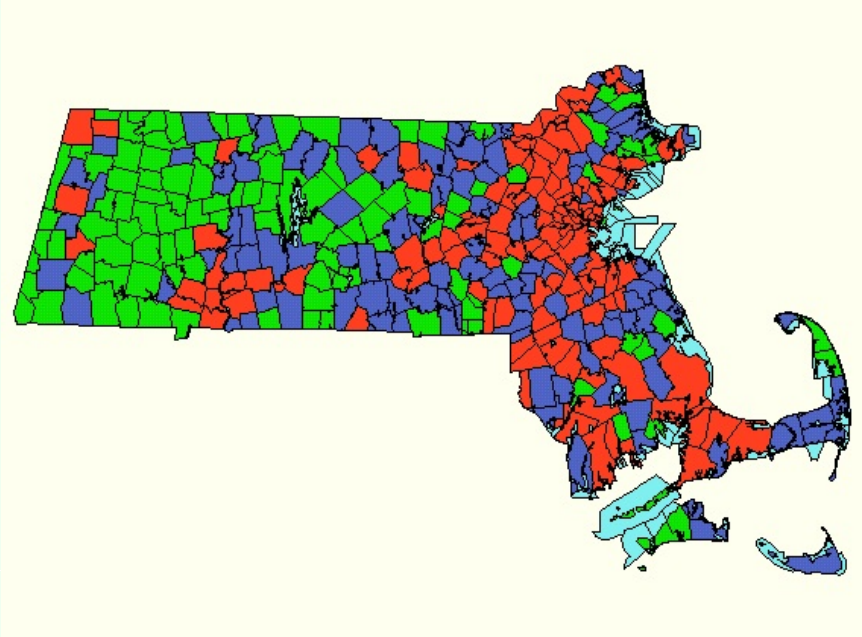
UNEQUAL EXPOSURE TO ECOLOGICAL HAZARDS
2005:
ENVIRONMENTAL INJUSTICES
IN THE COMMONWEALTH OF MASSACHUSETTS



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Methodology: How Do We Measure Environmental Injustice?

In 2001, we published a report entitled *Unequal Exposure to Ecological Hazards: Environmental Injustices in the Commonwealth of Massachusetts.* Making use of the 1990 Census, the report found that environmentally hazardous industrial facilities, power plants, municipal solid waste combustors (incinerators), toxic waste sites, landfills of all types, and trash transfer stations were unequally distributed with respect to the income and/or racial composition of a community in the Commonwealth of Massachusetts. The report received national attention, and contributed to the first-time adoption of a comprehensive environmental justice policy by the Executive Office of Environmental Affairs (EOEA) in Massachusetts.

This new report, *Unequal Exposure to Ecological Hazards 2005*, is an updated and expanded version of the last report. For instance, new data on community exposure to carcinogens and reproductive toxins, etc., are included in this report. The environmental rankings of low income towns and communities of color are also included. Utilizing demographic data from the 2000 Census, as well as data collected in mid-October of 2004 from the Massachusetts Department of Environmental Protection (DEP), United States Environmental Protection Agency (EPA), and the Massachusetts Toxics Use Reduction Institute, we analyze the exposure rates of all 350 cities and towns (minor civil divisions, or MCDs) in the state to the environmentally hazardous industrial facilities and sites listed above. As the 351st MCD, the City of Boston as a whole is excluded from the analysis. Instead, the study incorporates twelve sub-towns or neighborhoods within the larger city of Boston: Allston/Brighton; Charlestown; Dorchester; East Boston; Hyde Park; Jamaica Plain; Mattapan; Roslindale; Roxbury; South Boston; West Roxbury; and Downtown Boston (for the purposes of the report, Downtown Boston encompasses Central Boston and Chinatown, Back Bay and Beacon Hill, the South End, and the Fenway/Kenmore neighborhoods). Because these more specific neighborhoods making up all of Boston are included, summary data for all-Boston are excluded from the totals. As a result, a total of 362 communities are analyzed in the report.[1]

Each of the 362 communities are classified by class and racial composition. In the 2001 report, we utilized data from the 1990 Census to identify the class status of a community by utilizing median household income figures: (1) *low income*: $0 to $29,999; (2) *medium-low income*: $30,000-$39,999; (3) *medium-high income*: $40,000-$49,999; and (4) *high income*: $50,000 and greater. These categories reflected reasonable cutoff points in the data for the following reasons: First, no distinct "gaps" in the income distribution of towns existed. Second, the $40,000 cutoff point was used because it divided the lower- and higher-income communities into roughly equal sized halves (see table below). Finally, a $10,000 decrease/increase from

[1] In the 2001 report, *Unequal Exposures to Ecological Hazards,* 368 communities were analyzed, including all Boston and the seven sub-towns or neighborhoods within the larger town of Barnstable: Barnstable; Centerville; Cotuit; Hyannis; Marstons Mills; Osterville; and West Barnstable. Data limitations did not allow us to make these separations for this report.

$40,000 was selected on the basis of generating reasonably sized groups with easily recognizable boundaries.

In this 2005 study, we have utilized the updated median household income figures from the 2000 census. However, we have adjusted the income classifications to take into account the rate of inflation over the 10 year period since 1990. We do this by using a Consumer Price Index (CPI) inflation conversion factor of .759 (multiplying the 2000 income levels by .759 will yield the equivalent figures for 1990). Using this method, we developed the following classifications:

Class Status of a Community: Median Household Income

Class Status of Town	1990 Median Household Income	2000 Median Household Income (adjusted for CPI rate of inflation)	Number of Towns	Percentage of all Towns	Cumulative Percentage of all Towns
low income	$0 to 29,999	$0 to 39,524	37	10.2	10.2
medium-low	$30,000 to 39,999	$39,525 to 52,700	133	36.7	47.0
medium-high	$40,000 to 49,999	$52,701 to 65,875	106	29.3	76.2
high income	$50,000 or more	$65,876 or more	86	23.8	100
totals			362	100	

For the purposes of this study, the term ***lower*** *income communities* will refer to the combination of both low income and medium-low income communities. The term ***higher*** *income communities* refers to the combination of medium-high and high income communities.

Although these lower income classifications may appear to be inflated, the reality is that Massachusetts is a very expensive place to live. In fact, Greater Boston is the most expensive metropolitan area in the United States. It now costs a family of four $64,656 to pay for basic necessities in Greater Boston ($6000 more than in New York).[2] Similarly, the National Low Income Housing Coalition ranked Massachusetts the least affordable state in the country for residential rents in 2003. As a result, traditional measures like the 2003 federal poverty level of $18,400 (for a family of four) do not reflect the actual high cost of living in the Bay State. High rents and housing costs create a number of severe economic hardships for poor residents and the underemployed (between 1992-2002, the total number of manufacturing jobs in the state

[2] See Bonnie Heudorfer and Barry Bluestone, *The Greater Boston Housing Report Card 2004: An Assessment of Progress on Housing in the Greater Boston Area* (a report prepared by: The Center for Urban and Regional Policy, Northeastern University for the Boston Foundation and Ctizens' Housing and Planning Association, September 2005).

decreased by 20 percent).[3] More than 25 percent of Massachusetts workers have low-wage jobs that pay less than $8.84 per hour, or $18,387 per year working full-time. It is generally accepted that people should strive to spend no more than one-third of their income on rent or mortgage payments. In Massachusetts over three-quarters of low-wage working families spend more than one-third of their income on housing. Under the Massachusetts Family Economic Self-Sufficiency Standard – a measure of the real income needed to meet the basic housing, health care, child care, food, and transportation needs of different types of families in specific regions – 25 percent of all families in the state (and nearly 50 percent of all urban families) did not earn enough to meet their basic needs in 1998. In Worcester, the self-sufficiency standard for 1 adult and 2 children is $40,598, while in Boston this figure rises to $51,284.[4] As a result of these considerations, our lower income classifications should actually be considered conservative.

The racial composition of a community is determined by the percentage of nonwhites in the general population: (1) *low minority*: less than 5% people of color; (2) *moderately-low minority*: 5 to 14.99%; (3) *moderately-high minority*: 15 to 24.99%; and (4) *high minority*: 25% and greater. These categories were decided upon on the basis of what are considered reasonable increases in the size of a community's nonwhite population. The vast majority of towns in Massachusetts have very small minority populations of "less than 5%." However, when the remaining towns are analyzed, 10% increases in population proportions seemed logical for generating relatively acceptable frequencies in each category.

Racial Status of a Community: Percentage of Population that is Non-White

Racial Status of Town	Percentage of Town that is Non-White	Number of Towns	Percentage of all Towns	Cumulative Percentage of all Towns
low minority	less than 5%	231	63.8	63.8
moderately-low	5 to 14.99%	97	26.8	90.6
moderately-high	15 to 24.99%	14	3.9	94.5
high minority	25% or more	20	5.5	100
totals		362	100	

[3] See Robert Vinson and Navjeet Singh, "Manufacturing: Losses and Gains," (Boston: Commonwealth Corporation, 2003), p.1.

[4] The real cost of living in Massachusetts has gone up 17-35 percent in regions across the state between 1998 and 2003, as low-wage working families faced severe job losses and stagnant wages. As a result, it is likely that more than 25 percent of Massachusetts families now earn less than the income needed to meet their basic needs without public or private supports. For a full discussion, see Hanna Bailey Boyle, Sheelah A. Feinberg, and Martin Liebowitz, *Investing in Massachusetts Working Families: A Framework for Economic Prosperity* (Boston, MA: A Report by The Women's Union, April 2004), pp.5-11, 39.

There are only fourteen communities in the state where 15 to 24.99% of the population consists of people of color (moderately-high minority); and twenty communities where 25% or more of the population consists of people of color (high minority). For the purposes of this study, the term *communities of color* will refer to the combination of moderately-high minority and high minority communities. The term *white communities* will refer to the combination of low minority and moderately-low minority communities.

Comparisons of low-to-high income communities and low minority-to-high minority status communities are made in terms of the location of environmentally hazardous industrial facilities and pollution releases, hazardous waste sites, power plants, incinerators, trash transfer stations, and landfills of all types. As seen in Section Six of this report, a point total is assigned to each facility or site based upon our assessment of the relative risks it typically represents to the community. These hazard points are then totaled for each community, and divided by total area to calculate the average hazard points per square mile for each community. This point system provides a more accurate assessment to the environmental hazards confronting a given community because it controls for the size the community and the severity of the facility/site.

Unfortunately, there are many other disparate environmental impacts that are beyond the scope of the data presented here in this report. Proximity to major traffic arteries, bus stations, large warehouses, and parking facilities that generate traffic noise and pollution (particularly from diesel vehicles), as well as smaller polluting businesses and other facilities (such as bioterrorism research labs), can pose major environmental health hazards to community residents. Furthermore, a lack of parkland and greenspace, along with the predominance of substandard housing and related home hazards such as mold and lead paint, should also be considered environmental justice issues. Furthermore, the location of neighborhoods in areas vulnerable to flooding and other weather-related problems can also be a problem. These issues need to receive greater attention from researchers and decision-makers. Policies also need to be put into place to ensure that the state collects the data necessary to assess the potential magnitude of these impacts.

Despite the limitations outlined above, this report is [perhaps] the most comprehensive environmental justice study of any state in the country. Most other researchers focus on exposure to a single hazard, such as toxic waste sites. Others reports are limited to much smaller geographic areas, such as a major metropolitan area. Our analysis looks at exposure rates to many different types of environmental hazards for every community in the state. Among our findings: *low income communities face a cumulative exposure rate to environmentally hazardous facilities and sites which is four times greater than high income communities.* In addition, *high minority communities face a cumulative exposure rate to environmentally hazardous facilities and sites which is over twenty times greater than low minority communities.* As we shall demonstrate in this report, not all communities in Massachusetts are polluted equally. Environmentally hazardous sites and facilities of all kinds are disproportionately located in working class towns and communities of color.

Acknowledgments

The authors would like to think Henderson Pritchard for his recommendations around the use of specific data on toxic emissions. We would also like to thank Megan Amundson, Tina Clarke, Cindy Luppi, and Penn Loh for their helpful comments and suggestions on an earlier draft of this report. The authors remain solely responsible for the content of this final report.

A significant contribution to the study of these problems is the creation of and public access to data sources that less than 20 years ago were often unavailable and/or non-existent. Access to certain types of environmental data was mandated under the Superfund Amendment and Reauthorization Act (1986); however, while some states have adopted aggressive approaches to the collection and distribution to data, not all states have responded equally to the call for environmental monitoring. Massachusetts is a leader among states in the compilation of and provision of public access to environmental data. This study would not be possible without the exemplary work done by the Massachusetts Department of Environmental Protection (DEP) in organizing and making this data available to the public. In addition, the Toxics Use Reduction Institute (TURI) at the University of Massachusetts at Lowell maintains an excellent database on the use and release of chemicals by large manufacturers in the Bay State. Much of the information presented in this report around industrial pollution was made possible by the work of TURI.

SECTION ONE

UNEQUAL EXPOSURE TO ECOLOGICAL HAZARDS: EXECUTIVE SUMMARY

While the quality of life for all citizens in Massachusetts is currently compromised by the contamination of the air, land, and water with toxic chemicals and other pollutants, not all segments of the citizenry are impacted equally. In order to bolster profits and competitiveness, industry typically adopts pollution strategies which are not only more economically efficient but that also offer the path of least political resistance. The less political power a community possesses, the fewer resources a community has to defend itself; the lower the level of community awareness and mobilization against potential ecological threats, the more likely they are to experience arduous environmental and human health problems at the hands of business and government. As a result, poorer towns and communities of color suffer an unequal exposure to ecological hazards.

This is not say that white and middle-to-upper income communities are not also being impacted by industrial pollution in the Commonwealth. But in contrast to the types of economic and social constraints confronting white working-class families and people of color (including discriminatory mortgage lending practices), higher- income salaried and professional workers can often afford access to ecological amenities and a cleaner environment in non-industrial urban, suburban and rural areas. In fact, working class families and people of color face a "triple unequal exposure effect" to toxic pollution and other environmental hazards in comparison with higher-income residents. For lower income communities and communities of color, this takes the form of exposure to: (1) greater concentrations of polluting industrial facilities and power plants; (2) greater concentrations of hazardous waste sites and disposal/treatment facilities, including landfills, incinerators, and trash transfer stations; and (3) higher rates of "on the job" exposure to toxic pollutants inside the factory.[5] Unequal exposure to environmental hazards is thus experienced by working class families and people of color in terms of where they *work, live, and play*.[6]

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[5] Over 1,600 workers were diagnosed with invasive cancers in 2004 alone. An estimated 1,430 Bay State workers died from occupational diseases during 2003-2004, while some 50,000 workers are seriously injured each year on the job, mainly because Massachusetts employers fail to institute or maintain basic safety measures. See *Dying for Work in Massachusetts: The Loss of Life and Limb in Massachusetts Workplaces*, A Report by the Massachusetts AFL-CIO, MassCOSH, and Western MassCOSH (April 26, 2004).

[6] See Dana Alston (ed.), *We Speak for Ourselves: Social Justice, Race, and Environment* (Washington, DC: The Panos Institute, 1991).

Unequal Exposure to Ecological Hazards 2005 documents Massachusetts residents' unequal exposure to environmental hazards. More specifically, the report analyzes both income-based and racially-based disparities in the geographic distribution of some 17 different types of environmentally hazardous sites and industrial facilities in the Commonwealth of Massachusetts. This report provides evidence that working class communities and communities of color are disproportionately impacted by toxic waste disposal, incinerators, landfills, trash transfer stations, power plants, and polluting industrial facilities. In some cases, not only are new toxic facilities and dump sites located in poorer neighborhoods and communities of color, but as in the case of the public housing development and playgrounds near the Alewife station in Cambridge, housing for people of color and low income populations is sometimes located on top of pre-existing hazardous waste sites and/or nearby polluting facilities. We conclude that striking inequities in the distribution of these environmentally hazardous sites and facilities are placing working class families and people of color at substantially greater risk of exposure to human health risks. We advocate the adoption of a number of measures, including a comprehensive environmental justice act, to reduce pollution and address unequal exposure to ecological threats

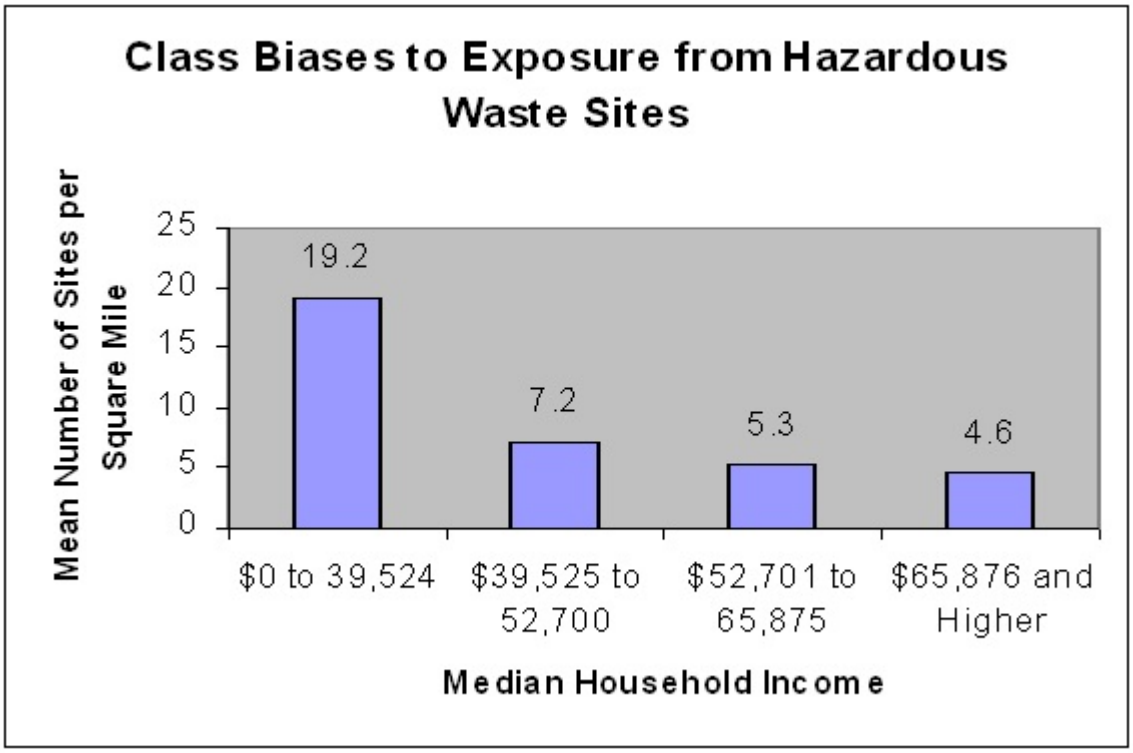
In this report, we will document the disproportionate environmental burden borne by these communities in the following areas:

(A) Unequal Exposure to Hazardous Waste Sites:

In Massachusetts, there are over 30,570 Department of Environmental Protection (DEP) hazardous waste sites. Some 3,741 of these sites are considered to pose serious environmental and human health threats, and include 31 sites on the Environmental Protection Agency's National Priorities List (NPL) or Superfund list. Our findings indicate that communities of color and low income communities experience a far more profound exposure rate to Department of Environmental Protection (DEP) hazardous waste sites than do wealthier and/or white communities, indicating that race and class are strongly associated with the location of both serious (Tier I-II) and less serious (Non-Tier) hazardous waste sites.

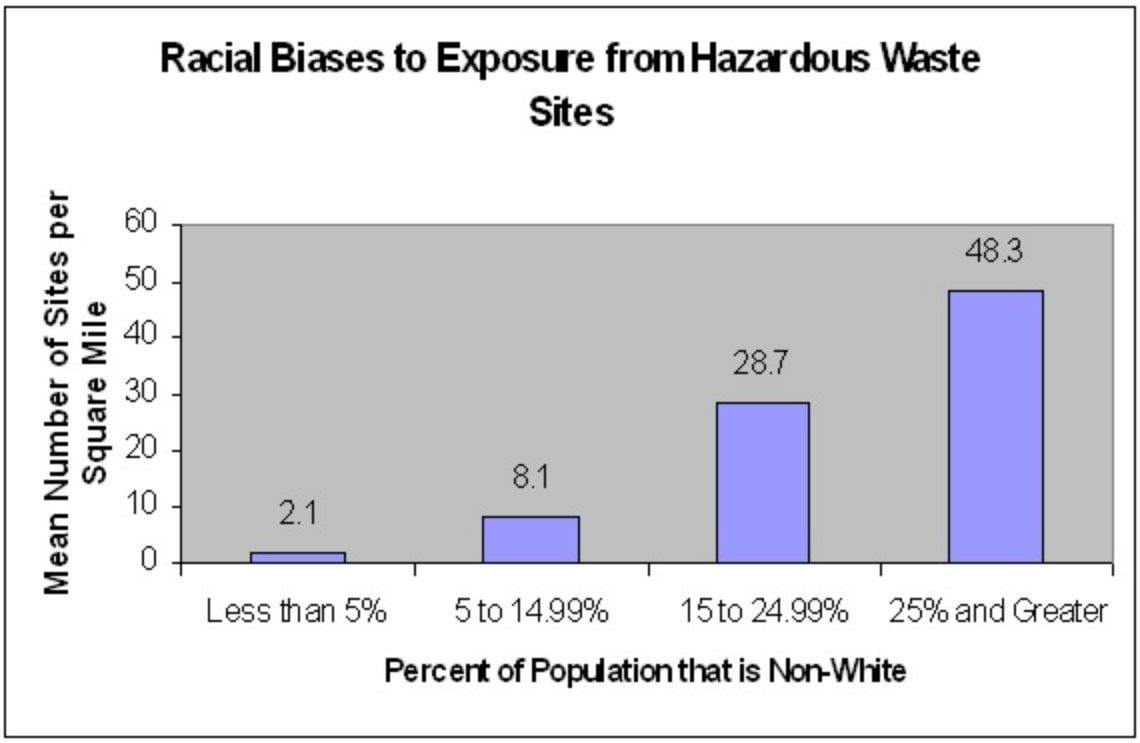
- In Massachusetts, low income communities, where the average household medium income is less than $39,524, contain an average of 203 DEP hazardous waste sites per town. In contrast, medium-high income communities ($52,701 - 65,875) average 66 hazardous waste sites per town. High income communities ($65,876 or greater) average 71 waste sites per town. As a result, *low income communities average roughly three times more DEP hazardous waste sites than higher income communities*.

- Low income communities also average nearly 19.2 hazardous waste sites per square mile. In contrast, high income communities average 4.6 hazardous waste sites per square mile. As a result, low income communities have *over four times* the number of hazardous waste sites per square mile as high income communities. These disparities remain consistent with comparisons of the more serious Tier I-II hazardous waste sites. In short, low income communities in Massachusetts experience a far more profound exposure rate to DEP hazardous waste sites than higher-income communities.



- Likewise, low minority communities, where less than 5% of the population is made up of people of color, average 39 hazardous waste sites per town. In contrast, high minority communities, where 25% or more of the population is made up of people of color, average 297 sites per town. Communities of moderately-high minority status, where 15 to 24.99% of the population is made up of people of color, average nearly 280 sites. As a result, *communities of color average well roughly seven-and-a-half times as many hazardous waste sites per town as low minority communities.*

- In high minority communities there is an average of 48.3 DEP hazardous waste sites per square mile (see chart on page 4). In contrast, low minority communities experience an average of 2.1 hazardous waste sites per square mile. As a result, *high minority communities average twenty-three times more hazardous waste sites per square mile than low minority communities*. These figures remain consistent with comparisons of the more serious Tier I-II hazardous waste sites. In short, *communities of color experience a far greater exposure rate to DEP hazardous waste sites than white communities.*



(B) Unequal Exposure to Landfills, Trash Transfer Stations, and Incinerators

There are a total of 980 landfill-type operations in the Commonwealth of Massachusetts, including 599 garbage dumps and 262 transfer stations. Most of the state's landfills and trash transfer stations are more heavily concentrated in lower-income towns and/or communities of color.

- ❑ In comparison to low minority communities (less than 5% people of color) that average .13 of all landfill types per square mile, high minority communities (25% or more people of color) average .35 of these facilities per square mile, *a rate nearly three times higher*.

- ❑ In low income communities, there are .22 of these landfill-types per square mile, a figure slightly higher than the .15-.17 rates for higher-income communities. However, when municipal solid waste landfills are excluded, it is clear that low and medium-low income communities have a higher proportion of most other types of landfill sites than higher income communities. For instance, while low and medium-low income communities together make up 46.9 percent of all towns in the state, they are home to 65.2 percent of all demolition landfills, 50 percent of all illegal sites, 73.3 percent of all sludge landfills, and 58 percent of all transfer stations.

- ❑ Racial biases are also present for some types of landfill sites. Although communities of color make up 9.4 percent of all towns in the study, they are home to 27.8 percent of all incinerator ash landfills, 41 percent of all illegal sites, and 45.9 percent of all inactive municipal incinerators.

- ❑ Incinerators are implicated in causing serious water and air pollution and related public health problems, and emit more mercury than any other source in the state. Five of the eight active municipal incinerators analyzed in the study are located in lower income communities. Only one was located in a minority community. Low income communities make up 10.2 percent of all towns in the study, but are home to 29.2 percent of all inactive municipal incinerators. In addition, high income communities comprise 23.8 percent of all towns, but hold 33.3 percent all incinerators. On the other hand, communities of color (15%> minority) comprise 9.4 percent of all towns, but are home to 45.9% of all inactive incinerators in the state. In this respect, there appears to be a class and racial bias in the siting of municipal incinerators in Massachusetts.

(C) Unequal Exposure to Polluting Industrial Facilities:

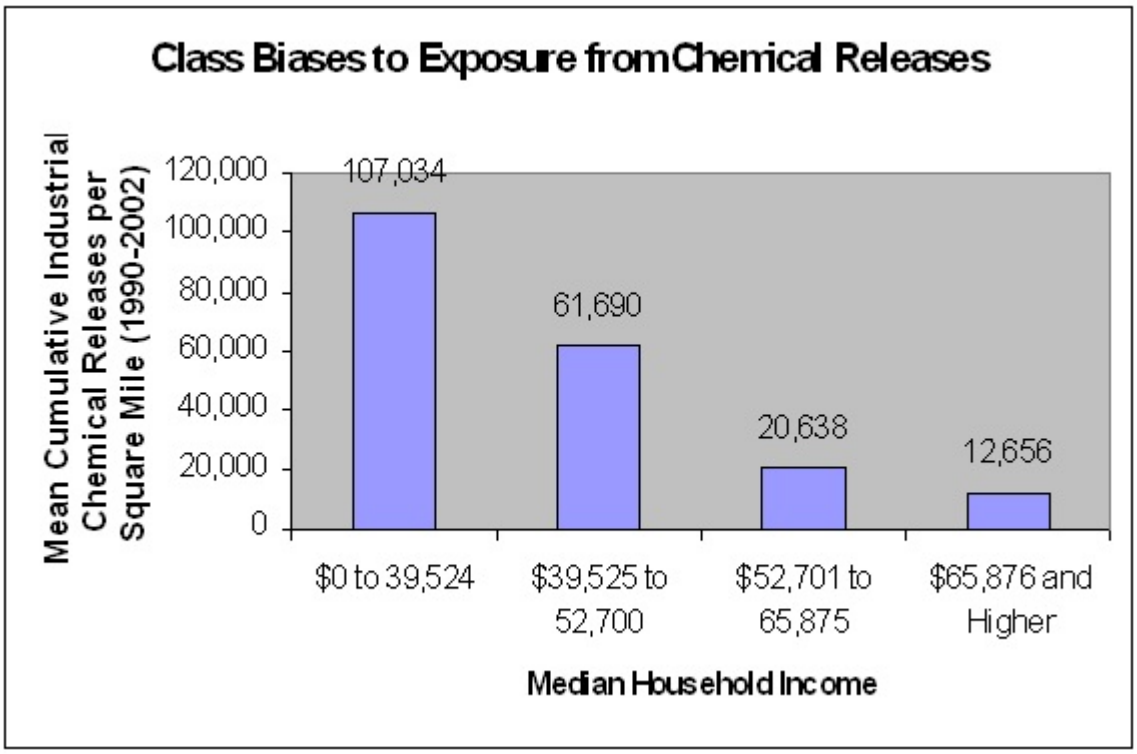
In Massachusetts between 1990-2002, some 1,298 large industrial facilities released over 204.3 million pounds of chemical waste directly into the environment (discharged into the air, ground, underground, or adjacent bodies of water) of the communities in which they were located. This figure is an amount equivalent to over 2,550 tractor-trailer trucks each loaded with 80,000 pounds of toxic waste. In recent years every county in Massachusetts has levels of air-borne toxic chemicals in the form of volatile organic compounds (VOCs) that exceed health-based state levels. For instance, concentrations of benzene, 1,3-butadiene, formaldehyde and acrolein -- chemicals which are known to cause numerous adverse health effects, including neurological disorders, birth defects, reproductive disorders and respiratory diseases -- exceed the health-based risk standards in all counties *by up to 80 times*. As a result, air pollution kills 1,300 people in the state each year. Our findings indicate that pollution release rates by large industrial facilities are significantly greater in lower income communities and communities of color.

- ❑ Low and medium-low income communities ($52,700 or less median household income) comprise 47 percent of all towns in Massachusetts, but *received 74.6 percent of all chemical releases from large-scale industries reporting under the Toxics Use Reduction Act (TURA) between 1990-2002.*

- ❑ In fact, low income communities ($39,524 or less household median incomes) average 9.9 TURA industrial facilities per town, some 1.569 million pounds of chemical releases into the environment per town, and 107,034 pounds of chemical releases per square mile for 1990-2002. This contrasts sharply in comparison to high income communities ($65,875 or more), which have an average of 2.6 TURA polluting facilites per town, an average of 246,428 pounds of chemical releases per town, and 12,656 pounds of chemical releases per square mile.

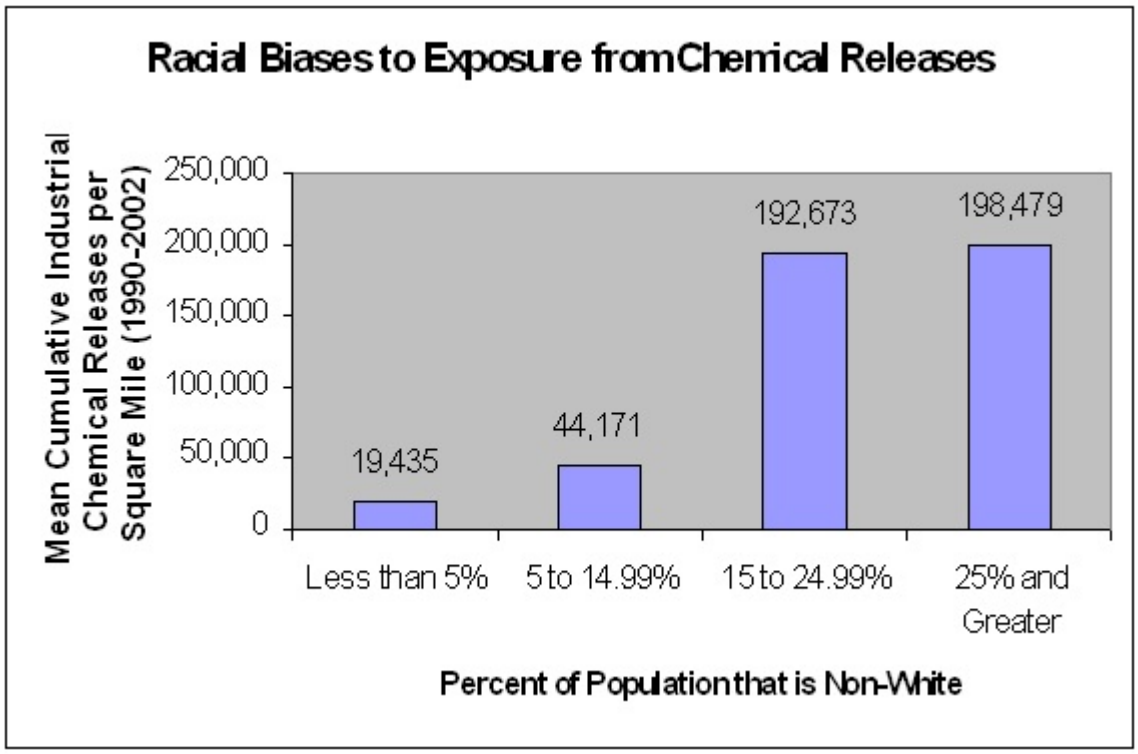
- In comparison to high income communities, *low income communities average over 3.7 times more TURA industrial facilities, three times as many TURA industrial facilities per square mile, 6.7 times more total chemical releases into the environment per town; and over 8.5 times as many chemical releases per square mile*. Thus, it would appear that the class status of a community is a major factor in the level of exposure to TURA industrial facilities and pollution.

- Low income communities are also over-exposed to the most dangerous families of chemical releases. *Although they represent just 10.2 percent of all towns, low income communities received 23.7 percent of all carcinogens; 30.8 percent of all organochlorines; 27.8 percent of all persistent bioaccumulative toxins; and 45.8 percent of all reproductive toxins*



- Communities of color are also overburdened. High minority communities (25% or more people of color) average 11.4 TURA industrial facilities per town and 1.28 TURA facilities per square mile, compared to an average of just 1.5 facilities and .08 facilities per square mile for low minority communities (less than 5% people of color).

- *Thus, high minority communities average over seven times as many TURA industrial facilities per town and over sixteen times as many TURA industrial facilities per square mile as low minority communities in the Commonwealth.*



- Furthermore, communities of color averaged well over 1.77 million pounds of chemical releases into the environment from TURA industrial facilities, and 192,000 pounds of chemical releases per square mile. In contrast, low minority communities averaged 303,516 pounds of chemical releases per town, and 19,435 pounds of releases per square mile from 1990-2002.

- Thus, *in comparison to low minority communities, communities of color average about six times more chemical releases into the environment from local TURA facilities; and ten times as many pounds of chemical releases per square mile.*

- Communities of color are also over-exposed to the most dangerous families of chemical releases. Although they represent just 9.4 percent of all towns, communities of color received 37.6 percent of all carcinogens; 41.8 percent of "more hazardous" toxic chemicals; 32.8 percent of all persistent bio-accumulative toxins; and 37.2 percent of all reproductive toxins.

(D) Unequal Exposure to Power Plants:

In Massachusetts, coal and oil-burning power plants, specifically those plants built prior to 1977, are also a major source of air pollution. In fact, some twenty seven plants in Massachusetts are responsible for over 114,545 tons of combined sulfur dioxide, nitrogen oxide, and volatile organic compounds emissions. These emissions are a major cause of respiratory disease in Massachusetts residents, especially in working class communities, which are burdened by the some of the worst polluting power plants in all of New England.

- ❑ Fossil-fuel power plants are also responsible for more than 230 pounds of airborne mercury emissions every year. Mercury causes severe damage to the neurological system and has developmental effects on fetuses and small children.

- ❑ Although communities of color comprise just 9.4 percent of all communities in the state, they are home to 29.6 percent of all active power plants. They receive 14.6 percent of plant releases of sulfur dioxide, nitrogen oxide, and volatile organic compounds.

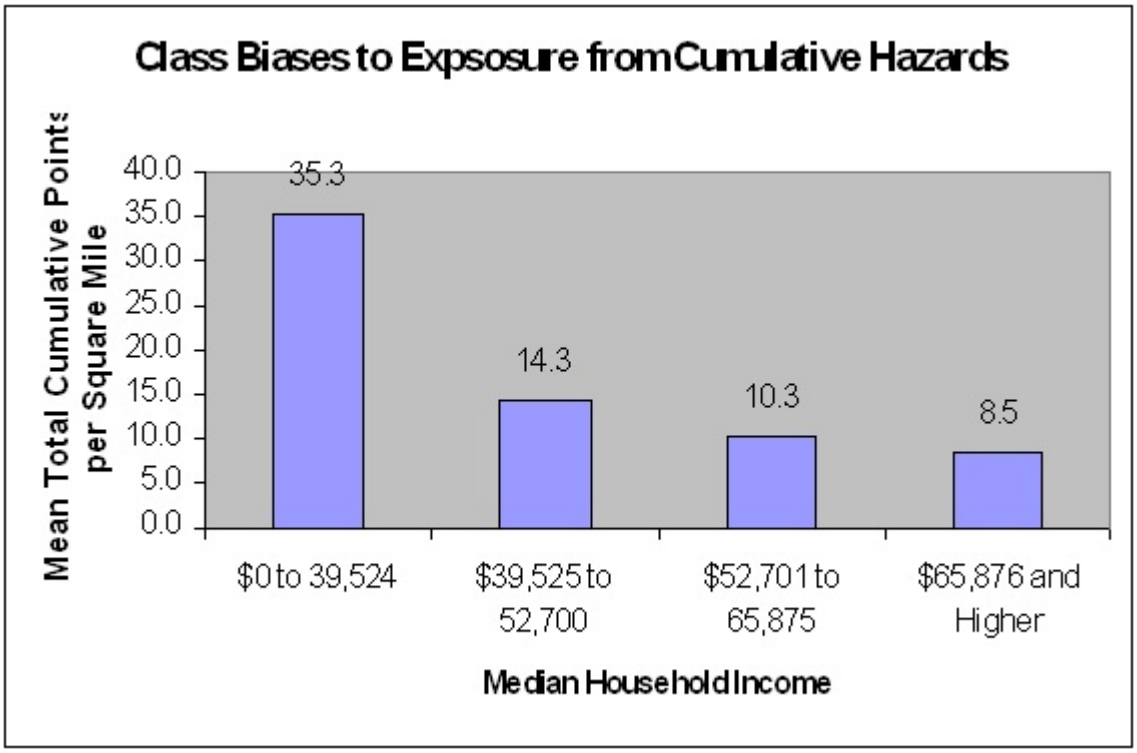
- ❑ Likewise, while low and medium-low income communities comprise 47.9 percent of all towns, they are home to 66.7 percent of all power plants and 73.6 percent of all releases of sulfur dioxide, nitrogen oxide, and volatile organic compounds. In contrast, high income communities ($65,876 or more household median income) comprise 23.8 percent of all communities but are home to only one power plant, and 0.2 percent of these emissions.

- ❑ In addition, five of the six dirtiest power plants in the state – the Brayton Point (Somerset), Salem Harbor (Salem), Mount To (Holyoke), and Somerset Operations (Somerset) facilities – are all located in low to medium-low income communities. Both the Mount Tom (Holyoke) and Mystic (Everett) power plants are located in communities of color. Along with the Canal power plant in Sandwich, these plants are the largest industrial sources of greenhouse gasses in the state.

(E) Unequal Exposure to Cumulative Environmental Hazards:

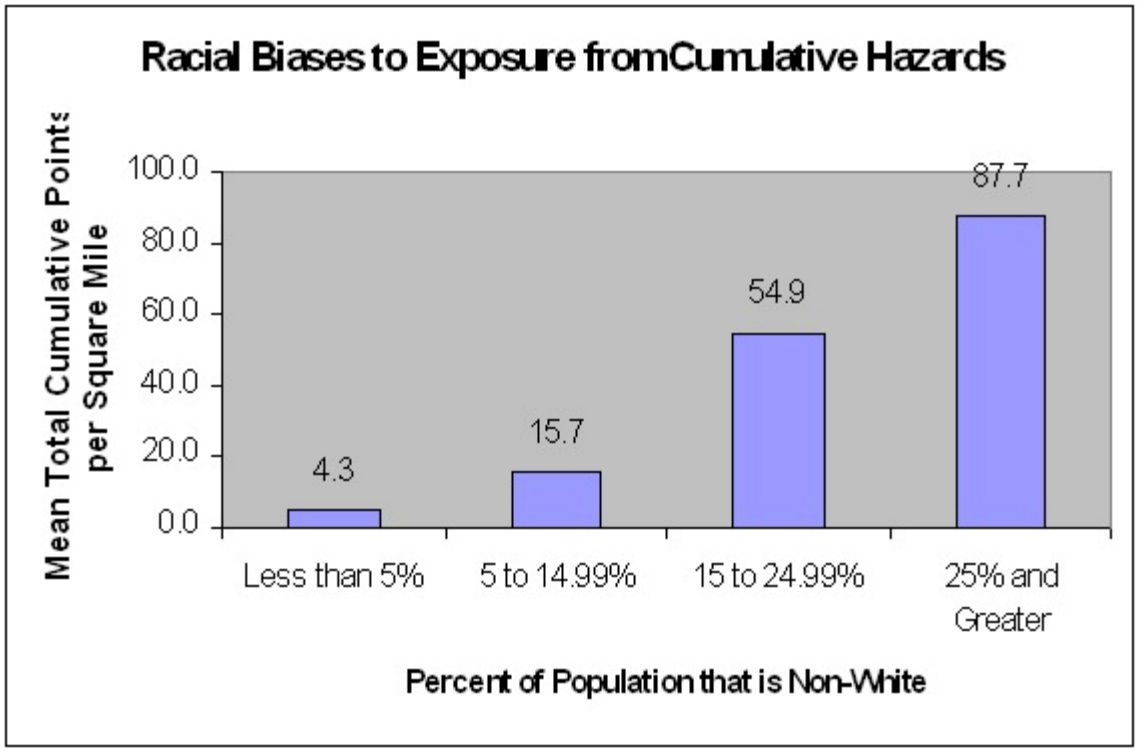
Many past studies on the disproportionate exposure of low income communities and communities of color have focused on a single type of hazardous facility or waste site. This study provides a cumulative method for measuring community exposure rates to all the types of environmentally hazardous facilities and sites listed above. This is accomplished by assigning a point system which weighs the average risks of various hazardous facilities and sites. These points are totaled for each community and then divided by total area to arrive at an exposure rate.

- ❑ According to this cumulative measure, low income communities ($39,525 or less median household income) average an exposure rate of 35.3 environmental hazard points per square mile. This rate stands in dramatic contrast to the exposure rates for all other communities, which ranges from 8.5 to 14.3 points per square mile. As a result, *low income communities face a cumulative exposure rate to environmentally hazardous facilities and sites of all types which is two-and-a-half to four times greater than all other communities (measured by income) in the state*.



- ❑ In terms of racial disparities, low minority communities (less than 5% people of color) average only 4.3 environmental hazard points per square mile, compared to 87.7 environmental hazard points per square mile for high minority communities (25% or more people of color).

- Put another way, *high minority communities face a cumulative exposure rate to environmentally hazardous facilities and sites of all types which is over twenty times greater than low minority communities*. In fact, there is a consistently sharp increase in the cumulative exposure rate to these hazardous facilities/sites which directly corresponds to increases in the size of the minority population in all communities. Without question, *it would appear that communities of color are greatly overburdened in comparison with white communities and are disproportionately exposed to environmental hazards of almost every kind.*



- In Section Six of this report, we present a list of the thirty most environmentally overburdened towns in the state, as determined by the greatest number of hazardous sites and facilities per square mile. The system takes into account the severity of the threat posed by the site or facility. *Communities of color make up 24 (or 80 percent) of these towns*. If the numbers were egalitarian, then you would expect to have only three communities of color (or 10%) to be among the most overburdened towns. Thirteen low income communities also appear on this list. However, all of these towns are also communities of color.

- As a consequence of these disparities, if a person lives in a predominantly white community, then they would have a 1.8 percent chance of living in one of the most environmentally overburdened communities in the state. However, if that individual resides in a community of color, then there is a 70.6 percent chance that person is in one of the most contaminated towns. As a result, a person living in a community of color is thirty-nine times more likely to live in one of the most environmentally hazardous communities in Massachusetts. In short, residents of minority communities face a cumulative exposure to environmental hazards far in excess of the typical white community.

(F) Recommendations for Addressing Environmental Injustice

For advocates of environmental justice (EJ), the most immediate mission is to dismantle the mechanisms by which government agencies and private business displace social and ecological burdens onto people of color and working-class families. To achieve this aim, the state should adopt *An Act to Promote Environmental Justice in the Commonwealth.* The overall priorities of any new EJ legislation should be to: (1) *increase public participation* and outreach through EJ training programs for government staff (including greater language accessibility); (2) *minimize risks* by targeting compliance, enforcement and technical assistance to EJ populations, and enhance Massachusetts Environmental Policy Act (MEPA) review of new or expanding large sources of air emissions and regional waste facilities in EJ neighborhoods; (3) *encourage investments* by expediting MEPA review of brownfields redevelopment projects that offer opportunities to clean up contaminated sites and bring them into clean productive use; (4) *expand existing brownfields efforts* to support the development of an inventory of Underutilized Commercial/Industrial Properties in the Commonwealth, incorporating EJ as a criterion for awarding technical assistance, grants, audits and toxic waste site investigations in affected communities, as well as targeting resources to more effectively create, restore, and maintain open spaces located in EJ neighborhoods; and (4) *promote cleaner development* by encouraging economic development projects that incorporate state-of-the-art pollution control technology, and alternatives to hazardous chemicals in neighborhoods where EJ populations reside.

Secondly, in addition to working to address disparities in exposure to environmental hazards, policy makers need longer-term approaches aimed at reducing the overall amount of pollution, including: the implementation of proactive, prevention-oriented policies that make use of a precautionary approach (the Precautionary Principle) to toxic hazards; the adoption of safer alternatives (the Substitution Principle); and creation of a transition blueprint to a clean economy that is beneficial for workers and EJ communities (Clean Production). As our research demonstrates, the release of toxic chemicals by industry is disproportionately concentrated in communities of color and working class towns. *An Act for a Healthy Massachusetts: Safer Alternatives to Toxic Chemicals* aims to create a model for the gradual replacement of toxic chemicals with safer alternatives, and could be a critical step in implementing longer-term solutions. Finally, a number of other legislative initiatives could also push the state toward the adoption of more effective environmental justice policies. These are outlined in greater detail in section seven of the report.

The following sections of this report provide a more elaborate presentation of our findings, as well as in-depth discussion and analysis of the current environmental injustices plaguing working class communities and people of color in the Commonwealth of Massachusetts.

SECTION TWO

UNEQUAL EXPOSURE TO HAZARDOUS WASTE SITES

In thousands of communities across the United States, billions of pounds of highly toxic chemicals including mercury, dioxin, PCBs, arsenic, lead, and heavy metals such as chromium have been dumped in the midst of unsuspecting neighborhoods. These sites poison the land, contaminate drinking water, and potentially cause cancer, birth defects, nerve and liver damage, and other illnesses. The worst of these are called National Priority List (NPL) or Superfund sites, named after the 1980 law to clean up the nation's most dangerous toxic dumps. In a 1991 study, the National Research Council found that there were over 41 million people who lived within four miles of at least one of the nation's roughly 1,500 Superfund waste sites.[7] It is estimated that groundwater contamination is a problem at over 85 percent of the nation's Superfund sites -- a particularly alarming statistic given that over 50 percent of the American people rely upon groundwater sources for drinking. Although these dumps are the worst of the worst, the Office of Technology Assessment recently estimated that there are as many as 439,000 other illegal hazardous waste sites in the country. [8]

In Massachusetts, there are 31 Sites on the EPA's National Priorities List, located [totally or partially] in 42 towns. The *Fort Devens Site* encompasses parts of the towns of Ayer, Shirley, Lancaster, Harvard. The *Fort Devens-Sudbury Training Annex Site* encompasses parts of the towns of Sudbury, Maynard, Hudson, and Stow. The *Hanscom Field/Hanscom Air Force Base Site* encompasses parts of Bedford, Concord, Lexington, and Lincoln. The *Otis Air National Guard/Camp Edwards Site* encompasses parts of Falmouth, Bourne, Sandwich, and Mashpee. The *South Weymouth Naval Air Station Site* encompasses parts of Weymouth, Abington, and Rockland. The *W.R. Grace & Company, Inc., Site* encompasses parts of Acton and Concord. The remaining 25 sites are located in single towns.[9] These towns are home to more than one million residents, including well over 100,000 people of color.[10] In addition to these Superfund sites, there are over 30,578 state Department of Environmental Protection (DEP) hazardous

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[7] See National Research Council, *Environmental Epidemiology: Public Health and Hazardous Wastes* (Washington, DC: National Academy Press, 1991).

[8] For a review, see Environmental Research Foundation, *Rachel's Hazardous Waste News*, No.332, April 8, 1993, pp.1-2.

[9] United States Environmental Protection Agency, Superfund Remedial Sites, National Priorities List, April 11, 2000.

[10] The General Electric-Housatonic River site is still as the proposal stage, and has yet to be officially listed.

waste sites in the Commonwealth. Some 3,741 of these sites (which include EPA Superfund sites) are considered serious Tier I or II sites.

For residents living near Superfund waste sites, the National Research Council has found a disturbing pattern of elevated health problems, including heart disease, spontaneous abortions and genital malformations, and death rates, while infants and children are found to suffer a higher incidence of cardiac abnormalities, leukemia, kidney-urinary tract infections, seizures, learning disabilities, hyperactivity, skin disorders, reduced weight, central nervous system damage, and Hodgkin's disease.[11] Exposure to industrial chemicals is also believed by scientists to be contributing to the dramatic increases since the 1950s in cancer of the testis, prostate gland, kidney, breast, skin, and lung, as well as malignant myeloma, non-Hodgkin's lymphoma, and numerous childhood cancers[12] – a cancer epidemic that kills half-a-million Americans each year. In fact, cancer now kills more American children than any other single disease for the first time in history. In Massachusetts, elevated rates of leukemia (especially among children) has been linked to the industrial chemical trichloroethylene found in the town of Woburn's drinking water, as well as tetrachloroethylene in drinking water on the Upper Cape.[13] Massachusetts now has one of the highest rates of breast cancer in the country -- some 4,400 women are diagnosed and 1,000 women die each year. Women living on Cape Cod are particular vulnerable, having a 20

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[11] Numerous other studies have documented similar health impacts as the NRC report. See Dean B. Baker, et.al., "A Health Study of Two Communities [sic] Near the Stringfellow Waste Disposal Site," *Archives of Environmental Health*, Vol.43 (Sept./Oct., 1988: 325-334); Sandra A. Geschwind, et.al., "Risk of Congenital Malformations Associated with Proximity to Hazardous Waste Sites," *American Journal of Epidemiology*, vol.135 (1992: 1197-1207); Stanley J. Goldberg, "An Association of Human Congenital Cardiac Malformations and Drinking Water Contaminants," *Journal of the American College of Cardiology*, Vol.16, No.1 (July, 1990: 155-164); Robert Hoover and Joseph F. Fraumeni, Jr., "Cancer Mortality in U.S. Counties with Chemical Industries," *Environmental Research*, Vol.9 (1975: 196-207); Beverly Paigen, et.al., "Prevalence of health Problems in Children Living Near Love Canal," *Hazardous Waste & Hazardous Materials*, Vol.2, No.1 (1985: 23-43); and J.B. Andelman and D.W. Underhill, (eds.), *Health Effects from Hazardous Waste Sites* (Chelsea, MI: Lewis, 1987)..

[12] For a discussion of the environmental impacts on cancer rates, see Eric J. Krieg, "Toxic Wastes, Race, and Class: A Historical Interpretation of Greater Boston" (Ph.D. Dissertation, Northeastern University, 1995), pp.1-26; Sandra Steingraber, *Living Downstream: An Ecologist Looks at Cancer and the Environment* (New York: Addison-Wesley, 1997); and Richard W. Clapp, "The Decline in U.S. Cancer Mortality From 1991-1995: What's Behind the Numbers?," *New Solutions: A Journal of Environmental and Occupational Health Policy*, Vol.7, No.4 (Summer 1997: 30-34).

[13] See J.J. Cutler, G.S. Parker, S. Rosen, B. Prenney, R. Healey, and G.G. Caldwell, "Childhood Leukemia in Woburn, Massachusetts," *Public Health Reports*, Vol.101, No.2 (1986: 201-205); S.W. Lagakos, B.J. Wessen, and M. Zelen, "An Analysis of Contaminated Well Water and Health Effects in Woburn, Massachusets," *Journal of the American Statistical Association*, Vol.81 (1986: 583-614); and Ann Aschengrau, David Ozonoff, Chris Paulu, Patricia Coogan, R. Vezina, Timothy Heeren, and Yuqing Zhang, "Cancer Risk and Tetrachloroethylene-Contaminated Drinking Water in Massachusetts," *Archives of Environmental Health*, Vol.48, No.5 (1993: 284-292).

percent higher rate of breast cancer than women living elsewhere in the state.[14]

As is evident from the proliferation of toxic waste sites, many current policy initiatives are actually intensifying problems they were designed to cure. Most environmental laws require businesses to *contain* pollution sources for more proper treatment and disposal (in contrast to the previous practice of dumping onsite or into nearby commons). Once the pollution is "trapped," the manufacturing industry pays the state or a private company for its treatment and disposal. The waste, now commodified, becomes mobile, crossing local, state, and even national borders in search of "efficient" (i.e., low-cost and politically feasible) areas for treatment, incineration, and/or disposal. More often than not, the waste sites and facilities are themselves hazardous and located in poor working class neighborhoods and communities of color.[15] In this respect, an environmental issue impacting the general population has been addressed in a manner which displaces the problem in a new form onto more politically marginalized sectors of the population.

Hazardous waste sites nationwide are among the more concentrated environmental hazards confronting low income neighborhoods and communities of color. According to a 1987 report by the United Church of Christ's Commission on Racial Justice, three out of five African Americans and Latinos nationwide live in communities that have illegal or abandoned toxic dumps. Communities with one hazardous waste facility have twice the percentage of people of color as those with none, while the percentage triples in communities with two or most waste sites.[16] A subsequent follow-up study conducted in 1994 has now found the risks for people of color to be even greater than in 1987, as they are 47 percent more likely than whites to live near these potentially health-threatening facilities.[17] In short, race and poverty are the two most

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[14] The Silent Spring Institute is conducting an extensive investigation of the possible environmental causes of the breast cancer epidemic on Cape Cod. See *The Cape Code Breast Cancer and Environment Study: Results of the First Three Years of Study* (Newton: Silent Spring Institute, 1998).

[15] For studies which examine the inequitable distribution of hazardous waste facilities in specific regions of the country, see Robert D. Bullard, *Dumping in Dixie: Race, Class, and Environmental Quality* (Boulder, CO: Westview Press, 1990); Robert D. Bullard, (ed.), *Unequal Protection: Environmental Justice and Communities of Color* (San Francisco: Sierra Club Books, 1994); Bunyan Bryant and Paul Mohai, (eds.), *Race and the Incidence of Environmental Hazards: A Time for Discourse* (Boulder, CO: Westview Press, 1992); and Daniel R. Faber, (ed.), *The Struggle for Ecological Democracy: Environmental Justice Movements in the United States* (New York: Guilford Press, 1998).

[16] See Benjamin F. Chavis, Jr., and Charles Lee, *Toxic Wastes and Race in the United States: A National Report on the Racial and Socioeconomic Characteristics of Communities Surrounding Hazardous Waste Sites* (New York: United Church of Christ Commission for Racial Justice, 1987). This study analyzed data on the number and type of hazardous waste facilities in the approximately 35,5000 residential zip codes of the United States, along with data on percent minority population, mean household income, mean home value, number of uncontrolled toxic waste sites per 1000 persons, and pounds of hazardous waste generated per person.

[17] See Benjamin Goldman and L. Fitton, *Toxic Waste and Race Revisited: An Update of the 1987 Report on the Racial and Socioeconomic Characteristics of Communities with Hazardous Waste Sites* (Washington, DC: Center for Alternatives, the National Association for the Advancement of Colored People, and the United Church of Christ Commission for Racial Justice, 1994).

critical demographic factors for determining where commercial hazardous waste facilities are located in the United States (including hazardous waste generators of all sizes across the Commonwealth of Massachusetts).[18] That the "disempowered" of American society should serve as the dumping ground for American business is often blatantly stated by industry itself. A 1984 report by Cerrell Associates for the California Waste Management Board, for instance, openly recommended that polluting industries and the state locate hazardous waste facilities in "lower socio-economic neighborhoods" because those communities had a much lower likelihood of offering political opposition.[19]

Federal governmental enforcement actions also appear to be uneven with regard to the class and racial composition of the impacted community. According to a 1992 nationwide study which appeared in the *National Law Journal*, Superfund toxic waste sites in communities of color are likely to be cleaned 12 to 42 percent *later* than sites in white communities. Communities of color also witness government penalties for violations of hazardous waste laws which are on average only one-sixth ($55,318) of the average penalty in predominantly white communities ($335,566). The study also concluded that it takes an average of 20 percent longer for the government to place toxic waste dumps in minority communities on the National Priorities List (NPL), or Superfund list, for cleanup than sites in white areas.[20] A more recent 2005 study confirms that a site in a low income or high minority area is less likely to make the Superfund list, and takes significantly longer to reach the NPL if it is listed. So, despite their over-representation in proximity to environmental hazards, communities of color are under-represented in environmental cleanup programs (such as the EPA Superfund program).[21]

In Massachusetts, there are currently over 30,578 hazardous waste sites, including 3,741 more serious Tier I-II sites, according to October 2004 DEP data. As required under the Massachusetts Contingency Plan, hazardous waste sites must be ranked according to the severity of their risk to human health and the environment. The DEP has developed a tier classification system for determining the danger level of a hazardous waste site to the public health and the environment. Sites can be classified as Tier IA, IB, IC or II, with Tier IA sites requiring the most

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[18] See Lisa Spence, *Race, Class, and Environmental Hazards: A Study of Socio-Economic Association with Hazardous Waste Generators and Treatment/Storage/Disposal Facilities in Massachusetts* (Master's Thesis, Civil and Environmental Engineering, Tufts University, Medford, MA, 1995).

[19] See Julie Roque, "Review of EPA Report: 'Environmental Equity: Reducing Risk for All Communities'," *Environment*, Vol.35, No.5 (June 1993: 25-28).

[20] See Marianne Lavelle and Marcia Coyle, "Unequal Protection: The Racial Divide in Environmental Law," *National Law Journal*, September 21, 1992, pp.2-12.

[21] See Sandra George O'Neil, "Environmental Justice in the Superfund Clean-Up Process." Ph.D. Dissertation (Boston College, Department of Sociology, April 2005).

stringent oversight and Tier II the least. A *Numerical Ranking Sheet* (NRS) is used to calculate the numerous ecological and public health factors which determine a site's classification. The NRS contains five main sections:[22]

(1) Exposure Pathways evaluate the ways a person can be exposed to toxics, specifically the soil, groundwater, surface water, and air;
(2) Disposal Site Characteristics evaluate the toxicity of the released material(s);
(3) Human Population and Land Uses evaluate the potential risks based on nearby population and land and water uses;
(4) Ecological Population evaluates the potential risks posed to the environment based on the site's proximity to sensitive areas, such as wetlands and endangered species;
(5) Mitigating Disposal Site Specific Conditions take into account conditions at the site not factored into the NRS.

One of the primary reasons the DEP ranks a large number of the most serious Tier I sites in the suburban versus urban areas such as Boston are related to drinking water issues. The presence of a hazardous waste site in a larger urban area where the drinking water is transported from a distant reservoir may not pose the same threat as in a suburban/rural community dependent upon local groundwater sources.

Class and Hazardous Waste Sites in Massachusetts

As indicated in Table 2A on "Class-Based Disparities in the Location of Hazardous Waste Sites," there appears to be a significant concentration of both Tier I-II and Non-Tier sites in lower income communities. In Massachusetts, low income communities (where median household income is less than $39,524) contain an average of 203 DEP hazardous waste sites. In contrast, medium-high and high income communities average 66 to 71 hazardous waste sites. As a result, *low income communities average roughly three times more DEP hazardous waste sites than higher income communities*.

If lower income communities are typically larger in size, however, one would expect to find a higher number of such sites. To control for the size of the community, it is useful to calculate the number of sites per square mile (in order to obtain a more accurate exposure rate). When this is done, the class bias persists. In low income communities, where median household income is less than $39,524, there is an average of nearly 19.2 DEP hazardous waste sites per square mile (psm). In contrast, all other community income groupings average 4.6 to 7.2

[22] For a discussion, see Eric Weltman, *A Citizen's Guide to the State Superfund: Understanding the Massachusetts Contingency Plan* (Boston: Massachusetts Campaign to Clean Up Hazardous Waste, February 1996).

hazardous waste sites per square mile. As a result, low income communities have about *two-and-a-half to over four times* the number of hazardous waste sites per square mile. These disparities remain consistent with comparisons of the more serious Tier I-II hazardous waste sites. In short, low income communities in Massachusetts experience a far more profound exposure rate to DEP hazardous waste sites than higher income communities.

Table 2A: Class-Based Disparities in the Location of Hazardous Waste Sites

Median Household Income 2000 U.S. Census N=Number of Towns (Percent of all Towns)		Number of all DEP Hazardous Waste Sites	Number of DEP Tier I-II Hazardous Waste Sites	Number of EPA Superfund Sites	Average Number of DEP Hazardous Waste Sites per Town	Average Number of DEP Hazardous Waste Sites per Square Mile
$0 to 39,524 (Low Income) N=37 (10.2%)	Count	7,497	998	3	203	19.2
	Percent	24.5%	26.7%	9.7%		
$39,525 to 52,700 (Med. – Low Income) N=133 (36.7%)	Count	10,038	1,283	8	75	7.2
	Percent	32.8%	34.3%	25.8%		
$52,701 to 65,875 (Med. – High Income) N=106 (29.9%)	Count	6,943	819	7	66	5.3
	Percent	22.7%	21.9%	22.6%		
$65,876 and greater (High Income) N=86 (23.8%)	Count	6,100	641	13	71	4.6
	Percent	19.9%	17.1%	41.9%		
Totals N=362 (100%)	Count	30,578	3,741	31	84	7.3
	Percent	(100%)	(100%)	(100%)		

** Information on all hazardous waste sites was provided by the Massachusetts Department of Environmental Protection (DEP) and U.S. Environmental Protection Agency (EPA) databases on October 15, 2004. All DEP waste site information provided above includes EPA Superfund sites as part of the count.

These disparities are more profound for communities of color, as indicated in Table 2B. In Massachusetts, low minority communities (5% or less people of color) average 39 DEP hazardous waste sites. In contrast, high minority communities (where 25% or more people of color) average 297 sites. Communities considered moderately-high minority (where 15 to 24.99% of the population is made up of people of color) average nearly 280 sites. As a result, *communities of color average well over seven-and-a-half times as many hazardous waste sites per town as low minority communities.*

Table 2B: Racially-Based Disparities in the Location of Hazardous Waste Sites

Non-White Population 2000 U.S. Census N=Number of Towns (Percent of all Towns)		Number of DEP Hazardous Waste Sites	Number of DEP Tier I-II Hazardous Waste Sites	Number of Towns with EPA Superfund Sites	Average Number of DEP Hazardous Waste Sites per Town	Average Number of DEP Hazardous Waste Sites per Square Mile
Less than 5% (Low Minority) N=231 (63.8%)	Count	8,934	1,079	7	39	2.1
	Percent	29.2%	28.8%	22.6%		
5 to 14.99% (Moderate - Low) N=97 (26.8%)	Count	11,795	1,306	21	122	8.1
	Percent	38.6%	34.9%	67.7%		
15 to 24.99% (Moderate - High) N=14 (3.9%)	Count	3,918	519	2	280	28.7
	Percent	12.8%	13.9%	6.5%		
25% and greater (High Minority) N=20 (5.5%)	Count	5,931	837	1	297	48.3
	Percent	19.4%	22.4%	3.2%		
Totals N=362 (100%)	Count	30,578	3,741	31	84	7.3
	Percent	(100%)	(100%)	(100%)		

To control for the size of the community, it is useful to calculate the number of sites per square mile in order to obtain a more accurate exposure rate. When this is done, we find an even more pronounced racial bias. In high minority communities (25% or more people of color) there is an average of 48.3 DEP hazardous waste sites per square mile (psm). In contrast, low minority communities (less than 5% people of color) there is an average of 2.1 hazardous waste sites psm. As a result, *high minority communities average more than twenty-three times the number of hazardous waste sites per square mile than low minority communities*. These figures remain consistent with comparisons of the more serious Tier I-II hazardous waste sites. In short, communities of color experience a far more profound exposure rate to DEP hazardous waste sites than white communities, *indicating that racial makeup of the area appears to be a significant factor* when it comes to the location of Tier and Non-Tier Hazardous waste sites in the Commonwealth of Massachusetts.

Only in the case of EPA Superfund sites do the class and racial biases associated with DEP hazardous waste sites disappear. Some 41.9 percent of all Superfund sites are located in high income communities – a factor related to the high number of these sites on military facilities located in rural and suburban locales near more affluent communities, particularly on Cape Cod. There are also at least 47 Tier IA sites in Bourne resulting from contamination from the Massachusetts Military Reservation.

SECTION THREE

UNEQUAL EXPOSURE to LANDFILLS, TRANSFER STATIONS, and INCINERATORS

Landfills can also pose health hazards to communities. Seven former Massachusetts landfills are now federal Superfund sites, and even newer ones, which are lined with plastic, will eventually leak, and could threaten underground water supplies. There are a total of 980 different landfill-type operations (including transfer stations and incinerators) in the Commonwealth. Tables 3A & 3B provide data on six different types of landfills: incinerator ash landfills (18); demolition landfills (46); illegal sites (15); sludge landfills (15); tire piles (1); and municipal solid waste landfills or garbage dumps (599). Data is also included for two types of related facilities: trash transfer stations (262); and inactive municipal incinerators (24). Of all these sites, incinerators and incinerator ash landfills are typically most hazardous, as emissions and fly ash wastes produced by incinerators and power plants contain concentrated levels of heavy metals like arsenic, lead and cadmium, radioactive elements, cancer causing organic compounds, and other contaminants.

As outlined in Table 3A, the state's demolition landfills, illegal sites, and sludge landfills are relatively more heavily concentrated in lower income communities. For instance, low income communities make up 10.2 percent of all towns in the state, but are home to 17.4 percent of all demolition landfills, 26.7 percent of all illegal sites, and 20 percent of all sludge landfills. To explore these disparities in more detail, it is important to control for the size of the community by calculating the number of these kinds of sites and facilities per square mile. This allows us to reveal a more accurate exposure rate. As shown in Table 3A, low income communities have a higher number of landfill-types per town and per square mile, although the differences are not extreme. This is explained by the equal distribution of a large number of solid waste landfills in all kinds of towns in Massachusetts. Still, total landfills are more concentrated in low income communities, averaging .22 per square mile, in comparison to .13 to .17 psm for all other communities.

In terms of potential racial disparities, Table 3B reveals that demolition landfills and illegal sites are disproportionately located in communities of color. However, when controlling for the size of the community by calculating the number of these kinds of sites and facilities per square mile, we find broader racial disparities. In comparison to low minority communities, which average .12 of all landfill types per square mile, high minority communities average .35 of these facilities per square mile, *a rate over three times higher.*

Table 3A: Class-Based Disparities in the Location of All Landfill-Types

Median Household Income 2000 U.S. Census Expressed in 1990 Dollars N=Number of Towns (Percent of all Towns)		Number of Incinerator Ash Landfills	Number of Demolition Landfills	Number of Illegal Sites	Number of Sludge Landfills	Number of Tire Piles	Number of Municipal Solid Waste Landfills	Number of Transfer Stations	Number of Inactive Municipal Incinerators	Average Number of all Landfill - Types per Town	Average Number of all Landfill-Types per Square Mile
$0 to 39,524 (Low Income) N=37 (10.2%)	Count	2	8	4	3	0	66	26	7	3.1	.22
	Percent	11.1%	17.4%	26.7%	20.0%	0%	11.0%	9.9%	29.2%		
$39,525 to 52,700 (Med. – Low) N=133 (36.7%)	Count	5	22	2	8	1	198	126	3	2.7	.13
	Percent	27.8%	47.8%	13.3%	53.3%	100%	33.1%	48.1%	12.5%		
$52,701 to 65,875 (Med. - High) N=106 (29.9%)	Count	9	10	7	3	0	197	64	6	2.8	.17
	Percent	50.0%	21.7%	46.7%	20.0%	0%	32.9%	24.4%	25.0%		
$65,876 and greater (High Income) N=86 (23.8%)	Count	2	6	2	1	0	138	46	8	2.3	.15
	Percent	11.1%	13.0%	13.3%	6.7%	0%	23.0%	17.6%	33.3%		
Totals N=362 (100%)		18 100%	46 100%	15 100%	15 100%	1 100%	599 100%	262 100%	24 100%	2.7	.15

** Information on all landfills was provided by the Massachusetts Department of Environmental Protection (DEP) databases on October 15, 2004.

Table 3B: Racially-Based Disparities in the Location of All Landfill-Types

Non-White Population 2000 U.S. Census N=Number of Towns (Percent of all Towns)		Number of Incinerator Ash Landfills	Number of Demolition Landfills	Number of Illegal Sites	Number of Sludge Landfills	Number of Tire Piles	Number of Municipal Solid Waste Landfills	Number of Transfer Stations	Number of Inactive Municipal Incinerators	Average Number of all Landfill-Types per Town	Average Number of all Landfill-Types per Square Mile
Less than 5% (Low Minority) N=231 (63.8%)	Count	7	28	6	12	1	356	168	2	2.5	.12
	Percent	38.9%	60.9%	40.0%	80.0%	100%	59.4%	64.1%	8.3%		
5 to 14.99% (Low - Moderate) N=97 (26.8%)	Count	6	12	3	2	0	185	73	11	3.0	.18
	Percent	33.3%	26.1%	20.0%	13.3%	0%	30.9%	27.9%	45.8%		
15 to 24.99% (Moderate - High) N=14 (3.9%)	Count	4	1	2	0	0	29	12	7	3.7	.27
	Percent	22.2%	2.2%	13.3%	0%	0%	4.8%	4.6%	29.2%		
25% and greater (High Minority) N=20 (5.5%)	Count	1	5	4	1	0	29	12	4	2.8	.35
	Percent	5.6%	10.9%	27.7%	6.7%	0%	4.8%	4.6%	16.7%		
Totals N=362 (100%)		18 100%	46 100%	15 100%	15 100%	1 100%	599 100%	262 100%	24 100%	2.7	.15

Significant disparities also exist with respect to incinerators. Municipal Solid Waste Combustors (MSWCs) are facilities that combust (burn) solid waste, in large part derived from household wastes. These incinerators contribute to massive water and air pollution and related public health problems. Along with power plants, garbage incinerators emit more mercury than any other source in the state.[23] Mercury is especially toxic to children and pregnant women, and is linked to kidney and nervous system damage, and developmental defects. The Environmental Protection Agency (EPA) has identified these facilities as being a major source of mercury emissions to the environment, although new standards (set at 28 ug dscm) have reduced mercury emissions about 90 percent since 2001. Prior to 2001, the state Department of Environmental Protection (DEP) estimated that these facilities emitted approximately 6,040 pounds of mercury into the air each year.[24] Once introduced into the environment, mercury is a very persistent toxin.

Massachusetts also incinerates a higher percentage of PVC waste than all but two states in the nation, topping an estimated 28,145 tons every year.[25] The disposal of PVC in incinerators and landfills poses many long-term environmental health problems, including the release of highly toxic dioxin emissions and the leaching of toxic additives such as cadmium and lead into groundwater. In fact, PVC disposal is the largest source of dioxin-forming chlorine and hazardous phthalates in solid waste. Dioxins are a family of chemicals known to cause cancer, reproductive and developmental disorders, as well as immune problems. Phthalates are suspected to cause developmental and reproductive damage in humans, while lead is a well-known neurodevelopmental toxin. Cadmium also causes cancer and liver damage in humans.[26]

As indicated in Table 3A, low income communities make up 10.2 percent of all towns in the study, but are home to 29.2 percent of all inactive municipal incinerators. It is also interesting to note that high income communities comprise 23.8 percent of all towns, but hold 33.3 percent all inactive incinerators. In Table 3B, we find that communities of color (15% or more people of color) comprise 9.4 percent of all towns, but are home to 45.9% of all non-active incinerators. Of

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[23] See "MASSPIRG urges Cut in Solid Waste," in *MASSPIRG*, Vol.17, No. 4 (Winter 2000): 1-3.

[24] The DEP estimate is based on 1991-94 Stack Test Data, and available on-line at www.state.ma.us/dep/files/mercury/hgch3b.htm.

[25] See Scott M. Kaufman, N. Goldstein, Ki. Millrath, N.J. Themel, "The State of Garbage in America: The 14th Annual Nationwide Survey of Solid Waste in the U.S.," a joint study with the Earth Engineering Center at Columbia University, *Biocycle* (January 2004: 31-41); and the U.S. Environmental Protection Agency, "Municipal Solid Waste in the U.S.: 2001 Facts and Figures," USEPA Office of Solid Waste and Emergency Response (5305W), EPA530-2-03-011 (October 2003).

[26] See Michael Belliveau and Stephen Lester, *PVC, Bad News Comes in Threes: The Poison Plastic, Health Hazards, and the Looming Waste Crisis*, a report by the Center for Health, Environment and Justice and the Environmental Health Strategy Center (December 2004).

much greater concern are the active and larger municipal incinerators currently operating in the state. As seen in Table 3C, Massachusetts hosts major active incinerators in the towns of Haverhill, Millbury, North Andover, Rochester, Saugus, and Springfield, as well as smaller active facilities in Agawam and Pittsfield. The Lawrence incinerator was certified closed in September of 1999 but remains in the DEP database. Collectively, these incinerators are permitted by the Department of Environmental Protection (DEP) to burn 9,798 tons of trash per day.

Table 3C: Resource Recovery Facilities (Major Incinerators)

Town	Facility Name	Tons of Trash Burned (1994-2002)	Class Status of Community	Racial Status of Community
Agawam	Pioneer Valley Resource Recovery	1,103,899	Medium Low Income	Low Minority
Haverhill	Haverhill Waste to Energy Facility	4,967,007	Medium Low Income	Moderately Low Minority
Lawrence[27]	Ogden Martin Systems RDF	1,092,263	Low Income	High Minority
Millbury	Wheelabrator Millbury	4,231,690	Medium Low Income	Low Minority
North Andover	Wheelabrator North Andover	3,727,793	High Income	Moderately Low Minority
Pittsfield	Pittsfield Resource Recovery	685,972	Low Income	Moderately Low Minority
Rochester	Semass Resource Recovery	9,335,068*	Medium High Income	Low Minority
Saugus	Wheelabrator Saugus	3,880,329*	Medium High Income	Low Minority

In 1998, DEP adopted a Municipal Waste Combustor Rule, including a mercury emissions standard nearly three times more stringent that the U.S. Environmental Protection Agency emission rules. EPA approved the DEP rule in November 2002. The 1998 rule required the five

[27] DEP data represents 1994 to 1998, although the facility is incorporated into active DEP databases.

largest facilities in Massachusetts to comply with the new standards (the smaller facilities in Agawam and Pittsfield handle less than 250 tons of waste per unit per day, and therefore are not subject to the 1998 Rule). Along with the closure of two other incinerator facilities in Lawrence and Fall River, the Rule contributed to a 90 percent reduction in combined mercury emissions between 1996 and 2002. Nevertheless, these facilities continue to pose hazards to their host communities. As seen in Table 3C, five of these eight communities are of lower income status.

Lawrence is the only community of color that has recently hosted a major incinerator. However, perhaps no other community in the state has been impacted more deeply by the adoption of incineration as a method of trash disposal. Located in the Merrimack Valley, Lawrence is a poor community of color with a household median income of just $27,983. More than half of the residents are people of color, and at least 60 percent do not speak English as their first language. Both the Ogden-Martin (RDF) trash incinerator (which ceased operations in 1998) and the Stericlye (formerly BFIs Merrimack Valley Medical Services) incinerator were both located in Lawrence. Before closing, the Ogden-Martin (RDF) facility was permitted to burn 600-700 tons of trash per day, and was responsible for significant emissions of mercury, lead, and dioxin. For instance, the facility released nearly 1000 pounds of mercury into the air in 1996 alone, and some 400 pounds of lead in 1995. Before ceasing operations in the 2000, the Stericycle facility was permitted for 24 tons of medical waste per day, and accepted biohazards and other materials from medical facilities throughout the New England area. In addition, the Wheelabrator incinerator in North Andover, and the Ogden-Martin Haverhill MSW incinerator, were both located within four miles of the Lawrence border. The North Andover incinerator is permitted to burn 1500 tons of waste a day, and has a history of problems with dioxin, mercury, and sulfur dioxide emissions. These emissions are widely dispersed into neighboring towns. Furthermore, the Safety-Kleen (formerly Laidlaw Environmental Services) hazardous waste storage and sorting facility was located in downtown Lawrence on the Merrimack River.

While the health impacts of these incinerators on community residents is difficult to measure, scientists know that mercury released into the environment from incinerator smokestacks is converted into methylmercury. Methylmercury has the ability to build up in the body of animals over time (bioaccumulation) and increase in concentration as one organism eats another organism lower on the food chain (biomagnification). As a result, mercury is extremely dangerous to humans (and especially children). According to a major study by the Biodiversity Research Institute, very high mercury concentrations have been detected in the urban corridor of Boston. In fact, the Lower Merrimack River watershed (including the City of Lawrence) has been identified as a mercury "hotspot" – one of nine areas of concern in the northeastern United States where mercury levels in biota exceed levels at which adverse impacts occur.[28]

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[28] See David C. Evers, *Mercury Connections: The Extent and Effects of Mercury Pollution in Northeastern North America*, a report by the BioDiversity Research Institute, Gorham, Maine, 2005, pp.1-28.

SECTION FOUR

UNEQUAL EXPOSURE TO POLLUTING INDUSTRIAL FACILITIES

American industry produces enormous quantities of pollution and toxic waste each year. According to the EPA's Toxic Release Inventory (TRI) for 2003 -- the most recent year available at this time -- some 23,000 facilities reported a total of 4.44 billion pounds of chemical pollutants disposed or released into the nation's air, water, land, and underground. The vast majority of these pollutants – some 40 percent (or 1.59 billion pounds) – were released into the air directly on-site. Thus, citizens who work and reside in the communities in which these facilities are located typically bear much greater exposure rates to industrial pollutants.

Exposure to industrial pollution -- especially air pollution -- is proving deadly to tens of thousands of citizens. Human exposure to hazardous air pollutants (HAPs) can result in both acute and chronic health effects. Short-term, acute effects can include eye irritation, nausea, difficulty breathing, asthma, or even death. Long-term, chronic effects include damage to the respiratory or nervous systems, birth defects and damage to reproductive systems, neurological disorders, as well as cancer. Aggravated by the exhaust from over two-hundred million motor vehicles (particularly in larger metropolitan areas), industrial air pollution kills over 60,000 Americans each year. Half a million people living in the most polluted areas in 151 cities across the country face a risk of death which is some 15 to 17 percent higher than in the least polluted areas.[29] Some 164 million Americans are now at risk for respiratory and other health problems from exposure to excessive air pollution.[30]

In Massachusetts, poor air quality poses a serious threat to public health. According to data provided by the EPA's Cumulative Exposure Project (CEP), every county in Massachusetts

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[29] A study conducted by researchers at the Harvard School of Public Health, Brigham Young University, and the American Cancer Society, which was released on March 10, 1995, and appeared in the *American Journal of Respiratory and Critical Care Medicine*, estimated some 60,000 annual air pollution deaths. Another study by the Natural Resources Defense Council (NRDC) released on May 8, 1996, which analyzed air quality in 239 cities across the country, estimated some 64,000 Americans to be dying each year from air pollution, even at levels which the federal government considers to be safe.

[30] According to a 1993 report by the American Lung Association, some 66 percent of U.S. citizens live in areas that violate standards for ozone (which causes lung tissue to become inflamed and impedes breathing); carbon dioxide (which impedes the blood's ability to carry oxygen to the heart); and lead (which causes brain and organ damage). Because their lungs are particularly sensitive, at highest risk are the 31 million children and 19 million elderly who live in these polluted areas.

has levels of key air-borne toxic chemicals in the form of volatile organic compounds (VOCs) that exceed health-based state levels. There are at least 16 toxic compounds which exceed the acceptable levels of concentration set by both federal regulatory agencies and the MA Allowable Ambient Limits (AAL) of the Department of Environmental Protection (DEP).[31] For instance, concentrations of benzene, 1,3-butadiene, formaldehyde and acrolein -- chemicals which are known to cause numerous adverse health effects, including neurological disorders, birth defects, reproductive disorders and respiratory diseases -- exceed the AAL health-based risk standards in all counties *by up to 80 times*. Nearly 1,300 deaths are caused by particulate air pollution in Massachusetts each year.[32] Another three quarters of a million Massachusetts residents are put at risk each summer from high smog levels, which is particularly harmful to children, the elderly, and those with respiratory problems. Some 8,000 of these people will end up in the hospital, and over 24,000 will visit emergency rooms. Cancer rates in the state currently exceed the national average, and toxic air pollutants are believed to be a major contributor to the problem. The Natural Resources Defense Council (NRDC) estimates that nearly 1,500 people die prematurely every year in the New England region from problems aggravated by air pollution.[33]

In recent years a number of studies have been conducted on the unequal exposure to air pollution and other environmental hazards. The findings of these studies point to a consistent pattern of environmental racism and class-based ecological injustices.[34] Within America's urban areas, for instance, lower-income people (particularly those living below the poverty level) are found to be more greatly exposed to combined concentrations of air pollutants than higher-income populations. Similarly, people of color are consistently exposed to significantly more air pollution

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[31] In Massachusetts, *mobile sources* (primarily motor vehicles) are responsible for 42 percent of the total HAP emissions in the state. *Area Sources*, which are smaller air sources that release less than 10 tons per year of any individual HAP and less than 24 tons per year of combined HAPs, emit 51 percent of all HAPs in the state. Examples include gas stations, dry cleaners, and small print shops. *Point sources* are stationary facilities that emits (or has the potential to emit) 10 tons or more per year of any one of the listed HAPS, or 25 tons or more per year of combined HAPs, emit 7 percent of the total HAPs in the state. Examples of point sources include chemical plants, paper mills, power plants, and waste incinerators. See Michelle Toering and Rob Sargent, *Every Breath We Take: How Motor Vehicles Contribute to High Levels of Toxic Air Pollution in Massachusetts* (Boston: A Report for the MASSPIRG Education Fund, July 8th, 1999), pp.1-32.

[32] See Richard Wiles, Jacqueline Savitz, and Brian A. Cohen, *Particulate Air Pollution in Boston: Human Mortality, Pollution Sources and the Case for Tougher Clean Air Standards*, a report by the Environmental Working Group (Washington, DC: 1997), pp.1-2.

[33] See Natural Resources Defense Council (NRDC), *Breathtaking: Premature Mortality Due to Particulate Air Pollution in 239 American Cities* (Washington D.C.: May 1996).

[34] For a concise summary of these studies, see Paul Mohai and Bunyan Bryant, "Demographic Studies Reveal a Pattern of Environmental Injustice," pp.10-24 in Jonathan S. Petrikin (ed.), *Environmental Justice* (San Diego: Greenhaven Press, 1995).

nationwide than whites (with the race gap being wider and more consistent than the income gap).[35] According to the EPA, 57 percent of all whites nationwide live in areas with poor air quality, compared to 80 percent of all Latinos.[36] In Los Angeles, it is estimated that 71 percent of the city's African Americans and 50 percent of the Latinos live in what are categorized as the most polluted areas, compared to only 34 percent of whites.[37] Unequal exposure to air pollutants for lower-income families and people of color is further aggravated by substandard housing; inadequate health care; a lack of public parks and safe spaces; a lack of social services; and so forth.

In a previous study, Nancy Maxwell explored whether polluting industrial land uses were differentially distributed with respect to the racial (percent of minority population) and class (median family income and percent living in poverty) compositions of 351 cities and towns in Massachusetts. She also examined whether higher intensities of polluting land uses were associated with increased incidence of certain cancers. The study used demographic and land use data from three time points spanning the 35-year period from 1950-85, as well as historical data on industry.[38] The study sought to answer two questions: (1) are there inequities in the social distribution of polluting land uses across Massachusetts communities?; and (2) are higher intensities of polluting land uses associated with increased cancer in Massachusetts communities? This study found that traditional manufacturing industries (associated with the "old" economy) inequitably burdened lower-income, higher-poverty, and higher-minority populated communities. The results of the regression analyses of land use and cancer also suggested that higher intensities of total manufacturing and industrial/commercial land uses were associated with a higher

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[35] See Michael Gelobter, "Toward a Model of 'Environmental Discrimination'," in Paul Mohai and Bunyan Bryant, (eds.), *Race and the Incidence of Environmental Hazards: A Time for Discourse* (Boulder, CO: Westview Press, 1992), pp.64-81; and L. Gianessi, H.M. Peskin, and E. Wolff, "The Distributional Effects of Uniform Air Pollution Policy in the U.S.," *Quarterly Journal of Economics* (May 1979: 281-301).

[36] See D.R. Wernete and L.A. Nieves, "Breathing Polluted Air: Minorities are Disproportionately Exposed," *EPA Journal*, March/April 1992, p.16.

[37] See Eric Mann, *L.A.'s Lethal Air: New Strategies for Policy, Organizing, and Action* (Los Angeles: Labor/Community Strategy Center, 1991).

[38] Demographic data came from the U.S. Census; land use data are from a series of statewide aerial surveys, supplemented by U.S. and Massachusetts Census of Manufactures data on manufacturing industry. Cancer incidence data from 1982-1990 came from the Massachusetts Cancer Registry. The cancers of concern, selected on the basis of confirmed or tentative links to agricultural or industrial chemicals, are non-Hodgkin's lymphoma (NHL), leukemia, multiple myeloma, soft tissue sarcoma, and cancers of the brain, stomach, prostate, bladder, kidney, lung, and breast. See Nancy Irwin Maxwell, "Land Use, Demographics, and Cancer Incidence in Massachusetts Communities," (Ph.D. Dissertation: Boston University School of Public Heath, 1996).

incidence of lung cancer (and probably also bladder cancer and non-Hodgkin's lymphoma).[39]

A 1993 study of Essex, Hampden, Middlesex, Norfolk, Suffolk, and Worcester counties in Massachusetts between 1987 and 1992 utilizing Resource Conservation and Recovery Act (RCRA) found that the vast majority of people of color are concentrated in the counties where 82.7 percent of the state's *large quantity generators* (LQG) of toxic materials and all commercial hazardous waste *treatment, storage, and disposal* (TSD) facilities are located. However, a closer analysis of Suffolk County found that 13.2 percent of LQG/ TSD facilities were located in the most-minority communities (census block groups) and that 26.4 percent of the facilities were located in the most-white communities.[40] Thus, it did not appear that in Suffolk County LQG and TSD facilities were concentrated in minority communities. Likewise, the study also found that 34 percent of these facilities were located in the poorest communities (measured by quartiling block groups) – with a median income of $21,615 or less – while 22.6 percent of facilities were found in the wealthiest communities with a median income of $37,452 or higher. Thus, in contrast to many national studies, the investigation concluded that minority communities in Massachusetts do not have a disproportionate share of facilities, suggesting that people of color are more likely to live near a RCRA facility because of their economic status. The study further found that in the six counties 62.7 percent of facilities in the most-minority areas were inspected while 54.9 percent of facilities in the most-white areas were inspected (block group level).[41] The study concluded that there did not appear to be much bias against inspecting facilities located in the most minority areas.[42]

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[39] The incidence of lung cancer was associated with industrial/commercial land use, but only in specific years which suggests that the high-tech industries disproportionately hosted by well-to-do suburbs do not carry the same lung cancer risk as traditional, high air-pollution manufacturing.

[40] One can argue that town are too large for detailed studies of environmental injustice. The size of town can potentially mask racial or economic heterogeneity within the town area. For instance, a town with a 10 percent minority population might be concentrated in a particular portion of the town – the same section of town where polluting industries and facilities may be concentrated. However, analysis at the town level would mask the concentration of hazards in minority neighborhoods.

[41] At the census tract level, 66.7 percent of facilities in the most-minority areas were inspected and 56.9 percent of facilities in the most white areas were inspected. See Michael G. Terner, *A Geographic Information System (GIS) Assisted Approach for Assessing Environmental Equity in the EPA RCRA Program's Site Inspection Selection Process* (Massachusetts Institute of Technology: Master's Thesis, Department of Urban Studies & Planning, May 1993), p. 63.

[42] EPA guidelines demand that each state inspect all land disposal and all commercial hazardous waste treatment, storage or disposal (TSD) facilities every year. Further, 50 percent of the full universe of TSDs in any state must be inspected every year. Thus, every two years, all TSDs should be inspected. Guidelines also require that 8 percent of all large quantity generators (LQGs) in each state must be inspected every year. Theoretically, every 13 years all LQGs will be inspected, at least once. The state has full discretion in selecting which 8 percent of

In this section of the report, we summarize information from the state's Large Quantity Toxics Users who reported to the Massachusetts Toxics Use Reduction Act (TURA) Program from 1990-2002.[43] As required under TURA, manufacturers meeting certain thresholds must report to the public the quantity and types of toxic chemicals they use. A company must report under TURA if is annually manufactures, processes, or uses 10,000 pounds of toxic chemicals or more. These toxic chemicals pose a threat to nearby residents, workers, and the environment from potential accidents, releases on-site into the immediate environment, worker handling, waste disposal, toxins in the product, and product disposal.

Between 1990-2002, some 1,298 distinct TURA-covered industrial facilities utilized nearly 14.228 billion pounds of toxic chemicals in production (does not include quantities for chemicals considered trade secret). During this same time frame, these facilities released on-site some 204,302,113 million pounds of chemical waste byproduct directly into the environment (discharged into the air, ground, underground, or adjacent bodies of water) of the communities in which they were located. This is an amount of pollution equivalent to 2,554 tractor-trailer trucks each loaded with 80,000 pounds of toxic waste.[44] As seen in Table 4A on "Class-Based Disparities in the Location and Pollution Levels of TURA Industrial Facilities (1990-2002)," low income communities ($39,524 or less median household income) and medium-low income communities ($39,525-52,700) together comprise 47 percent of all communities in Massachusetts, but are home to 58.5 percent of all TURA facilities and 79.4 percent of all chemicals used by TURA facilities between 1990-98. More importantly, *these lower income communities received 74.6 percent of all chemical releases into the local environment by TURA facilities during this time*.

LQG facilities should be inspected.

[43] There weree some 520 *Large Quantity Toxics Users* who reported to the Massachusetts Toxics Use Reduction Program (TURA) during the 1998 calendar year. These companies reported using over 1.184 billion pounds of chemicals (not including trade secret chemicals), of which over 132.6 million pounds were generated as waste byproduct. Of this byproduct, some 50.5 million pounds of toxic chemicals were transferred off site (for recycling, recovery, treatment or disposal), while another 12 million pounds were released on-site directly into the environment (discharged into the air, ground, underground, or adjacent bodies of water). When trade secret data is incorporated into the 1998 TURA aggregate quantities, we find that: 1.380 billion pounds of chemicals were used by state industry; 137 million pounds were generated as byproduct; and 64 million pounds of this byproduct was either released on-site into the environment or transferred off-site.

[44] The Toxics Use Reduction Act (TURA) was enacted in 1989, and had a stated 10-year goal of reducing the generation of toxic waste by 50% from the base year of 1987 to 1997. From 1990, the first reporting year, to 1998, there was a 48% reduction production adjusted byproduct. Using the same adjustment method, TURA filers were equally successful in reducing their releases of TRI reported on-site chemicals by 83%. See Massachusetts Department of Environmental Protection, Bureau of Waste Prevention, *1998 Toxics Use Reduction Information Release,* A Report Developed in Conjunction with the Office of Technical Assistance for Toxics Use Reduction, the Toxics Use Reduction Institute, and the Executive Office of Environmental Affair (Spring 2000: 1-34).

While higher income communities ($52,701 or more median household income) represent over half of all communities in the state (53.7%), they house 41.5 percent of all TURA facilities and just 20.6 percent of all chemicals used by TURA facilities. More importantly, only 25.4 percent of all chemical *releases* into the local environment from 1990-2002 occurred in these higher income communities.[45]

Table 4A: Class-Based Disparities in the Location and Pollution Levels of TURA Industrial Facilities (1990-2002)

Median Household Income 2000 U.S. Census N=Number of Towns (Percent of all Towns)		Total Pounds of Chemical Releases (1990-2002)	Total Pounds of Chemical Byproducts (1990-2002)	Total Pounds of Chemical Used in Production (1990-2002)	Number of Distinct TURA Facilities (1990-2002)
$0 to 39,524 (Low Income) N=37 (10.2%)	Count	58,063,865	534,481,153	6,423,801,363	367
	Percent	(28.4%)	(30.8%)	(45.1%)	(28.3%)
	Mean	1,569,294	14,445,437	173,616,253	9.9
$39,525 to 52,700 (Medium – Low Income) N=133 (36.7%)	Count	94,429,327	659,356,937	4,882,618,919	392
	Percent	(46.2%)	(38.0%)	(34.3%)	(30.2%)
	Mean	709,995	4,957,571	36,711,420	2.9
$52,701 to 65,875 (Medium – High Income) N=106 (29.9%)	Count	30,616,097	398,526,169	1,788,806,389	312
	Percent	(15.0%)	(23.0%)	(12.6%)	(24.0%)
	Mean	288,831	3,759,681	16,875,532	2.9
$65,876 and greater (High Income) N=86 (23.8%)	Count	21,192,823	143,180,358	1,132,634,379	227
	Percent	(10.4%)	(8.2%)	(8.0%)	(17.5%)
	Mean	246,428	1,664,888	13,170,167	2.6
Totals N=362 (100%)		204,302,113 (100%) 564,370	1,735,544,617 (100%) 4,794,322	14,227,861,050 (100%) 204,302,113	1,298 (100%) 3.6

[45] A *release* is defined by the Toxics Use Reduction Institute (TURI) as a "discharge of a toxic chemical to the environment. This includes releases to the air, either as a stack or fugitive emission, discharges to bodies of water such as streams or lakes, or discharges to the ground or underground. In contrast, *emission(s)* are a release of toxic or hazardous substance to the environment or a transfer of a toxic or hazardous substance in waste to an off-site location.

In fact, as seen in Table 4B on "Class-Based Disparities in the Exposure Rate to TURA Industrial Facilities (1990--2002)", low income communities average 9.9 TURA facilities per town, some 1,569,294 pounds of chemical releases into the environment per town, and some 107,034 pounds of total chemical releases per every square mile of town space during this time frame. This contrasts sharply in comparison to high income communities, which have an average of 2.6 TURA facilites per town, an average of 246,428 total pounds of chemical releases per town, and 12,656 pounds of chemical releases per every square mile of town space. Therefore, *in comparison to high income communities, low income communities average over 3.7 times as many TURA industrial facilities per town, 6.7 times as many pounds of chemical releases into the environment per town, and over 8.5 times as many pounds of chemical releases per square mile.* Thus, it would appear that the class status of a community is a major determinant in the level of exposure to TURA industrial facilities and environmental releases of chemicals. The data indicate that lower-income communities bear a disproportionate burden of the pollution released by these types of industrial facilities, and are clearly overburdened.

Table 4B: Class-Based Disparities in the Exposure Rate to TURA Industrial Facilities (1990-2002)

Median Household Income 2000 U.S. Census N=Number of Town (Percent of all Towns)	Average Number of TURA Facilities per Town (1990-2002)	Average Number of TURA Facilities per Square Mile (1990-2002)	Average Total Chemical Releases (lbs.) Per Town (1990-2002)	Average Total Chemical Releases (lbs.) per Square Mile (1990-2002)
$0 to 39,524 **(Low Income)** N=37 (10.2%)	9.9	.68	1,569,294	107,034
$39,525 to 52,700 **(Medium –Low Income)** N=133 (37.7%)	2.9	.24	709,995	61,690
$52,701 to 65,875 **(Medium – High Income)** N=106 (29.9%)	2.9	.24	288,831	20,638
$65,876 and greater **(High Income)** N=86 (23.8%)	2.6	.14	246,428	12,656

The data also indicates that communities of color are overburdened. As demonstrated in Table 4C, "Racially-Based Disparities in the Location and Pollution Levels of TURA Industrial Facilities (1990-2002), although white communities (less than 15% people of color) account for 70.3 percent of all chemical releases and 71.3 percent of all TURA facilities, they also account for 90.6 percent of all communities in the state. On the other hand, communities of color receive nearly 30 percent of all TURA pollution and house 28.6 percent of all TURA facilities, but comprise only 9.4 percent of towns in the state.

Table 4C: Racially-Based Disparities in the Location and Pollution Levels of TURA Industrial Facilities (1990-2002)

Non-White Population 2000 U.S. Census N=Number of Towns (Percent of all Towns)		Total Pounds of Chemical Releases (1990-2002)	Total Pounds of Chemical Byproducts (1990-2002)	Total Pounds of Chemical Used in Production (1990-2002)	Number of Distinct TURA Facilities (1990-2002)
Less than 5% **(Low Minority)** N=231 (63.8%)	Count Percent Mean	70,112,185 34.3% 303,516	410,002,350 23.6% 1,774,902	3,058,747,122 21.5% 13,241,330	352 27.1% 1.5
5 to 14.99% **(Low – Moderate Minority)** N=97 (26.8%)	Count Percent Mean	73,446,625 36.0% 757,182	763,297,361 44.0% 7,869,045	5,712,879,098 40.2% 58,895,661	574 44.2% 5.9
15 to 24.99% **(Moderate – High Minority)** N=14 (3.9%)	Count Percent Mean	24,857,248 12.2% 1,775,518	327,521,659 18.9% 23,394,404	1,142,321,899 8.0% 81,594,421	160 12.3% 11.4
25% and greater **(High Minority)** N=20 (5.5%)	Count Percent Mean	35,886,054 17.6% 1,794,303	234,723,246 13.5% 11,736,162	4,313,912,931 30.3% 215,695,647	212 16.3% 10.6
Totals N=362 (100%)		204,302,113 (100%) 564,370	1,735,544,617 (100%) 4,794,322	14,227,861,050 (100%) 39,303,484	1,298 (100%) 4

Table 4D, "Racially-Based Disparities in the Exposure Rate to TURA Industrial Facilities," shows that high minority communities average 11.4 TURA facilities per town and 1.28 facilities for every square mile of community space, compared to an average of just 1.5 facilities per town and .08 facilities per square mile for low minority communities. *In short, high minority communities average over seven times as many TURA industrial facilities per town and sixteen times as many TURA industrial facilities per square mile as low minority communities in*

the Commonwealth. More importantly, communities of color averaged well over 1.77 million pounds of chemical releases into the environment from TURA industrial facilities, while low minority communities averaged 303,516 pounds per town. Furthermore, communities of color averaged over 192,000 pounds of chemical releases into the environment per square mile for 1990-2002. In comparison, low minority communities averaged 19,435 pounds per square mile.

Table 4D: Racially-Based Disparities in the Exposure Rate to TURA Industrial Facilities (1990-2002)

Non-White Population 2000 U.S. Census N=Number of Town (Percent of all Towns)	Average Number of TURA Facilities per Town (1990-2002)	Average Number of TURA Facilities per Square Mile (1990-2002)	Average Total Chemical Releases (lbs.) Per Town (1990-2002)	Average Total Chemical Releases (lbs.) per Square Mile (1990-2002)
Less than 5% (Low Minority) N=231 (63.8%)	1.5	.08	303,516	19,435
5 to 14.99% (Low-Moderate Minority) N=97 (26.8%)	5.9	.37	757,182	44,171
15 to 24.99% (Moderate-High Minority) N=14 (3.9%)	11.4	1.00	1,775,518	192,673
25% and greater (High Minority) N=20 (5.5%)	10.6	1.28	1,794,303	198,479

Thus, *in comparison to low minority towns, communities of color average roughly six as many pounds of total chemical releases into the environment from local TURA facilities; and ten times as many pounds of chemical pollutants per square mile as low minority communities.* Thus, it would appear that the racial status of a community is once again a major determinant in the level of exposure to TURA industrial facilities and pollution. Although the greatest quantity of pollution is released in white communities (because they comprise 90.6 percent of all communities), the pollution rates in communities of color are profoundly higher. The data indicate that communities of color bear a greatly disproportionate burden of the pollution released by the types of industrial facilities.

In addition to the analysis provided above on the overall *quantity* of chemicals released in Massachusetts, we also provide an analysis regarding the *quality* of chemical pollution. The TURA Program lists over 1400 chemicals that are subject to reporting by companies. Various types of chemicals pose different kinds of environmental and human health risks and dangers. Below we analyze the distribution of different *families* of chemical releases that are grouped according to human health considerations. These families of chemicals include: (1) carcinogens, or cancer-causing chemicals; (2) chlorine compounds; (3) common solvents; (4) metals; (5) more hazardous toxic chemicals; (6) organochlorines; (7) persistent bioaccumulative toxins (PBTs); and (8) reproductive toxins. Any given chemical may contain properties which allow it to be classified into more than one family of chemical.[46] In other words, one chemical can pose multiple health risks.

As seen in Table 4E, low income communities are disproportionately impacted by toxic releases in every chemical family. For instance, low income communities comprise just 10.2 percent of all towns in this study, but receive 23.7 percent of all cancer-causing (carcinogenic) chemical releases. They also receive 30.8 percent of all organochlorines, and 27.8 percent of all persistent bioaccumulative toxins (PBTs). Organochlorines and PBTs are of particular concern not only because they are toxic (and often carcinogenic) but also because they remain in the environment for long periods of time, are not readily destroyed, and build up or accumulate in body tissue. For example, the half-life of the organochlorine pesticide toxaphene is fifteen years in the soil, meaning that fifteen years after application, one-half of the pesticide remains in the soil as poison. As a PBT, methylmercury has the ability to build up in the body of animals over time (bioaccumulation) and increase in concentration as one organism eats another organism lower on the food chain (biomagnification). As a result, mercury is extremely dangerous to humans (and especially children). Low income communities also received 45.8 percent of all releases of reproductive toxins – chemicals which affect the reproductive capabilities of people, including potential chromosomal damage (mutagens) and effects on the fetuses (teratogens). Examples of signs and symptoms include birth defects and sterility.

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[46] These classifications are utilized by the Toxics Use Reduction Institute (TURI). *Carcinogens* are any TURA chemical which is also an OSHA carcinogen. The source for this information is the TRI Public Data Release OSHA Carcinogen List. *Common Solvents* are chemicals commonly used in industry for their solvent properties. This list was developed by the technical staff at TURI and at the TURI Surface Cleaning Lab. *Metals* are any TURA chemical which is also a metal. *More hazardous* is a list of 258 TURA SAB More Hazardous chemicals developed by the TURA Science Advisory Board, published in the report *Categorization of the Toxics Use Reduction List of Toxic and Hazardous Substances.* The physical-chemical properties of the toxic chemicals increases their potential for exposure through dispersal in the workplace, and have the highest ranking for carcinogenicity. *Organochlorines* are any TURA chemical which is a carbon containing chlorine compound. *PBTs* are any TURA reported chemical which is on the *Draft EPA PBT Chemical List*, Federal Register, Volume 63, Number 216, pages 60332-60343. Finally, *reproductive toxins* are any TURA chemical which is listed as a reproductive toxin by Physicians for Social Responsibility in the document *Generations at Risk: How Environmental Toxins May Affect Reproductive Health in Massachusetts*.

In contrast, both categories of higher income communities are under-represented in virtually every chemical grouping. Only with respect to PBTs is there a slightly higher proportion of environmental releases (26.6%) than the percentage of high income communities (23.8%) in the state. In contrast, while both categories of lower income communities comprise 46.9 percent of all towns in the study, they receive 72.1 percent of all carcinogens; 79.2 percent of all chlorine compounds; 65.5 percent of common solvents; 79.9 percent of more hazardous chemicals; and 73.2 percent of reproductive toxins.

Table 4E: Cumulative Pollution Rates (in lbs.) by Income and Chemical Group, 1990-2002

Chemical Group	$0 to 39,524 **Low Income Communities** (10.2% of towns)	$39,524 to 52,700 **Medium-Low Income** (36.7% of towns)	$52,701 to 68,875 **Medium-High Income** (29.3% of towns)	$68,876 and Higher **High Income Communities** (23.8% of towns)	**Chemical Group Total Release**
Carcinogens	9,530,356 (23.7%)	19,495,217 (48.4%)	8,336,481 (20.7%)	2,888,300 (7.2%)	**40,250,354 (100%)**
Chlorine Compounds	16,185,775 (20.4%)	46,691,022 (58.8%)	9,531,851 (12.0%)	6,956,936 (8.8%)	**79,365,584 (100%)**
Common Solvents	34,421,807 (34.7%)	30,578,427 (30.8%)	20,328,995 (20.5%)	13,864,070 (14.0%)	**99,193,299 (100%)**
Metals	1,038,948 (38.0%)	555,781 (20.3%)	262,988 (9.6%)	876,080 (32.0%)	**2,733,797 (100%)**
More Hazardous	7,424,767 (23.3%)	17,995,624 (56.6%)	5,161,714 (16.2%)	1,220,835 (3.8%)	**31,802,940 (100%)**
Organochlorines	11,084,726 (30.8%)	9,136,356 (25.4%)	8,829,494 (24.5%)	6,916,051 (19.2%)	**35,966,627 (100%)**
Persistent Bio-accumulative Toxins	3,672,826 (27.8%)	3,232,509 (24.5%)	2,788,217 (21.1%)	3,507,035 (26.6%)	**13,200,587 (100%)**
Reproductive Toxins	26,660,058 (45.8%)	15,954,320 (27.4%)	10,041,082 (17.2%)	5,561,506 (9.6%)	**58,216,966 (100%)**
Total	**110,019,263**	**143,639,256**	**65,280,822**	**41,790,813**	**360,730,154**

As seen in Table 4F, "Cumulative Pollution Rates by Race and Chemical Group, 1990-2002," we find that communities of color are also greatly over-represented in every chemical grouping. For instance, communities of color comprise just 9.4 percent of all towns in the study, but receive 37.6 percent of all carcinogens, 41.8 percent of all more hazardous chemical releases, 31.3 percent of all organochlorines; 32.8 percent of all persistent bioaccumulative toxins, and 37.2 percent of all reproductive toxins.

In contrast, low minority communities are under-represented in virtually every chemical grouping. However, it should also be noted that moderately-low minority communities (5 to 14.99% people of color) are also over-represented in terms of total releases for virtually every chemical group. And while the disparities are not as wide as they are for communities of color, the differences are significant.

Table 4F: Cumulative Pollution Rates (in lbs.) by Race and Chemical Group, 1990-2002

Chemical Group	0 to 4.99% **Low Minority Communities** (63.8% of towns)	5 to 14.99% **Moderately-Low Minority** (26.8% of towns)	15 to 24.99% **Moderately-High Minority** (3.9% of towns)	25% and Greater **High Minority Communities** (5.5% of towns)	**Chemical Group Total Release**
Carcinogens	14,573,414 (36.2%)	10,528,630 (26.2%)	10,310,776 (25.6%)	4,837,534 (12.0%)	**40,250,354 (100%)**
Chlorine Compounds	36,475,454 (46.0%)	24,865,802 (31.3%)	8,523,956 (10.7%)	9,500,372 (12.0%)	**79,365,584 (100%)**
Common Solvents	20,617,384 (20.8%)	47,199,685 (47.6%)	14,904,160 (15.0%)	16,472,070 (16.6%)	**99,193,299 (100%)**
Metals	607,733 (22.2%)	1,174,356 (43.0%)	395,563 (14.5%)	556,145 (20.3%)	**2,733,797 (100%)**
More Hazardous	10,952,927 (34.4%)	7,558,992 (23.8%)	9,299,683 (29.2%)	3,991,338 (12.6%)	**31,802,940 (100%)**
Organochlorines	8,163,243 (22.7%)	16,551,185 (46.0%)	7,133,682 (19.8%)	4,118,517 (11.5%)	**35,966,627 (100%)**
Persistent Bio-accumulative Toxins	2,252,333 (17.1%)	6,625,674 (50.2%)	2,453,561 (18.6%)	1,869,019 (14.2%)	**13,200,587 (100%)**
Reproductive Toxins	12,329,048 (21.2%)	24,208,344 (41.6%)	8,915,921 (15.3%)	12,763,653 (21.9%)	**58,216,966 (100%)**
Total	**105,971,536**	**138,712,668**	**61,937,302**	**54,108,648**	**360,730,154**

SECTION FIVE

UNEQUAL EXPOSURE TO POWER PLANTS

The electric power industry is one of the most polluting industries in New England and the entire country. Power plants emit 67 percent of the sulfur dioxide (SO_2) in the U.S., a noxious gas that irritates the lungs and worsens asthma and causes significant respiratory problems. Power plants also produce over one-third of all mercury pollution, and 23 percent of nitrogen oxides (NOx) emissions, a major contributor to the formation of smog.[47] Smog, also called ground-level ozone, is formed when nitrogen oxides, emitted as a byproduct of burning fossil fuels at electric power plants and in automobiles, mix with volatile organic compounds in the presence of sunlight. Smog is a major trigger of asthma, increased lung inflammation, coughing, and emergency hospitalization due to respiratory distress. The unhealthiest levels of smog are generally recorded during the summer. A recent nationwide study estimated that smog pollution in the summer of 1997 was responsible for more than 6 million asthma attacks, 159,000 emergency room visits and 53,000 hospitalizations (nearly 1,500 people die prematurely every year in New England from problems aggravated by air pollution).[48] Nationwide, sixty-eight percent of African Americans live within 30 miles of a coal-fired power plant. This is the distance within which the maximum effect of the smokestack plume are expected to occur.[49] This is believed to be a contributing factor to a death rate from asthma for African Americans that is twice that of whites (38.7 vs. 14.2 deaths per million population).[50] Power plants also account for 38 percent of carbon dioxide emissions – a greenhouse-causing gas – from the burning of fossil

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[47] See Martha H. Keating and Felicia Davis, *Air of Injustice: African Americans & Power Plant Pollution*, a report by the Black Leadership Forum; Clear the Air; Georgia Coalition for Peoples' Agenda; and The Southern Organizing Committee for Economic and Social Justice (October 2002), pp.4.

[48] See Natural Resources Defense Council (NRDC), *Breathtaking: Premature Mortality Due to Particulate Air Pollution in 239 American Cities* (Washington D.C.: May 1996).

[49] See Martha H. Keating and Felicia Davis, *Air of Injustice: African Americans & Power Plant Pollution*, a report by the Black Leadership Forum; Clear the Air; Georgia Coalition for Peoples' Agenda; and The Southern Organizing Committee for Economic and Social Justice (October 2002), pp.1-15.

[50] See *Minority Lung Disease Data 2000*, American Lung Association, October 2000, available at www.lungusa.org.

fuel. In addition, electric utilities are the leading source sulfuric acid and hydrochloric acid emissions in many states.[51]

Coal and oil-burning power plants, specifically those plants built prior to 1977, are a major source of air pollution in the state. In fact, utilities in Massachusetts are responsible for over 60 percent of the state's soot-forming sulfur dioxide emissions, 15 percent of the state's smog-causing nitrogen oxide emissions and 30 percent of the state's heat-trapping carbon dioxide emissions. Sulfur dioxide (SO_2) emissions are the main precursor to the creation of soot -- tiny particles which penetrate deep into the throat and lungs (and causes an estimated 1,500 premature deaths each year in the northeastern region of the U.S., according to the American Lung Association). In Massachusetts, nearly 1,300 Massachusetts residents die each year from particulate air pollution.[52] Each summer, three quarters of a million Massachusetts residents are put at risk from high smog levels. Some 8,000 of these people will end up in the hospital, and over 24,000 will visit emergency rooms. The people currently most vulnerable to the effects of breathing smoggy air are children, the elderly and people with asthma or other respiratory diseases.[53]

Fossil-fuel power plants in Massachusetts are also responsible for more than 230 pounds of airborne mercury emissions every year. Mercury causes severe damage the neurological system and has developmental effects on fetuses and small children.[54] Mercury is so toxic that a mere one-third of a teaspoon is enough to render the fish of a 25 acre lake unsuitable for children and pregnant women to eat. As a result of a loophole in clean air laws, fourteen plants in New England are legally polluting at much higher levels than newer plants built since 1977. Under the 1970 and 1977 amended Clean Air Act, the oldest fossil-fuel power plants – those built before 1977 – are not required to meet the same emissions standards as newer, cleaner plants.

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[51] For the first time, electric utilities and mining facilities were included in the Environmental Protection Agency's annual toxic inventory report, which reviewed seven industrial sectors. See "EPA names leading toxic polluters," *The Boston Globe* (Friday, May 12, 2000), p.A21.

[52] See Richard Wiles, Jacqueline Savitz, and Brian A. Cohen, *Particulate Air Pollution in Boston: Human Mortality, Pollution Sources and the Case for Tougher Clean Air Standards*, a report by the Environmental Working Group (Washington, DC: 1997), pp.1-2.

[53] See Becky Stanfield, Angie Farleigh and Gina Porreco, *Danger in the Air: Unhealthy Smog Days in 1999* (Washington, D.C.: A Report by the Clean Air Network and U.S. Public Interest Research Group Education Fund, January 2000), p.2.

[54] See Rob Sargent and Michelle Toering, *Dirty Power in the Northeast: A Report on the 1998 Emissions of the Northeast's Dirtiest Power Plants* (Boston: Campaign to Clean Up Polluting Power Plants, 1999).

As indicated in Table 5A, "Racial and Class-Based Disparities in the Location of Power Plants", the state's power plants are disproportionately located in communities of color and lower income communities. Although communities of color comprise just 9.4 percent of all communities in the state, they are home to 29.6 percent of all active power plants. However, they receive only 14.6% of power plant releases of sulfur dioxide, nitrogen oxide, and volatile organic compounds. Likewise, while low and medium-low income communities together comprise 47.9 percent of all towns in the state, they are home to 66.7 percent of all power plants. In fact, medium-low income communities make up 37.7 percent of all communities but see 67.4 percent of all power plant emissions. In contrast, high income communities comprise 23.8 percent of all communities in the state but are home to only one power plant, and 0.2 percent emissions.

Table 5A: Racial and Class-Based Disparities in the Location of Power Plants

Non-White Population 2000 U.S. Census N=Number of Towns (Percent of all Towns)		Number of DEP Active Power Plants (2005)	Tons of SO_2, NOx, VOCs Released (2005)	**Median Household Income** 2000 U.S. Census N=Number of Towns (Percent of all Towns)		Number of DEP Active Power Plants (2005)	Tons of SO_2, NOx, VOCs Released (2005)
Less than 5% (Low Minority) N=231 (63.8%)	Count	11	81,002	**$0 to 39,524 (Low Income)** N=37 (10.2%)	Count	3	7,121
	Percent	40.7%	70.7%		Percent	11.1%	6.2%
5 to 14.99% (Moderately-Low) N=97 (26.8%)	Count	8	16,747	**$39,525 to 52,700 (Med. - Low)** N=133 (37.7%)	Count	15	77,212
	Percent	29.6%	14.6%		Percent	55.6%	67.4%
15 to 24.99% (Moderately-High) N=14 (3.9%)	Count	2	7,348	**$52,701to 65,875 (Med. - High)** N=106 (29.9%))	Count	8	29,968
	Percent	7.4%	6.4%		Percent	29.6%	26.2%
25% and greater (High Minority) N=20 (5.5%)	Count	6	9,448	**$65,876 and greater (High Income)** N=86 (23.8%)	Count	1	244
	Percent	22.2%	8.2%		Percent	3.7%	0.2%
Totals N=362 (100%)		27 100%	114,545 100%	Totals N=362 (100%)		27 100%	114,545 100%

Large power plants pose significant health threats to nearby residents. As shown in Table 5B, "Unequal Exposure to the Top Six Power Plant Polluters in Massachusetts," five of these six large plants are located in low- to medium-low income communities (two plants are in Somerset); indicating a class-bias in the location of the worst polluting power plants in the state. In terms of racial bias, both the Mount Tom (Holyoke) and Mystic (Everett) facilities are located in communities of color. If the numbers were representative, only one (or less) power plants would be located in a community of color. The remaining four power plants are located in low- to moderately-low minority communities. As a result, lower income communities and communities of color are disproportionately burdened by the some of the worst polluting power plants in all of New England.

Table 5B: Location of Large Power Plant Polluters in Massachusetts (2003)

Facility Name and Town	Emissions of SO_2 (tons)	Emissions of NOx (tons)	Emissions of CO_2 (tons)	Emissions of Mercury (lbs.)	Class Status of Town	Racial Status of Town
Brayton Point in Somerset	35,888	10,847	7,023,893	180	Medium-Low Income	Low Minority
Canal Station in Sandwich	23,471	4,890	4,019,279	23	Medium-High Income	Low Minority
Salem Harbor in Salem	11,338	3,310	2,474,075	6	Medium-Low Income	Moderately-Low Minority
Mystic River in Everett	5,837	1,343	3,933,468	N/A	Medium-Low Income	Moderately-High Minority
Mount Tom in Holyoke	4,790	1,700	1,140,057	8	Low Income	High Minority
Somerset Operations in Somerset	3,175	968	624,276	17	Medium-Low Income	Low Minority

Again, the potential health impacts for residents living in close proximity to these facilities are severe. Five of these dirtiest power plants in the state – the Canal, Brayton Point, Salem Harbor, Mount Tom, and Mystic plants – have emitted pollutants in recent years at a rate that is from 2.9 to 4.0 times the emission rate of plants built after 1977. The five plants are responsible for 89 percent of sulfur dioxide emissions and 57 percent of nitrous oxide emissions from all stationary sources in Massachusetts (the Brayton Point plant is the largest, most polluting power plant in all of New England). In fact, these five plants are responsible for more than 50 percent of the power plant pollution in all of New England.[55]

According to a 2000 report by the Harvard School of Public Health, current emissions from the 805 megawatt Salem Harbor (Salem) and 1611 megawatt Brayton Point (Somerset) coal-fired power plants alone can be linked to 43,300 asthma attacks and nearly 300,000 daily incidents of upper respiratory symptoms per year among the 32 million people residing in New England, eastern New York, and New Jersey. An additional 159 premature deaths can be attributed to this pollution each year. However, the health risks are greatest for those living in communities adjacent to these plants. Twenty percent of the total health impact occurs in the 8 percent of the population that lives within 30 miles of the facilities.[56] Again, four of the six worst power plants are located in lower income communities, where the median household income is less than $52,700, while two of the plants are located in communities of color.

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[55] Data for the first half of 1999 shows significant increases in nitrogen oxide and carbon dioxide, and slight decreases for sulfur dioxide (with the exception of the Brayton Point and Canal plants, which showed considerable gains). However, it should be noted that the overall reductions in sulfur dioxide recorded during that time frame stemmed from the fact that many units were shut down for repairs or maintenance – and not from improvement in air pollution control technologies. "Reports show that the Salem Harbor Plant in Salem was in fact shut down for good amount of time due to a fire at the plant, thus resulting in lower emission outputs. Even taking this into account, the emission rate of sulfur dioxide at Salem was still four times the emission rate of new coal-fire plants. The average emission rate of sulfur dioxide for all of Massachusetts was 1.04 lbs/mmBTU, 3.46 times the 0.3 lbs/mmBTU rate for newer, cleaner coal plants. See Michelle Toering, with Rob Sargent and Cindy Luppi, *Pollution Rising: New England Power Plants Emissions Trends 1st Half 1998 vs. 1st Half 1999* (Boston: A Report for the Campaign to Clean Up Polluting Power Plants, 1999), pp.2-4.

[56] See Jonathan Levy, John D. Spengler, Dennis Hlinka, and David Sullivan, *Estimated Public Health Impacts of Criteria Pollutant Air Emissions from the Salem Harbor and Brayton Point Power Plants*, A report commissioned by the Clean Air Task Force (Harvard School of Public Health and Sullivant Environmental Consulting, May, 2000).

SECTION SIX

UNEQUAL COMMUNITY EXPOSURE TO CUMULATIVE ENVIRONMENTAL HAZARDS

Many past studies on the disproportionate exposure of low income communities and communities of color have focused on single indicators of environmental hazards. This study provides a composite measure to assess community exposure rates which includes all hazardous facilities and sites. We have developed a point system which weighs the average risks of each various type of hazardous facility/site to arrive at a cumulative measure of community exposure to all potential hazards. The point system is shown in Table 6A on the following two pages.

Table 6A: Environmental Hazard Point System for 2005

Type of Hazardous Facility or Site	Points for Rating Severity of Each Facility or Site
Sites and Releases	
EPA National Priority List Site	25
DEP TIER 1A Site	10
DEP TIER 1B	8
DEP TIER 1D (Formerly defaulted to TIER 1B)	8
DEP TIER 1C	6
DEP TIER 2	4
DEP Other Sites	1
Landfill Types (O – Operating, NO – Not Operating)	
Ash Landfill (O)	6
Ash Landfill (NO)	3
Demolition Landfill (O)	6
Demolition Landfill (NO)	3 Text
Illegal Site (O)	6
Illegal Site (NO)	3
Municipal Incinerator (O)	10

Type of Hazardous Facility or Site	Points for Rating Severity of Each Facility or Site
Sites and Releases	
Municipal Incinerator (NO)	3
Recycling Facility (O)	4
Recycling Facility (NO)	2
Resource Recovery Facility (O)	10
Resource Recovery Facility (NO)	3
Municipal Solid Waste Landfill (O)	6
Municipal Solid Waste Landfill (NO)	3
Sludge Landfill (O)	6
Sludge Landfill (NO)	3
Transfer Station (O)	6
Transfer Station (NO)	3
Tire Pile (All tire piles)	6
Industrial Facilities	
TURA Facilities	5

To determine the cumulative exposure to environmentally hazardous facilities and sites, we totaled the points for each hazardous facility and site in each community. Since geographically larger communities could have more facilities and sites, it is necessary to control for the spacial size of each community. This can be done by calculating the average number of hazard points per square mile. This results in a more valid measure of exposure rate. When this is done we find gross imbalances in average hazard point totals for lower income communities and communities of color. As indicated in Table 6B, "Unequal Exposure to All-types of Hazardous Facilities/Sites Combined," low minority communities (less than 5% people of color) average only 4.3 points per square mile, compared to 87.7 points per square mile for high minority communities. In other words, *high minority communities face a cumulative exposure rate to environmentally hazardous facilities and sites which is over twenty times greater than low minority communities*. In fact, there is consistently sharp increase in the cumulative exposure rate to these hazardous facilities/sites which directly corresponds to increases in the size of the minority population in all communities. Without question, it would appear that communities of color bear a much greater environmental burden than white communities.

Table 6B: Unequal Exposure to All-Types of Hazardous Facilities/Sites Combined

Non-White Population 2000 U.S. Census N=Number of Towns (Percent of all Towns)	Average Number of Hazard Points per Square Mile	**Median Household Income** 2000 U.S. Census N=Number of Towns (Percent of all Towns)	Average Number of Hazard Points per Square Mile
Less than 5% (Low Minority) N=231 (63.8%)	4.3	**$0 to 39,524 (Low Income)** N=37 (10.2%)	35.3
5 to 14.99% (Low - Moderate) N=97 (26.8%)	15.7	**$39,525 to 52,700 (Med. – Low Income)** N=133 (37.7%)	14.3
15 to 24.99% (Moderate - High) N=14 (3.9%)	54.9	**$52,701to 65,875 (Med. – High Income)** N=106 (29.9%)	10.3
25% and greater (High Minority) N=20 (5.5%)	87.7	**$65,876 and greater (High Income)** N=86 (23.8%)	8.5
Totals N=362 (100%)	13.9	Totals N=362 (100%)	13.9

Likewise, as indicated in Table 6B, low income communities ($39,525<) average 35.3 environmental hazard points per square mile. This rate stands in dramatic contrast to the exposure rates for all other communities (where median household income is $39,525 or greater), which ranges from 8.5 to 14.3 points per square mile. As a result, *low income communities face a cumulative exposure rate to environmentally hazardous facilities and sites which is two-and-a-half to four times greater than all other communities in the state*. As is the case with communities of color, low income communities are disproportionately exposed to environmental hazards of all kinds. Ecological racism and class-based environmental injustices appear to be profound in the Commonwealth of Massachusetts.

This claim is confirmed in Table 6C, "Most Extensively Overburdened Communities in Massachusetts: Total Environmental Hazard Points per Town," which analyzes the twenty communities with the greatest number of environmentally hazardous industrial facilities and sites.

Utilizing a method whereby the point totals for all hazards present in the community are added together, the table reveals that seventeen of the twenty most extensively overburdened towns in Massachusetts are of lower income status. *In fact, 10 of the worse 20 towns are classified as low income communities, where the median household income is less than $39,525.*

In terms of racial disparities, we similarly find that *14 of the 20 most extensively overburdened towns in the state are communities of color.* This is significant in light of the fact that there are only 34 communities in the entire state where 15 percent or more of the population are people of color. *In fact, seven of the top ten most extensively overburdened communities are high minority communities (where 25 percent of the community are made up of people of color)!* Again, high minority communities comprise only 5.5 percent of all towns in the state, yet they comprise 80 percent of the ten most extensively overburdened towns.

These disparities are further explored in Table 6D, "Most Intensively Overburdened Communities in Massachusetts: Total Hazard Points per Square Mile." This table calculates the point totals for all hazards present in the community divided by the total area of the town. This controls for the size of a community, and paints a more accurate portrayal of the density of environmental hazards. *As seen in the table, 17 of the 20 most intensively overburdened towns in Massachusetts are of lower income status (median household income of less than $52,701). In fact, 8 of the 20 towns are classified as low income communities (where median household income is less than $39,525). Likewise, 16 of these 20 intensively overburdened towns in the state are communities of color.* As previously mentioned, this is significant in light of the fact that there are only 34 communities of color out of 362 communities in the entire state. *In fact, 12 of the 20 most intensively overburdened towns are of high minority status (25% or more people of color). Again, there are only twenty high minority communities in the state, and more than half appear on this list of the worst twenty rankings.*

Table 6C: Most Extensively Overburdened Communities in Massachusetts (Based on Total Environmental Hazard Points)

Rank	Town Name	Total Points	Class Status of Town *	Racial Status of Town**
1	Worcester	1,698	Low Income ($35,623)	Moderately-High Minority Pop. (22.9%)
2	Boston - Downtown	1,449	Medium-Low Income ($45,053)	High Minority Pop. (29.9%)
3	Springfield	1,222	Low Income ($30,417)	High Minority Pop. (43.9%)
4	Cambridge	1,191	Medium-Low Income ($47,979)	High Minority Pop (31.9%)
5	New Bedford	964	Low Income ($27,569)	Moderately-High Minority Pop. (21.1%)
6	Lowell	807	Low Income ($39,192)	High Minority Pop. (31.4%)
7	Boston – East Boston	781	Low Income ($31,310)	High Minority Pop. (32.2%)
8	Boston – Dorchester	770	Low Income ($37,890)	High Minority Pop. (65.8%)
9	Brockton	709	Low Income ($39,507)	High Minority Pop. (38.5%)
10	Boston – South Boston	661	Medium-Low Income ($40,311)	Moderately-Low Minority Pop. (13.0%)
11	Fall River	658	Low Income ($29,014)	Moderately-Low Minority Pop. (8.8%)
12	Framingham	654	Medium-High Income ($54,288)	Moderately-High Minority Pop. (20.2%)
13	Everett	606	Medium-Low Income ($40,661)	Moderately-High Minority Pop. (20.3%)
14	Waltham	598	Medium-High Income ($54,010)	Moderately-High Minority Pop. (17.0%)
15	Pittsfield	596	Low Income ($35,655)	Moderately-Low Minority Pop. (7.4%)
16	Somerville	589	Medium-Low Income ($46,315)	Moderately-High Minority Pop. (23.0%)
17	Woburn	589	Medium-High Income ($54,897)	Moderately-Low Minority Pop. (9.4%)
18	Quincy	578	Medium-Low Income ($47,121)	Moderately-High Minority Pop. (20.4%)
19	Lynn	576	Low Income ($37,364)	High Minority Pop. (32.1%)
20	Salem	560	Medium-Low Income ($44,033)	Moderately-Low Minority Pop. (14.6%)

* 17 of the 20 towns are of lower-income status $52,700<)

** 14 of the 20 towns are communities of color (15%> minority)

Table 6D: Most Intensively Overburdened Communities in Massachusetts (Total Environmental Hazard Points per Square Mile)

Rank	Town Name	Points per Square Mile	Class Status of Town	Racial Status of Town
1	Boston – Downtown	321.2	Medium-Low Income $45,053	High Minority (29.9%)
2	Boston – South Boston	211.2	Medium-Low Income $40,311	Moderately-Low Minority (13.0%)
3	Chelsea	187.9	Low Income $30,161	High Minority (42.1%)
4	Boston - Charlestown	183.2	Medium-High Income $56,110	Moderately-High Minority (17.7%)
5	Boston – East Boston	173.2	Low Income $31,310	High Minority (32.2%)
6	Cambridge	167.1	Medium-Low Income $47,979	High Minority (31.9%)
7	Everett	165.5	Medium-Low Income $40,661	Moderately-High Minority (20.3%)
8	Somerville	139.6	Medium-Low Income $46,315	Moderately-High Minority (23.0%)
9	Boston - Dorchester	127.7	Low Income $37,890	High Minority (65.8%)
10	Boston - Roxbury	123.9	Low Income $27,133	High Minority (89.9%)
11	Boston – Allston/Brighton	107.3	Low Income $38,941	High Minority (26.5%)
12	Watertown	91.6	Medium-High Income $59,764	Moderately-Low Minority (8.6%)
13	Malden	75.6	Medium-Low Income $45,654	High Minority (27.9%)
14	Lawrence	74.4	Low Income $27,983	High Minority (51.4%)
15	Boston – Jamaica Plain	72.0	Medium-Low Income $41,524	High Minority (41.0%)
16	Lowell	55.5	Low Income $39,192	High Minority (31.4%)
17	Boston – Hyde Park	46.2	Medium-Low Income $44,704	High Minority (52.7%)
18	Woburn	45.7	Medium-High Income $54,897	Moderately-Low Minority (9.4%)
19	Medford	44.8	Medium-Low Income $52,476	Moderately-Low Minority (13.6%)
20	Worcester	44.0	Low Income $35,623	Moderately-High Minority (22.9%)

* 17 of the 20 towns are of lower-income status ($52,700<)

** 16 of the 20 towns are communities of color (15%> minority)

In Table 6E, "Environmental Rankings of Low Income Communities in Massachusetts," we have listed all 37 low income towns in the state. These rankings include "most extensively overburdened" (most hazard points per town) and "most intensively overburdened" (most total points per square mile). Fifteen of these low income communities are among the thirty most extensively overburdened communities in the state. In addition, thirteen of these low income communities are among the thirty most intensively overburdened communities in the state. Hence, it would appear that the class standing of a community is a major factor in determining the total environmental burden of a community. However, on closer inspection, there are two findings that should be noted. First, all thirteen of the low income communities that are among the most intensively overburdened are communities of color. In addition, twelve of the 15 low income communities that make the list of the most extensively overburdened towns are also communities of color. Hence, race may be trumpeting class in determining these rankings. Secondly, a number of these low income communities (Gosnold, Monroe, Sunderland, Plainfield, and Hawley) are among the *least burdened* communities in the state.

In Table 6F, "Environmental Rankings of Communities of Color in Massachusetts," we have listed all 34 communities of color in Massachusetts. These rankings also include the state's most extensively overburdened communities (most hazard points per town) and most intensively overburdened communities (most hazard points per square mile). The findings are rather remarkable. As indicated in Table 6F, communities of color make up 19 (or 63%) of the 30 most extensively overburdened communities in the state. Similarly, *communities of color comprise 24 (or 80%) of the 30 most intensively overburdened communities – what we consider to be the most environmentally hazardous towns in the state*. These findings are significant. Again, communities of color comprise only 10% (or 34) of all 362 towns in the study. If the numbers were egalitarian, you would expect only three communities of color to make the list of the most hazardous towns.

Put another way, if you live in a white community, then you have a 1.8 percent chance of living in the most environmentally hazardous communities in the state.. However, if you live in a community of color, then there is a 70.6 percent chance that you live in one of the most hazardous towns. In short, if you live in a community of color, you are thirty-nine times more likely to live in one of the most environmentally hazardous communities in Massachusetts. The conclusion to be drawn from this analysis is that the communities most heavily burdened with environmentally hazardous industrial facilities and sites are overwhelmingly low income towns and/or communities of color. Clearly, not all Massachusetts residents are polluted equally – working class families and people of color are disproportionately impacted. Governmental action is urgently required to address these disparities.

Table 6E: Environmental Rankings of Low Income Communities (37 Total)

Town	Income	Total Points	State Ranking by Total Points	Points per Square Mile	State Ranking by Points per Square Mile
GOSNOLD	$22,344	13	338	0.1	362
MONROE	$25,500	17	322	1.6	281
BOSTON - ROXBURY (minority)	$27,133	488	25	123.9	10
NEW BEDFORD (minority)	$27,569	964	5	40.1	23
NORTH ADAMS	$27,601	197	96	9.6	110
LAWRENCE (minority)	$27,983	552	22	74.4	14
FALL RIVER	$29,014	658	11	17.2	64
CHELSEA (minority)	$30,161	466	30	187.9	3
SPRINGFIELD (minority)	$30,417	1222	3	36.8	28
HOLYOKE (minority)	$30,441	445	35	19.5	57
BOSTON - EAST BOSTON (minority)	$31,310	781	7	173.2	5
ADAMS	$32,161	116	159	5.1	166
PROVINCETOWN	$32,716	85	199	4.9	170
BOSTON - MATTAPAN (minority)	$32,748	107	169	38.1	26
GREENFIELD	$33,110	259	64	11.8	96
ATHOL	$33,475	145	131	4.3	177
MONTAGUE	$33,750	46	259	1.5	284
SOUTHBRIDGE	$33,913	198	95	9.6	109
WARREN	$34,583	86	197	3.1	213
WORCESTER (minority)	$35,623	1698	1	44.0	20
PITTSFIELD	$35,655	596	15	14.1	82
CHICOPEE	$35,672	502	24	21.0	50
ORANGE	$36,849	113	161	3.1	212
WARE	$36,875	91	186	2.3	244
FITCHBURG (minority)	$37,004	454	32	16.2	73
TISBURY	$37,041	74	210	9.2	111
REVERE (minority)	$37,067	402	37	40.1	24
SUNDERLAND	$37,147	19	318	1.3	286
PLAINFIELD	$37,250	14	334	0.7	326
GARDNER	$37,334	266	62	11.6	97
LYNN (minority)	$37,364	576	19	42.7	22
BOSTON - DORCHESTER (minority)	$37,890	770	8	127.7	9
HAWLEY	$38,125	9	354	0.3	354
WEBSTER	$38,169	208	89	14.3	80
BOST.-ALLSTON/BRIGHT. (minority)	$38,941	468	29	107.3	11
LOWELL (minority)	$39,192	807	6	55.5	16
BROCKTON (minority)	$39,507	709	9	32.8	32

Table 6F: Environmental Rankings of Communities of Color (34 Total)

Town	Percent of Population that is Non-White	Total Points	State Rank by Total Points	Total Points per Square Mile	State Rank by Total Points per Square Mile
BOSTON - MATTAPAN	94.3	107	169	38.1	26
BOSTON - ROXBURY	89.9	488	25	123.9	10
BOSTON - DORCHESTER	65.8	770	8	127.7	9
BOSTON - HYDE PARK	52.7	202	92	46.2	17
LAWRENCE	51.4	552	22	74.4	14
AQUINNAH	46.5	13	338	0.3	351
SPRINGFIELD	43.9	1222	3	36.8	28
CHELSEA	42.1	466	30	187.9	3
BOSTON - JAMAICA PLAIN	41.0	221	84	72.0	15
BROCKTON	38.5	709	9	32.8	32
BOSTON - ROSLINDALE	37.6	128	148	34.4	29
RANDOLPH	37.2	180	104	17.1	66
HOLYOKE	34.2	445	35	19.5	57
BOSTON - EAST BOSTON	32.2	781	7	173.2	5
LYNN	32.1	576	19	42.7	22
CAMBRIDGE	31.9	1191	4	167.1	6
LOWELL	31.4	807	6	55.5	16
BOSTON - DOWNTOWN	29.9	1449	2	321.2	1
MALDEN	27.9	387	39	75.6	13
BOSTON - ALLSTON/BRIGHTON	26.5	468	29	107.3	11
SOMERVILLE	23.0	589	16	139.6	8
WORCESTER	22.9	1698	1	44.0	20
NEW BEDFORD	21.1	964	5	40.1	23
AMHERST	20.7	135	142	4.9	171
QUINCY	20.4	578	18	21.5	49
EVERETT	20.3	606	13	165.5	7
FRAMINGHAM	20.2	654	12	24.7	44
BROOKLINE	18.9	267	61	39.2	25
FITCHBURG	18.1	454	32	16.2	73
BOSTON - CHARLESTOWN	17.7	251	68	183.2	4
WALTHAM	17.0	598	14	43.9	21
SHIRLEY	16.1	39	274	2.5	240
REVERE	15.7	402	37	40.1	24
LANCASTER	15.5	91	186	3.2	207

And the environmental divide between whites and people of color, as well as the working poor and the middle class, has continued to widen in recent years. During the 1990s, the Boston metropolitan area grew by 262,000 people, or 6.4 percent. Eighty percent of this population increase occurred in the suburbs surrounding Boston, and was fueled by "white flight" from the inner city. In all, more than 47,000 whites left the City of Boston, while suburban communities such as Franklin, Mansfield, Plymouth, and Taunton gained about 90,000 whites. As the whites moved out of neighborhoods such as East Boston, nearly 62,000 residents of color (especially recent Asian and Latino immigrants) moved in to replace them. As a result, whites dropped sharply from 59 percent of the City's population in 1990 to 49.5 percent in the year 2000.[57] Although Boston neighborhoods are becoming more multi-ethnic, the economic segregation of people of color continues. According to the Metro Boston Equity Initiative of the Civil Rights Project at Harvard University, poor residents of color are twice as likely to live in high poverty neighborhoods (where over 20 percent of residents are poor) and three times as likely to live in severely distressed neighborhoods than are poor whites. In fact, African-American and Latino households with incomes over $50,000 are more likely to live in high poverty neighborhoods than are white households with incomes under $20,000. As a result, racial segregation in Metro Boston is far more intense than income differences would produce. As identified by the Civil Rights Project, much of the problem lies with the differential treatment people of color receive in the mortgage market.[58]

There is a disturbing pattern of mortgage lending in Massachusetts that serves to reproduce highly-segregated patterns of residential location by race/ethnicity. Just a handful of town and cities – typically the most polluted and environmental degraded communities in the Bay State – account of the majority of loans given to African-Americans and Latinos. For instance, just four communities (Brockton, Randolph, Lynn, and Lowell) typically receive more than half of all home-purchase loans to African-Americans, while five other communities (Lawrence, Lynn, Chelsea, Brockton, and Revere) receive more than half of all home-purchase loans to Latinos.[59] With the exception of Randolph, every one of these communities is ranked as among the most environmentally contaminated communities in Massachusetts (see Table 6F). In addition, African

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[57] Blacks comprise roughly a quarter of Boston residents (the largest minority group), and is highly concentrated in the city neighborhoods of Roxbury, Mattapan, South Dorchester and Hyde Park. Roughly a quarter of the city's population are foreign-born (27 percent). Some 14 percent are immigrants who came to Boston over the last decade. Latinos now make up 39 percent of the population in East Boston. See Nancy McArdle, "Race, Place, and Opportunity: Racial Change and Segregation in the Boston Metropolitan Area: 1990-2000," prepared for the Harvard University Civil Rights Project (April 2003), p.1.

[58] See Jim Campen, "The Color of Money in Greater Boston: Patterns of Mortgage Lending and Residential Segregation at the Beginning of the New Century," Prepared for the Metro Boston Equity Initiative of the Harvard Civil Rights Project (January 2004), pp.3-8.

[59] Campen, 2004, *op.cit.*, p.3-8.

Americans and Latinos *at all income levels* are more than twice as likely to be rejected for a home-purchase mortgage loan than are white applicants *at the same income levels*.[60] Racial discrimination of this sort has severely restricted home-ownership opportunities for people of color – opportunities that have facilitated large-scale class/geographic mobility for most white Americans out of the more polluted and distressed areas.[61] More than two-thirds (67.8% of the housing units in the city of Boston are rental units (rather than owner-occupied): with home ownership rates for Latinos only one-third those of whites (21.7% vs. 65.8%). For African-Americans, ownership rates (31.5%) are half those of whites.[62]

[60] Campen, 2004, *op.cit.*, p.3.

[61] See Melvin L. Oliver and Thomas A. Shapiro, *Black Wealth/White Wealth: A New Perspective on Racial Inequality* (New York, NY: Routledge, 1995).

[62] See Campen, 2004, *op.cit.,* p.9-18.

SECTION EIGHT

WHAT CAN BE DONE?: POLICY RECOMMENDATIONS FOR ADDRESSING ENVIRONMENTAL INJUSTICES IN THE COMMONWEALTH

As suggested by the evidence presented in this report, all people are not polluted equally in the Commonwealth of Massachusetts. Ecologically hazardous industrial facilities and waste sites are instead disproportionately located in communities of color and lower-income communities. As a result, citizens do not share the same access to a healthy environment. Policy-makers need to develop and implement a plan to reduce these disparities for ecologically overburdened communities, beginning with public hearings on environmental injustices so that those who are affected can voice their concerns. As part of these efforts, the state must also begin to more systematically address the environmental injustices documented in this report. This includes the establishment of local, state and federal government programs and policies which insure environmental equity; avoid the siting of future hazardous facilities/sites in already overburdened lower income communities and communities of color; provide resources to these overburdened communities in order to create environmental amenities which can partly offset other environmental risks; and promote greater citizen participation in the problem-solving and decision-making processes. Elected officials, policy-makers, government agency staff, community activists, and ordinary citizens must work together to overcome the profound environmental injustices that exist in the Commonwealth of Massachusetts. It is also important that any strategies simultaneously address both the racial and class contexts of environmental injustice.

The most immediate mission is to dismantle the mechanisms by which government agencies and private business displace social and ecological burdens onto people of color and working class families. At this point in time, the Executive Office of Environmental Affairs (EOEA) has established an environmental justice (EJ) policy. This policy needs to be expanded and turned into law that would be binding on future administrations. Such EJ legislation has been proposed – termed *An Act to Promote Environmental Justice in the Commonwealth* – and includes measures for enhancing the education, notification, and participation of community residents in state-based environmental-problem solving. More specifically, the legislation should assist communities in determining whether they qualify for consideration under the law and establish an EJ Advisory Committee to the Director of Environmental Justice and Brownfields Redevelopment in the Office of the Secretary. Such legislation should also support the creation of alternative information outlets that service EJ Populations for the purpose of seeking public comments or publishing public notices, and direct agencies to develop and implement a formal strategy to enhance their public participation and input to agency decision making.

The overall priorities of any new EJ legislation should be to: (1) *increase public participation* and outreach through EJ training programs for government staff (including greater language accessibility); (2) *minimize risks* by targeting compliance, enforcement and technical assistance to EJ populations, and enhance Massachusetts Environmental Policy Act (MEPA) review of new or expanding large sources of air emissions and regional waste facilities in EJ neighborhoods; (3) *encourage investments* by expediting MEPA review of brownfields redevelopment projects that offer opportunities to clean up contaminated sites and bring them into clean productive use; (4) *expand existing brownfields redevelopment efforts* to support the creation of an inventory of Underutilized Commercial/Industrial Properties in the Commonwealth, incorporating EJ as a criterion for awarding technical assistance, grants, audits and toxic waste site investigations in affected communities, as well as targeting resources to more effectively create, restore, and maintain open spaces located in EJ neighborhoods; and (4) *promote cleaner development* by encouraging economic development projects that incorporate state-of-the-art pollution control technology, and alternatives to hazardous chemicals in neighborhoods where EJ populations reside. Furthermore, the legal authority of *An Act to Promote Environmental Justice in the Commonwealth* should be extended beyond environmental agencies to all state agencies, requiring each to undertake and EJ-oriented analysis whenever a potentially hazardous facility is sited or expanded in a lower-income town and/or community of color.

In addition to working to address disparities in exposure to environmental hazards, policy makers need longer-term approaches aimed at reducing the overall amount of pollution. An EJ policy aimed at eliminating the *discriminatory* or *unequal distribution* of ecological hazards is an essential step in the right direction, but alone it is not sufficient. In this respect, while the proposed EJ legislation described above offers important protections often denied to poorer communities of color, it is just one piece in a larger puzzle. Distributive justice has as it primary goal a more even distribution of ecological hazards across all communities. But EJ policy should not just about more fairly distributing pollution risks. Rather, the necessity is for a more "productive" EJ politics with an orientation toward the prevention of environmental risks from being produced in the first place. A movement for environmental justice is of limited efficacy if the end result is to have all residents poisoned to the same perilous degree, regardless of race, color, or class. Efforts to achieve environmental justice must be about the politics of production per se and the *elimination* of the ecological threat, and not just the "fairer" distribution of ecological hazards via better government regulation of inequities in the marketplace.

Laws and regulations against procedures that result in the unequal distribution of environmental problems (*distributional inequity*) will have limited success unless policy-makers also address the procedures by which the environmental problems are *produced* in the first place (*procedural inequity*). It is precisely this distinction between *distributional justice* versus *productive justice* that policy-makers in Massachusetts must begin to address. The transition to *clean production* and utilization of the *precautionary principle* are key components of a more "productive" EJ politics. The precautionary principle posits that if there is a strong possibility of

harm (instead of scientifically proven certainty of harm) to human health or the environment from a substance or activity, precautionary measures should be taken.[63] Standard environmental policy approaches in Massachusetts utilize risk assessments to determine "acceptable" levels of public exposure to industrial pollutants, which are then applied as a general standard on industry. There are a number of significant flaws with this approach. For instance, policy makers often assume that "dilution is the solution," that the wide dispersion of environmental pollution from various sources leads to what are considered safe levels of public exposure. However, if pollution is highly concentrated in poorer communities of color, as this report documents, then this approach can be grossly inadequate. Furthermore, the scientific standards of proof for demonstrating the vast array of potential health impacts of a chemical are very difficult to demonstrate conclusively. Over 70 percent of the 3,000 high production volume (HPV) chemicals produced by industry (HPV chemicals are produced in quantities of one million pounds or more annually) have not undergone even the simplest health and safety testing.[64] All communities (and especially overburdened EJ communities) must be granted additional protections as offered by the precautionary principle, which includes: promoting additional study of activities of concern; shifting the burden of proof so that a chemical/activity must be proven safe; providing incentives for preventive behavior; and/or enacting clean production measures such as bans or phaseouts of substances suspected of causing harm.[65]

State policy-makers should work for the adoption of proactive, prevention-oriented policies that make use of a precautionary approach (the Precautionary Principle) to toxic hazards, call for the adoption of safer alternatives (the Substitution Principle), and provide a transition blueprint to a clean economy that is beneficial for workers and EJ communities (Clean Production). As our research demonstrates, the release of toxic chemicals by industry is disproportionately concentrated in communities of color and working class towns. The most comprehensive approach to address these disparities in encased in the proposed legislation, *An Act for a Healthy Massachusetts: Safer Alternatives to Toxic Chemicals*. This bill aims to create a model for the gradual replacement of toxic chemicals with safer alternatives. It initially targets ten substances that are currently replaceable with feasible safer alternatives. It accomplishes this goal by laying out a careful process to examine all available evidence to identify safer alternatives and manufacturing processes that will benefit the health of workers, customers, children, the environment, and the economy. The proposed program would stimulate research and development on new technologies and solutions when a safer alternative is not currently feasible. It would also create programs to

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[63] See C. Raffensperger and Joel Tickner J (eds.), *Protecting Public Health and the Environment: Implementing the Precautionary Principle* (Washington, DC: Island Press, 1999).

[64] See Environmental Defense Fund, *Toxic Ignorance: the Continuing Absence of Basic Health Testing for Top-Selling Chemicals in the United States* (Washington, DC: 1997).

[65] See Raffensperger and Tickner, 1999; and Mary O'Brien, *Making Better Environmental Decisions: An Alternative to Risk Assessment* (Cambridge, MA: MIT Press, 2000).

assist workers and businesses in the transition to the safest available alternatives, with funding provided through a fee on toxic chemicals.

The goal of this legislation is to ensure that the targeted chemical only be phased out from use when the state determines that there is a feasible safer alternative available within a reasonable period of time. At the same time, the state would try to avoid seeing companies simply moving to another equally toxic alternative. More specifically, the bill would require the Department of Environmental Protection (DEP) to develop and implement an Action Plan for each priority toxic chemical identified, with the focus being placed on chemical uses that have the biggest health and environmental impacts. Action Plans are designed to create an orderly, achievable transition process for moving to safer alternatives by undertaking a full analysis of the potential substitutes and alternatives. An implementation plan details the steps and timeline required to substitute the use or emission of the priority toxic chemical by the safer alternatives. The transparency of state actions would be insured via the creation of a Safer Alternatives Oversight Board. To be comprised of fourteen members from health, labor, environment and environmental justice, and business associations appointed by the Secretary of Environmental Affairs, the board would participate in developing the Action Plans by holding hearings, reviewing consultant work, and participating in working groups. A Science Advisory Panel, consisting of members with expertise in the environmental and health sciences would review DEP's characterization of usage category alternatives.

A number of other legislative initiatives could also push the state toward the adoption of a more "productive" environmental justice politics. *An Act to Promote Sustainable Agriculture and the Use of Non-Toxic Pest Management* would remove the sales tax exemption from toxic pesticides and fertilizers and dedicate those dollars to a Non-Toxic Pest Management Fund. In addition, 30% of existing revenues raised from pesticide registration fees and licenses and from certain fines would also be direct into the Non-Toxic Pest Management Fund. *An Act to Reduce Asthma and Other Health Threats from Cleaning Products* would require that no cleaning product may be used in schools, hospitals, and other health care facilities, day care centers, public building, and public housing unless the product is included on the "Healthy Cleaning Products" list established annually by the Commissioner of the Department of Public Health (DPH).[66] The bill has enlisted the support of labor unions representing janitors and cleaning workers, as well as environmental health advocates. In addition, *An Act Relating to Mercury Reduction and Education*

[66] Healthy Cleaning Products on the list are defined as products that: do not contain chemicals that cause or trigger asthma, as determined by DPH; are on the Environmentally Preferable Products (EPP) contract list; and are fragrance free. The legislation requires manufacturers of cleaning products to submit information to DPH that details the ingredients contained in their products. Requirements for worker training and testing (to be paid for by a fee on the manufacturers of cleaning products) is also included in the proposed legislation.

supports a regional strategy, set by all New England Governors, to reduce mercury emissions 75% by 2010 (and for eventual zero mercury emissions in New England). Mercury is a powerful neurotoxin linked to the development of learning disabilities in children. The proposed legislation would: (1) *require producer take-back*, whereby manufacturers of mercury-added production would be financially responsible for collection of recycling of the products; (2) *require labelin*g that reveals the mercury content of the product and advising the purchaser on proper disposal; and (3) *prohibit the knowing collection and disposal* of mercury-containing producing by solid waste haulers for landfills or incinerators.

As guaranteed under the Massachusetts Constitution, the public has the right to clean air and water. When any citizen is unwillingly harmed by exposure to industrial toxic pollutants found in the environment, an injustice is being perpetrated. So that no citizen of any community be put at risk, government agencies on all levels must deepen efforts to reduce the overall level of dangerous pollutants currently found in the environment, as well as our schools, homes, and workplaces. In this regard, the Toxic Use Reduction Act (TURA) is a model program which should be expanded. Likewise, the state should take steps to reduce the overall waste stream, increase recycling and continue a moratorium on new landfills and incinerators. To reduce the amount of solid waste disposal facilities, the state needs to fully fund the state recycling and waste reduction program in the Solid Waste Master Plan with funds from the Clean Environment Fund. The state should support mandatory extended producer responsibility programs, also called producer take back, on computer products and other manufactured products to put the financial burden on manufacturers for the collection and recycling of their discarded production.

Similarly, capping the emissions of the older power plants at levels similar to those plants built more recently will reduce emissions in Massachusetts by tens of thousands of tons. This action would also ensure that newer, cleaner plants benefit from a level playing field by removing the pollution subsidy these old plants currently enjoy. The state should finalize and enforce the "filthy five" regulations, the carbon dioxide section (CMR 7.29) that caps total CO_2 emissions, and creates an emissions standard of 1,800 pounds of carbon dioxide per megawatt-hour for these old plants. Although the overall regulation was finalized in 2001, the DEP has not finalized the carbon dioxide section of the regulations that defines compliance offsets. The state should aggressively implement the 72 policies outlined in the Massachusetts Climate Protection Plan, which sets a goal of reducing carbon pollution 10 percent below 1990 emissions levels by 2020, and ultimately 75-85 percent overall.

Newer types of technologies and facilities can also pose significant risks to a community. The state should adopt *An Act to Protect the Public Health and Environment from Toxic Biological Agents*. This legislation would create a comprehensive regulatory public health and safety program for high containment biological laboratories, based on existing state laws for hazardous and polluting facilities and federal guidance. Currently, there is no state regulation of such facilities.

It is also important to note that in recent years, the Department of Environmental Protection and Executive Office Environmental Affairs has suffered devastating budget cuts and staff reductions. The capacity of the DEP and EOEA to successfully address issues of environmental injustice will require the provision of additional funding, staff, and other resources to adequate levels. Additional responsibilities should not placed on already overburdened State agencies without the necessary funding and political support to successfully perform the work.

Finally, there is an additional component to achieving healthy, livable, and sustainable communities, which includes the creation of safe, family-supporting jobs in clean industries; healthy and affordable homes; accessible and efficient public transportation; zoning and land use planning that accentuates the cultural, economic, social, and natural assets of a community; sufficient public parks, greenfields, and recreational spaces; good schools, libraries, health clinics and hospitals, childcare, and other essential social services; racial equality and economic justice; and a profound respect for cultural diversity. The potential benefits of an environmental justice policy are limited if the choices for a marginalized community are to reject construction of a polluting industrial facility that may pose significant health hazards, on the one hand, versus community acceptance of such a facility because of the greater job opportunities and tax revenues it affords, on the other. Unless movements for environmental justice can address the larger political-economic forces that compel communities to make such tradeoffs, their ability to achieve significant improvements will remain limited.

What is needed is a more holistic strategy for achieving social and environmental justice; one that involves moving from locally reactive actions to more regionally proactive approaches to community planning and economic development. To do so requires crossing profound racial and ethnic boundaries, and bridging the divides between the white middle-class of suburbia and poorer people of color and working class whites in the inner cities. Policy-makers can play an instrumental role in advanced new forms of smart growth that would reverse the inequitable patterns of development that have concentrated poverty, segregated communities, and limited opportunities for people of color and lower-income residents in the region. As stated by Dwayne Marsh of PolicyLink, the policies should "enable communities to cooperate across jurisdictions, share fairly in the benefits of development, build a diverse housing stock, ensure accessible green space, create efficient transit systems, and maintain bustling commercial services."[67] There are clearly a number of factors, such as housing discrimination, bank lending policies, local planning and zoning practices, licensing and permitting processes, and the geographic distribution of public services, transportation networks, and industries, etc., which play some role in creating environmental injustices. The State should sponsor additional investigations to better understand the sources of environmental injustice outside the traditional terrain of environmental law.

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[67] See Dwayne S. Marsh, *Promise and Challenge: Achieving Regional Equity in Greater Boston* (Oakland, CA: A Report by PolicyLink, May 2003), p.4.