part of the EJ movement, giving communities and individuals who were once in the dark about the pollution surrounding them the power to obtain that information and to use it to educate citizens and, in some cases, initiate calls to action against polluting firms.[7]

However, there is an EJ component that contributes to the problems surrounding TRI. This issue is known as the digital divide. Since TRI and its complementary datasets are Internet-based tools, it is difficult for individuals in impoverished communities, which are also the ones most likely to suffer the effects of pollution, to tap into these programs because these populations are less likely to have web access. Some researchers have posited that this fact alone is enough to substantially detract from any touted EPCRA and TRI successes:

> In theory, EPCRA and the TRI provide information to the public, and the public then responds by putting pressure on facilities that use, store or release toxic substances in a way that may endanger the community. The more pressure the community applies, the more likely the facility will change its behavior. However, if poorer communities do not have access to the information or are less equipped to understand and use it, those communities will not reap EPCRA's benefits.[8]

In short, the people who are more likely to access TRI data are those who live in affluent, educated and predominantly white communities – in other words, the very communities that are less likely to have any need for this information in the first place.[9]

Lack of public interest

Sometimes when individuals are made aware of TRI, they have a lack of interest in what the system has to offer. In a 2007 study mean to assess public awareness of TRI, researchers found that despite media coverage about TRI and information disseminated by the government, activists and researchers, a very small percentage of the public was aware of the database.[10]

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[5] *"Emergency Planning and Community Right-to-Know Act (EPCRA) Requirements." (2011) U.S. EPA. Web. <http://www.epa.gov/oem/content/epcra/>.*

[6] *"Toxics Release Inventory." (2012) U.S. EPA. Web. <http://www.epa.gov/tri/>.*

[7] *Toxics Release Inventory Program Division. "How Are the Toxics Release Inventory Data Used? -- Government, Business, Academic and Citizen Uses." (2003). U.S. Environmental Protection Agency. Web. <http://www.epa.gov/tri/guide_docs/pdf/2003/2003_datausepaper.pdf>.*

[8] *Durham-Hammer, Kathryn E. "Left to Wonder: Reevaluating, Reforming, and Implementing the Emergency Planning and Community Right-to-Know Act of 1986." (2004) Columbia Journal of Environmental Law. <https://litigation-essentials.lexisnexis.com/webcd/app?action=DocumentDisplay&crawlid=1&doctype=cite&docid=29+Colum.+J.+Envtl.+L.+323&srctype=smi&srcid=3B15&key=ae927ac030805785c78122d2fd64984e>.*

[9] *Ibid.*

[10] *Atlas, Mark. "TRI to Communicate: Public Knowledge of the Federal Toxics Release Inventory." (2007) Social Science Quarterly. <http://content.ebscohost.com.proxygw.wrlc.org/pdf19_22/pdf/2007/SSQ/01Jun07/24814332.pdf?T=P&P=AN&K=24814332&S=R&D=bth&EbscoContent=dGJyMNHX8kSeprU4v%2BbwOLCmr0qep7BSr6q4S7KWxWXS&ContentCustomer=dGJyMPGut1C1pq9NuePfgeyx43zx>.*

Perhaps of more concern was the finding that once respondents were provided with information about TRI, only 69 percent said they bothered to review it, indicating a lack of interest in the data.[11] Just 3.9 percent of participants reported taking any action after looking at the data. Of those who said they took action, five contacted friends or family members for more information, four visited other Internet sites for more information, one wrote a letter to the local media and one reached out to one or more TRI facilities.[12]

These results stand in stark contrast to results from an earlier phase of the survey in which as many as 75 percent of participants said they would definitely or probably take concrete action if they found out an industrial facility in their area was using significant amounts of hazardous chemicals.[13] The report includes no discussion of why respondents did not take further action, but one possibility is that the data were not presented in an understandable way. This is a problem that will be explored later on in this paper.

Skepticism

Another problem that may be contributing to the lack of public interest in TRI is individuals' and communities' skepticism about the accuracy of the data companies report to EPA. TRI user Julie Fox Gorte of New Hampshire-based PaxWorld Management LLC said she has heard reports of companies "gaming" the numbers they report in an effort to put forth a more positive corporate image. If those reporting tricks were exposed, she asked, "would the record of TRI substance releases and production be as rosy as it is?"[14]

Although less-than-accurate reporting numbers might be somewhat of a misconception – the introduction of routine environmental audits in the 1980s has largely reduced the inaccuracy of self-reported data – the perception is nevertheless out there and might prevent potential TRI users from fully interacting with the data.[15]

TRI limitations

Some environmental groups have raised the concern that TRI only tracks a limited number of chemicals. Allison Tracy, chemicals policy fellow for the Environmental Defense Fund, said that as of 2006, the TRI Inventory Update Reporting Modifications Rule included more than 6,000 chemicals that were reported as being in commerce in the United States in excess of 25,000 pounds per year.[16] Still, she said, there are currently fewer than 600 chemicals in TRI.[17] Other chemical databases, including EPA's Toxic Substances Control Act (TSCA) Inventory, include far more chemicals, she said. In January 2012 the TSCA database contained more than 67,000 chemicals.[18]

> As a result, the TRI is not very useful if we want to collect/analyze information about the 'chemicals in commerce' in general. … The TRI is most useful if I am looking for information on one specific chemical, but that is less frequent.[19]

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[11] *Ibid.*

[12] *Ibid.*

[13] *Ibid.*

[14] *Fox Gorte, Julie. Email interview. 28 March, 2012.*

[15] *Grant, Don and Andrew Jones. "Are Subsidiaries More Prone to Pollute? New Evidence from the EPA's Toxics Release Inventory." Social Science Quarterly. March 2003.*

[16] *"2006 Inventory Update Reporting: Data Summary." U.S. EPA Office of Pollution Prevention and Toxics. December 2006. <http://www.epa.gov/oppt/iur/pubs/2006_data_summary.pdf>.*

[17] *"TRI-Listed Chemicals." U.S. EPA. 29 March 2012. <http://www.epa.gov/tri/trichemicals/index.htm>.*

[18] *"How to Access the Inventory." (2012) U.S. EPA. <http://www.epa.gov/oppt/existingchemicals/pubs/tscainventory/howto.html>.*

[19] *Tracy, Allison. Email interview. 18 March 2012.*

Defining communities

A primary purpose of TRI is to inform *communities* about toxic chemical releases to the environment.[20] TRI wishes to increase its reach to these communities and could benefit from revising or expanding its definition of community. The word "community" has many possible interpretations. According to the Merriam-Webster Dictionary, the word refers to "a unified body of individuals."[21] These individuals might be unified in a few different ways, including demographic and socioeconomic variables such as location, profession, ethnicity, age and other factors.[22]

When deciding how to disseminate information to specific segments of the population, it is crucial to first decide on how to define that segment, or community. This ensures efficient and effective communication with the desired public. TRI wishes to inform people about emissions at a local level, and they have therefore traditionally defined communities according to geographical units such as zip codes, area codes, counties or states. Since both chemical emissions and community action are local, presenting the data by specific localities is efficient in this regard.

But there are weaknesses in this approach. For example, there is a possibility of emission exclusion. A facility that may be located just outside of a particular zip code may not register on that community's release report. Switching to a larger geographical unit may mitigate that concern but, due to the inclusion of possibly irrelevant emissions, could simultaneously reduce a user's ability to identify risks.

The primary weakness of TRI's approach, however, is not defining communities by geography but its lack of complementary data organization techniques. As it stands, TRI provides a set of tools, such as TRI Explorer, that largely organize the data by geographical area. These tools feature on the TRI website without an evident organization, leading to confusion as to which best serves varying types of users.

According to L.D. Richardson, "individuals in our contemporary pluralistic society may identify themselves with multiple communities."[23] Each of these communities can have its own interests and agendas and, consequently, may require different means for effective communication.[24] In searching TRI data, users have their own objectives and may therefore form their own communities. An example of that is a group defined by its shared interest in health risks, such as community advocates. This consideration is missing in TRI's data organization. While the data themselves cannot currently be presented in ways other than by geographical unit, the information and tools within TRI's website could benefit from a reorganization that reflects particular interest groups. The GWU team's report will further highlight the importance of an added layer of community definitional units. Users sometimes have difficulty navigating the TRI website, suggesting that EPA may want to consider defining communities not just by their location, but by their activities as well.

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[20] *"Toxics Release Inventory." U.S. EPA. 2012. <http://www.epa.gov/tri/>.*

[21] *"Community." Def. 1. Merriam-Webster Dictionary. 2012. Online.*

[22] *Williams, Robert. "The Contested Terrain of Environmental Justice Research: Community as Unit of Analysis." The Social Science Journal 32.2 (1999): 313-328. Web.*

[23] *Richardson, L. D. "Communicating with Communities about Emergency Research." Academic Emergency Medicine 12.11 (2005): 1064-070. Print.*

[24] *Ibid.*

Existing definitions

A 2003 document composed by the EPA TRI Program Division attempted to identify the types of organizations that use TRI data and describe how these groups used TRI.[25] Groups use the data in a variety of ways, some of which EPA intended and some that were unexpected. EPCRA describes Congress' intentions for the program:

> The release forms required under this section are intended to provide information to the federal, state, and local governments and the public, including citizens of communities surrounding covered facilities. The release form shall inform persons about releases of toxic chemicals to the environment; to assist governmental agencies, researchers, and other persons in the conduct of research and data gathering; to aid in the development of appropriate regulations, guidelines, and standards; and for other similar purposes.[26]

This mix of users and their intents is constantly expanding as new issues, research and government action evolve. EPA's research on the subject, provided in the 2003 report, does not include a description of all programs, activities and analyses that incorporate TRI data. However, it identifies the main users as the public, industry, government, international, investment and academic sectors. (*See Appendix B*.)

For the purposes of this paper, the use of the word community will generally refer to geographical communities.

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[25] *Toxics Release Inventory Program Division. "How Are the Toxics Release Inventory Data Used? -- Government, Business, Academic and Citizen Uses." (2003). U.S. Environmental Protection Agency. Web. <http://www.epa.gov/tri/guide_docs/pdf/2003/2003_datausepaper.pdf>.*
[26] *Ibid.*

What information does TRI provide, and should it give rise to concern?

TRI's immense success is often attributed to the program's ability to put information about pollution into the hands of ordinary citizens, as opposed to legislators and scientists. Once people become aware of and interested in TRI, they want to know if there are polluters in their area and if they should be concerned. The public pressures associated with TRI data disclosure force companies to emit what is publicly acceptable, which appears to be a lower amount than what is legally acceptable.[27] If TRI's success hinges on its ability to expose potentially dangerous industry activity, then it is essential that citizens can actually understand the data the program presents.

Challenges interpreting data

One problem TRI users could encounter is that, while resources to put the data into context do exist, those tools might be hard to find. Without these resources, it is difficult for users to understand the information. Even if community members are aware of and interested in toxic releases in their neighborhoods, they still face barriers. There are four domains that need to be achieved to empower a community to reduce their environmental health risks.[28] These domains are physiological, vulnerability, epistemological and health protection.[29] Since TRI is first and foremost an information source, it is most appropriate to consider it in the epistemological domain, which asks, "How does everyone know about this?". In order to feel empowered to take action to reduce environmental health risks, communities have to go beyond feeling concerned to being knowledgeable about the chemicals to which they are exposed.

> Whatever the effort to increase expertise, however, there are sharp barriers, including a limited capacity to focus consciousness on one issue, in the context of all of the competing demands of life. People who are not experts cannot become experts easily or quickly.[30]

In order to put TRI data into context, the GWU team conducted an informal investigation in Texas City, TX to see what steps citizens would have to take to determine if they should be concerned. The team selected Texas City and benzene because the town is home to the third largest oil refinery in the United States and benzene a known human carcinogen is a release inherent to the oil refining process. According to TRI Explorer, the total on- and off-site releases for benzene in 2010 were 146,884 pounds.[31] The Superfund reportable quantity (RQ) for a 24-hour release of benzene is 10 pounds, which means that Texas City is currently looking at the equivalent of 40 RQs a day.[32] The team decided to use the RQ for benzene because an RQ is considered a potential emergency, so if Texas City were facing the equivalent of even one or two RQs per day, its residents would have reason to be concerned. If an established RQ is exceeded in a 24-hour period without a permit, the person in charge of the polluting facility must immediately

[27] Fung, Archon and Dara O'rourke. "Reinventing Environmental Regulation from the Grassroots Up: Explaining and Expanding the Success of the Toxics Release Inventory," Environmental Management, 25, no. 2 (2000): 115-127. <http://www.springerlink.com/content/rat9902qaqmggb09/>.

[28] Dixon, Jane and John Dixon "An Integrative Model for Environmental Health Research," Advances in Nursing Science, 24, no. 3 (2002): 43-57.

[29] Ibid.

[30] Ibid.

[31] TRI Explorer Chemical Report for All chemicals, zip code 77590. <http://iaspub.epa.gov/triexplorer/release_chem?p_view=ZPCH&trilib=TRIQ1&sort=_VIEW_&sort_fmt=1&state=&city=&spc=&zipcode=77590&zipsrch=yes&chemical=All+chemicals&industry=ALL&year=2010&tab_rpt=1&fld=RELLBY&fld=TSFDSP>.

[32] Reportable Quantities (RQs) for CERCLA Section 102(a) Hazardous Substances. 40 CFR 302.4 (July 1, 2001) <http://www.epa.gov/osweroe1/docs/er/302table01.pdf>.

notify the National Response Center so that officials are aware of potential dangers and can evaluate the need for response. The Superfund RQ is a useful tool for putting data into context because RQs are based on intrinsic characteristics of the hazardous substance, such as its aquatic toxicity, acute and chronic toxicity, ignitability, reactivity and potential carcinogenicity.[33]

It is important to note that the GWU team did not access the information on Superfund RQs through TRI Explorer. That finding required additional research, which some users, especially those without a science or public health background, might not know how to approach. The math and additional research required did not seem overly challenging for the GWU team, but knowing how to contextualize the data could be difficult for ill-equipped individuals and grassroots groups.

In the case of Texas City, even getting to the starting point of looking at benzene might be difficult. When a user runs a chemical report for Texas City on TRI Explorer, the resulting report lists 51 chemicals in alphabetical order. The listed substances are those that are putting communities at risk but might not be noticed. Benzene is not the first chemical on the list, although it might be if the list were not ranked alphabetically, but rather by importance or toxicity. If users did not know what chemical information they are seeking, they might not be concerned about anything on this list. Further investigation of usability, using a sample of people without a science or public health background, is required to determine if this is actually the case.

When the GWU team found the high number of benzene releases in Texas City, it looked further to see from where these releases were coming. Most came from one BP processing facility, which is the third-largest oil refinery in the country. In 2005 there was an explosion at the refinery that killed 15 people and injured 170. This explosion prompted an investigation that identified a series of violations, including the mismanagement of benzene waste. The BP Texas City Clean Air Act settlement requires BP to spend $170 million improving its controls, including a $150 million expenditure to improve controls of benzene waste.[34]

From the BP Texas Clean Air Act Fact Sheet, users can click to learn more about benzene, leading them to a fact sheet about the substance from the Air Toxics website.[35] From the fact sheet, users learn that benzene is classified as a known human carcinogen through all possible routes of exposure and has non-cancer acute and chronic effects that include:

> [D]rowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation, and, at high levels, unconsciousness, various disorders in the blood, including reduced numbers of red blood cells and aplastic anemia, in occupational settings. Reproductive effects have been reported for women exposed by inhalation to high levels, and adverse effects on the developing fetus have been observed in animal tests.[36]

When users click on benzene on the chemical report in TRI Explorer, they are directed to a facility report for benzene, which is necessary information if users are trying to exert pressure on polluters, but there is no information describing the actual risks of benzene exposure, even though there are fact sheets available from the Air Toxics website.

Difficulties identifying actual source of pollutant health risk

A common concern raised by TRI users was that there is currently no way to find the total number of releases for a specific company. Since TRI data are organized by facility and not by company, a corporation could have several emitting facilities in different locations

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[33] *"Superfund Reportable Quantities (RQs)." U.S. EPA. 13 May 2011.*

<http://www.epa.gov/osweroe1/content/reporting/rqover.htm>.

[34] *"Petroleum Refinery National Initiative Case Results." U.S. EPA. 25 April 2012.*

<http://www.epa.gov/compliance/resources/cases/civil/caa/oil/>.

[35] *"BP Texas City Clean Air Act Settlement Information Sheet" U.S. EPA. 14 April 2011.*

<http://www.epa.gov/compliance/resources/cases/civil/caa/bptexasinfosht09.html>.

[36] *"Benzene" U.S. EPA.. 3 February 2012. <http://www.epa.gov/ttn/atw/hlthef/benzene.html>.*

but face less public pressure because TRI does not sum those releases, therefore downplaying the magnitude of the total pollution. Julie Fox Gorte of PaxWorld Management identified this as one of TRI's biggest issues, using the example of Ford Motor Co., which has a multitude of facilities nationwide:

> [I]t would be wonderful to be able to get company (parent) totals, rather than having to compile them facility by facility. I haven't done this in about a year … but last time I checked the only way to get Ford's TRI totals were to go facility by facility, which is like the Bataan Death March for Ford and a cakewalk for Microsoft. In short, it can be quite time-consuming to get company totals for industrials, materials, and utilities.[37]

TRI user Diane Heminway, the environmental projects coordinator for United Steelworkers, also found this issue to be a source of frustration when she was trying to total the releases for DuPont, a science and engineering firm. Heminway called EPA and found the hotline operators to be very helpful and friendly, but they told her that current TRI tools are incapable of providing per-company totals.[38] This appears to be a miscommunication, or perhaps the last time Heminway attempted to total parent companies was over a year ago, because there actually is a TRI tool that can now sum parent company data. TRI.NET has the capabilities to find totals for companies, but this was established last year when EPA changed the way TRI data are reported. Facilities are given a drop-down menu, instead of having to type in their parent company, so that entries are consistent. For example, before last year a facility might write in that it was owned by B.P., BP or British Petroleum, creating inconsistencies in the data that were impossible to standardize. Now that the names of parent companies are consistent in TRI reporting, users can access those data from TRI.NET.[39]

The inability to look up emissions for a company on a national scale can be very frustrating for a researcher or investor, but it can also hinder the achievement of TRI's primary purpose of informing communities. Companies with a larger number of smaller-emitting facilities appear in the press less often than companies with just a few larger-emitting facilities.[40]

Lack of attention to environmental fate and transport of releases

TRI reports raw data of toxic releases, without accounting for issues with the fate and transport of releases. The medium to which a chemical is released can cause health effects to vary by six degrees of magnitude.[41]

A 2004 study done by Dolinoy and Miranda that looked at glycol ethers in Durham, NC, for the year 2000 found that TRI reporting requirements missed impacts that their study picked up on because their study used inclusive modeling of all facilities, including facilities that were too small to be required to report to TRI.[42] The study also addressed environmental fate and transport by incorporating atmospheric dispersion modeling. The researchers found this model significantly alters the magnitude and spatial distribution of air concentrations of toxics. This study modeled the exposure receptors at more refined levels of geographic resolution, the most refined level being the block level, which revealed localized, neighborhood-level exposure hot spots that are not apparent at coarser geographic scales.[43] Currently used by TRI, multivariate analysis indicates that inclusive facility modeling at fine levels of geographic resolution reveals exposure disparities by income and race. These new methods of using GIS and addressing

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[37] *Fox Gorte, Julie. Email interview. 28 March, 2012.*

[38] *Heminway, Diane. Phone interview. 16 April 2012*

[39] *Kohern, Kara. In-person interview. 24 April 2012.*

[40] *J.T. Hamilton. "Pollution as News: Media and Stock Market Reactions to the Toxics Release Inventory Data." (2002) Journal of Environmental Economics and Management. <http://www.sciencedirect.com/science/article/pii/S0095069685710078>.*

[41] *Toffel, Michael, and Julian Marshall "Improving Environmental Performance Assessment: A Comparative Analysis of Weighting Methods Used to Evaluate Chemical Release Inventories." Journal of Industrial Ecology, 8, no. 1-2 (2004): 143–172.*

[42] *Dolinoy DC, Miranda ML, 2004 GIS Modeling of Air Toxics Releases from TRI-Reporting and Non-TRI-Reporting Facilities: Impacts for Environmental Justice. Environ Health Perspect 112(17).*

[43] *Ibid.*

environmental fate and transport significantly enhances researchers' ability to model air toxics and clarify conflicts in the literature regarding EJ findings at a more specific geographic level. The researchers point out that the tools they used were most useful and generated the most interesting results for areas where there were no facilities reporting to TRI but that contained smaller-emitting facilities.

Few users aware of full suite of TRI capabilities

TRI tools for a variety of applications may exist, but they are not easy to find, or it can be hard to determine what tool is appropriate for certain tasks. EPA's website offers several tools to interpret TRI data. From the TRI homepage, a user can access a variety of tools. The first one that the GWU team used, which might be the tool with which most people start, was TRI Explorer. The TRI homepage says, "For information about TRI chemical releases in your neighborhood, enter your zip code, then click go." After users enter their zip codes, they are directed to a TRI Explorer Facility Report for their zip code. Other tools that can be accessed from the TRI homepage are the myRTK application, TRI.NET and TRI-CHIP. There are also other tools on the EPA website that use TRI data; these include Envirofacts, NATA and RSEI. A study done on two community groups found that TRI users were not aware of and did not use RSEI or NATA, both of which could help communities put TRI data into context.

The Risk-Screening Environmental Indicators (RSEI) program is a computer-based screening tool that analyzes risk factors in order to put TRI release data into a chronic health context.[44] RSEI has usability issues because it is a tool for risk screening, not risk assessment. The National-Scale Air Toxics Assessment (NATA) is, "EPA's ongoing comprehensive evaluation of air toxics in the U.S."[45] NATA in particular can empower communities to take action against polluters, which may be more effective than traditional command-and-control programs. According to EPA:

> Communities have found that accessing NATA data helps inform and empower citizens to make local decisions concerning the health of their communities. In some cases, local projects can achieve environmental improvements sooner than federal regulations alone.[46]

One issue with NATA is that the data take a long time to get out there. Other issue areas are that risk assessment isn't easy and that NATA is a prioritizing tool. TRI is useful because even though some users thought that TRI took too long to process data, NATA is currently using data that are seven years old, so comparatively speaking, if users have the ability to interpret TRI data, that tool might be of more user. However, one thing NATA users could do is look at NATA and set priorities and then cross-reference the NATA output with TRI data.

Envirofacts is EPA's one-stop source for environmental data and has its own TRI tool that helps communities use and link to other tools, including RSEI. Envirofacts' connection with RSEI is helpful. Going back to the Texas City example, if users go to TRI from Envirofacts, they can then enter their zip codes and obtain a facility report that tells them all of the TRI reporting facilities in their area. Users can then obtain a RSEI report for each facility in their area. Below is a bar chart for the RSEI score comparison of the BP plant in Texas City:[47]

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[44] "Risk-Screening Environmental Indicators (RSEI)." U.S. EPA. 9 December 2011. <http://epa.gov/oppt/rsei/index.html>.
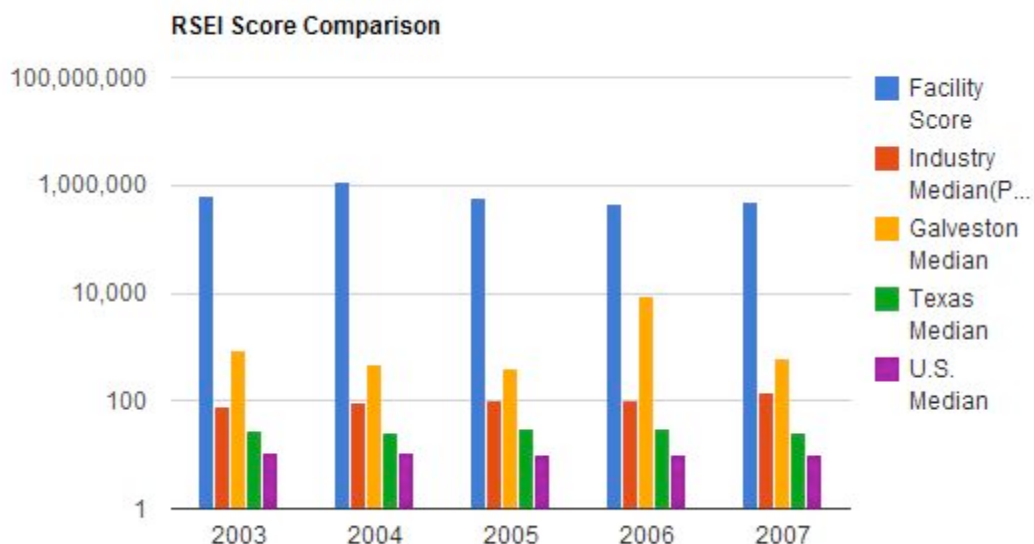
[45] "National Air Toxics Assessments." U.S. EPA. 27 October 2011. <http://www.epa.gov/ttn/atw/natamain>.

[46] Ibid.

[47] "Envirofacts RSEI Score Comparison." U.S. EPA. 26 April 2012.
<http://oaspub.epa.gov/enviro/rsei.html?facid=77590MCLCM24015>.

RSEI Score Comparison

The GWU team has not looked at usability or how individuals without a science background would interpret these reports, but it appears that even users who know nothing or very little about the toxicity of chemicals or toxic releases can see that the facility score is much higher than the U.S. or even the industry median. The data presented in this chart might help prompt a sense of alarm in communities and facilitate further investigation.

It is important to note that even on the Envirofacts' Toxic Release page, it is hard to know where to start, but the tool does have a feature that can capture users' attention. Envirofacts lists the number of submissions that a facility has. The BP plant in Texas City had by far the highest number of submissions, so maybe users would click on that facility first. However, as mentioned in this report, the greatest number of submissions does not always translate to the greatest risk. Facilities could be ranked based on highest RSEI score, though. As with NATA, a big con for using RSEI is timing and that it is essential to emphasize that RSEI is not a risk analysis tool, but rather a risk screening tool.

Neither RSEI nor NATA was easily accessible from the TRI homepage, and at least one study has found that there is a lack of awareness of these tools by community organizations that actually use TRI.[48]

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[48] Conlon, Lindsay and Joseph Foti. "Growing the Grassroots: Integrating Environmental Justice into the Toxics Release Inventory Program." (2011) World Resources Institute.

When communities are concerned, what can they do?

The success of TRI in reducing pollution and serving as a rallying point for communities depends in large part on the capacity and degree of public participation in the program. In general, information disclosure systems like TRI are meant to increase civil society's knowledge about pollution in local environments so that affected citizens are able to take action to lower pollution levels in their areas. However, there have been debates about whether disclosure actually serves to empower citizens and promote environmental democracy.[49] Providing data and information about toxic releases through the TRI online database alone is not always sufficient to engender action against polluters. Communities, particularly minority and low-income populations that are affected by toxic releases, often need more support in order to have their voices heard and to make significant impacts in political processes and decisionmaking.

Principle 10 of the Rio declaration states:

> Environmental issues are best handled with participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decisionmaking processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.[50]

Essentially, principle 10 of the Rio declaration describes what are known as "access rights." In order to have effective environmental democracy, the public needs three key forms of access:[51]

• Access to information
• The ability to participate in decisionmaking
• Access to redress and remedy

The following discussion specifically addresses issues with public participation, how citizens' and community groups' ability to participate is inhibited by a variety of factors and how TRI may fail to empower citizens to act on pollution problems.

Inadequate public participation in environmental decisionmaking

Many countries have had success in establishing legal infrastructure for access to environmental information, like EPCRA. However, studies have shown that implementation of public participation policy is weak and has lagged behind information access in multiple countries.[52] In the United States, in particular, Executive Order 12898, issued by the Clinton administration in 1994, sought to increase public participation by ensuring that information and documents are understandable and accessible and that EJ concerns

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[49] Van Den Burg, Sander. "Informing or Empowering? Disclosure in the United States and the Netherlands." (2004) Local Environment 9 (4): 367-381.

[50] "Principle 10 of the Rio Declaration." United Nations Conference on Environment and Development. World Resources Institute. June 1992. < http://www.wri.org/publication/content/8078>.

[51] Foti, Joseph, Lalanath de Silva, Heather McGray, Linda Shaffer, Job Talbot and Jacob Werksman. "Voice and Choice: Opening the Door to Environmental Democracy." (2008) World Resources Institute.

[52] Ibid.

were a central part of agencies' missions. The first "Environmental Justice Strategy" and "Environmental Justice Implementation Plan" were issued in 1995 and 1996, respectively, but implementation of these initiatives was ineffective and lacked accountability measures to track progress.[53] In 2003, the Bush administration developed a "Public Involvement Policy" which stated that officials should, when "appropriate," give "extra encouragement and consider providing assistance" to minority and low income communities.[54] Yet, this policy actually had the effect of further limiting public participation because officials used their judgment on when to provide assistance to communities, given resources and time constraints.[55]

Public participation depends on a number of factors, including how well the information is disseminated to affected parties, the public's ability to understand and interpret the information, the extent to which the public is aware of their rights, the capacity of ordinary citizens and civil society organizations to take action and the presence or absence of government support.

Inadequate information dissemination, publicity and usability of TRI

This report has already made it clear that there are several gaps in TRI in terms of publicity, usability and ability to present information in a way that ordinary citizens can understand and use the data. But to add to the points already made, information should be circulated and publicized in ways that are "meaningful and supportive" of public participation.[56] In addition, White and Runge suggest that "access to information will initiate public participation only when the public understands and acts on that information. Collective action usually requires a change in ideas about how things are or how they ought to be."[57]

There also needs to be a sense of urgency and a shock factor to stimulate public action. For example, a community that sees ash from a mill falling on its houses on a daily basis might not take action until a study announces the dangerous health effects of the ash.[58] Communications about toxics data is usually done though front-page headlines, rather than through online formats, and media still remains the primary source of information on pollution issues.[59]

Citizens unaware of rights under EPCRA

As mentioned earlier in this report, ordinary citizens are often unaware of their rights under EPCRA and usually do not know what avenues are available to express their concerns. In particular, workers who may be exposed to certain chemicals in their work environments have expressed that they do not know when and if it is appropriate for them to speak up when they suspect their employers have made a toxic release that violates the law. These workers complain that they feel as if their supervisors are watching them and may accuse them of suspicious behavior if workers seek out information in this vein.[60] Furthermore, studies of

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[53] *United States Commission on Civil Rights. Not in my Backyard: Executive Order 12898 and Title VI as Tools for Achieving Environmental Justice. October 2003. Washington D.C.: US Commission on Civil Rights.*

[54] *Public Involvement Policy of the U.S. Environmental Protection Agency. May 2003. Washington DC: Office of Policy, Economics and Innovation.*

[55] *Conlon, Lindsay and Joseph Foti. "Growing the Grassroots: Integrating Environmental Justice into the Toxics Release Inventory Program." (2011) World Resources Institute.*

[56] *Foti, Joseph, Lalanath de Silva, Heather McGray, Linda Shaffer, Job Talbot and Jacob Werksman. "Voice and Choice: Opening the Door to Environmental Democracy." (2008) World Resources Institute.*

[57] *White, T. A., and C. F. Runge. 1995. The emergence and evolution of collective action: Lessons from watershed management in Haiti. World Development 23 (10): 1683-1698.*

[58] *Foti, Joseph, Lalanath de Silva, Heather McGray, Linda Shaffer, Job Talbot and Jacob Werksman. "Voice and Choice: Opening the Door to Environmental Democracy." (2008) World Resources Institute.*

[59] *Ibid.*

[60] *Heminway, Diane. Email interview. 30 March 2012.*

public participation policies have shown that citizens lack venues and information on how to express their opinions.[61]

Affected populations lack capacity for action

A major impediment to community action, particularly with information disclosure systems like TRI, is that there is a lack of capacity in low-income populations. First, in many cases, educational and social barriers inhibit citizen engagement. Second, social scholars have questioned whether ordinary citizens have the necessary resources, time and skills needed to interpret the environmental and health implications of the data that TRI produces.[62] Third, when state and local government support is lacking, it is difficult for communities to be successful in achieving favorable outcomes.

Ordinary citizens, especially those in under-privileged communities, are often uneducated and sometimes lack basic reading skills and an ability to understand technical data and language. Their illiteracy also acts as a barrier to communication with bureaucratic figures and government officials, which is a major impediment to achieving successful public participation in environmental decisionmaking. Additionally, these citizens do not have the luxury of devoting their time to pollution abatement efforts, since that means forgone work. Members of poor communities also do not have the money to pay for official fees. Because ordinary citizens and minority or low-income communities face so many obstacles, intermediaries such as nongovernmental organizations and public interest and environmental groups are necessary to bridge the gap and make public access rights fully effective.

The three most frequent uses of TRI by public interest and environmental groups involve 1) directly pressuring facilities for change, 2) educating citizens and 3) lobbying for policy changes.[63] Yet, these civil society organizations may be lacking in the same areas as citizens, particularly with respect to funding, expertise and local government support, and it is common for most of these intermediary groups to be voluntary and community-based. In a 1994 study by Lynn and Kartez, public interest groups reported that 39 percent of the time, a lack of access to people with computer expertise hampered their use of TRI.[64] Although that study was conducted 18 years ago, it is not uncommon to find public interest groups without the proper training necessary to interpret TRI data in a meaningful way.

To illustrate, Literacy for Environmental Justice (LEJ), a nonprofit organization in San Francisco, reported that without the training and assistance it received from an EPA Region 9 staff member, it would not have been able to successfully implement its project to engage and prepare youths involved in urban planning decisions with trainings on how to use TRI online tools to ultimately reduce outflows from a sewage treatment plant.[65] The only problem with this particular case is that LEJ would most likely not have received help from the EPA Region 9 staff member if she had not been in direct contact with the organization for her master's program.

Weak state and local government support for community engagement

State and local government support in general public participation policy is crucial for successful community engagement. There are few states in which successful EJ and public participation policies are implemented. The New York State Department of Environmental Conservation's Office of Environmental Justice offers an EJ hotline, grant programs and links to community

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[61] Foti, Joseph, Lalanath de Silva, Heather McGray, Linda Shaffer, Job Talbot and Jacob Werksman. "Voice and Choice: Opening the Door to Environmental Democracy." (2008) World Resources Institute.

[62] Lynn, F.M and J.D Kartez. "Environmental democracy in action: the Toxics Release Inventory." (1994) Environmental Management 18 (4): 511-521.

[63] Ibid.

[64] Ibid.

[65] Conlon, Lindsay and Joseph Foti. "Growing the Grassroots: Integrating Environmental Justice into the Toxics Release Inventory Program." (2011) World Resources Institute.

resources. Additionally, The California Environmental Protection Agency is in charge of overseeing a state-wide EJ program and has issued several policies that command the use of "alternative communication techniques," such as the use of pictures to illustrate complex concepts to increase public access to information.[66] Yet, the most successful state implementation policy so far has been Massachusetts' "Environmental Justice Policy," which requires financial investment and capacity building in minority and low-income neighborhoods that are most at risk of being unable to participate in environmental decisionmaking.[67] The policy requires all state agencies to include public participation plans in EJ strategies that include outreach and improved access to information.

Communities in these states clearly have a leg up in taking action with state support. Specifically, as mentioned before, LEJ in San Francisco has been successful in engaging TRI tools to mitigate environmental health issues from a wastewater treatment plant largely because of state government support of community engagement policy. The city and county of San Francisco, the San Francisco Public Utilities Commission and the state of California directs resources to engage minority and low-income groups and has a centralized online urban planning portal that includes all the necessary documents and information relating to public involvement. The Public Utilities Commission also has an EJ subcommittee that provides guidance on meaningful public participation.

On the other hand, states that do not have policies for EJ and public participation and do not support capacity building for communities make it difficult for citizens to act on their struggles. For example, the Louisiana Bucket Brigade (LABB) in New Orleans is a grassroots organization that works to empower communities to reduce pollution from refining and chemical facilities in the Mississippi River Corridor. EPA provided a mini-grant to LABB to help the group educate community members on how to use TRI tools. However, LABB has complained that a lack of state government support has hampered its ability to attain an acceptable level of environmental quality.[68] According to LABB, Louisiana is dismissive of claims from communities, and citizens feel that hearings are unfair and useless because the state makes preconceived decisions. Essentially, TRI data on toxic releases "can only be useful if it is tied to some process that takes serious environmental health and rule of law," including civil and human rights.[69]

Limited government resources for capacity building

It is obvious that to take effective action, communities and civil society groups need appropriate training, assistance and resources. However, the issue that always arises is how to allocate resources among communities that are in need of assistance with limited budgets and constraints.

Common-sense knowledge can take higher priority than codified official information

In cases where a community is suffering from pollution, the official information regarding facilities emissions and "safe" levels of pollution is sometimes erroneous and not useful to the struggling community. Affected communities require both technical information and common-sense knowledge in order to take effective action against polluters. However, local common-sense knowledge about what is actually happening in a community is often silenced by experts who disseminate "official" knowledge.[70] Clearly, this situation results in conflicts over the meaning of risk, and communities have difficulty voicing their concerns, particularly through the use of an information system like TRI.

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[66] *Ibid.*

[67] *Massachusetts Executive Office of Environmental Affairs. Environmental Justice Policy of the Executive Office of Environmental Affairs. October 2002. Available from <http://www.mass.gov/Eoeea/docs/eea/ej/ej_policy_english.pdf>.*

[68] *Conlon, Lindsay and Joseph Foti. "Growing the Grassroots: Integrating Environmental Justice into the Toxics Release Inventory Program." (2011) World Resources Institute.*

[69] *Ibid.*

[70] *Hill, Robert J. "Fugitive and codified knowledge: implications for communities struggling to control the meaning of local environmental hazards." (2004) International Journal of Lifelong Education 23 (3): 221-242.*

A study examining the actions of four emergent citizen groups in environmental conflicts and how they acquired knowledge revealed that the application of local knowledge in interpreting environmental hazards were suppressed by the larger political sphere and expert determination of risk scenarios.[71] However, this study also revealed that citizen groups are successful when they are able to take their actions directly to the source of the problem rather than go through government intermediaries.

TRI has yet to meaningfully integrate EJ concerns

In 2008, EPA announced its "Collaborative Problem Solving Model," the agency's newest effort to deal with EJ issues. The model provides a framework for community groups to successfully address environmental concerns in their local areas and engage in effective community decisionmaking and dispute resolution. The program awards small grants to communities if they want to apply the collaborative problem solving framework to combat local environmental issues. However, the strength, scalability and wide application of the small grants program have been questioned due to a decrease in award amounts and number of grantees.[72] Recently, EPA published Plan EJ 2014 with the goal of integrating EJ procedures into agency-wide decisions. Thus, the new challenge for TRI is to identify what is necessary to incorporate and expand on its EJ programs.[73]

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[71] *Ibid.*

[72] *National Environmental Justice Advisory Council (NEJAC). The Model Plan for Public Participation. February 2000. Available from <http://www.epa.gov/compliance/ej/nejac/recommendations.html>.*

[73] *Conlon, Lindsay and Joseph Foti. "Growing the Grassroots: Integrating Environmental Justice into the Toxics Release Inventory Program." (2011) World Resources Institute.*

Recommendations

This section offers a number of recommendations that EPA, in collaboration with future student groups, shoud pursue in order to address some of the aforementioned issues with TRI. Some problems do not correlate directly with the recommendations below. This section is meant to offer a partial list of a variety of projects EPA could conduct in the future, although the problems listed in this report might spur ideas beyond those listed in this section.

Usability studies, information intermediary trainings

The GWU team suspects that TRI data are not being used to their full potential, but the findings in this report are by no means scientific and require additional study. To use Texas City as an example, TRI data in this case did not prompt the legal action mentioned earlier in this report. A future project to determine how effective TRI is at fulfilling its primary purpose of informing citizens about toxic chemical releases could be to look at a number of legal settlements to see whether TRI was the catalyst for action in any of those cases. Further investigation is required to find out how individuals perceive their communities' level of risk from certain chemicals.

There are data contextualizing tools on EPA's website, such as RSEI or NATA, with which the community groups mentioned in this report were not aware. There have also been previous studies finding that community organizations that use TRI do not know about RSEI or NATA or more advanced TRI tools. A future project could be to interact more with information intermediaries, such as reporters and community advocates, to inform them about the capabilities of TRI. From there, EPA might begin to see where TRI is lacking and how it might be better organized.

Since the issues this report found with putting TRI data into context were based largely on the example of Texas City and individual researchers' experiences, more usability studies are needed to determine the best way to reformat TRI data. A possible focus group might be composed of high school students because they are currently in basic science courses and might be able to provide some unbiased feedback on how they view TRI data. Another group to look at might be the elderly because they belong to a community that is becoming more technologically savvy. Older individuals might also face unique risks from releases.[74]

Defining communities for effective communication

One question raised in this report is how should TRI define communities? This thought exercise is valuable because it aims to understand TRI's "market segments," or foundations upon which all the tool's marking actions can be based. TRI would like to increase awareness of its offerings to various communities. As with any organization that wishes to attract consumers, TRI must first determine its consumer characteristics in order to communicate effectively. EPA does not sell anything and thus does not have customers. However, TRI does have a user base that must be expanded to further the tool's success and outreach. EPA, like any other government body, cannot engage in advertising or public relations. Therefore, to "advertise" TRI more effectively, EPA may want to consider reorganizing the tool's resources according to alternate definitions of community.

As discussed in this report, TRI currently defines communities primarily by geographical unit. This approach can sometimes lead to users to encounter data outputs that can seem overwhelming or confusing. The GWU team therefore recommends exploring additional definitions of community that could further improve TRI's user experience.

Research indicates that community categories linked to socioeconomic factors like age, education, ethnicity, gender and income are

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[74] *Kohern, Kara. In-person interview. 24 April 2012.*

not relevant for the purposes of TRI, since it is unlikely that people of a certain ethnicity or age group are more or less likely to seek TRI data. Instead, thinking about TRI users in terms of *types of users* (research role) or *types of uses* (research topic) may be more useful. Examples of types of users include investors, community advocates and environmental researchers. Possible uses include financial, health and environmental risk and exposure analysis.

Markets are typically segmented by distinguishing groups of consumers who have similar needs and wants.[75] Focusing on users and uses of TRI will help EPA obtain this objective. Over the years, TRI data has gained a wide array of users both intended and unexpected. This mix of users and their intents is constantly expanding as new issues, research and government action evolve. In order to evolve with them, TRI would greatly benefit from continuously evaluating these categories and by developing ways to communicate more effectively with each.

Additionally, a study analyzing tools available to communities for conducting exposure and cumulative risk assessments found that "the primary question that arises with searching existing databases is how useful are they for the purpose of the specific project."[76] To begin, it is important to identify the overarching categories of TRI users and uses. TRI did this with its 2003 report titled, "How Are the Toxics Release Inventory Data Used?" The GWU team invites future consultant groups to further investigate the question of users and uses. An update of the 2003 report using a robust research method is recommended. Once this is done, the categories of both users and uses of TRI can be operationalized to improve the organization of TRI data, its complementary tools and any other resources aiming to assist communities.

TRI disclosures have the potential to both inform and empower various civil groups. The technical nature of TRI's tools suggests a greater ability to inform but a weaker ability to empower.[77] Therefore, in the process of redefining communities, it will be crucial to present TRI materials in a way that enhances their use without limiting potential applications of the disclosed emissions. If done in a way that is too narrow, this recommendation may run the risk of doing just that. EPA must strike a careful balance between guidance and open access.

Website fixes, data integration

The TRI website would become much clearer if it were split into two parts, thus segregating individuals intending to extract data and those who wish to report emissions. Simply put, resources should be organized by input or output users. Navigating through the website, users can quickly find themselves staring at information that is not relevant to their needs. A project to address this could be a simple preliminary step.

The main TRI website should more clearly lay out the tools available at a user's fingertips. In addition to its main database, TRI offers a number of tools, including TRI.NET, TRI-CHIP and TRI Explorer. Links to these tools are available on the TRI homepage, but users must click the links for every tool to access a description of what it does, and even then, the explanation is sometimes incomplete or unclear to users.

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[75] *Baker, Gregory A., and Thomas A. Burnham. "Consumer Response to Genetically Modified Foods: Market Segment Analysis and Implications for Producers and Policy Makers." Journal of Agricultural and Resource Economics 26.2 (2001): 387-403.*

[76] *Medina-Vera, Myriam, Jeanette M. Van Emon, Lisa J. Melnyk, Karen D. Bradham, Sharon L. Harper, and Jeffrey N. Morgan. "An Overview of Measurement Method Tools Available to Communities for Conducting Exposure and Cumulative Risk Assessments." Journal of Exposure Science and Environmental Epidemiology (2009): 1-14.*

[77] *Van Den Burg, Sander. "Informing or Empowering? Disclosure in the United States and the Netherlands." Local Environment 9.4 (2004): 367-81.*

To illustrate, Julie Fox Gorte of PaxWorld Management told the GWU team that she could not access release data organized by parent company, but, in fact, she can do this using TRI.NET. However, the main information page for TRI.NET does not make this use apparent, and reading a dense user's guide may seem too onerous to more time-pressed individuals and groups.

One approach to this problem might be a simple web page that lists possible uses of TRI and directs users to the appropriate tools. For example, the page might say, "If you are looking to get information about toxic releases organized by parent company, please use TRI.NET," followed by a link to TRI.NET. Each use could be dictated by the usability studies suggested in one of this report's prior recommendations.

Downfalls to this type of approach are that listing out uses of TRI is inherently limiting. The GWU team believes that this disadvantage is mitigated if EPA maintains its main TRI website where users are free to use the inventory as they wish but allows users the option of navigating their TRI experience through frequent uses in the vein of frequently asked questions.

Future groups might also take a more technical approach to this task by, for instance, integrating TRI.NET filters into the main TRI system.

EPA could also take similar steps with other non-TRI tools, including RSEI and NATA. It could also integrate short fact sheets like the one on benzene mentioned in the Texas City case study. This report describes a desire among users to have access to these types of data integration systems and information, but again, their availability is not apparent on the main TRI website.

A future project could be to integrate these tools on the TRI page as well, either on a separate web page or through a more technical approach.

Changes to TRI reporting
An issue the GWU team found with TRI was that it does not address environmental fate and transport or smaller facilities. Fate and transport can affect toxicity by a magnitude of six degrees, and smaller facilities could have a large impact if they are heavily concentrated in one area. Future student groups could build upon the 2004 Dolinoy and Miranda study by looking at areas with no TRI reporting facilities to see if these regions have any EJ impact or to determine if there is a feasible way to accurately model environmental fate and transport on a national scale for 593 chemicals.

Community group action framework
Citizens need to be aware of their rights under EPCRA, and it is the government's responsibility to inform people of these rights. A project for a future student group could involve producing a how-to guide for citizens, listing all the information they need to know in order to initiate action. Such a guide would also describe their rights and specific action steps. EPA's myRTK tool gives citizens directions on how to report concerns to regional offices, state hotlines, the Occupational Safety and Health Administration or the EPA Office of Enforcement and Compliance Assurance. Still, more attention should be given to ensuring that citizens are aware of their rights and that they know how to apply their rights using TRI tools. Really, all the TRI tools should include explicit guidance and information on what citizens' rights are and how they can take appropriate action.

Building external support
Furthermore, in order to increase the capacity of communities and civil society organizations to take action against polluters, government should provide staff, funding and resources for the trainings these groups need to meaningfully interpret and act on TRI information. Subsequently, state and local governments need to be more supportive of community engagement. Perhaps a future project could be to investigate why local government support for community engagement is lacking in many states and suggest ways for EPA to encourage states to adopt more supportive roles. For instance, a student group could identify which states have policies and specific organizations dedicated to increasing community engagement in environmental concerns and then analyze the success or failure of those programs.

Another project could be to investigate organizations that are specifically dedicated to the education and training of communities in need of assistance in evaluating environmental health concerns in their localities. For example, the John Snow Institute Center for Environmental Health Studies is a nonprofit association that "strives to empower communities to play an informed role in solving environmental problems."[78] Through training activities and educational materials, the center provides scientific, technical, legal and organizational assistance to communities that are struggling with issues of pollution and environmental health hazards.

From 2004 to 2006, the center worked with the Dorchester Environmental Health Coalition on a project titled, "Informed Communities: Environmental Health Initiative." The project provided training for staff of community-based organizations to help them access, critically evaluate and disseminate information from environmental databases, such as TRI. The project also included direct training of community residents in Dorchester, MA, in accessing, interpreting and applying environmental health information in their local areas. The initiative was so successful that it served as a model for providing assistance to underserved New England communities that had been affected by pollution.[79] Essentially, it may be helpful for future student groups to reach out to organizations like JSI to gain insight on how to increase local support for community engagement on a national scale and possibly give EPA ideas on how to provide resources to communities that want to use TRI to generate favorable outcomes.

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[78] *"About JSI." John Snow, Inc. 2012. <http://www.jsi.com/JSIInternet/AboutJSI/index.cfm>.*
[79] *"Informed Communities: Environmental Health Initiative." John Snow, Inc.*
<http://www.jsi.com/JSIInternetProjects/InternetProjectFactSheet.cfm?dblProjDescID=208>.

Conclusion

The goal of this report was to make TRI more useful and easier to use for communities. The report accomplished this objective by identifying a suite of problems with the TRI program regarding awareness, use, ease of use and citizen empowerment that are organized into three larger spheres of concern for the average TRI user. This report relied heavily on case studies and conversations with EPA employees and TRI users. By ranking issues identified by impact, solvability and severity, the GWU team was able to determine what the next steps for future student groups should be. Issues of data integration and usability should take first priority. Many of the issues the team has identified require further investigation in order to evaluate the pros and cons of various courses of action for EPA. Future projects could include implementing suggestions for data integration and further investigations using the methodology the team has provided.

Appendix A: Scoring Matrix

Problem		Criterion			Total
Overarching	**Individual**	**Solvability**	**Severity**	**Impact**	**(Recommended priority level)**
1. TRI Awareness	a. Lack of public awareness	3	5	5	**13**
	b. Lack of public interest	3	5	5	**13**
	c. Lack of clarity in reporting requirements and limitations	5	3	4	**12**
	d. Narrow definition of community	4	4	4	**12**
2. Public interpretation of TRI Data	a. Challenges interpreting the data	4	4	5	**13**
	b. Difficulty to rank and assess toxic releases in terms of health risks	2	5	5	**12**
	c. No preliminary risk identifiers, i.e. red flags. (A component of above problem)	5	4	2	**11**
	d. Lack of tools accessibility and awareness	4	5	5	**14**
	e. Difficulty to ID actual pollutant source of health risks	2	2	4	**8**
	f. Lack of attention to environmental fate transporting or industry emissions	2	3	4	**9**
	g. Minimum reporting requirements do not require smaller industrial facilities to report.	1	4	3	**8**
3. Steps for advocacy and action	a. Inadequate public participation in environmental decisionmaking	4	3	5	**12**
	b. Common-sense knowledge can take higher priority than codified official information	4	2	4	**10**

Beyond dividing the issues into three main categories, this process resulted in the expansion, concentration or omission of certain identified problems. Item 2g, for example, was eliminated due to its very low solvability score. It scored low in this category because EPA does not have direct jurisdiction to alter this situation. Some other problems that scored low on solvability, such as 2e, were kept because they served to expand on and inform some of the report's recommendations. Due to their similar root cause, items 2a, 2b and 2c were collapsed into the "Challenges interpreting the data" issue. Lastly, problem 1c was expanded into two distinct sections, representing the linked issues of "Skepticism" and "TRI Limitations." All items of problem category 3 were similarly expanded into more detailed sub-problems.

Appendix B: TRI Uses and Users[80]

Example Users of TRI Data	Categories					
	Public	**Industry**	**Government**	**International**	**Investment**	**Academic**
Individuals	Participate in environmental decisionmaking				Learn more about environmental behavior of companies in communities to which they might consider moving	
Community groups	Educate their citizens or residents about toxic chemical releases, combining education with a call to action	Initiate discussions with local industries	Call on local and public interest organizations to lobby for their causes			
National organizations	Help the public interpret the data	Work with local public interest and community organizations to initiate discussions between citizens and industry	Use TRI data to help them lobby for changes in environmental policy			Analyze TRI data and use it to conduct risk screening and risk assessment
Private	Demonstrate environmental	Improve internal			Provide socially	

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[80] *U.S. EPA, Toxics Release Inventory Program Division. "How Are the Toxics Release Inventory Data Used? -- Government, Business, Academic and Citizen Uses." (2003).*

industries	progress	auditing and stimulate more efficient use of chemicals by identifying materials losses			responsible investment options	
Government	Environmental targeting initiatives that help governments and communities prioritize their needs and ensure that their resources are used most efficiently	Take action when TRI data reveal an environmental problem in a specific state or region, such as voluntary incentive programs for companies	Influence and change environmental standards, regulations, and legislation by providing the impetus for legislative action from federal, state, and local governments	Compare data internationally and share ideas about improving environmental regulations		Create tools to address assessments of the levels of risk in communities
Academia	Clarify risks associated with toxic chemicals at the state and local level		Examine environmental policies and strategies			Perform studies based on TRI data in areas ranging from doctoral theses to journal publications to use in the classroom itself

Appendix C: Conversations with TRI Users

March 14, 2012 email from Allison Tracy, chemicals policy fellow for the Environmental Defense Fund

I would say that although the TRI information can be useful, we often run across problems because of its limited scope. For example, in the 2006 Inventory Update Reporting rule (IUR) there were more than 6700 chemicals reported as being in commerce in the United States in excess of 25,000 lbs/ year. However, there are far fewer chemicals in the TRI (around 600-700). As a result, the TRI is not very useful if we want to collect/ analyze information about the "chemicals in commerce" in general. And of course the TSCA Inventory has upwards of 80,000 chemicals. The TRI is most useful if I am looking for information on one specific chemical, but that is less frequent. I do appreciate the efforts EPA has undertaken to make the TRI more accessible, including a recent webinar on how to use the TRI effectively.

In addition to our work on chemicals under TSCA, the Climate and Air team at EDF has also used the TRI. See a report here: http://www.slideshare.net/EnvDefenseFund/mercury-alert-cleaning-up-coal-plants-for-healthier-lives.

March 21, 2012 in-person interview with Martha Stevenson, senior program officer of research and development for World Wildlife Fund, notes

Before she took her position at WWF, Stevenson was an environmental consultant for engineering firms. She used TRI to develop life cycle analyses, compose Brownfield information and search emissions violations. She mentioned also mentioned using EnviroFacts. While discussing potential improvements for TRI, Stevenson said that TRI resources are "not intuitive" and that they could benefit from being "more clear about what is missing" in the data presented. She used the President Bush years as an example of a period of time when data reporting seemed to change, making it difficult to compare. Something she would like to see added is market-specific visuals that provide context.

March 28, 2012 email from Julie Fox Gorte, senior vice president for sustainable investing for PaxWorld Management LLC

I'm not sure whether the issues I've encountered are completely at home in a place called 'problems,' but here's what I've encountered.

1. It is only every other year (and thank goodness it is, as there was a period when it was less frequent, in the Bush administration), and then it often takes EPA a year or so to get the latest figures up on the website. So the information is fairly dated; having things that are at best 2.5-3 years old is not ideal in the world of investment. If there were a way to reflect accurate information more rapidly that would be worth its weight in rubies. That said, being able to trace things back to 1987 is also worth its weight in rubies— having a time series is very good.

2. I've talked with several company people who have mentioned that it's really easy to game the numbers reported. I've never really dived into this sinkhole, but I would be very interested to get video back from someone who has. What are the major mechanisms for gaming? And if those were somehow eliminated (like, for example, a chartered financial analyst would do to a company's financial reporting—backing out all the company's accounting games and coming up with a more accurate picture) would the record of TRI substance releases and production be as rosy as it is?

3. What would be really ideal is to make sure that every facility can be traced back to its current owner. So let's say, for instance, that Ford bought the Rouge plant from GM in 1995 and then sold it to Toyota in 2005. So if I were looking up Toyota's TRI figures today I'd see the Rouge plant's TRI production and releases back to 1987, and I wouldn't find it under GM or Ford. But if I were

looking it up in 2004 it would be under GM, and if I were looking it up in 1994 it would be in Ford's orbit. This can be quite fiendishly difficult to do, and perhaps that's why the numbers take so long to process at the agency, but knowing that that's how the numbers work would help to reduce my dependence on sleeping pills to get any rest at night.

4. Which leads seamlessly to the last point: it would be wonderful to be able to get company (parent) totals, rather than having to compile them facility by facility. I haven't done this in about a year—I generally don't DO a lot of research, although I do oversee all the people who do at Pax—but last time I checked the only way to get Ford's TRI totals were to go facility by facility, which is like the Bataan Death March for Ford and a cakewalk for Microsoft. In short, it can be quite time-consuming to get company totals for industrials, materials, and utilities.

5. The final thing, and I know this isn't entirely something that EPA can make happen, would be some way to understand the degree of compatibility between our TRI (or EPCRA) and other countries PRTR laws and databases. If you can get EPA to convince EPER—the European TRI-like database—to give as much detail as Envirofacts does I would, if I won the lottery, make them millionaires.

March 28, 2012 email from Maria Powell, community-based participatory researcher for the Midwest Environmental Justice Center

Yes, we sometimes use TRI to get data on emissions from various facilities in our community. We find it helpful but in a very limited way. We know it is missing a lot of information and few of us trust the numbers because we know they are self-reported. We know that certain facilities in our community emit many more toxic chemicals (and at higher levels) than are reported on the TRI for the facility--e.g., Madison Kipp Corporation.

March 30, 2012 email from Diane Heminway, environmental projects coordinator for United Steelworkers

United Steelworkers (labor union) has been using TRI data for many years. The changes EPA made to the TRI Explorer made accessing data MUCH more difficult than it used to be. I can discuss this further with you next week as I am currently on a deadline.

April 19, 2012 email from Lyman Welch, director of Alliance for the Great Lakes Water Quality Program

Thank you for writing about the EPA's Toxics Release Inventory (TRI) system. The Alliance for the Great Lakes works for clean water that protects the health of the people, fish and wildlife of the Great Lakes. The TRI as a database is a useful tool for the Alliance because it allows us to have access to the data on discharges of chemicals from various sources into the waterways. Tools such as DMR (Discharge Monitoring Report) Pollutant Loading Tool and Downloadable Data Files have been the most useful. We have not frequently used the other analysis tools that are available because oftentimes our analysis is focused on a very specific question related to the Great Lakes basin or a specific subset of industrial facilities.

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