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JUSTICE IN ENVIRONMENTAL IMPACT

ANALYSIS: ARE ALL
NEIGHBORHOODS EQUAL?

A Thesis

Presented to

The Faculty of the Department of Environmental Studies

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

by

Ada Edith Márquez

August 2007

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ABSTRACT

JUSTICE IN ENVIRONMENTAL IMPACT ANALYSIS: ARE ALL NEIGHBORHOODS EQUAL?

By Ada E. Márquez

Environmental Impact Assessment documents (EIAs) provide a direct record of the decision-making process used in identifying and reducing environmental pollution in different neighborhoods, yet they have never before been used to assess environmental justice. This study evaluated the quality of scientific data and in EIAs in San Jose, California, contrasting Caucasian versus Latino neighborhoods across a range of economic levels. Geographic Information System (GIS) was used to map and select projects, based on neighborhood income and dominant ethnicity. The quality of EIR air resource impact analysis and the number of overall environmental impacts were then analyzed using a standardized methodology. Results reveal that air quality analysis in dominant Latino neighborhoods was measurably weaker than in EIAs from Caucasian neighborhoods. Recommendations include requiring environmental justice analysis of EIAs, training for urban planners, and professional assistance for residents in underrepresented communities as part of the EIA process.

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INTRODUCTION

Environmental justice is the principal that no racial, ethnic, or social economic group should bear a disproportionate share of the negative environmental consequences resulting from the development, implementation, and enforcement of environmental laws, regulations, and policies (EPA). The US Environmental Protection Agency (US EPA) established the Office of Environmental Justice in 1994 to ensure equal environmental protection and meaningful public involvement in the decision-making processes.

Background

Environmental contamination does not affect all segments of society equally. The causes are complicated and controversial. Faber (1998) states working class and people of color are exposed disproportionately to hazards as a result of “quadruple effect”: 1) higher rates of “on the job” exposure to toxics, 2) greater community exposure to nearby pollutants from numerous sources, 3) faulty cleanup of hazardous waste sites, and 4) higher exposure rates to toxic chemicals in foods and other consumer products.

Studies done as early as the 1970s showed that minority and low socio-economic status communities experience a disproportionate amount of environmental pollution (Mohai and Bryant 1992, 166). The United Church of Christ, Commission for Racial Justice conducted the first comprehensive national study of the demographic patterns associated with the location of hazardous waste sites. The analysis evaluated several racial and socioeconomic variables: race, mean household income, land values, historical land use, and proximity to waste generators (Lee 1993, 48). Findings documented the

following information that revealed nationwide patterns of environmental racism (United Church of Christ 1987; Lee 1993, 48):

- In communities with one commercial hazardous waste facility, the average minority percentage of the population was twice the average minority percentage in communities without such facilities (24% vs. 12%).
- In communities with two or more facilities or one of the nation's five largest landfills, the average minority percentage was more than three times that of communities without facilities (38% vs. 12%).
- Three out of five largest commercial hazardous waste landfills in the United States were located in predominantly African-American or Hispanic communities.

Research findings from many studies provide convincing evidence that exposure to potentially deadly environmental hazards transcends to every aspect of their lives: the places where they work, live, play, and learn, and in the foods they eat (White 1998, 63).

For example, researchers have analyzed the location of hazardous waste facilities (Burton and Yandle 1996; Anderston et al. 1996; Boer et al. 1997; Been and Gupta 1997;), industrial toxic releases (Pollock and Vittas 1995; Kriesel et al. 1996; Rinquist 1997; Downey 1998; Szasz and Meuser 2000), air pollutants (Loomis and Shaikh 1999), transportation projects (David and Schweitzer 1999), and others. Thus, the problem is well documented and acknowledged by different academic fields (Appendix A).

However, the environmental justice (EJ) literature is criticized for using subjective methodologies for proving environmental racism, especially in the area of statistical analysis (Foreman 1998). The most forceful criticism was published by the

Brooking Institution in 1998. Foreman (1998), claims the deficiencies of the environmental justice movement range from weak evidence to insufficient health data, to distracting community attention from more severe problems to worsening the gap between the public and policy-making to “its unwillingness to face politically inconvenient facts about environmental and health risks.”

In response, several publications addressed some of the methodological and statistical problems in environmental justice research (Hird and Reese 1998; Williams 1999; Krieg 1998). Pinderhughes (1996) suggests that future research on environmental equity needs to “bridge different disciplines to produce a more comprehensive picture of the scope, character, and effect of environmental inequity” (54). Furthermore, Hird and Reese (1998) argue that a “fuller understanding of environmental inequality can only emerge from a study of multiple pollutants and combinations of pollutants, and researchers should attempt to widen the scope of study to include such pollutants” (714).

Although the California Environmental Quality Act (CEQA) does not require an environmental justice component, the results from this study can indicate if government agencies need to implement a mechanism to alleviate environmental inequities in environmental documents. This study also addresses the issue of “bridging different disciplines” to obtain a holistic approach to finding solutions to environmental inequities. The City of San Jose was used as a model to examine whether socio-economic status affects the quality of environmental impact assessments. The public often lacks knowledge of the environmental impact assessment (EIA) process and can confront obstacles obtaining information. Through an adequate analysis of proposed projects,

decision-makers and public citizens can ensure that the burden of society's environmental pollution is distributed equally.

This thesis work addresses whether the environmental documents for projects in Caucasian versus minority communities differ in quality. This study analyzed the quality of science for air resource in environmental impact assessments. Although the methodology in this study is unique, many other methods from various fields were combined to assess the question from several angles. The methodology can be applied to other cities and expanded to collect larger amount of data for analysis. Through analyzing Environmental Impact Reports (EIRs) and explicitly looking at socio-economic factors, researchers and government agencies can address environmental justice issues and improve public participation.

Related Research

Concepts and Theories

Helfand and Peyton (1999) reviewed the EJ literature and found a need for a conceptual model. They developed a model based on the three key groups involved in an industrial siting: facility managers, community decision-makers, and community residents. Based on this model, researchers can develop various hypotheses and identify where in the decision-making process determines the siting of a facility, what group is impacted, and how environmental inequities occur in particular communities (Helfand and Peyton 1999). Helfand and Peyton (1999) point out those policy solutions then could be developed based on the identified causes of environmental disparities.

Pellow (2000) addresses several gaps in environmental justice and inequities research: conceptual, theoretical, and methodological. He presents the *environmental inequality formation* (EIF) model that provides an important linkage between three neglected areas of research:

- a) the need to redefine environmental inequality as a sociohistorical process rather than simply viewing it as a discrete event;
- b) the need to understand that environmental inequity involves multiple stakeholder groups with contradicting and shifting interests and allegiances rather than simply viewing environmental inequality as the result of perpetrator-victim scenarios; and
- c) viewing the ecology of hazardous production and consumption through a life-cycle analysis (Pellow 2000, 588).

The EIF model reveals the causes and consequences of environmental inequities. Pellow concludes that the EIF model contributes as a useful tool for researchers, organizations, and policymakers to study the mechanisms and find solutions.

Pinderhughes (1996) provides an analysis on the link between race and environmental quality from existing social science research. The article examines empirical work and theoretical perspectives to clarify and improve the understanding of environmental inequities. For theoretical perspectives, she found two important components. First, hazardous industries and facilities intentionally locate in minority communities because, “they are poorer, less informed, less organized, and less politically influential (Pinderhughes 1996). Second, segregated housing patterns limit people of

color to communities with higher levels of environmental pollution (Godsil 1991; Bullard 1983, 1993; Bullard and Feagin 1991; Pinderhughes 1996). In reviewing empirical studies, Pinderhughes's (1996) results indicate that minority and low-income people bear a disproportionate amount of pollution, from air pollutants to hazardous waste. Pinderhughes argues that future research is needed that is interdisciplinary to address the "scope, character, and effect of environmental inequity" on a regional and local level (244).

Been and Gupta (1997) point out that early research did not examine the host communities before and after the establishment of the TSDF's. Been and Gupta's analysis focused on two important issues, (1) "whether siting process, market dynamics, or some combination of the two" produced the inequalities and (2) to examine whether neighborhoods that currently host locally undesirable land uses (LULUs) are disproportionately populated by minorities and low-income residents compared to neighborhoods without LULUs (1997, 2). Their methods consisted of collecting nationwide data on 455 communities that have active TSDFs as of 1994 and analyze changes in the demographics through census data before and after becoming hosts. Communities with a disproportionate Hispanic population were found more likely chosen for hosting facilities. As of 1990, "the areas surrounding TSDFs are disproportionately populated by African Americans and Hispanics (2).

Szasz and Meuser (1997) propose new research for studying environmental inequalities. Through their literature review of studies conducted in the 1990's, they found several patterns. First, the studies only show the relationship between

demographics and the disparities to environmental hazards without explaining the historical process (Szasz and Meuser 1997). Second, national-level studies did not produce convincing evidence of disparities as compared to regional or local studies (Szasz and Meuser 1997). However, Szasz states that results in the smaller scale studies varied greatly from one another, such as race being the best indicator, income, or at other times another social category. He argues that researchers need to improve theoretical work and cross disciplines, in order to improve data showing the locations, rates, and dispersion of environmental hazards, and health effects from exposure. Furthermore, his literature review revealed two neglected topics, the geographic location of economic elites to toxic hazards, and setting environmental inequality in global and historical contexts that have characterized modern society from its inception” (Szasz and Meuser 1997, 100).

Case Studies

One of the limitations of EJ literature is that most are based on case studies throughout the United States. Davidson and Anderton (2000) provide an examination at the national level using an environmental equity survey of the Resource Conservation and Recovery Act (RCRA) (2,299 surveys) across socioeconomic segments of the United States population. They extract community demographic information from the 1990 tract level census data (61,258 tracts). The population measures included (1) the percentage of blacks, Hispanics, and foreign-born persons in census tracts with and without RCRA facilities; (2) the percentage of families below the poverty line, the percentage of males in the labor force, the median household income; (3) the percentage of persons 18 and older

without a high school diploma (or equivalent) and the percentage of persons with at least one year of college education; (4) the percentage employed in manufacturing/industrial enterprises; and (5) the average value of owner-occupied housing (Davidson and Anderton 2000, 461). Their multivariate results did not show strong evidence of environmental inequities across different neighborhoods. Instead, they found RCRA facilities “are more likely to be sited in working-class neighborhoods with lower percentages of minority residents; but, surrounding areas may be more likely to include minority and disadvantaged populations” (Davidson and Anderton 2000, 461-6).

Shaikh and Loomis (1999) investigate the permitting of stationary sources of air pollutants and the socioeconomic characteristics of a community at the time of construction in Denver, Colorado. Their data sources include: zip code summary of the 1990 Census of Population and Housing Summary, zip code area size from the Environmental System Research Inc. County Boundary Data File for 1995, and the number and location of stationary sources of criteria air pollutants within the Denver metropolitan area from the AIRS database by the Colorado Department of Public Health and Environment Air Quality Division (CDPHE) and the EPA (Shaikh and Loomis 1999, 77). The study investigates several independent variables: race (Asian, Black, Hispanic, and Native American), education, income, percentage of renter occupied units, and home values. The dependent variable is “number of newly permitted sites in a given zip code divided by the square miles of the zip code area” (80). Through multivariate analysis, the researchers found that racism does not appear to be the factor for permitting new polluting sites in minority communities. Nevertheless, other socioeconomic and

demographic factors such as less homeowner and political opposition, and less expensive land have a stronger influence in the location of the new stationary sources from 1988-1992 (90).

Yandle and Burton's study (1996) study analyzed hazardous waste landfill siting patterns in Metropolitan Texas. In order to avoid past published limitations, their methodology included statistical analysis of both historical and current 1990 demographic data for host communities. The results show "statistically significant positive relationship between siting, poverty, and predominantly white host" neighborhoods (Yandle and Burton 1996, 489). Although, race did not have statistical significance, the results indicate a greater shift in nonwhite population into host neighborhoods between the time of siting and 1990 (Yandle and Burton, 487).

Krieg (1998) reviews the appropriate methodologies for analyzing the location of toxic hazards. He compares and contrasts four toxic indicators: Toxic Release Inventory (TRI), waste sites, Treatment, Storage, and Disposal Facilities (TSDFs), and contaminant levels. For urban areas without industrial areas, TRI may be an inappropriate indicator for analysis within a community; the reported estimate of discharge may be too low (Krieg 1998, 191). Data from Superfund sites may be problematic, different states may have different thresholds for listing waste sites (Krieg 1998, 192). In addition, cumulative effects are not taken into consideration along with waste sites, such as toxic emissions (Krieg 1998, 193). More comprehensive data is available for TSDFs; however, the researcher must be aware of only operationalizing TSDFs. The author notes the significance of underreported emissions or illegal emissions, the inability to compare

the size and danger of a facility to another and the differentiation between the “producer” community and the “handler” community (194). Lastly, sampling techniques for contaminant levels in the air, soil, water, and food must consider the following: which indicator is the best one to measure, reliable data may depend on samples from multiple indicators, and do they reflect the actual risk by the community (Krieg 1998).

In other environmental areas, transportation projects are required to conduct EJ assessment under NEPA. Forkenbrock and Schweitzer (1999) researched the environmental impacts and thresholds for air and noise of a transportation corridor (U.S. Highway 63) located in Waterloo, Iowa. They argue that the route is an appropriate case study since the highway passes through various types of neighborhoods, such as minority and low-income populations (96-111). The researchers incorporated a unique method for this study: integrating “modeling vehicle emissions, modeling pollution dispersion, and mapping concentrations of pollutants relative to the location of protected populations,” and the MINNOISE for noise modeling (100). Their study concluded that the amount of PM10 and carbon monoxide concentration at the census block-level for the percentage of minorities were below federal standards (108). Nevertheless, Forkenbrock and Schweitzer provide an innovative approach to display the environmental effects of transportation projects on GIS maps and using U.S. census data.

Szasz (2000) documents environmental inequalities in Santa Clara County through historical process. His study illustrates one of the newest methods incorporated into EJ assessment, geographic information systems (GIS). The GIS maps display three types of data: census data (income and race), EPA’s Toxic Release Inventory (TRI), and

industrial land use data from various sources (604). Szasz's study found explicit evidence of environmental disparities in Santa Clara County as of 1990 through census data and TRI emissions. However, Szasz argues that the inequities are unintentional; instead the contributing factors are high-tech growth, inadequate planning, and the complex relationship between race, class, education, and occupation (616-627). GIS maps effectively point out the percentage of minorities in each census tract and TRI facilities.

Morello-Frosch and Jesdale (2006) propose a relatively new methodology to analyze environmental inequities: air toxics concentrations, cancer risks, and racial segregation (regions). Although Morello-Frosch (2006) collected socioeconomic status (SES) data for 45,710 census tracts, results were provided by level of metropolitan area segregation (total 309). The authors argue that segregation captures both racial and environmental inequities and not by census tracts (Morello-Frosch and Jesdale (2006). Their results reveal that highly segregated areas increased cancer risks related to air toxics for all racial groups. However, Hispanics and Asians received the largest burden of cancer risks (Morello-Frosch and Jesdale 2006). The study recommends conducting future research of environmental health disparities at the regional level integrating a holistic approach from both a planning and policy perspective.

Environmental Justice Methodologies

Williams (1999) addresses one of most controversial areas in environmental justice, the unit of analysis. He points to the importance of selecting the appropriate unit of analysis to the research questions. For example, national case studies are not

comparable to county, census tracts, or zip code level of analysis, therefore yielding different results (Williams 1999). He suggests two types of analytical units depending on the research project: the neighborhood and the composite data constructs of aggregated and radial zones (313-28). For example, aggregated zones are composed of census tracts or block groups to remove the problem of boundary effects and the health effects of an environmental exposure (Williams 1998, 313-28). The neighborhood as an analytical unit is selected to uncover discriminatory effects of environmental burdens, e.g., the intent or outcome of the placement of a waste facility (Williams 1998). The author recommends selecting the borders by using the demographic data from census tracts or census blocks. However, Williams (1998) cautions researchers about the difficulties: reliable data for neighborhood over time, the variety of sizes of neighborhoods, and data collection for neighborhoods encompassing different census tracts (322).

Mennis (2002) studied the methodological controversies surrounding GIS and the unit of analysis due to different statistical results. He describes the disadvantages of the using the three different “distance buffers” in GIS to analyze the relationship between the community and the environmental impact: polygon containment, buffer containment, and the centroid containment. Mennis proposes a different approach to question the distribution of environmental hazards; in fact, to look for patterns depending the scale of analysis. First, he argues to convert areal units (e.g., census tracts) to significantly smaller units, called raster grid cells; because, the aggregation of data will yield a different statistical result. Since each of these cell grids contains socioeconomic data,

maps can be created displaying a more accurate picture of patterns of environmental hazards and for multiscale analysis. The study found the following for the southeast region of Pennsylvania: as the “density of hazardous facilities increases, the density and percentage for both the minority and poverty variables increase” within a distance of 2.5 kilometer radius.

A second limitation has derived from the difficulty of obtaining accurate demographic and economic data. Liu defines “who are the disadvantaged?” The population measures include race/ethnicity, income, exposed subpopulations, age, housing, and education (Liu 2001). For categories and definitions for race/ethnicity, the author recommends using census data. The CEQ (1997) Environmental Justice guidance provides definitions for identifying minority population (Liu 2001). Poverty thresholds and guidelines issued by the Social Security Administration and the Department of Health and Human Services (HHS) can be used for income measures. Liu (2001) highlights some technical dilemmas such federal guidelines. For example, the CEQ Environmental Justice guidelines define low-income population using the annual statistical poverty thresholds from the Bureau of the Census (Series P-60); whereas, the Department of Transportation uses the Department of Health and Human Services poverty guidelines (Liu 2001, 103). Thus, a variety of population variables and definitions are used in environmental justice studies.

For a qualitative and a semi qualitative approach, Cooper and Canter (1997) systematically review a total of 33 Environmental Impact Statements (EIS) for the adequacy of cumulative impacts (CI). Similar to other EIS studies, the authors found

deficiencies in cumulative impact assessment. The study uses 15 criteria questions with an assigned weighting of ranges from 0.0 to 1.0; for example, “is CI quantitatively or qualitatively described in the report?” (388-389). This numerical index is for the semi-quantitative rating system, “which reflects an overall evaluation of the agencies’ performance in documenting CIs” (390). A qualitative rating system includes a rating system with parameters: excellent, average, and poor with each one have a subcategory (391). For example, the researchers assigned “Poor (P) if the word cumulative is used in the EIS less than five times” (391). Based on their results, the authors offer general recommendations for improving CI format, reporting, guidelines, and methodologies.

Culhane’s (1997) book, *Forecasts and Environmental Decision-making: The Content and Predictive Accuracy of Environmental Impact Statements (EIS)*, provides a methodology to assess the adequacy and accuracy of the reports and he evaluated 29 EIS’s using this methodology. He found that most of the impacts were verbally quantified; thus not satisfying the technical and scientific approach of quantifying impacts. For data collection, the book provides the following categories: physiographic, economic, social, and mixed. The methodological appendices include a coding protocol (e.g., impact type, impact category, forecast type, unit of measurement, forecast quantification, imputed significance, directionality, certainty, beneficiality, referent population, time frame, and salience). The appendices also include a coding form used by the researchers for data collection. In a content analysis of 13 final EIRs, graduate students at Cal Poly found similarities to Culhane’s study (Dubbink 1993, 4).

Environmental Justice in Transportation Planning and Investments (ICF

Consulting, 2003) prepared for the CA Department of Transportation provides a chapter on analytical methods for environmental justice. The authors recommend a specific document structure and they include a checklist for data required and analytical tools for social and economic impacts: land use and development impacts, population and housing impacts, fiscal and economic impacts, public facilities and service impacts, and physical and health impacts (113-115). They use four types of environmental impacts for conducting environmental justice analysis: air quality, noise and vibration, water quality, and hazardous materials (116-117). Some of the analytical tools used for these impacts are the CALINE4 model, CA SOUND 2000 model, and air, water, and soil sampling analysis (116-117). In summary, this desk guide offers professionals and researchers with a vast amount of legal information, case studies, and guidance to effective project impact assessment.

Environmental Impact Assessment

Lawrence (2000) examines the similarities, differences, and overlaps between planning theory and environmental impact assessment (EIA). Both theories can benefit from reviewing the limitations and potential positive outcomes. Lawrence (2000) argues that EIA needs to integrate planning theories to improve the planning process and application. Thus, he provides a new perspective which integrates five planning theories (rationalism, pragmatism, socio-ecological idealism (SEI), political-economic mobilization (PEM), and communications and collaboration (CC); and he adds significant concepts (e.g., professional ethics, moral theories, environmental ethics, and

postmodernism). Consequently, the new framework proposed by (Lawrence 2000) addresses the issues of sustainability, environmental and social inequities, new tools for problem solving, and other solutions to planning and environmental impact assessment.

Currently, federal government agencies, the EPA, and the public only have the EPA's rating system to compare the quality of DEISs over time. Tzoumis (2007) reviewed a total of 1,732 Draft Environmental Impact Statements (DEIS) which was rated by the EPA from 1998 to 2004. The author's results for four agencies (the Forest Service, the Federal Highway Administration, Army Corps of Engineers, and the Bureau of Land Management) revealed in general, documents did not improve over time for the "adequacy of information" based on 3 point scale and "potential environmental impacts" (a 4 point scale) (Tzoumis 2007). Low ratings received by these four agencies indicate that the public does not receive adequate information and scientific analyses in order to understand fully the environmental impacts. The author (Tzoumis 2007) provides several recommendations for improving the quality of DEIS's: create standard methodologies for EISs, use a framework which incorporates "practioner-researcher-and stakeholders" (Toth and Hizsnyik 1998), utilize the ratings more, and increase data monitoring of ratings to minimize missing data. Furthermore, the author states that the ratings should be available to public (Tzoumis 2007).

Krieg and Faber (2004) developed and conducted a new method to analyze environmental inequities: a cumulative environmental justice impact assessment (CEJIA). They specifically studied at total of 351 towns and cities in Massachusetts, collecting other data, such as, race/ethnicity, income, and environmental data. Unlike

other studies which investigate one environmental factor, the researchers analyzed a total of 17 indicators, ranging from Superfund sites, a variety of landfills, to proposed power plants (Krieg and Faber 2004). This study found two significant results: first, as low-income and minority population increases, the amount of cumulative environmental exposure increases, as well; second, racially mixed communities did not avoid the health risks associated with these environmental hazards (Krieg and Faber 2004). The authors assert that a combination of approaches are needed to alleviate the environmental justice problem: the Precautionary Principle (PP) which requires scientists to prove the community is safe from the environmental hazard; prevent and reduce pollution from its source; and to include cumulative exposure in the community (Krieg and Faber 2004).

OBJECTIVE

This study was designed to evaluate the quality of environmental impact reports (EIRs) for projects in affluent predominantly Caucasian communities versus economically-disadvantaged predominantly Latino communities in San Jose, California. Specifically, I analyzed impact data found in 14 EIRS.

Hypotheses (Quantitative)

The following hypotheses were tested to assess the differences in quality of EIRs in Caucasian versus Latino-dominant neighborhoods:

H₁ EIRs in Latino communities have more impacts overall than EIRs in Caucasian dominated communities.

H₀ : There is no significant difference in number of impacts overall per EIR between projects in Caucasian versus Latino dominated communities.

H₂ : EIRs in Latino communities have more air resource impacts than EIRs in Caucasian dominated communities.

H₀ : There is no significant difference in number of air resource impacts or overall impacts per EIR between projects in Caucasian versus Latino dominated communities.

H₃ : EIA is more rigorous in Caucasian than Latino communities.

H_{3a} Higher quality data is used in EIRs in Caucasian communities than in low – income Latino communities.

H_{3b} Primary technical reports are more often generated for EIRs in Caucasian communities than in low –income Latino communities.

H_{3c} : Environmental Impact Reports (EIRs) are overall more complete in Caucasian communities than in Latino communities.

H_{3o} : Demographic background of neighborhood has no effect on the quality of environmental impact assessment

Research Questions (Qualitative)

In addition, I asked the following research question in order to begin to understand the causes of effects I observed:

What factors contribute to differences in the quality of methods and data sources for the air resource analysis in EIRs for projects within and between Caucasian and versus Latino dominated communities?

METHODS

Overview

The methodology used is both quantitative and qualitative. I selected a total of 14 EIRs in the City of San Jose, California. The number of impacts for each resource area was added for each EIR: traffic/transportation, biological, air, land use, water quality, geology/soils, public health/safety, hazardous materials, cultural, aesthetics/visual, noise, energy, and utilities/service systems (Culhane et al. 1987). I looked at the total number of impacts before and after mitigation measures in predominantly Caucasian and Latino communities. In addition, I created a protocol to collect qualitative information and data for the air resource section in each EIR. Other researchers have used similar protocols to evaluate the quality of science in habitat conservation plans (HCPs) and Recovery Plans for endangered species (Kareiva et al. 1998; Boersma 1999; Harding et al. 2001; Watchman et al. 2001; Hoekstra et al. 2002a).

Research Site: City of San Jose

The City of San Jose, located at the southern end of San Francisco Bay is the second largest city in California and was the study area for this research. The city is known for computer jobs, a large number of educated people, and a diverse population. The City of San Jose predicts over a five year period (2007-2012) residential construction activity at an average rate of 2,750 units per year (City of San Jose 2007). Commercial construction activity is estimated to have a permit valuation of \$275 million over the forecast period (City of San Jose 2007). In addition, during the fiscal year 2006/07,

industrial construction activity was estimated to reach \$225 million for total permit valuation. For these three major land uses, the report (City of San Jose 2007) estimates over the forecast period a permit valuation of about \$ 1 billion, which is an increase from previous years. Thus, continuous job growth and housing demand has created many projects requiring environmental review under the California Environmental Quality Act (CEQA).

Census 2000 shows the following for demographics: White 36.0%, Asian 26.6%, Hispanics/Latino 30.2%, and other 7.2%. The median annual household income in 2000 was \$70,243 (Census 2000); however, income disparities are evident throughout San Jose (Table 1). For example, median annual household income for Downtown families was about \$43,000 compared to the area of Silver Creek Country Club of \$133,843 (San Jose Census Info 2000). San Jose has visible ethnic patterns; six of its ten City Council Districts have a single race/ethnicity majority (Table 2). San Jose's census maps show that communities are relatively segregated by ethnicity and income (Figures 2 and 3).

Table 1. Race and income data for the City of San Jose (San Jose Census Information 2000).

Race/Ethnic Group	Median Family Household Income 2000
Hispanic	\$52,817
Asian	\$80,312
Non-Hispanic White	\$87,486

Table 2. Race and city council district data for the City of San Jose (San Jose Census Information 2000).

Race/Ethnic Group Majority	City Council Districts
Non-Hispanic White	District 6 (55.7%) ; District 9 (69.2%) ; District 10 (58.1%)
Hispanic	District 3 (58.1%) ; District 5 (58.0%)
Asian	District 4 (52.1%)
Diverse Race/Ethnic Groups	Districts 1, 2, 7, and 8

The City's climate, wind movement, and topography can cause severe environmental health concerns for residents. The Diablo Range, the Santa Cruz Mountains, and the San Francisco Baylands surround the Santa Clara valley. The regional climate is Mediterranean with temperature ranging from 55-77° during the fall and winter and 65-82° in the summer. The terrain features of the surrounding hills restrict movement of air pollutants, affecting air quality. In addition, the valley receives pollutants from upwind of the Peninsula, especially during the summer months. The City is a nonattainment area for ozone and PM-10 under the State Air Quality Act. In

addition, the area is affected by variety of pollution problems, such as Superfund sites and Toxic Release Inventory sites (TRI). Therefore, San Jose's socioeconomic and race/ethnicity patterns, as well as the great number of projects the City undertakes each year, make San Jose an appropriate study site for analyzing environmental inequities.

City of San Jose Race/Ethnic Group Majority by Census Tract*

Figure 1 City of San Jose: Race/Ethnicity Majority by Census Tract shows segregated neighborhoods.

City of San Jose Median Household Income by Census Tract*

Figure 2. City of San Jose: Median Household Income by Census Tracts shows segregation by income.

EIR Project Selection

I conducted research to locate EIRs on the State of California, Office of Planning & Research CEQAnet database (www.ceqanet.cagov/default.html). The database provided 36 documents from 2001-2005. Additional research, using the public library catalog revealed six documents that were not listed on the state database from that time period. The City of San Jose planning department provided a list of CEQA documents completed since 1995, totaling 184 EIRs. Most of the documents were discarded after the legal public comment period of 45 days. A total of 10 hard copies of EIRs were available through the public library and SJSU's Athena EIR Catalog housed in the Department of Environmental Studies. The City of San Jose could provide four documents on CD. However, SJSU's Athena EIR library holds about 200 environmental documents.

In order to locate EIRs in two different types of communities: Latino dominant and Caucasian dominant, I created a GIS map of the City of San Jose by downloading Census 2000 TIGER/Line shapefiles. As the unit of analysis, I used census block groups. I mapped a total of 30 EIRs completed by the City of San Jose from 1998-2005 for which the documents were still available at the public library or SJSU's Athena library. EIRs for proposed projects were located throughout the city's boundaries. EIRs were chosen for analysis if 1) the documents were available for review and 2) the proposed project was located within a census block group with a majority Latino or Caucasian. The majority of the original 184 documents were discarded or incomplete, such as, not having the technical report available for review. I then selected 14 projects for quality analysis,

7 in predominantly Caucasian and 7 in predominantly Latino communities (Table 3).

Proposed projects requiring environmental review from the City of San Jose included research and development buildings, transportation projects, and housing developments.

The projects were paired based on the following four: type of project, size, and the impacts on target resources. Due to spatially segregation of these communities, projects were spatially segregated as well.

Table 3. Proposed projects in SJ from 1998-2005 for which an EIR was completed.

Environmental Impact Reports			Size	Ethnicity			Income
Projects	Project Type	Year	City Block	% Latino	% Asian	% White	Median Income: San Jose 2000 \$70,243
Goble Lane	Retail/commercial/mix	2005	<5	21	11	73	\$49,416
Hitachi Campus	Hospital/office/mix	2005	<5	17	22	61	\$86,307
Regional Medical	Hospital/office/mix	2004	<5	76	6	45	\$96,580
BEA	Retail/office/mix/R&D	2004	<5	6	38	54	\$97,098
Franklin M. Housing	Residential	2002	1	49	34	38	\$43,816
General Electric	Retail/commercial/mix	2005	<5	58	9	47	\$50,362
KB Home Monte	Residential	2004	1	14	14	69	\$30,938
San Jose Market	Retail/office/mix/R&D	2004	<5	68	6.4	45	\$35,781
EBAY	Program Master Plan/Site	2003	>20	6	38	54	\$97,098
US Dataport	Low-industrial/electric power/R&D	2000	>10	75	3.3	41	\$57,589
Coyote Valley	Low-industrial/electric power/R&D	2000	>10	45	15	62	\$69,798
Brandenburg	Mix-use (office/multifamily units)	2003	1	13	39	46	\$59,464
Alviso	Program Master Plan/Site	1998	>20	75	3.3	41	\$57,589
Reed/Graham	Mix-use (office/multifamily units)	2002	1	52	9	41	\$36,000
Downtown Strategy		2005		44	11	45	NA
Lundy		2004		11	67	20	NA
BFI		2003		45	21	36	NA
East Mall		2003		22	70	12	NA
Civic Plaza		2003		56	13	40	NA
SJ Flea GP		2002		5.3	78	14	NA
PD Hillsdale		2000		51	20	44	NA
GP Fruitdale		2000		14	69	17	NA
Union Pacific		1999		51	8	62	NA
Harry Rd Resid		1999		10	8	86	NA
South Almaden		2004		9.8	7.9	85	NA
SJ Water PD		2003		50	4.5	63	NA
PD for FMC		2003		51	8	62	NA
Capitol Storage		2001		31	44	25	NA
Creekside		2000		36	21	45	NA

IBM		2003		17	22	61	NA
Metcalf		2002		45	15	62	NA
Vistapark/Branham		2002		16	11	74	NA

Data Collection

Demographics

The Census 2000 data for the City of San Jose provided demographic and socioeconomic data. The poverty thresholds and guidelines from the federal government were used for income measures. These are issued by the Social Security Administration and the Department of Health and Human Services (HHS), or the Bureau of the Census which are used by the CEQ Environmental Justice guidelines. Thresholds used by the Housing Department for Santa Clara County were also compared to the other thresholds. The type of projects and the quantity were documented for each community. Based on all above data, two data collection data protocols were created for EIRs: quantitative and qualitative.

EIR Review: Quantitative

As recommended by the Federal Highway Administration (FHWA), air quality was analyzed for environmental justice (EJ). A coding system was used to collect quality of analysis data from the EIRs (Bass et al., 1999; Cooper and Canter 1997; Culhane 1987). Each document was acquired upon availability for comparison: Draft EIR, Final

EIR, Supplemental EIRs and/ or Addendums. The most updated information on the number of impacts and number unmitigated impacts were recorded on the data sheet. The quantitative protocol has 10 coding items for analysis which includes the number of impacts, unmitigated impacts, mitigations, number of revisions, etc (Appendix B).

H₁: Number of impacts identified in the documents overall. For each project, I counted the number of impacts for each environmental resource area: land-use, transportation and circulation, air, noise, geology, hydrology, biotics (vegetation and wildlife, hazardous materials, cultural, visual, utilities, energy, and public services.

H₂: Number of Air Quality impacts identified in the documents. I focused on Air quality analysis in particular, because it is of common interest in environmental justice analysis.

H₃: Quality of Assessment: A separate protocol for EIR quality analysis was developed based on past research studies on habitat conservation plans (Kareiva et al. 1998; Boersma 1999; Harding et al. 2001; Watchman et al. 2001; Hoekstra et al. 2002a; Appendix C). The 14 selected environmental documents were reviewed for technical data, adequacy of discussion of impacts (Cooper 1997), and quality of analysis (Culhane 1987; Lee-Colley 1991). Quality was rated ranging from the lowest score of 0 to the highest possible points of 3 to assess different components of each EIR. Based on the CEQA guidelines, I developed 30 questions from applicable laws, impact assessment to mitigations and monitoring. The questions were created for the purpose of content analysis. From the 30 questions, a total of 9 questions were used to assess the quality of science used for each impact in each EIR. The questions were based on the use of scientific data, quality of technical reports, and the use of mitigations and monitoring

where possible. The Bay Area Air Quality Management District, CEQA Guidelines Assessing the Air Quality Impacts of Projects and Plans (1999) provided technical guidance for analyzing air impacts in the EIRs. . Documents received the following points: 3 points for primary data collection, cited in the EIR text, and in the technical appendix; 2 points for correct type of data included to make conclusion, but did not cite documents; and 1 point for inclusion of secondary data, from other previous documents without assumptions; and 0 points for absent data and with only assumptions.

EIR Review: Qualitative

Throughout document review, I kept detailed notes on observations regarding causes of differences in analysis quality. These notes formed the basis for my qualitative assessment.

Analysis

Quantitative

H₁: Number of impacts identified in the documents overall: Census block groups (CBGs) were categorized by their largest ethnicity group. Numbers of significant impacts before and after mitigation in Latino-dominant CBGs (n=7) were then contrasted with significant impacts in Caucasian dominant CBGs (n=7) using both a Student's T-test (Excel version ...) and a Mann-Whitney U test (Systat 9).

H₂: Number of Air Quality impacts identified in the documents: To see whether there was a continuous influence of percent latino in a CBG on the significant air quality impacts, regression analysis with percent Latino was used for the number of significant

impacts on air quality. Specifically, the number of significant impacts identified in each document was regressed against % latino in each CBG.

H₃: Quality of Assessment: T-tests and Mann-Whitney U tests were also used to test for the difference in quality of scientific analysis for each of the 9 questions in the protocol. T-tests were used to contrast quality of analysis between Caucasian and Latino-dominant CBGs. A power analysis was also conducted to assess probability of finding differences among the groups.

Qualitative

Scientific themes in the air resource impacts section in each document were analyzed qualitatively as well. To do this, I summarized the basis for variation in quality of scientific analysis for data collection and methodology. The themes included the following: sensitive receptors, toxic air contaminants, traffic impacts, regional impacts, and construction impacts. Thus, quality of technical data, analysis, and other information was compared for projects in Latino- and Caucasian- dominant neighborhoods.

Limitations

The EIRs were limited to the documents accessible from the public library and public agencies. The results only apply to the projects proposed in the City of San Jose. As a result, findings may reflect idiosyncrasies unique to this locale.

RESULTS

Quantitative

A total of 14 documents were mapped for the proposed projects (Figure 4). Before mitigations, both groups had similar number of total environmental impacts. Variability in total number of impacts among documents was high within each ethnicity. Latino area projects ranged from a 67 total impacts to the lowest with 24 total impacts (Table 4). Similarly, projects located in Caucasian census block groups revealed 65 impacts in the highest impact EIR and 27 impacts in the EIR with the lowest total impacts. The higher number of mitigation measures were found in Caucasian census block groups; but the results was not significant.

The mean number of significant impacts for air quality per EIR revealed a positive relationship between Latino census blocks and the number of significant air impacts in the EIRs (Figure 5). For example, both the *Alviso Master Plan* and the *US Dataport* projects had the highest Latino population in the census block groups, 75%, and both had the largest number of significant air impacts compared to all other projects (3 and 4 respectively). The *Alviso* project had the following significant unavoidable impacts: toxic air contaminants (TAC), regional emissions, and construction. The *US Dataport* project did not these mitigate significant unavoidable air impacts: total emissions criteria pollutants, mobile, and stationary emissions. Census block groups with a Caucasian majority had at least one significant impact for each project, but Hitachi had 3 impacts.

Figure 3. Location of 14 projects in Caucasian and Latino communities (created by author).

Table 4. EIRs in the study which were compared for number of impacts.

	Number of Impacts				Number of Impacts		
Latino	Total	Significant Before Mitigations	Significant Unmitigated Impacts	Caucasian	Total	Significant Before Mitigations	Significant Unmitigated Impacts
Regional Medical	51	13	3	Hitachi Campus	57	27	10
General Electric	24	15	3	Goble Lane	32	10	3
Franklin M. Housing	36	7	1	KB Home Monte	37	11	1
US Dataport	67	29	14	Coyote Valley	65	31	9
San Jose Market	30	21	3	BEA	31	9	3
Alviso	45	35	24	EBAY	27	7	3
Reed & Graham	30	19	1	Brandenburg	28	25	3
Total	283	139	49	Total	277	120	32
Mean	40.4	20	7	Mean	39.6	17	4.6

Figure 4. A trend toward more major air quality impacts identified in projects in Latino neighborhoods.

Qualitative analysis of air impacts analysis showed that projects located in majority Caucasian census block groups scored higher than Latino projects (Figure 6). 3c asks whether the documented collected more data to assess the impact; and conducted more rigorous research than did in projects in Latino blocks. Latino projects on average lacked citations and/or scientific data in the text to justify the level of significance of the air impact and they received scores ranging from a minimum of 0 to a maximum of 2 points, yielding a mean of 1.1. Caucasian dominant projects received higher scores, reflecting higher quality scientific data and source citation than their Latino neighborhood counter parts with an average of 7.3 quality points.

Figure 5. Protocol question 3c for quality analysis.

Figure 6. Methodology and technical question for all EIRs.

In addition, I found a statistical difference for Question 3d (Figure 7). This question entails whether the document provided or collected enough data to quantify impacts, considered all necessary parameters, including technical reports. The missing data could include technical studies by scientific experts or not following explicit air quality standards. For projects located in Latino neighborhoods, the Reed and Graham and the Regional Medical Center EIRs scored the lowest quality score. In comparison, the Hitachi and the BEA EIRs in Caucasian areas received the highest quality score. In general, Latino projects did not provide technical studies or were not included in the appendix; therefore, the document did not prove the level of significance. In addition, these projects provided secondary data instead of hiring a field expert. An important finding for Latino projects was the misuse of factors to calculate air quality. For example, the year used determines which rollback factors to use for carbon monoxide calculation. On the other hand, projects in majority Caucasian census tracts indicates that experts used the correct methodology in the technical studies, i.e., expected build out for modeling parameters and included in the attachments with the data results.

Figure 7. Mean score for all questions in the protocol.

For Questions 3a to 4c, I found a statistical difference in the overall quality of significant air impacts (Figure 8). The mean ranged from a maximum mean of 1.36 for the Alviso EIR to a minimum of 0.5 for the *Reed and Graham* project in Latino block groups. Majority Caucasian projects received a maximum mean of 2.9 (BEA) to a minimum of 1.15 (Goble EIR). Many questions from the protocol did not show a statistical difference (Table 5). For example, the adequacy of mitigation measures (question 4a) revealed no difference between Latino and Caucasian dominant projects. Nevertheless, question 3aa which describes the types of impacts cited shows a trend. The explicit statement of type of impact is important because the reader needs to know whether the impact will be short-term, long-term, or only during construction. For 3a, 3b, 3f, and 4c, were limited to sampling size; therefore, they did not reveal statistical significance. In general, project EIRs in both ethnicities often lacked adequate scientific data and other air quality information to conclude the level of significance.

Table 5. Sample questions in the protocol for EIRs and significance.

Questions	P
3a. Quantification in scope (area covered; whether impacts described correctly), timing (duration, cyclic events, rare events, etc) and intensity (whether impact is significant or not)	.151
3aa. Types of impacts cited (short-term, construction, or long-term, operational)	.094
3b. Appropriate units for quantification	.126
3c. Collected enough data to assess impact (research)	.014
3d. Provided or collected enough data to quantify impacts considered all necessary parameters (technical studies)	.013
3e. Discuss what information needs to be provided for the impacts listed to be adequate	.150
4a. Adequacy of Mitigation Measures	.622
4b. Monitoring Strategies	.205
Mean Overall Quality (significant impacts)	.056

Qualitative

Quality of Data: Latino / Low Income Project Sites

Data output varied between the EIRs. Out of the five projects by the same consultant, three DEIR's did not have the URBEMIS2002 emission model and CALINE-4 dispersion model attachments in their technical reports. Only two DEIRs out of seven total had the detailed data attachments. These attachments show the factors and assumptions used for their data. The inputs for each project can vary, for example, the analysis year. Each analysis year will have a different factor value for calculations which can determine the level of significance for impacts. Therefore, the reader is unable to verify if the correct factors were used in the analysis.

In addition, qualitative descriptions rather than a quantitative analysis provided a significant amount of the data in the documents. For example, in the Alviso Master, the following description is given: "Future industrial uses allowed under the Master Plan could release toxic air contaminants that pose health risks to nearby sensitive land uses, including residential uses and George Mayne Elementary School (Significant Impact)" (188). The section does not provide readers with the legal emission thresholds as established by the BAAQMD nor does it provide data on which pollutants are considered toxic air contaminants (TAC). The following should be provided in DEIRs:

Thresholds of Significance for Toxic Air Contaminants:

1. Probability of contracting cancer for the Maximally Exposed Individual (MEI) exceeds 10 in one million.
2. Ground-level concentrations of non-carcinogenic toxic air contaminants would result in a Hazard Index greater than 1 for the MEI. (BAAQMD CEQA Guidelines, December 1999, 18)

Similarly, the Regional Medical Center Expansion Project does not provide any quantitative or primary data on the TAC emission levels caused by the diesel-powered backup generators. The DEIR does not provide duration of testing, the total number of generators, or any other data for calculations: “The generators would be run for short periods for testing and maintenance purposes and otherwise would not operate unless there was a power outage (66).” In contrast, US Dataport DEIR gives primary data in the detailed technical report on emission levels from the diesel engine generators, boilers, and turbines. The technical report also includes the health impacts to justify the conclusion of “less than significant”. However, the authors neglect to provide the quantitative information for cancer risks and thresholds to the reader.

Inconsistent data was also common for the five projects. For carbon monoxide concentrations in PPM, different data were presented by projects completed by the same air resource consultant. For the General Electric project, the DEIR only shows CO concentration data for “Existing (2004), Background (2004), and Project (2004)” (94). Most other projects reveal data for the following: Existing (analysis year); Existing + Background (analysis year), and Existing + Background + Project (analysis year). The Background value represents “that part of the ambient CO concentration that is not attributable to traffic sources from nearby street or intersection” (BAAQMD CEQA Guidelines, 41). Thus, to add the Background CO levels to the Existing is important to have in the data table. By not following standards established by the BAAQMD, the public citizen does not receive the adequate information on air impacts in the DEIR.

Quality of Methods

For most of the projects, the quality of methods was difficult to evaluate because the documents did not have their technical data sheets. The public citizen is unable to verify whether the common scientific standards were followed accordingly. In the quantitative analysis, the quality of methods received a low score if the quality of data was low or incorrect. Therefore, one can assume that inadequate data had also inadequate methodology for air quality analysis. For the emissions of carbon monoxide from vehicles, only one project had the correct methodology: US Dataport. The BAAQMD requires “mean winter minimum temperatures” for the URBEMIS7G input for the San Francisco Bay Area (32). The remaining projects used the mean summer temperature of 85 degrees. The value used affects the level of impact caused by vehicles at local street intersections. In addition, the correct built out year of a project was not used consistent throughout the DEIR. Projects used built out years later than the actual year because the rollback factors decline for future years. For example, a project completed in 2004 will have a factor of .65 and a 2010 project, .58 (BAAQMD CEQA, 42). The BAAQMD states that carbon monoxide concentrations are expected to decline in the future due to new emission controls. Consequently, the year and factor will affect the level of impact on local intersections.

The methodology for regional emissions of ROG, NO_x, and PM₁₀ was not included for most of the projects because the data output data attachments were missing. The significance level of the impact cannot be verified without the assumptions and calculations. A qualitative description for regional emissions and a table showing the

levels are given in the text of the document. For example, the General Electric project has a table with the “proposed project trip emissions” and “emissions from existing trips” (94). The author subtracts both of these concentrations without providing the calculations or justification for those results. By not following the BAAQMD guidelines, the regional emission levels appear to be lower with removing existing trips. In addition, Regional Medical Center qualitatively describes the impact without providing methods for results. This document does not present quantitative data: the number of generators on the site, the Megawatts, and methodology. Thus, the correct methods are difficult to determine in absence of the data attachments or incorrect methodologies are found in all seven DEIRs.

The most important component for methodology for environmental impact assessment is whether all the impacts were cited and analyzed in the document. I looked for whether five impacts were assessed per BAAQMD guidelines: construction emissions, project operations emissions, odor, toxic air contaminants, and accidental releases of hazardous materials. The public depends on the preparer’s knowledge to assess all of the impacts in the air resource analysis. Four projects did not have all of the air impacts cited and analyzed in the DEIR: Regional Medical Center, General Electric, Franklin McKinley Housing, and Reed and Graham. The Reed and Graham project only cited a total of one air impact: regional vehicle emissions. The following impacts were missing: carbon monoxide concentrations, toxic air contaminants levels near sensitive receptors, odor from a nearby asphalt facility, and construction emissions. The other three projects, General Electric, Regional Medical Center and the Franklin Housing

project each had one impact not cited in the air analysis. Thus, DEIRs have impacts not analyzed; although, document preparers have access to BAAQMD guidelines for assessing air resources.

Quality of Data: Caucasian Project Sites

For worst case carbon monoxide emissions levels, most of the projects presented data correctly in the DEIR: Existing (analysis year); Existing + Background (analysis year); and Existing + Background + Project (analysis year). Two projects had some minor data missing, such as the analysis year or adding the Existing values: Goble and Coyote Valley Research Park. Only one project, KB Home, did not have any quantitative data for CO emissions or threshold levels for state and federal standards.

In general, throughout the seven projects, quantitative information was provided for regional emission concentrations, as well. For example, the Hitachi project gives data for ROG_x, NO_x, and SO_x from the proposed project and ongoing operations. The text includes the information about the project: “up to 3.6 million sq. ft. of industrial buildings, up to 490,000 sq. ft. of commercial development, and up to 2,930 residential units” (259). Detailed data and project information ensures the reader that all emissions were included in the primary data. The Goble Lane project, justifies the level of significance with quantitative data: “Based on meteorological data over a five year period, the average yearly concentration of particulate matter at 80 feet and 180 feet would be 0.028 micrograms per cubic meter and 0.015, respectively. Based on this average concentration and assuming constant exposure over a 70 year period, the maximum cancer risk (per million) is 8.3 (at 80 feet) and 4.5 (at 180 feet)” (107). The

public citizen receives primary quantitative data and whether the project exceeds health risks thresholds.

Quality of Methods

Four of the seven documents included their detailed data attachments in their technical reports. Therefore, one is able to refer to the attachments and view the URBEMIS2002 emission model and CALINE-4 dispersion model inputs, assumptions, and methodologies. A total of two projects, the Bradenburg and the Goble Lane, showed results for regional emissions (ROGx, NOx, and SOx) without the correct methodology. Both projects removed regional emissions of “existing uses” from the “proposed project” without justifying their methodologies. The remaining seven projects followed the BAAQMD standards of calculating total emissions from motor vehicles and stationary sources. In addition, the projects use a built out year or analysis year very near to the published DEIR year. As stated before, the analysis year is very important due to the different factor values. Most important, overall the projects were inclusive of different methodologies, including: air dispersion modeling, health risk analysis, estimated air emissions risks and hazards indices, and estimated non-cancer hazard indices.

A total of six projects out of seven cited all the required air impacts required by the BAAQMD: Hitachi Campus, Goble Lane, KB Home, BEA, EBAY, and Bradenburg. The impacts assessed included construction, project operation emissions (carbon monoxide, ROGx, SOx, NOx), odor impacts, and toxic air contaminants. The Coyote Valley Research project had one impact missing: toxic air contaminants. Since this project proposes the development of 6.6 million sq.ft. of industrial uses, a separate

analysis of toxic air contaminants is needed in the DEIR. Therefore, in general, analyses for air resource sections were adequate because the documents made all of the impacts readily available for public citizens.

Quality of Data: Differences between Latino and Caucasian

One can find two major differences in air resource data for Latino and Caucasian projects: consistent and quantitative data are not found throughout the documents. For carbon monoxide concentrations, Latino projects had inconsistent data. The reports did not always show data for Existing (year); Existing + Background (year); Existing + Background + Project (year). Although the same consultant assessed air impacts for most of the projects, different ways of presenting carbon monoxide data are found throughout the 14 documents. Overall, Caucasian projects had the primary carbon monoxide data correct. One Latino project did not give any primary data for carbon monoxide concentrations. In contrast, all of the Caucasian projects analyzed carbon monoxide levels. However, the KB Home project used a different format for presenting carbon monoxide data than described above. This project was not analyzed by the same consultant as the other six Caucasian projects. Thus, one should expect consistent data in eleven of the fourteen DEIRs air impact analyses, especially because they were assessed by the same consultant.

Qualitative data was more prevalent in Latino projects than in Caucasian projects. For example, the US DataPort project gave the following qualitative information: “The health effects of the combined emissions of toxic air contaminants from the U.S. DataPort Campus and CREC were evaluated by Sierra Research” (98). The DEIR does

not give any quantitative results which were found in the technical report. In addition, Latino projects do not provide the quantitative threshold for impacts, such as, toxic air contaminants and health risks. The reader should be able to refer to the technical report, if the DEIR does not provide sufficient information in the text. Primary data, assumptions, and methodology are easier to verify in Caucasian projects because most of the DEIRs have the technical reports complete with all data attachments. In comparison, more Caucasian projects presented quantitative data and the BAAQMD thresholds to justify level of significance. Thus, the public citizen can question the correct primary data that should be given in DEIR.

Quality of Methods

Three significant differences were observed between the two ethnicities: methodology for the proposed project built out year, citing all of the impacts, and the availability of toxic air contaminant and health risk methodologies. First, the analysis year for carbon monoxide levels in Latino projects used different assumptions. The analysis year varies, some use the project's built out year that is approximately near the DEIRs date. However, two documents use the years 2010 or 2013 for analysis of CO levels. As described before, rollback factors decrease in future years. In contrast, most Caucasian projects used analysis year that is approximately the same as the DIER.

As stated above, the analysis of all the impacts is one of the most important elements of a DEIR. For intentional or unintentional reasons, document preparers do not cite all the required air impacts required by the BAAQMD. Caucasian projects were more rigorous of including all the impacts. The Coyote Valley project was the only

document lacking one impact. On the other hand, a total of four Latino projects did not have all of the required impacts assessed in the DEIR. Furthermore, only in the predominate Latino community had a project with the most missing impacts of three: the Reed & Graham project.

Lastly, the accessibility of toxic air contaminants and health risks methodologies is crucial for an adequate analysis. The BAAQMD Guidelines state that exposure to “substantial levels of toxic air contaminants would be deemed to have a significant impact.” (18). Therefore, the methods should be included in the DEIR in order to provide evidence of the impact falling below or above the thresholds. All seven Latino projects either exposed sensitive receptors to toxic air contaminants or a project located near sensitive receptors, impacted them with pollutants. Only two Caucasian projects exposed sensitive receptors to toxic air contaminants, both included analysis for health risks. In contrast only the US DataPort project in the predominate Latino community, included methodology for health risks. All of Caucasian projects adequately proved the level of significance by providing methods for evaluating toxic air contaminants. A total of seven projects in predominate Caucasian communities used the BAAQMD, *Toxic Air Contaminant Control Program Annual Report, 2000* to locate major sources of toxic air contaminants surrounding the proposed project site. Furthermore, both ethnicities had at least one large proposed project. But, only in the predominate Caucasian project (Hitachi) included all of their methodologies: air dispersion, health risks, and estimated non-cancer hazard indices. This DEIR gives a summary for each of the models and analysis with results and level of significance. The reader can see their assumptions and

methods with out reading the technical reports. Although Latino communities also had large projects, such as, the Regional Medical Center and US Dataport, their DEIR were not as rigorous and inclusive.

Similarities between Latino and Caucasian

The air quality analyses for Latino projects had five out seven project sites conducted by the same consultant, which was the same as the six projects sites for the Caucasian (Table 6 and Table 7). Consequently, both Latino and Caucasian DEIRs presented similar environmental baseline data. All 14 DEIRs had adequately described the existing air quality setting in San Jose and the San Francisco Bay Air Basin. In addition, the air quality standards for Federal and California were provided for various criteria pollutants (e.g., ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, etc), other major air sources, and health effects. A summary of the number of violations of different pollutants were presented for Federal and State standards. Furthermore, a description of sensitive receptors and air pollutant sources were include in the documents.

Table 6. Scientists for air resource analyses in DEIRs for predominant Latino sites.

Project Sites	Consultant
Franklin McKinley Housing Project	Donald Ballanti
General Electric Facility PD Rezoning	Donald Ballanti
Alviso Master Plan	Donald Ballanti
US DataPort	Donald Ballanti (mobile sources); Sierra Research, Inc (stationary sources)
Regional Medical Center	Donald Ballanti
Reed & Graham	E2C, Inc.
San Jose Market Center	LSA Associates, Inc

Table 7. Scientists for air resource analyses in DEIRs for predominant Caucasian sites.

Project Sites	Consultant
Hitachi Campus	Donald Ballanti
Goble Lane	Donald Ballanti
KB Home Monte	M'OC Physics Applied
Coyote Valley Research	Donald Ballanti
BEA	Donald Ballanti
EBAY	Donald Ballanti
Bradenburg	Donald Ballanti

All of the DEIRs included air quality impacts analyses for the same areas: construction emissions, project operations emissions (ROG, NO, PM10), odor, and toxic air contaminants (TAC). The accidental releases of hazardous materials were analyzed in the Hazardous Materials section of the documents. The thresholds of significance for these impacts were shown per CEQA Guidelines. Regional impacts created by vehicle trips show calculations for reactive organic gases, nitrogen oxides, and PM10 in pounds per day (PPD). Carbon monoxide levels which has an effect on a local scale, provided calculations near project intersections with concentrations for Existing traffic (year); Background (year); and Project (year). If the proposed project site locates near an industrial area or other types of odor emitting facilities, the DEIR must analyze the wind direction and the duration of exposure to objectionable odors. As necessary, an analysis was provided for indirect odor impacts, especially near sensitive receptors.

Per BAAQMD CEQA Guidelines, construction impacts are significant and temporary. Trucks generate dust emissions, organic gases, toxic air contaminants, and

ozone. Construction related impacts were analyzed in all 14 documents. All the documents incorporated mitigation and avoidance measures for all air quality impacts.

Hence, in predominantly Caucasian neighborhoods, air resource analysis is more rigorous. The number of missed air impacts cited was fewer than in Latino neighborhoods. For most projects, the methodology for carbon monoxide was correctly conducted by the consultant. Furthermore, exposure of toxic air contaminants to sensitive receptors or on the project site occurs less frequently. In contrast, predominantly Latino neighborhoods, EIRs often did not use primary or scientific data. Technical studies were not included in the documents or technical appendices. Overall the quality of science was lower: qualitative data was provided less often. As described previously, DEIR document in both Caucasian and Latino communities had similarities and differences.

DISCUSSION

The protocol used to analyze air quality analysis provide the following evidence in EIRs in majority Latino census block groups: 1) often do not use primary scientific data, 2) technical studies are not included in the documents or not made available to the public, and 3) quality of science is lower. Through this study, I found that the planning process is unequal, science used in decision making is not objective, and bias occurs after communities are established.

Environmental justice research has not adequately studied the planning process of projects and waste facility sitings. Academia developed conceptual, theoretical, and methodological models for advancing EJ research (Helfand and Peyton 1999; Pellow 2000). A significant amount of research has investigated the social inequities in a variety of environmental resource areas (Burton and Yandle 1996; Anderston et al. 1996; Boer et al. 1997; Been and Gupta 1997; Pollock and Vittas 1995; Kriesel et al. 1996; Rinquist 1997; Downey 1998; Szasz and Meuser 2000; Loomis and Shaikh 1999; David and Schweitzer 1999). Case studies conducted at a local, regional, and nation wide level prove that Asians, Latinos, and African-American receive a disproportionate amount of society's environmental pollutants (Bullard 1993; Mohai and Bryant 1992; Burton and Yandle 1996; White 1998; United Church of Christ 1987; Pinderhughes 1996; Been and Gupta 1997; Krieg 1998; Morello-Frosch and Jesdale 2006). As reviewed, possible causes and historical processes of environmental inequities are complicated and difficult to prove. Some studies, such as, Shaikh and Loomis (1999) results indicate that air stationary sources of criteria air pollutants is strongly correlated to socioeconomic and demographic

factors (less homeownership, less political opposition, less property value). Needless to say, academia acknowledges society's environmental and socioeconomic dilemma.

My research contributes a different perspective to environmental justice research. I used Environmental Impact Reports as required by the California Environmental Quality Act, which requires the participation of community members, policy makers, and project developers. Similarly to Tzoumis (2007) study of Draft Environmental Impact Statements, I found that scientific analysis and information was not adequately discussed in documents. In contrast to Tzoumis (2007) research, I included sociodemographic data and utilize GIS to map project in Latino and Caucasian census block groups. As suggestion by numerous researchers, my studies crossed a variety of disciplines: environmental science, planning, geography, and social science (Pinderhughes 1996; Krieg 1998; Szasz and Meuser 1997; Szasz 2000; Morello-Frosch and Jesdale 2006). Through my research, possible of causes can be generated for the low quality of science in DEIRs: cultural and economic differences, education levels, language barriers, and stereotypes; lower public participation, lacking access to information; budget, lack of scrutiny, and agency oversight.

RECOMMENDATIONS

A variety of recommendations can improve environmental impact assessment and environmental inequities. Environmental Impact Reports must be included in environmental justice research. As a tool, these documents provide invaluable data and information to community residents and policy makers. The question whether projects are permitted to be built near disadvantage populations with lower quality science can be seen through analyzing the technical reports and the EIRs. Furthermore, whether disadvantage human populations move to degraded ecosystems due to socioeconomic reasons is another factor to include when analyzing EIRs. Future research needs to include correlations between race, income, and the quality of EIR. In addition, researchers should provide analysis of other resource areas, such as, biotics and hazards.

Academics, ecologists, engineers, and other scientists must help to improve environmental equality in our society. By crossing disciplines, a wide range of solutions can be incorporated to alleviate environmental disparities. Scientists can defend science of environmental impact assessment in all neighborhoods by the following actions: engaging in the review process of science in EIRs in neighborhoods other than their own, providing professional assistance to underrepresented communities, and participating in any local environmental struggle to protect habitat. Simultaneously, everyone can engage in achieving the environmental justice goals: to improve ecological/environmental research and data collection in decision-making; to enhance environmental equity for minority and economically disadvantaged populations; to provide equal government access, public participation, and grassroots empowerment.

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APPENDIX A. Environmental Inequality Research

Year	Author	Type of Study
1995	Pollock and Vittas	Toxics Release Inventory (TRI)
1996	Kriesel et al	TRI
1996	Burton and Yandle	Hazardous Waste Sites
1996	Anderston et al.	Hazardous Waste Facilities
1996	Pinderhughes	Empirical and Theoretical Discussion
1997	Ringquist	TRI
1997	Been and Gupta	TSDF
1997	Boer et al.	TSDF
1997	Szasz and Meuser	Literature Review and Proposals
1998	Bass	Evaluating EJ under NEPA
1998	Downey	TRI
1998	Hired and Reese	29 Measures of Environmental Quality
1998	Krieg	Methodological Considerations in the Study of Toxics Waste Hazards
1999	Helfand and Peyton	A Conceptual Model of EJ (framework for testable hypothesis)
1999	Loomis and Shaikh	Air Pollutants
1999	Padgett and Imani	Qualitative and Quantitative Assessment of Land-Use Manager's Attitudes Toward EJ
1999	Stetesky and Lynch	Accidental Chemical Release
1999	Williams	Analytical Units for Community
2000	Pellow	Environmental Inequality Formation : Toward a Theory of Env. Injustice
2000	Szasz and Meuser	TRI
2000	Whitehead	Demand-Side Factors and Environmental Equity Analysis

APPENDIX B. Quantitative data collection sheet

											EIR
Hazardous Materials		Flooding, Drainage and Water		Geology, Soils	Biological	Noise	Air	Transportation	Land-use	Resource	
										Number of Mitigations	
										Length of Time for	
										Number of Significant	
										Number of Pages	
										Number of Revisions	
										Number of Responses	
										Number of Comments	
										Type of Project	
										Mitigations by City or Consultant	

APPENDIX C. Qualitative Protocol

CEQA Guidelines Section [15125; 15126.2; 15127; 15147]

Did the Environmental Impact Assessment include the following:

- a) Quantification in scope (area covered, whether impacts described correctly), timing (duration, cyclic events, rare events, etc), and intensity (whether impact is significant or not)

(3) = Excellent (a-c) ; (2) = Good (a+c) or (b+c) ; (1) =

Satisfactory (c); (0) = Poor incorrect information or missing

- aa) Types of impacts cited (short-term, construction, or long-term, operational)

(3) = Explicit ; (2) = Implicit w/ correct level ; (1) = Implicit ;

(0)None

- b) Appropriate units for quantification

(3) = All correct units used to quantify impact w/ methodology ;

(2) = Methods absent but units are included ; (1) = Qualitative description and/or some quant. ; (0) = Qualitative and Quant.

Absent or incorrect methods

- c) Collected enough data to quantify impacts (research)

(3) = Primary data collected; cited in the EIR text; included in the techn. App ; (2) = correct type of data included-most is there-- enough to make a conclusion, but did not cite documents ; (1) =

Secondary data; from other previous documents; made
assumptions ; (0) = No data; only assumptions made

- d) Provided or collected enough data to quantify impacts considered all necessary
parameters (technical studies)

(3) = Explicit methods and databases; meet standards of good
science at all stages; (2) = Not all methods and databases included
in the text: some stages ; (1) = Did not follow common scientific
standards, but other methods w/justification (0) = The technical
study did not meet the complexity of the impact; too simplistic
or not included

- e) Recognized controversy among experts

(3) = Explicit language: "inexact science" / controversy among
experts ; (2) = Implicit language: "further sampling/analysis
needed" ; (1) = Include info. From other documents supporting or
not the level of significance of impact ; (0) = Absent discussion