

# Building Community Capacity?

*Mapping the Scope and Impacts of the EPA Environmental Justice Small Grants Program*

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## **Abstract**

As state and national environmental justice (EJ) programs have expanded in recent years to address new risks and challenges, there are important lessons to be learned from one of the earliest federal agency EJ programs, the EPA Environmental Justice Small Grants (EJSG) program. Since 1994, over 1,000 small grants have been awarded to support communities in developing solutions to local environmental and public health problems; however, the collective impact of these investments has never been evaluated. Using GIS to map the locations of EJSG funds relative to data from the Toxics Release Inventory (TRI), this paper addresses two main questions. First, are grants being awarded to the types of communities (low-income, minority areas facing major environmental hazards) intended to be served by the program? Second, have there been any significant environmental changes in EJSG areas since the start of the program? Results of county-level spatial analysis reveal that EJ grants are only in part being awarded to minority or low-income counties facing higher than the national average TRI releases and that average toxic releases have increased significantly in EJSG counties in some EPA regions relative to non-EJSG counties. These results highlight the need for systematic EJ program evaluation and coordination.

**Key Words:** environmental justice, regulatory evaluation, GIS, spatial analysis, grants

**JEL Classification Numbers:** Y80

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## Contents

<b>Introduction.....</b>	<b>1</b>
<b>Background and Motivation .....</b>	<b>2</b>
<b>The EPA Environmental Justice Small Grants Program .....</b>	<b>4</b>
<b>Spatial Analysis Methodology and Assumptions .....</b>	<b>7</b>
<b>Mapping Patterns of EJSG Funding.....</b>	<b>10</b>
Demographic Characteristics of EJSG and non-EJSG counties .....	11
Toxic Releases in EJSG and non-EJSG counties .....	15
<b>Summary of Results and Lessons Learned.....</b>	<b>20</b>
<b>Conclusions and Discussion .....</b>	<b>22</b>
<b>References.....</b>	<b>23</b>

## **Building Community Capacity? Mapping the Scope and Impacts of the EPA Environmental Justice Small Grants Program**

Shalini P. Vajjhala \*

### **Introduction**

Since the beginning of the environmental justice (EJ) movement in the early 1980s, numerous research studies have centered on understanding if and to what extent minority and low-income communities are disproportionately burdened with significant environmental hazards. In contrast, far less research attention has been given to assessing federal agency activities intended to mitigate inequitable impacts of environmental hazards on minority and low-income communities. Although more than a decade has passed since the signing of Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” (EO 12898) in 1994, which mandates federal agencies to address environmental justice in their policies and procedures, the programs associated with this mandate remain extremely broad in scope and intent.

Compared to environmental regulations, which set specific performance criteria or standards enforceable by law, the EJ requirements established by EO 12898 are directed solely at federal agency procedures and programs. Despite this limited reach, the requirements set forth in EO 12898 are very broad, addressing both the *process* of making equitable decisions and their desired *outcomes*. As a result, most agency initiatives designed in response to this Executive Order are also expansive, ranging from building community capacity, improving public awareness, and educating citizens about exposure to environment hazards to expanding public participation. The far-reaching goals and aims of both EO 12898 and related agency EJ programs make the impacts of this mandate difficult to assess and evaluate.

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To bridge the growing gap between EJ research studies and state and federal EJ programs, this paper applies traditional spatial analysis methods used in EJ research to evaluate one of the very few, long-standing, relatively consistent sources of federal agency environmental justice program data: the U.S. Environmental Protection Agency's Environmental Justice Small Grants (EJSG) database. Since the program's inception in 1994, more than 1,000 grants have been awarded to help communities develop solutions to local environmental and public health problems. Despite the program's long history (in the context of the EJ movement as a whole) and national scope, the collective impact of these investments has never been evaluated.

This paper uses Geographic Information Systems (GIS) to plot the locations of grants made through the EJSG program and then compare the patterns of these investments to county-level toxic releases reported in the Toxics Release Inventory (TRI) to address two major research questions. First, *are EJ small grants being awarded to the types of communities (low-income, minority areas facing major environmental hazards) intended to be served by the program?* Second, *have there been any significant environmental changes in the areas that have received EJ small grants since the start of the program in 1994?*

The goals of this analysis are to establish a systematic approach to EJ evaluation for the EJSG program specifically, to put forward a method for reviewing federal and state EJ mandates more generally, and to lay the groundwork for setting priorities for future EJ investments. Section 2 presents a brief discussion of the background and motivation for this research. Section 3 describes the history and criteria of the EJSG program, and Section 4 outlines the mapping methodology and key analytic assumptions. Sections 5 and 6 then describe each analysis and highlight major results. Finally, Section 7 concludes with a discussion of the implications of this research for future government agency EJ program development and evaluation.

## **Background and Motivation**

Early environmental justice analyses show significant disparities in the location of environmental hazards in primarily poor and minority communities compared to other communities with lower minority populations. Seminal works on this topic include U.S. GAO's study of EPA's Region IV, which found that three of the four off-site hazardous waste landfills in EPA's Region IV were in African American communities although African Americans constituted a minority of the region's total population (U.S. GAO 1983); a 1987 United Church of Christ report, which examined 415 operating commercial ('off-site') hazardous waste facilities and found such facilities were more likely to be located in communities with significant minority

populations (Commission for Racial Justice 1987); and the book *Dumping in Dixie: Race, Class, and Environmental Quality* by Robert Bullard (1990).

As mapping and measurements tools have grown more sophisticated, EJ studies have evolved to examine changes in the timing and locations of environmental hazards, risk exposure, and other more detailed measures of inequity, using finer-grained spatial data and more targeted evaluations of local populations. As Shapiro (2005) states, “The majority of early environmental justice studies indicate environmental inequities. The record is mixed, however, among the more methodologically sophisticated studies (Adeola, 1994; Anderton et al., 1994; Cutter, Holm, & Clark, 1996; GAO, 1995; Glickman & Hersh, 1995; Hamilton, 1995a, b; Jenkins, Maguire, & Morgan, 2002; Lambert & Boerner, 1997; Mohai, 1995; Morgan & Shadbegian, 2003; Oakes, Anderton, & Anderson, 1996; Yandle & Burton, 1996).”

Despite the mixed results of many newer studies, one common feature of these types of analyses, emphasized by Bowen et al. (1995) and Been (1995), is that they reveal the importance of spatial scale in environmental justice analyses and point to significant differences in evidence of environmental injustice depending on the unit of analysis (e.g. county, census tract, etc.).<sup>1</sup> Moreover, despite advances in spatial analysis tools and technologies that allow evaluations of EJ issues at multiple scales, most of these studies remain largely backward looking at the sources of environmental injustice rather than forward looking to possible solutions (Holifield 2001).

This trend in EJ research toward increasingly detailed analyses and evaluations of uncertainties has resulted in a divide between EJ research and government EJ initiatives and programs, which remain extremely broad in scope and intent. As Bowen (2002) points out, “If environmental managers and policy-makers do not recognize the high levels of empirical uncertainty surrounding the [environmental justice] issue, they are apt to attribute an empirically unwarranted level of concreteness to the empirical research findings, thus leading to poorly conceptualized and therefore potentially harmful policy and management decisions.” Similarly, in his book *The Promise and Peril of Environmental Justice*, Foreman (1998) highlights key barriers to moving environmental justice from a federal agency mandate to a more broadly enforceable regulation. He identifies a lack of clear environmental priorities and a process for setting such priorities as some of the main obstacles to implementing and enforcing EJ standards.

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<sup>1</sup> Mixed results produced by variations in spatial scale are defined as a “modified areal unit problem” or MAUP. For general discussions on the MAUP and its implications see Openshaw (1984) and Unwin (1996).

The difficulties associated with setting EJ priorities and addressing scientific uncertainties are evident when considering the wide-variety of approaches different agencies have taken to meeting federal EJ requirements. Because federal agencies, ranging from EPA to DOT, have focused on different aspects of EO 12898 relevant to their specific agencies' responsibilities and needs, systematically assessing and comparing agency EJ initiatives and their impacts requires a scalable approach to program evaluation.

For this reason, this paper focuses on the EPA EJ Small Grants program. By evaluating the EJSG program as a whole, it is possible to demonstrate how small-scale agency program data can be examined collectively to begin to address the question of whether or not disproportionately affected minority and low-income communities are receiving sufficient attention and resources through EJ initiatives at a national level.

The need for this type of comprehensive assessment is now critical. Despite the lack of evidence on the impacts or effectiveness of federal agency EJ programs, there is a renewed public and political interest in national environmental justice policies and programs (Little 2007). Additionally, states have been moving forward with EJ rules and action plans of their own for addressing injustice. States that have enacted EJ mandates to date include California, Florida, Hawaii, Maryland, New York, Pennsylvania, and Texas. As EJ policies directed at federal and state agencies have become increasingly widespread and far-reaching, the EJSG program has been held up as a model and is now being adopted by states like California to build community capacity in the face of new environmental risks and impacts.

Because this program is one of the most organized and outcome-focused approaches to mitigating local environmental injustice, it is critical to develop a clear system for defining and measuring success, before the program is further extended and applied to wider regions and new types of projects. In order to lay the groundwork for such an evaluation, this paper examines if the grants awarded to date have fulfilled the EPA's own selection criteria and assesses to what extent these grants correspond to broader patterns of changes in the distribution of environmental hazards. The next section provides a brief overview of the EJSG program.

### **The EPA Environmental Justice Small Grants Program**

Following the founding of the National Environmental Justice Advisory Council (NEJAC) in 1993 and Executive Order 12898 in 1994, EPA established the EJSG program and awarded its first round of small grants. Since this time, funds have been disbursed to a variety of organizations and projects, including studies and interventions on air quality, children's health,

farm worker safety, hazardous waste disposal, pollution prevention, radon, and recycling, among others (EPA 2001). Over the last 13 years, approximately \$18 million dollars have been awarded through the program as a whole; however, as Figure 1 shows, funding for the program has steadily declined. The EJSG program started with a budget of \$500,000 in the first year, and then reached a peak of \$3 million within one year. Overall, the program's funds have supported an average of 90 grants of approximately \$17,000 each per year from 1994 to 2005 (EPA 2006a).

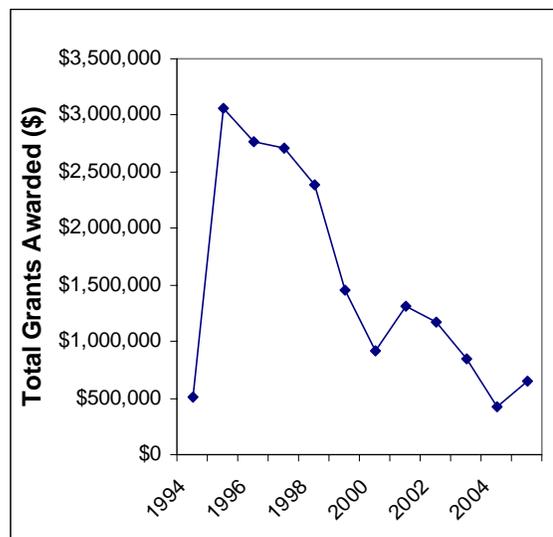


Figure 1. Total EJSG program funds 1994-2005.

For most of its first decade, the goals of the EJSG program remained broadly focused on “the use of collaborative problem-solving to address local environmental and/or public health issues” (EPA 2006b). Within this larger goal, the EPA Office of Environmental Justice (OEJ) defined several criteria for grant selection. These selection criteria include “geographic and socioeconomic balance, diversity of project recipients, and sustainability of benefits of projects after the grant is completed” in each EPA region where projects are proposed (EPA 2001).

To maintain geographic balance, all EJSG applications are evaluated in the EPA region of the applicant organization and program funds are allocated evenly across all ten EPA regions. All proposals are reviewed competitively in the region where the proposed projects are located, making the distribution of funds highly diffuse within the spatial constraints of each EPA region. Additionally, EJSG evaluation criteria prioritize proposals that show community involvement in the proposal's development and implementation ensuring to a degree that grantee organizations are proximate to the EJ communities they intend to serve.<sup>2</sup>

As outlined above, the EJSG program selection criteria specifically prioritize diversity in geographic spread, organizational type, and project focus in order to support a wide-range of relevant organizations and projects,. However, this same goal of reaching a wide variety of groups and addressing a broad range of hazards also makes it difficult to define, compare, or

<sup>2</sup> See <http://www.epa.gov/epahome/locate2.htm> for a map and full listing of all states and territories by EPA region. (Retrieved: August 9, 2006).

measure success even when comparing projects in the same areas or those projects addressing the same types of hazards or problems.

In an effort to periodically evaluate the grants program, the EPA Office of Environmental Justice (OEJ) has issued two reports since 1994 on project best practices funded through the program. Additionally, the agency has created an online database with profiles of grantee organizations to disseminate program information. Despite the importance of both of these measures, the result of these efforts is a focus on individual project successes that provides little sense of the impact and effectiveness of the EJSG program as a whole in reaching its target populations and supporting coordinated environmental improvements at a large-scale.

As part of the most recent EJ Small Grant program revision and update in June 2006, EPA has reoriented the program in an effort to better manage the outputs and outcomes of funded projects. This new focus is part of the agency's larger strategic plan, where evaluating effectiveness of programs and demonstrating the impact of funded projects is a priority. To this end, the EJSG program's structure and application requirements have become significantly more formal. The OEJ issued a new application guide with more stringent technical and eligibility requirements, and raised the maximum award to \$50,000 for a required period of two years.

The guidelines for eligibility still encompass the same types of organizations funded in previous years; however, the criteria are now stricter. In the past, eligible applicants included community-based grassroots organizations, churches, tribal governments, and other nonprofit organizations. Now organizations must demonstrate eligibility under the program by showing that they are local, small-scale, community-based nonprofit organizations that are not a part of any larger regional or national group (for example, as a local chapter). Furthermore, organizations are required to be physically located in the same communities as the affected population and the environmental and/or public health problem they are seeking to address, and, to the greatest extent possible, they must also include members from these same affected areas.

Although these new requirements appear to be intended to make the program more directed and easier to evaluate, it is unclear to what extent the existing requirements were effective or ineffective at reaching target populations and problems. The next section illustrates how spatial analysis methods can be applied to evaluate the implementation of both past and newer EJSG grant selection criteria.

## Spatial Analysis Methodology and Assumptions

Because environmental justice issues are inherently defined based on the location of environmental hazards relative to minority, low-income populations, evaluating EJ programs lends itself to spatial analysis. Existing EJ research already draws heavily on Geographic Information Systems (GIS) to map and analyze population distributions and exposures to environmental hazards. The contribution of this study is in its integrated analysis of a specific federal agency program and intervention alongside the types of social-environmental relationships captured in earlier EJ work. The focus here is on illustrating the geographic distribution of EJ grants relative to regional changes in the distribution of environmental hazards.<sup>3</sup> This type of spatial analysis allows for comparisons of minority populations, poverty rates, and changes in toxic environmental releases over time in counties funded by the EJSG relative to those not funded by the program.

By using Census data on poverty rates and distributions of minority populations and annual data on total pounds of all on- and off-site chemical releases from Toxics Release Inventory (TRI) reports, this approach allows for national program evaluation with existing, publicly available county-level data. The framework used here follows three basic steps relevant for a variety of EJ program assessments: compilation, coordination, and evaluation.

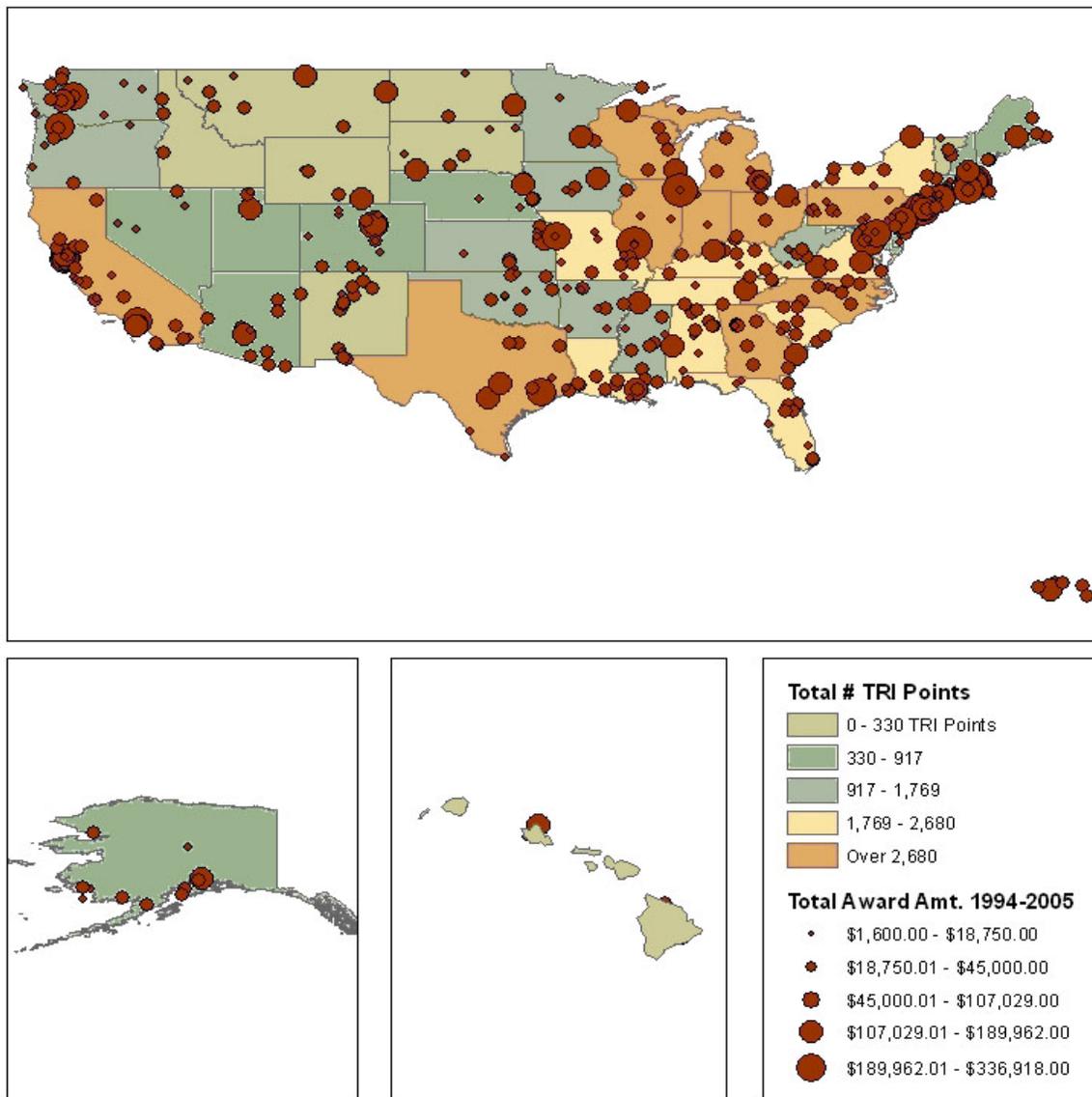
First, as part of EPA's documentation on the EJSG program, the Office of Environmental Justice releases a comprehensive listing of all grants awarded every year.<sup>4</sup> These listings provide information on grants, including geographic information such as the grantee organization's address, zip code, EPA region, and other project information. Based on a compiled database of all 1,080 grants awarded to date, the zip code of each grant awarded was used as a geographic

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<sup>3</sup> In this paper, the term *minority* is used to refer to members of all nonwhite populations. The government defines minority populations as "individual(s) who are members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander; Black, not of Hispanic Origin, or Hispanic." Low-income populations are identified using the Census Bureau statistical poverty thresholds.

<sup>4</sup> Information on all grants awarded from 1994–2005 through the EJSG program to date are posted online through the EPA Office of Compliance and Enforcement website as individual PDF files. Online Source: <http://www.epa.gov/compliance/environmentaljustice/grants/ej-smgrants.html>. (Retrieved: August 9, 2006.)

identifier to plot each grant by its latitude and longitude coordinates.<sup>5</sup> Grants were then summed by zip code, plotted based on zip code coordinates, and mapped as shown in Figure 2.<sup>6</sup>



**Figure 2.** Sum of EJ Small Grants Awarded by County (1994-2005) plotted and overlaid on total TRI Release Points by State. (EPA TRI data downloaded from ESRI Geography Network GIS Server. <http://www.geographynetwork.com>. Retrieved: August 10, 2007).

<sup>5</sup> Approximately 130 grants are missing address and zip code information in the EPA online listings of awardees. As a result, the GIS maps and analyses here are based on 946 of the total 1,080 grants awarded.

<sup>6</sup> Zip code latitude and longitude coordinates were downloaded from the U.S. Census Bureau 1990 and 2000 Gazetteer Files at <http://www.census.gov/tiger/tms/gazetteer/zips.txt>. (Retrieved: August 9, 2006.)

Second, using the U.S. Census Zip Code Tabulation Areas database, which matches each zip code to the best corresponding county, the EJ small grants were then assigned to counties to coordinate databases and allow for spatial comparisons of Census Poverty and Minority Population Data and TRI Data.<sup>7</sup> Poverty and race data were downloaded from the Census Small Area Income & Poverty Estimates,<sup>8</sup> and TRI releases were downloaded from publicly available EPA TRI data summaries of total pounds of annual toxic releases by county.<sup>9</sup>

Using the zip code as the unit of analysis and consolidating all EJ small grants awarded in the same zip codes, 497 zip codes have received one or more EJ small grants, averaging approximately \$31,500 each, during the period from 1994–2005. Because in many cases zip codes are smaller than counties, aggregating the grant data to the county level yields fewer counties than zip codes with 346 counties receiving total grant funds averaging approximately \$45,300 each to date.<sup>10</sup> To give an overview of the spatial relationships between EJSG counties and TRI data at a broad level, Figure 2 illustrates the distribution of all EJ grants by zip code relative to the number of TRI release points by state.<sup>11</sup>

Third, analyzing and comparing differences in the distributions of minority populations, poverty rates, and TRI releases allows for consistent program evaluation. Because the initial (from 1994-2006) criteria for EJSG awards specifically prioritize minority and low-income communities at risk from environmental hazards, these data sources support analysis of how well the geographic distribution EPA's EJ investments across all EPA regions correspond to the

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<sup>7</sup> See <http://www.census.gov/geo/ZCTA/zcta.html> for more information on the Census Bureau's tabulation process for matching zip codes and counties.

<sup>8</sup> Census.gov poverty database downloads: <http://www.census.gov/housing/saibe/estmod93/est93ALL.dat> and <http://www.census.gov/housing/saibe/estmod04/est04ALL.dat>. (Retrieved: January 12, 2007.)

<sup>9</sup> Online Source: TRI Explorer <http://www.epa.gov/triexplorer/geography01.htm?year=1993> and <http://www.epa.gov/triexplorer/geography01.htm?year=2004>. (Retrieved: January 10, 2007.)

<sup>10</sup> Of the total 346 counties analyzed here, 7 of these counties, located in U.S. Territories, including Guam, American Samoa, and the U.S. Virgin Islands, have insufficient data on minority populations and poverty rates in these areas to allow for comparisons with the other counties in the dataset. Therefore, Table 1 and Figures 3 and 4 that compare minority and poverty rates in EJ Grant and non-EJ Grant counties do not include any of the counties in these regions; however, all other results are based on the full dataset of 346 EJ Grant counties.

<sup>11</sup> It is important to note that this map is based on a count of the total number of facilities with toxic releases (TRI release points), and not on total environmental releases in pounds. All analyses from this point forward in the paper use data on total TRI releases, referred to interchangeably as total releases or total pounds of toxic releases.

locations of target communities (counties) with large minority populations and high poverty rates, and also to examine to what extent toxic releases have changed in these counties over time.

It is important to note here that this framework for analysis, while robust, contains several implicit assumptions based on the data being used, the scale (county-level) of evaluation, and the method of aggregation. For example, it is assumed, based in part on EJSG program criteria, that organizations funded by the EJSG, while not necessarily in the same zipcode as an EJ project or community, are in relatively close proximity (within the same county) as the population and environmental hazards they are targeting to allow for county-level comparisons of funds disbursed and environmental and demographic characteristics.

Additionally, it is assumed that the TRI provides a useful estimate of environmental hazards at large. Because the TRI provides one of the few national-level databases on a wide range of pollutants and chemical contaminants, TRI data is used in a large number of EJ analyses and its strengths and limitations are well-documented in the literature and (Been 1995, Cutter et al. 1996, Morello-Frosch et al. 2002, and Pastor et al. 2001). The most important limitation of this data for the purposes of this analysis is that even as one of the best-available nationally-representative sources of information, the TRI still represents only a subset of potential environmental hazards facing minority and low-income communities. Additionally, the specific hazards addressed by individual EJ small grants are difficult to ‘match’ directly to standard TRI categories of toxic releases.

For example, environmental justice small grants have been disbursed to promote education and awareness about asthma. Although some of the air pollutants captured in the TRI are linked to asthma rates, there are many other possible contributors and causes of asthma, including indoor air pollution, that are not necessarily reflected here. As a result, at this level of evaluation, this analysis does not make any causal links between toxic releases and EJSG awards. Instead, the goal of this analysis is to identify patterns of EJ funding and investment and place these investments in the context of broader patterns of environmental change over time, using the TRI as a proxy and to form the basis for more detailed program evaluation.

### **Mapping Patterns of EJSG Funding**

Based on the data described in the previous section, this section details the results of county-level analyses focused on the two main research questions outlined at the beginning of this paper. These analyses highlight the differences between the percentages of minority populations, poverty rates, and average toxic releases in EJSG and non-EJSG counties using

1993 as a baseline year. The year prior to the start of the EJSG program is used as a baseline because it provides a big picture of the EJ ‘landscape’ that motivated the distribution of the first several years of funds when the largest amounts and greatest numbers of EJ small grants were awarded. Additional analyses compare differences in EJSG and non-EJSG counties between two periods from 1988–1993, from when TRI data were first made available to the start of the EJSG in 1994, to the period from 1994 to 2004, after a decade of grants awarded. The following subsections focus respectively on assessing, first, if and to what extent EJ grants were awarded to counties matching the program criteria of significant minority or low-income populations facing environmental hazards, and second, if and how the distribution of toxic releases has changed over time in EJSG counties relative to other counties.

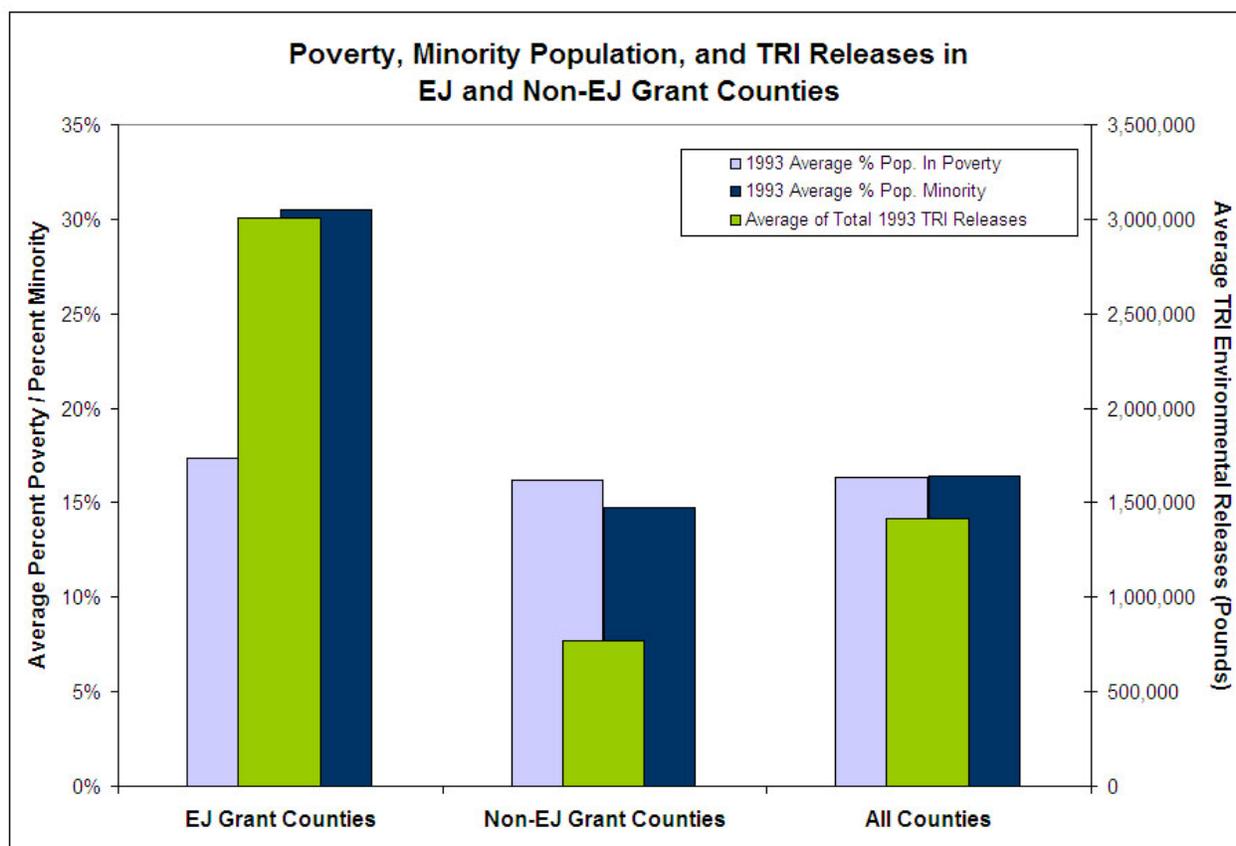
### ***Demographic Characteristics of EJSG and non-EJSG counties***

Using the county-level estimates of poverty, minority populations, and TRI releases, the first question this analysis seeks to answer is: *are EJ small grants being awarded to the low-income, minority, high environmental hazard communities intended to be targeted by the program?* As Figure 3 illustrates, taking all counties that have received EJ grants since the EJSG program’s inception through 2004 and examining their demographic and environmental characteristics reveals that EJSG counties did, in fact, have higher poverty rates, larger minority populations, and also much higher total environmental releases in 1993 than those counties that did not received grants at anytime during the period from 1994-2004.

At a more detailed level of analysis within EPA regions, however, it is less clear that EJ small grants are being awarded to communities that have both higher than average poor or minority populations and higher than average TRI releases in the same county. Taking the national averages of 1993 TRI releases, poverty rates, and percent minority populations by county, counties were assigned to one of four categories based on whether each county TRI, Minority, and Poverty averages were above or below the national averages. All counties were coded into one of four categories, as shown in Figure 4, and 1993 TRI, Minority and Poverty averages were calculated for each of these categories.<sup>12</sup>

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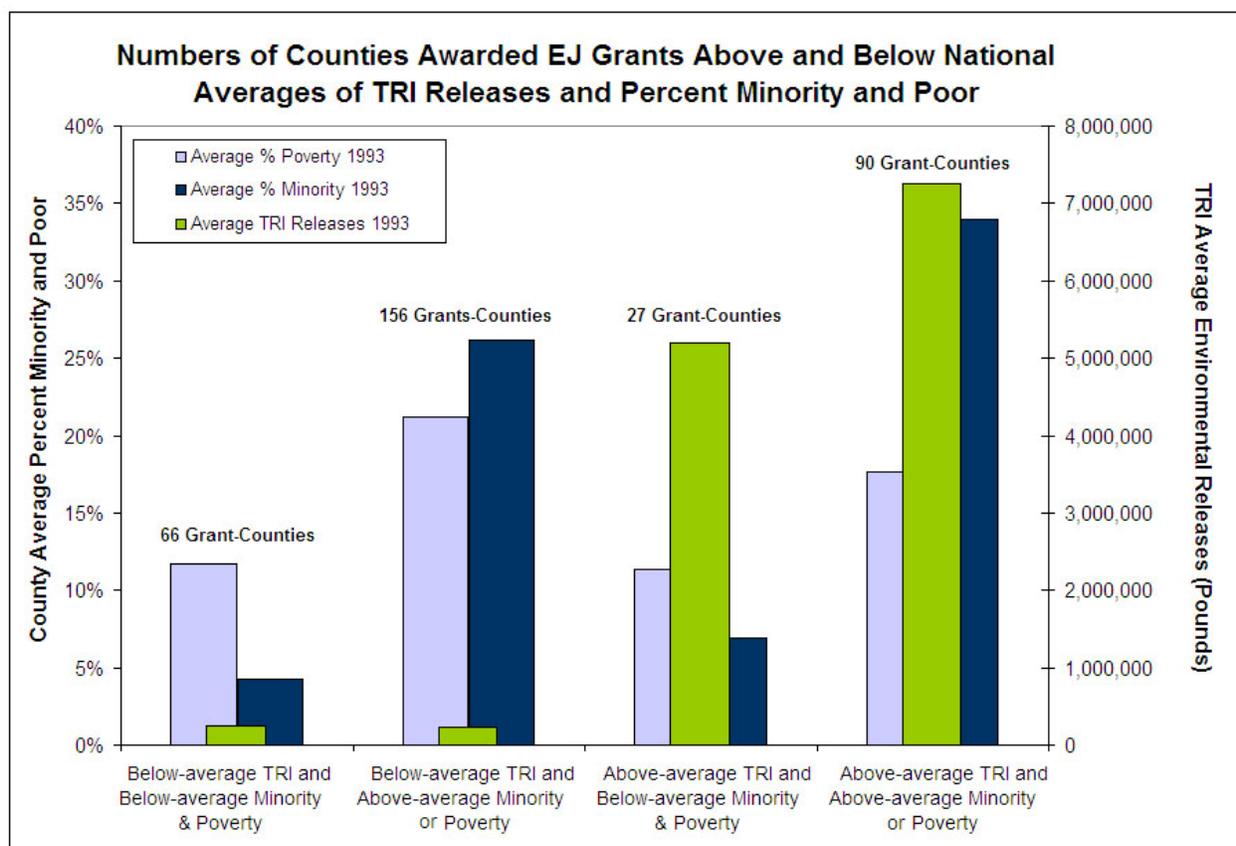
<sup>12</sup> The categories defined for the purposes of this analysis include counties with *either* the percent Minority *or* percent Poverty above the national average as being in the Above-Average Minority *or* Poverty category to take into account EJSG program criteria targeting minority *and/or* low-income populations.



**Figure 3.** Average Percent Poverty (1993), Average Percent Minority Population (1993), and Average of Total On- and Off-Site Toxic Releases (TRI 1993) at the county-level for all EJSG Counties (where one or more organizations received EJ small grants between 1994-2005), non-EJSG Counties (those counties without any EJSG recipient organizations), and the combined national average (all counties).

Results of these comparisons reveal that the majority of EJ small grants have been awarded to counties with higher-than-average minority or poor populations relative to the national average and below-average TRI releases nationally. If the program criteria were being applied to reach EJ communities with the highest poverty rates, minority populations, and toxic releases, one would expect to see the largest number of grants and the greatest proportion of funds awarded to Above-average TRI and the Above-average Minority or Poverty counties.

Not only did fewer counties in this category receive funding, the total grant funds awarded to these counties, totaling approximately \$6.2 million, was less than the total funding of \$7.0 million awarded to the 156 EJSG Counties in the Below-average TRI and Above-average Minority or Poverty category. The remaining funds were split between the last two categories with \$1.6 million awarded to Below-average TRI and Below-average Minority/Poverty counties, and \$720,000 to Above-average TRI, Below-average Minority/Poverty counties.



**Figure 4.** Summary of descriptive statistics for all EJSG counties disaggregated by 1993 county average Minority, Poverty, and TRI Releases relative to the 1993 National averages. EJSG Counties with Above-Average TRI Releases in 1993 and Above-Average Poverty Rates or Above-Average Percent Minority Population received only 90 out of 339 total grants awarded. These results show that the majority of EJ small grants and funds have been awarded to communities with higher minority and poor populations, but not higher TRI releases.

These results might appear counterintuitive with the results presented in Figure 3, where EJSG counties have both much higher-than-average environmental releases and higher minority and poor population rates; however, the results are consistent. What Figure 4 illustrates is that although there are fewer EJ small grants awarded to counties with above-average TRI releases, the average releases in pounds of chemicals in these counties are so much higher than other counties that it brings the average up across all EJSG counties.

Table 1 further disaggregates these county-level data based on regional averages instead of a single national average to assess if some regions are performing better than others at soliciting applications and funding organizations in counties that are above the 1993 regional averages in both the TRI and the Minority or Poverty categories. As the table shows, more than 50% of all counties receiving EJ grants in Regions 2, 5, and 1 were above the regional averages for both TRI releases and Minority or Poverty rates. In contrast, Regions 9 and 6, which include

California and the Southwest among other states and territories, have the highest 1993 regional averages of percent minorities by county at 34% and 26% respectively, but only 33% and 24% of the EJSG counties in these regions fall into the above-average TRI and above-average Minority or Poverty category.

**Distribution of EJSG Counties by EPA Region Based on Regional Average Minority, Poverty and TRI Estimates**

EPA Region	Below-average TRI & Below-average % Minority OR Poverty				Below-average TRI & Above-average % Minority OR Poverty				Above-average TRI & Below-average % Minority OR Poverty				Above-average TRI & Above-average % Minority OR Poverty			
	% of EJ Counties	Average % Minority 1993	Average % Poverty 1993	Average All TRI Releases 1993 (1000s of pounds)	% of EJ Counties	Average % Minority 1993	Average % Poverty 1993	Average All TRI Releases 1993 (1000s of pounds)	% of EJ Counties	Average % Minority 1993	Average % Poverty 1993	Average All TRI Releases 1993 (1000s of pounds)	% of EJ Counties	Average % Minority 1993	Average % Poverty 1993	Average All TRI Releases 1993 (1000s of pounds)
<b>1</b>	17	4	9	266	22	5	14	136	9	4	9	1,138	52	19	13	2,083
<b>2</b>	0	5	4	203	27	14	13	178	0	0	0	-	73	26	12	1,923
<b>3</b>	9	6	11	237	41	20	18	187	13	5	12	3,689	38	23	15	3,174
<b>4</b>	18	9	15	273	38	32	25	220	14	11	15	5,326	29	39	21	5,181
<b>5</b>	9	2	10	289	27	5	15	255	3	3	8	2,871	61	19	13	5,552
<b>6</b>	19	13	16	329	52	39	25	260	5	17	17	10,294	24	42	22	24,336
<b>7</b>	14	1	11	56	49	9	18	87	3	2	11	1,562	35	13	15	2,436
<b>8</b>	11	3	11	98	67	17	18	142	7	6	11	14,982	15	19	12	13,441
<b>9</b>	17	15	10	130	50	41	18	212	0	17	7	5,577	33	50	17	5,109
<b>10</b>	11	6	11	128	61	24	16	130	18	9	11	1,972	11	19	13	2,281
<b>National</b>	14	6	12	234	44	23	20	207	8	7	12	4,215	35	27	16	5,869

**Table 1.** Descriptive statistics on EJSG counties sorted by category into above- and below-average TRI, Minority, and Poverty rates relative to EPA regional averages.

Several possible explanations exist for why the EJ small grants awarded in the program's first decade have been distributed in this manner. First, it could be that there are far fewer grant applicants representing the "worst affected" counties with Above-average TRI releases and Above-average Minority or Poverty rates. Second, any highly localized environmental disparities could be masked at the county-level, and different regional interpretations of the grant selection criteria could emphasize specific problems and priorities differently across EPA regions. Third, because funds are divided equally across EPA regions, this distribution constraint could leave regions with lower minority or poor populations or those with fewer large TRI releases no option

but to award grants to organizations in counties that are below the national average in any category—poverty rates, minority populations, or TRI releases. Finally, regions with many counties above the national average on all three criteria might not have had sufficient funding to reach all “qualified” counties that applied for funding.

Overall, these results highlights the need to evaluate EJSG counties in a broader context and also consider the potential for using demographic and environmental data to identify EJSG geographic priority areas or non-EJSG counties that meet the criteria for funding through the program but have not applied for or received grants. Together the programmatic, demographic, environmental databases used here illustrate how different types of data can be integrated to allow for improved program evaluation and future funding allocation.

### ***Toxic Releases in EJSG and non-EJSG counties***

The second question this analysis seeks to answer is: *have there been any significant social and/or environmental changes over time in the counties that have received EJ small grants to date?* This sub-section focuses on evaluating how the EJ landscape and distribution of environmental hazards has changed over time in EJSG and non-EJSG counties. Note that this comparison does not require or suggest a causal link between EJ small grants and changes in the TRI. It is not assumed that grants are awarded based on the locations of high TRI releases nor is it assumed that EJ small grants are of a sufficient size, scope or duration to affect changes in the amounts of TRI chemicals released in EJSG counties. Instead what this analysis is intended to illustrate is how time-series data can be used to understand the implications of changes in the locations of environmental hazards for past and future EJ funding.

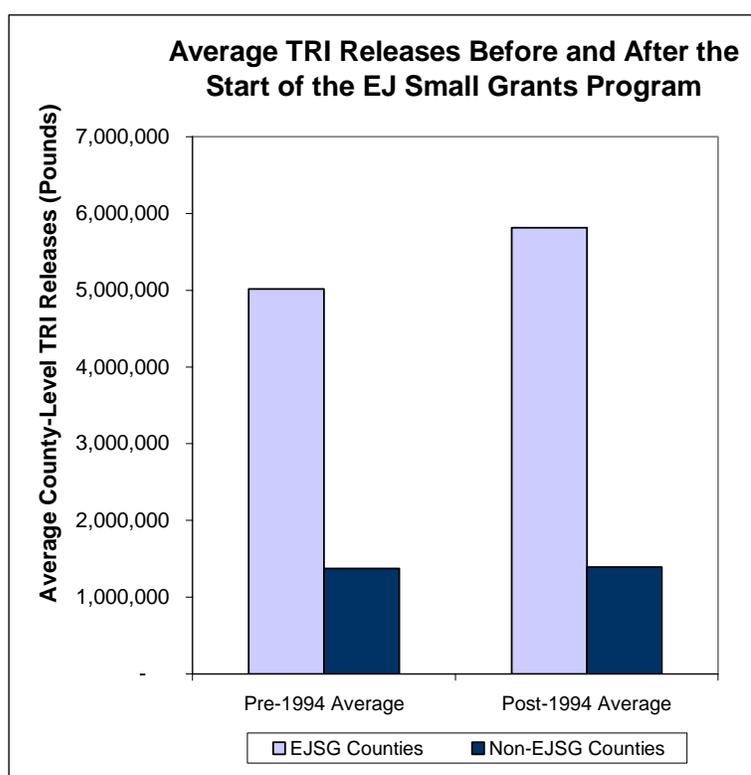
Based on county-level poverty and minority population data from the 2000 Census, neither average poverty rates nor proportions of minority populations have changed significantly in EJSG counties relative to non-EJSG counties since 1993 prior to the start of the EJ Small Grants program. In contrast, there have been major changes in TRI releases over the same period of time.<sup>13</sup> Looking at the core chemicals included in the earliest TRI reports, total environmental

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<sup>13</sup> It is important to note than when evaluating total pounds of releases across the period under consideration here, several chemicals have been added to the reporting criteria. Therefore, in absolute numbers the 2004 releases are higher, since many more chemicals are being reported; however, comparing only those chemicals also included in the 1988 reports shows that releases declined steadily. These changes are summarized by EPA at <http://www.epa.gov/triexplorer/yearsум.htm>. (Retrieved: January 18, 2007.)

releases have declined over time; however, with the addition of several new chemicals and industries to the TRI, reported releases have increased overall (Natan and Miller 1998). In order to take into account these reporting requirement changes, this analysis focuses solely on between-group comparisons of EJSG and non-EJSG counties and not any within-group analysis.

As a first test of how TRI releases have changed in EJSG and non-EJSG counties, averages of the total annual on- and off-site TRI releases by county were separately calculated for both types of counties. Looking at two specific periods, pre-1994 (from 1988–1993) prior to the implementation of EO 12898 and the start of the EPA EJSG programs, and post-1994 (including the year 1994 through 2004) during which EJ small grants were disbursed, Figure 5 shows that average TRI releases have increased significantly in EJSG counties compared to non-EJSG counties.<sup>14</sup> In absolute terms, this is to be expected since additional chemicals were included in reports filed between 1988 and 2004. But what is striking is that the change in average pounds released per county in non-EJSG counties is approximately 1-percent while the increase in EJSG counties is approximately 16-percent over the pre-1994 average.



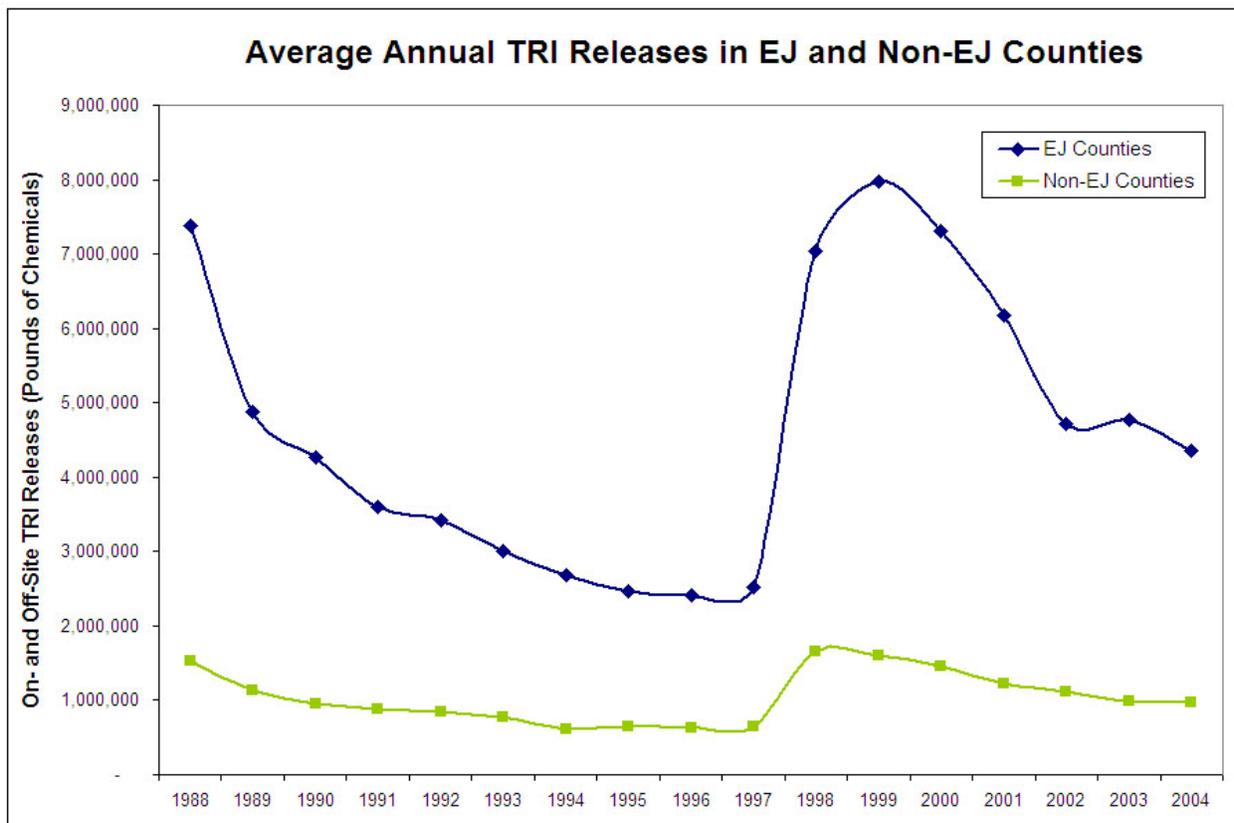
**Figure 5.** Change in Total Toxic Releases Pre- and Post the EJSG Program (1994) in EJSG and Non-EJSG Counties

<sup>14</sup> Results of two-tailed t-tests comparing pre-1994 TRI releases (millions of pounds) in EJSG counties ( $\bar{x} = 5.02$ ) and non-EJSG counties ( $\bar{x} = 1.37$ ) are significant at  $p < 0.0001$ ,  $t(337) = 5.38$ . Between county post-1994 TRI releases (millions of pounds) in EJSG counties ( $\bar{x} = 5.82$ ) and non-EJSG counties ( $\bar{x} = 1.39$ ) are also significant at  $p = 0.006$  ( $t(326) = 2.77$ ). Because of changes in TRI reporting requirements in the post-1994 period and variations in the number of years pre- and post-1994 that TRI releases were reported by different counties, this analysis focuses only on between-group (EJSG and non-EJSG counties) comparisons and does not include any county-level or within-group analysis of rates of change of TRI releases.

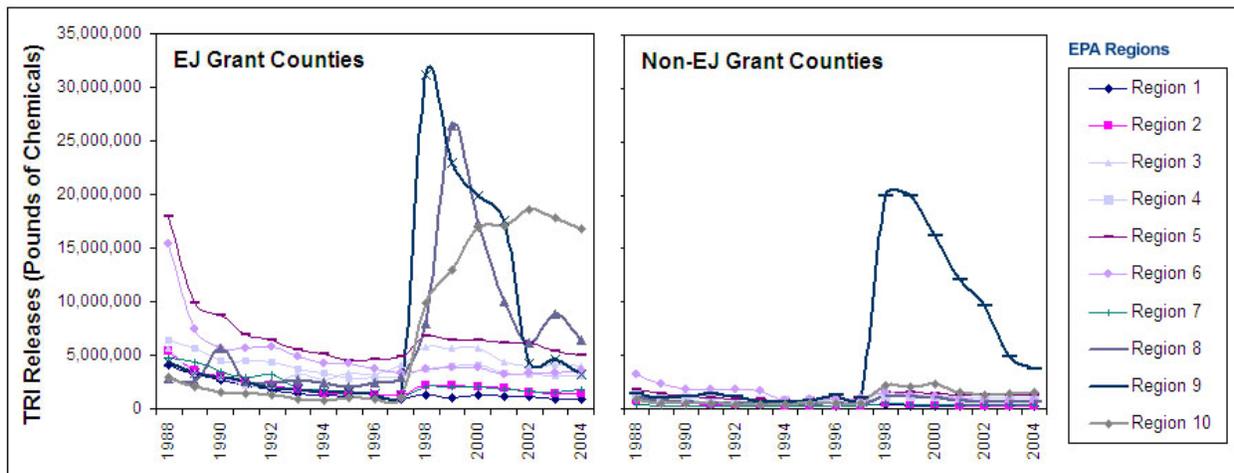
Although this increase in both types of counties is largely due to changes in reporting requirements, one would expect that the percent increase across EJSG and non-EJSG counties would be of similar magnitude unless the chemicals and industries added to the Inventory were already disproportionately represented in EJSG Counties. A second explanation for why TRI releases in EJSG counties have increased more than in non-EJSG counties is that the program is continually adding communities with chronically high levels of toxic releases to the set of grant recipients. Therefore, on average across all EJ Grant counties, if releases in preexisting EJSG counties are not decreasing in significant enough proportions to offset the higher releases in new counties added to the program, overall average toxic releases would show an increase.

In order to take this timing issue into account, average TRI releases were calculated for each county for all the years prior to the starting year in which each EJSG county was awarded its first grant and then for all years after the first grant. Comparing average toxic releases pre- and post-award for all EJSG counties, reveals that average releases are very similar between the two periods with an average of 5.1 million pounds per county in the pre-grant period and 5.0 million pounds in the post-grant period. Since the pre-grant period amount in EJSG counties is higher than the pre-1994 amount shown in Figure 5, this suggests that counties with higher toxic releases were added in the more recent years of the program.

Looking in more detail at the distribution of TRI releases over time (Figure 6) reveals that not only have total toxic releases (unadjusted for changes in reporting) increased in both EJSG and non-EJSG counties over time, but also that counties with much higher average toxic releases were selected as EJSG counties later in the program, especially in 2004. Disaggregating the data even further shows that significant differences exist between EPA regions, and the largest post-1994 increases in both EJSG and non-EJSG counties occur primarily in EPA Regions 8, 9, and 10, as shown in Figure 7. Examining regional pre- and post-grant differences in TRI releases, similarly reveals that EJSG counties in most regions have experienced decreases in average TRI releases after receiving awards; however, average releases have increased in Regions 3, 8, 9, and 10 relative to the pre-grant period.



**Figure 6.** Variations in county average annual TRI releases (pounds of chemicals) in EJSG and Non-EJSG Counties. The large increase after 1997 is the result of TRI reporting additions where seven new industry sectors were required to report beginning in 1998, including metal mining, coal mining, electric utilities, chemical wholesale distributors, petroleum bulk storage/terminals, hazardous waste management facilities, and solvent-recovery facilities.



**Figure 7.** Annual Average TRI Releases (pounds of chemicals) by EPA Region for all EJSG and Non-EJSG Counties

Several possible explanations exist for these differences between EJSG counties and non-EJSG counties and also for the regional disparities within EJSG counties, such as historical and geographic variations in the locations of manufacturing and industry. For this reason, it is important to emphasize that the EJ grants program is very recent and very small program relative to larger environmental investments focused on site cleanup, monitoring, testing, enforcement, and other related activities. Additionally, the program's funding has been steadily dropping over the last decade as shown in Figure 1. Therefore, the findings presented here are not intended to imply any causal connection between EJ grants awarded to date and either reductions or increases in TRI releases; however, they are intended to highlight the importance of assessing how EJ funds are being distributed relative to both long-standing and emerging hazards.

In response to the question outlined at the beginning of this section, these results highlight that environmental conditions (approximated by total TRI pounds of toxic releases) have, in fact, changed differently over time in EJ grant counties than in non-EJ Grant counties. Because EJ grants are not focused on large-scale mitigation of environmental hazards, higher post-grant TRI releases in EJ Grant counties in specific EPA regions do not mean that the EJSG program is not fulfilling its intended mission.

In fact, in areas where high toxic releases remain a problem after more than a decade, the types of immediate local outreach and education efforts funded by the EJSG are critical to helping long-term residents avoid harmful exposures to the greatest extent possible until site clean-up can occur. In contrast, these results bring into question the long-term effectiveness of other larger federal environmental investments relative to EJ objectives if environmental conditions in at-risk low-income and minority communities remain degraded or deteriorating.

Although the EJSG provides funds primarily for small scale activities, this program is only one of many environmental funds, ranging from in size and scope from the slightly larger EPA Community for a Renewed Environment (CARE) program to the significantly larger Superfund program. The framework for spatial analysis applied here could potentially be extended to evaluate investments occurring in parallel to the EJSG focused on mitigating significant hazards. This type of comparative assessment could provide a launching point for greater coordination and incremental EJ investment across a variety of scales from local outreach, large site-level cleanups, regional monitoring and sampling, and national mitigation of new environmental hazards. The next sections summarize the main findings of this research and highlights additional opportunities for systematic EJ evaluation and linking program objectives.

## Summary of Results and Lessons Learned

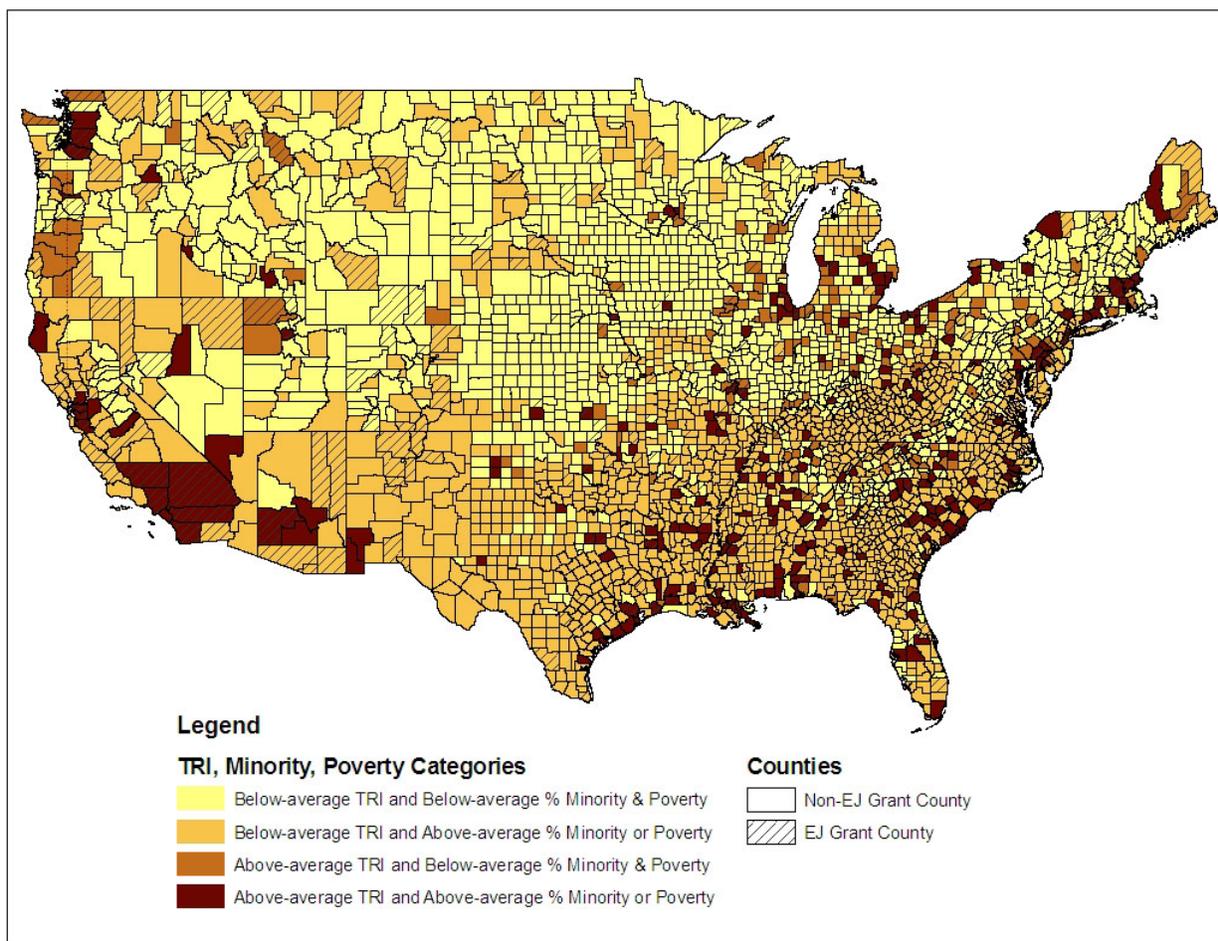
In answer to the two main research questions posed at the beginning of this paper, the analyses here suggest that EJ small grants are only in part being awarded to the types of counties intended to be served by the program, and the majority of the program's funds to date have not been distributed to counties with both above-average TRI releases and above-average minority or low-income populations. Second, there have been significant environmental changes in the areas that have received grants since the start of the program, and some EPA regions show improvement or reductions in toxic releases in EJSG counties, while others show significant increases in total toxic releases over time.

The primary lesson from this study is that without a systematic approach for evaluating the distribution and impact of EJ grants, there is little basis for understanding regional variability, evaluating local impacts, or prioritizing new investments. As the spatial analytic methods used here demonstrate, some counties awarded EJSG funds now face significantly higher toxic releases and risks—even after more than a decade of federal environmental justice attention. Therefore, as the EPA moves forward with changes to the EJSG program it is important to simultaneously establish a system for identifying measurable program outcomes, such as changes in pollution, exposure, and community health indicators; increases in local public participation in EJ outreach efforts; leveraging of EJ funds by community organizations; that can be compared to larger social and environmental indicators. These program measures can then allow for more detailed analysis at multiple scales and for multiple outcomes, cross-agency comparisons, and broader EJ policy development.

Summarized below are several recommendations that the EPA OEJ could consider in its next evaluation of the EJSG program to support improved evaluation and coordination:

- Establish clearer criteria for grant selection both to better reach intended target populations and to allow for more systematic follow-up and evaluation.
- Re-evaluate equal allocation of EJSG funds by EPA region to reflect regional differences in minority populations, poverty rates, and environmental hazards.
- Conduct 3–5 year evaluations of the geographic distribution of grants relative to larger social or environmental changes.
- Coordinate EJSG program with other larger awards for environmental assessment, monitoring, and/or site cleanup to identify new underserved areas/populations.

Building on these recommendations, it is possible to extend the preliminary spatial analysis developed here a tool for both historical assessment and priority setting. Figure 8 highlights one potential application of this approach for more forward-looking analysis. By mapping the geographic distribution of TRI releases, minority populations, and poverty rates for each county relative to the national average and overlaying the locations of all EJ Grant counties to date, it is possible to identify above-average TRI and above-average Minority or Poverty counties that have not yet received grants.



**Figure 8.** Locations of all EJSG Counties from 1994-2005 relative to all counties mapped by category of TRI and Minority Populations or Poverty Rates relative to national averages.

Using this analysis as a diagnostic tool can help to establish a baseline for defining EJSG priority areas or conducting targeted recruitment for grant applications in underrepresented counties or regions. In the long term, such analysis could further play a decision support role and assist in identifying patterns and trends in investments and environmental improvements or

degradation to allow for the types of larger, more targeted, and more coordinated interventions recommended above. Taken as a whole, this paper provides a worked example of EJ program evaluation that can be adapted to support the implementation and evaluation of a wide-variety of related environmental justice programs into the future.

## **Conclusions and Discussion**

The approach to EJ program evaluation put forward here is especially important in the face of new threats and hazards to existing EJ communities. With new risks, such as climate change, facing a growing number of newly vulnerable populations, effective and flexible local and national EJ rules and programs are vitally important. As the 2005 Gulf Coast hurricane season demonstrated, there is still significant variability in the exposure of minority and low-income populations to environmental risks and their long-term impacts (Bullard et al. 2007). To respond to these challenges, EPA needs to evaluate if its current EJ requirements are being met, and also to determine if programs are reaching and meeting the needs of the at-risk areas and target populations they are intended to serve. Using mapping and spatial analysis to support these assessments can lay the groundwork for communicating the results of different programs and coordinating interventions between communities and agencies at local, state and national levels.

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