

**COMMUNITY-BASED ENVIRONMENTAL JUSTICE ASSESSMENT FOR THE  
CITY OF POUGHKEEPSIE  
DUTCHESS COUNTY, NEW YORK<sup>1</sup>**

**SEPTEMBER 2012**

**PREPARED BY**

**POUGHKEEPSIE CLIMATE JUSTICE COUNCIL  
HUDSON RIVER SLOOP CLEARWATER, INC.**

**Authors:**

Karla C. Raimundi, Environmental Justice Associate, Hudson River Sloop Clearwater, Inc.  
Ryan Palmer, Green Cities Project Coordinator, Hudson River Sloop Clearwater, Inc.  
Victor-Pierre Melendez, Green Cities Director, Hudson River Sloop Clearwater, Inc.

**Project Interns:**

Sean Carroll, Ithaca College, Lead Project Intern

Tanay Ranadive, Marist College  
Alyssa Scott, Marist College  
Kaitlin Cole, Clearwater Intern  
Olivia Arnow, Vassar College

Daniel Freeman, Vassar College  
Jack Gross, Vassar College  
Sean Morash, Vassar College  
Marshall Daly, Vassar College



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### **Poughkeepsie Climate Justice Council:**

Ryan Palmer, Clearwater; Meridith Nierenberg, Mid-Hudson Energy Smart Communities and RUPCO; Mary Spriggs, Jobs Not Jails; Terry Gipson, NYS Senate Candidate; Jenny Coronel, Hudson River Housing/Middle Main Revitalization; Howard Dean, Green Peace; Nancy Cozean, Former Mayor of Poughkeepsie; Meadow Burrett, Community Member; Lisa Serviano, Community Member; Peter Leonard, Vassar College; Dan Freeman, Vassar College; Robert Wright, Nubian Directions; Mario Johnson, Nubian Directions; Elizabeth Celaya, Hudson River Housing/Middle Main Revitalization

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## **A. INTRODUCTION**

Low income communities and communities of color have historically been overburdened as a result of air pollution from energy-generating facilities, small stationary sources, dense traffic, and water pollution from the disproportionate siting of locally undesirable land use practices.<sup>2</sup> For instance, studies have found that New York City residents in high asthma hospitalization areas were almost twice as likely to be African-American or Hispanic/Latino.<sup>3</sup>

To minimize further burdening these populations it is important that decisions with the potential to affect environmental justice communities consider the environmental and health impacts various public and private actions will have on these communities. In an effort to develop more robust and effective environmental justice policies and programs it is imperative to identify areas with disproportionately high rates of poverty, unemployment, traffic, and areas with greater concentrations of polluting facilities.<sup>4</sup>

Recognizing the importance of advancing these principles, Hudson River Sloop Clearwater, Inc. (Clearwater) submitted an Environmental Justice Grant to Environmental Protection Agency Office of Environmental Justice to examine various environmental and health impacts in four cities in the Hudson Valley. US EPA Office of Environmental Justice funded Clearwater to do this research and community outreach in Poughkeepsie, Kingston, Peekskill, and Beacon, communities that have been designated as Potential Environmental Justice Areas (PEJA). (See Attachment 1: NYSDEC Office of Environmental Justice Map of Potential Environmental Justice Areas.)

The project goal was to objectively research multiple sources of pollution, review existing health data, and evaluate if there are any disproportionate impacts on communities of color, ethnicity, or low-income populations. To accomplish this, team members reached out to a wide-range of community stakeholders to collaboratively identify environmental issues and potential health impacts. This group, with the help of community stakeholders, city officials, and other environmental groups and technical advisors identified a wide range of sources of pollution in the designated study area, including transportation impacts.

To complete the environmental justice profile of the City of Poughkeepsie, the report attempts to assess whether there are any disparate health patterns in communities of

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<sup>2</sup> New York State, "Environmental Justice Issue Brief, New York State Energy Plan 2009." December 2009. [www.nysenergyplan.com](http://www.nysenergyplan.com)

<sup>3</sup> Schrager, Thomas F., Asthma and Air Pollution, Toxicology Source. 2009. [www.toxicologysource.com/scitox/asthma.html](http://www.toxicologysource.com/scitox/asthma.html); Miller, K.A., et al., Long Term-Exposure to Air Pollution and Incidence of Cardiovascular Events in Women. 365 New Eng J Med, (2007).

<sup>4</sup> New York State, "Environmental Justice Issue Brief," op. cit.

color or low income, and identify possible environmental stressors. It was already known, for example, that asthma disproportionately affects low-income communities and communities of color. Between 2003 and 2005, the age-adjusted asthma death rate among non-Hispanic Black New Yorkers and Hispanic New Yorkers was more than 4.6 times higher and 3.8 time higher, respectively, than that among non-Hispanic White New Yorkers.<sup>5</sup>

This report identifies multiple point and non-point sources of pollution, health data, and an evaluation of any disproportionate impacts on communities of color, ethnicity and low-income populations.

Most importantly, this report is the product of an iterative collaboration with an inclusive task force of community stakeholders that came to call itself the Poughkeepsie Climate Justice Council and other interested community members and leaders. As such it depicts Poughkeepsie's environmental values and concerns, and recommendations for future actions, including protecting existing assets, mitigating harms, and identifying further research needed. The goal is that this report will provide valuable information that will help Poughkeepsie in future planning to protect impacted communities from further pollution burdens or environmental degradation.

## **B. ENVIRONMENTAL JUSTICE ASSESSMENT**

### **1. ENVIRONMENTAL JUSTICE**

The environmental justice movement arose to address the disproportionate injustices of environmental inequity being committed against communities of color and low income. Noticing the trend of toxic wastes, landfills, and other dangers to public health being concentrated in these communities soon led to an assertion that this was a case of environmental racism. The movement helped empower small communities around the world to stand up for their right to equal access to a clean, healthy, and fair environment, and helped these issues gain national attention.

#### **History of the Environmental Justice Movement**

The Environmental Justice movement has its values grounded in the struggles of the 1960's Civil Rights Movement<sup>6</sup>, but was created into a distinct, notable movement only in recent decades. As Dr. Robert Bullard, the father of the movement, says, "(t)he struggle for environmental justice was not invented in the 1990s. People of color, individually and collectively, have waged a frontal assault against environmental

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<sup>5</sup> Department of Health. "New York State Asthma Surveillance Summary Report." 2007.

[www.health.state.ny.us/statistics/ny\\_asthma/pdf/2007\\_asthmasurveillance\\_summary\\_report.pdf](http://www.health.state.ny.us/statistics/ny_asthma/pdf/2007_asthmasurveillance_summary_report.pdf)

<sup>6</sup> US Environmental Protection Agency. "Environmental Justice." Retrieved December 22, 2010 from [www.epa.gov/environmentaljustice/basics/ejbackground.html](http://www.epa.gov/environmentaljustice/basics/ejbackground.html).

injustices that predate the first Earth Day...many of these struggles, however, were not framed as 'environmental' problems- rather they were seen as addressing 'social' problems".<sup>7</sup> Seen from this perspective, the environmental justice movement is a component of a much larger fight for social equality.

One great example of a defining case for the movement is the 1982 community mobilization in Warren County, North Carolina against the state government's decision to dump 6,000 truckloads of toxic PCB-laced soil into their county.<sup>8</sup> Legitimately worried about a large-scale contamination of their drinking water, many individuals physically stopped the trucks from entering the dumpsite. Though the community didn't succeed in the end, the demonstration of social action for a cause of environmental equity was the first of its kind.

As the Warren County protests gained more attention nationally, interest was stimulated in what demographics were most affected by the siting and construction of hazardous waste landfills. It was only a year later in 1983 that Congress's General Accounting Office published a study that declared that three-fourths of the hazardous waste disposal sites in eight states were localized in low income, African American and Latino communities.<sup>8</sup>

Further solidifying the notion of environmental racism, the United Church of Christ's Commission for Racial Justice, under the leadership of Dr. Ben Chavis, published *Toxic Wastes and Race in the United States* in 1987, the first report to demonstrate the strong correlation between race and the siting of hazardous wastes. As this "Toxic Movement" evolved, the year 1990 saw an even greater solidification of many environmental justice leaders, as they drafted and signed a widely publicized letter to the "Big 10" active environmental organizations, all of which were dominated by upper class whites, accusing them of racial bias in their agendas and representation. As a result, some mainstream environmental organizations adopted environmental justice into their activism and hired several people of color.<sup>9</sup>

The Environmental Justice Movement really spurred its growth with the 1991 First National People of Color Environmental Leadership Summit meeting in Washington D.C. This summit brought hundreds of leaders together from a variety of places to network and strategize. Out of this meeting came two keystone documents of the movement: the "Principles of Environmental Justice" (see Attachment 4) and the "Call to Action". The movement gained more power when President Clinton appointed Dr. Chavis and Dr. Bullard to his Natural Resources transition team, where they were able to develop a

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<sup>7</sup> Bullard, Robert D. *Confronting Environmental Racism: Voices from the Grassroots*. Boston, MA: South End, 1993. p.9.

<sup>8</sup> Skelton, Renee, and Vernice Miller. "The Environmental Justice Movement." (2006). Natural Resources Defense Council. Retrieved December 22, 2010 from [www.nrdc.org/ej/history/hej.asp](http://www.nrdc.org/ej/history/hej.asp).

<sup>9</sup> *Ibid.*

strong voice and make environmental justice a top priority. Soon enough, this led to a change in federal policy. In 1994, Clinton signed an executive order that “directed federal agencies to identify and address disproportionately high adverse health or environmental effects of their policies or programs on low-income people and people of color. It also directed federal agencies to look for ways to prevent discrimination by race, color or national origin in any federally funded programs dealing with health or the environment.”<sup>10</sup>

Although many cite the Warren County incident as what ignited the movement, it is difficult to pinpoint a particular event as the sole cause. The movement grew organically out of hundreds of local struggles and events and emerged from a variety of other social movements.<sup>11</sup> The movement itself has evolved from issues seen primarily from a community perspective to issues that are of national, and even international, concern.

### **What is Environmental Justice?**

The United States Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC)<sup>12</sup> define environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.<sup>13</sup> Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies. Meaningful involvement means that people have an opportunity to participate in decisions about activities that may affect their environment and/or health; the public’s contribution can influence the regulatory agency’s decision; their concerns will be considered in the decision making process; and the decision makers seek out and facilitate the involvement of those potentially affected.<sup>14</sup>

More specifically, environmental justice includes the right to be free from ecological destruction, the assurance that environmental burdens will be distributed fairly and equally, and equal access to environmental goods, such as food, clean air and water, education, and recreation.<sup>15</sup>

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<sup>10</sup> Skelton, Renee, and Vernice Miller. 2006, *op. cit.*

<sup>11</sup> Center for Community Action and Environmental Justice. "Environmental Justice History." Retrieved December 23, 2010 from [www.ccaej.org/environmental-justice/environmental-justice-history.html](http://www.ccaej.org/environmental-justice/environmental-justice-history.html).

<sup>12</sup> The NYSDEC adopted EPA’s definition in 2003 under its Commissioner Policy on Environmental Justice Permitting. DEC. Commissioner Policy 29, “Environmental Justice and Permitting.” 2003. [www.dec.ny.gov/docs/permits\\_ej\\_operations\\_pdf/ejpolicy.pdf](http://www.dec.ny.gov/docs/permits_ej_operations_pdf/ejpolicy.pdf).

<sup>13</sup> New York State Department of Environmental Conservation. "Environmental Justice" (2011). [www.dec.ny.gov/public/333.html](http://www.dec.ny.gov/public/333.html).

<sup>14</sup> U.S. EPA. Basic Information about Environmental Justice. [www.epa.gov/compliance/basics/ejbackground.html](http://www.epa.gov/compliance/basics/ejbackground.html)

<sup>15</sup> *Ibid.*

## 1.2 Examples of Environmental Justice in New York

The need for environmental justice is widespread. As mentioned in Section 2.1, many leaders and small grassroots organizations were born out of the environmental justice movement when it started gaining national attention. These include many leaders in the New York area, who founded organizations that are now well established and contribute a valuable role in the environmental justice movement.

### **WE ACT**

West Harlem Environmental Action (WE ACT for Environmental Justice), one of the first environmental organizations in New York State to be run by people of color, and the first environmental justice organization in New York City, was founded and incorporated by Peggy Shepard, its current executive director, in 1988 as the result of local community struggles around environmental threats and resulting health disparities created by institutionalized racism and the lack of social and political capital.<sup>16</sup> WE ACT's goals are to improve environmental health and quality of life in communities of color by fighting against public health threats apparent in communities. This organization strives to work on the community level conducting public health research and stressing an educational approach. Through community organizing and outreach WE ACT was able to mobilize its members to file a lawsuit against the Metropolitan Transit Authority (MTA) for their plans to construct a sixth diesel bus depot in Northern Manhattan, when only one other one existed in Lower Manhattan. Working to reduce fleet emissions and improve practices and conditions in and around bus depots has been an ongoing and increasingly successful effort of WE ACT. WE ACT also addressed the North River Sewage Treatment Plant detrimental emissions, winning a \$1.1 million settlement against the City of New York in 1993. With this victory WE ACT became a leading and important voice in ensuring political accountability and sound governmental regulations in the area.<sup>17</sup>

### **UPROSE**

Another active participant in the regional environmental justice movement is UPROSE, the United Puerto Rican Organization of Sunset Park. Currently led by executive director Elizabeth Yeampierre, "UPROSE is dedicated to the development of Southwest Brooklyn and the empowerment of its residents primarily through broad and converging environmental, sustainable development, and youth justice campaigns."<sup>18</sup> It aims to foster community leadership by promoting activism around a host of environmental justice issues. Its two biggest accomplishments include securing \$1 million for

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<sup>16</sup> We Act For Environmental Justice. "History of WE ACT." (2010). [www.weact.org/tabid/180/Default.aspx](http://www.weact.org/tabid/180/Default.aspx)

<sup>17</sup> *Ibid.*

<sup>18</sup> United Puerto Rican Organization of Sunset Park. "Welcome to UPROSE." [www.uprose.org](http://www.uprose.org).

community pollution reduction and organizing a coalition to halt the siting of a 520-megawatt fossil fuel power plant in Brooklyn.

### **Sustainable South Bronx (SSBx)**

Majora Carter established Sustainable South Bronx in 2001 to advocate for the creation of new parks and green spaces and to oppose the construction of a new waste transfer station. The organization now serves to transform the South Bronx and surrounding underdeveloped areas into sustainable living spaces through policy change, community education, green job training, and community greening programs. Sustainable South Bronx was winner of the 2003 United States Department of Clean Energy's Clean Cities Program and the 2008 winner of the National Conservation Achievement Award from the National Wildlife Federation.<sup>19</sup> One of its notable programs is the Stewardship Training Program that provides urban green collar training and placement programs, which allows communities to step out of poverty and into the expanding field of environmental sustainability and public health. Another issue for the area is the Sheridan Expressway, according to the organization, a poorly planned 1.25-mile redundant highway link, which was built by Robert Moses and has contributed to the blight, disinvestment and public health problems plaguing the South Bronx. SSBx is hoping that this short stretch of highway will be removed to reunite South Bronx neighborhoods and allow residents to access the newly restored Bronx River. The South Bronx also handles 25 percent of New York City's waste, with 15 waste transfer stations located within a one-mile radius in this community. SSBx is advocating for the redistribution of waste facilities and the elimination of long-haul diesel trucks by replacing them with more sustainable barge and rail export options.<sup>20</sup>

### **New York City Environmental Justice Alliance (NYCEJA)**

NYCEJA is an umbrella organization comprised of member groups based in low-income communities throughout New York City. Founded in 1991, NYCEJA became a 501(c)(3) corporation in 1995. It works as a citywide network that links grassroots' organizations, low-income neighborhoods and communities of color in their struggle for Environmental Justice. NYCEJA empowers its member organizations to fight against environmental injustice by coordinating citywide EJ campaigns and by encouraging them to coalesce around specific issues which threaten the ability of low income communities of color to thrive, by supporting the work that local community-based organizations are already doing, and by helping to replicate projects and activities that have proven successful in one or more communities. NYCEJA's board is comprised of executive directors of its member organizations, who set policy and guide program development.<sup>21</sup>

### **W. Haywood Burns and Arbor Hill Environmental Justice Corporation**

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<sup>19</sup> Sustainable South Bronx. "History and Mission." [www.ssbx.org/index.php?link=2#history](http://www.ssbx.org/index.php?link=2#history).

<sup>20</sup> Loria, Keith. "Sustainable South Bronx: Reimagining a Neighborhood." *The Cooperator*. [www.cooperator.com/articles/1916/1/Sustainable-South-Bronx/Page1.html](http://www.cooperator.com/articles/1916/1/Sustainable-South-Bronx/Page1.html)

<sup>21</sup> NYCEJA. "History and Mission." [www.nyceja.org/aboutus.html](http://www.nyceja.org/aboutus.html).

In Albany and the surrounding Capital District, the Arbor Hill Environmental Justice Corporation (AHEJC) is the voice for Environmental Justice. AHEJC was established in 1998 through a \$1.6 million federal Resource Conservation and Recovery Act (RCRA) settlement with New York State regarding pollution from the state-owned regional waste incinerator, the ANSWERS Plant. Located in a heavily populated minority neighborhood, it was described by then NY State DEC Commissioner, Thomas Jorling, as “abysmal” -- emitting the highest levels of dioxin and furans in the state: 188 times the state-of-the-art standard on dioxin of 0.10 ng per dry normal cubic meter, as well as the highest lead emissions. When attempts to retrofit the plant failed, it was closed permanently.<sup>22</sup> Aaron Mair, founder and president of AHEJC and long-time Sierra Club Atlantic Chapter president, used the settlement to create two nonprofit community service organizations: AHEJC and the W. Haywood Burns Environmental Education Center, both of which are assets to the surrounding community. They actively advocate for environmental health, the rehabilitation of green spaces, and political accountability. Made up of mostly local community members, Arbor Hill EJ Corp. is a member of the White House Council on Environmental Quality.<sup>23</sup> Working closely with the W. Haywood Burns Environmental Education Center, much has been done to clean up the Tivoli Preserve and the Patroon Creek Watershed. Air pollution, exposure to lead, brownfields, toxic waste, pesticides, and water pollution are all areas of concern for the AHEJC, which works to educate the inner city community about pollution-related diseases and to establish links for care. It should be noted that Aaron Mair and W. Haywood Burns, former Dean of the City University of New York School of Law at Queens College and a longtime civil rights advocate for whom the Center is named, both came from Peekskill.

### **1.3 Environmental Justice and Human Rights**

The Environmental Justice movement shares close ties with the fight for human rights. Many concepts in each movement parallel each other and possess the same core values. The Universal Declaration of Human Rights (Declaration), proclaimed in 1948 by the United Nations General Assembly, addresses the necessity to promote positive social progress and to hold all human beings to a higher standard in their obligation to show humane treatment and equitable regard for others.

In respect to environmental justice, the Declaration asserts the requirement of total equality of all people and the opportunity all should enjoy to equal access to an adequate standard of living. As such, Article 2 states that “(e)veryone is entitled to all the rights and freedoms set forth in this Declaration, without distinction of any kind, such as race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status(...)” and Article 25 declares, “(e)veryone has the right to a

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<sup>22</sup> Clarke, M. J. *Burning Garbage in the U.S.: Practice vs. State of the Art*. New York: INFORM, 1991.

<sup>23</sup> *Wiser Earth- The Social Network for Sustainability*. “Arbor Hill Environmental Justice Organization.” [www.wiserearth.org/organization/view/9ad859b3be242f5be9a095426fb1b0a6](http://www.wiserearth.org/organization/view/9ad859b3be242f5be9a095426fb1b0a6).

standard of living adequate for the health and well-being of himself and of his family(...)"<sup>24</sup> This fundamental Declaration set a new standard for conduct on an international, national, and community level. Many of its values are mirrored in subsequent declarations, including the 17 Principles of Environmental Justice.

The 17 Principles, developed during the First National People of Color Environmental Leadership Summit, have served as a defining document for the growing grassroots movement for environmental justice.<sup>25</sup> The document takes the human rights argument and connects it wholeheartedly to a human debt to and reverence for Mother Earth. It stresses that not only should each person bear the burden of environmental wastes equally, but also that we should strive to altogether reduce the impact we have on the environment as a species. This includes the right to be free from ecological destruction and equal access to the environmental goods of clean air, land, water, and food. Most importantly, to further confirm the intimate link between environmental justice and human rights, Principle 10 states that "(e)nvironmental (j)ustice considers governmental acts of environmental injustice a violation of international law, the Universal Declaration On Human Rights, and the United Nations Convention on Genocide."<sup>26</sup> Both the definition of environmental justice, referenced in Section 2.2, and the 17 Principles emphasize the disproportionate negative environmental impacts on communities of color and low income. They call for a need to address this environmental racism by reducing and conserving our use of earth's resources and by equally distributing the results of our uses, both beneficial and destructive, to all peoples collectively.

## **2. POUGHKEEPSIE HISTORY, DEMOGRAPHICS, AND COMMUNITY CHARACTER**

### **2.1 History**

The City of Poughkeepsie is located in Dutchess County on the east shore of the Hudson River, halfway between Albany and New York City. The area was originally settled by the Dutch in 1683, and later became an incorporated village in 1799. During the American Revolutionary War, Poughkeepsie served as the second capital of New York. The city was as an important political hub, with leaders like Alexander Hamilton and John Jay visiting to approve New York's ratification of the Constitution, which was signed in the courthouse on Market Street.

In 1854, the City of Poughkeepsie was chartered, distinguishing the smaller city from the surrounding Town of Poughkeepsie. The city, both a major grain port and center of

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<sup>24</sup> Welcome to the United Nations: It's Your World. "The Universal Declaration of Human Rights." Retrieved December 23, 2010 from [www.un.org/en/documents/udhr/index.shtml](http://www.un.org/en/documents/udhr/index.shtml).

<sup>25</sup> First National People of Color Environmental Leadership Summit held on October 24-27, 1991, Washington DC.

<sup>26</sup> First National People of Color Environmental Leadership Summit, 17 Principles of Environmental Justice, Principle 10. October 24-27, 1991, Washington DC.

whale rendering, was a regional economic hub during the early 19th century. Later, as the American industrial revolution swept the Northeast, Poughkeepsie evolved into a regional center of industrial production. The city was home to prominent breweries, paper mills, and hatteries, as well as a vibrant shipping industry.

During the 19<sup>th</sup> century, Poughkeepsie's strong economy supported a vibrant downtown district, complete with commercial offerings and cultural institutions lining Main Street. Education was also a prominent facet of the city, with Vassar College and Marist College anchoring the city's western and eastern borders, respectively, and later joined by Dutchess Community College and The Culinary Institute of America . By the turn of the century, Poughkeepsie had received the moniker, "Queen City of the Hudson." Combined with the city's ready access to the Hudson Valley's natural beauty, these commercial and cultural offerings drew wealthy residents from New York City; many families, notably the Astors, Vanderbilts, and Roosevelts, built vast weekend estates on the city's fringes.

After World War II, Poughkeepsie's economy shifted from manufacturing to technology. IBM opened a large mainframe development facility just outside the city, which provided hundreds of well-paying jobs and drew highly skilled employees to the area. However, in the 1990s IBM moved much of their production and development capacity away from the Poughkeepsie campus, and the city's economy consequently took a serious hit.

In recent years, as real estate prices around New York City have risen, Poughkeepsie, the last stop on the Metro-North Railroad, has become a popular bedroom community for professionals employed in the New York metro region. However, the city still lacks a solid economic base. Regional development has largely shifted away from the city to focus on the suburban fringes along Route 9, but the 21<sup>st</sup> century has witnessed efforts to reverse that shift. Like many other post-industrial cities, the revitalization of Poughkeepsie's industrial fabric is beginning to attract cultural and heritage tourism, as exemplified by the restoration of the Poughkeepsie-Highland Railroad Bridge into the Walkway Over the Hudson State Historic Park, but the city continues to struggle with flight to the residential and commercial sprawl of the surrounding region.<sup>27</sup>

## **2.2 Demographics**

The City of Poughkeepsie comprises 5.1 square miles, with a population of 32,736. However, the larger Town of Poughkeepsie encompasses an additional 38,087 people, for a total metropolitan population of over 70,000 (U.S. Census Bureau's 2010 survey). Of the roughly 33,000 City residents, only 40% own their home. Similarly, fully 68% of residents live in multi-unit structures, well above the state average of 50%. The 2010

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<sup>27</sup> Main Street to Main Frames. Harvey K. Flad. 2009

census also indicates that the city skews young; as of 2012, 22% of residents were under the age of 18, while only 13% were over 65.

Poughkeepsie is quite diverse; 48% of city inhabitants identify as white, 34% as African American, and 20% Latino, compared to the 66%, 16%, and 17% averages for New York State, respectively. Poughkeepsie is, however, quite poor; 23% of city residents live below the federal poverty line, 10% higher than both the state and national average. The median household income is \$38,533, again significantly below the New York State average of \$55,233. Economically, in 2010 city was home to 2,227 businesses, supporting average per capita retail sales of \$13,642.

### **2.3 Community Character**

Poughkeepsie is home to a number of cultural offerings. Educational institutions Vassar College and Marist College are located on the edge of the city. Dutchess Community College and the Culinary Institute of America, both located in the Town of Poughkeepsie, also have significant presence in the city. The Arts are also well represented; the Bardavon Opera House is a regionally acclaimed institution, and Vassar's Leman Loeb Art Center displays work by world-renowned artists. Smaller organizations like Mill Street Lofts and the Children's Media Project also provide support for the local art scene. Community organizations abound as well. Institutions like the Adriance Memorial Library and Dutchess Historical Society provide historical and cultural resources to the community. Non-profits like the Family Partnership Center and the Celebrating Community initiative offer important services to the urban community, while groups like the Rural Migrant Ministry and Battered Women's Services provide advocacy for minority groups. Many smaller organizations also cater to more specialized interest; the Poughkeepsie Farm Project is a bastion of nutritional innovation, Hudson River Housing supports affordable housing in the region, and Clearwater, Scenic Hudson and Sustainable Hudson Valley advocate the preservation and appreciation of the area's natural landscape.

The city is also home to many festivals. In June, the Poughkeepsie Summer Concert Series draws music lovers to Greenvale Park. In September, the Greek Festival shows off the city's Mediterranean culinary and musical assets. Also in October, the Italian community hosts Taste of Little Italy Festival which draws hundreds to the city's Little Italy community. Other ethnic communities put on similar festivals throughout the year, such as the particularly popular Mexican Guelagueta fair. In the winter, the annual Tree Lighting Ceremony regularly draws thousands of residents to Main Street. Throughout the year, smaller events, like the Catskill Mountain Foundation's ArtHop events, celebrate other cultural institutions in the city.

### **2.4 Environmental and Community Assets to be Protected**

The city's dense urban environment presents a host of social, economic, and political realities that must be considered when planning for the protection of biodiversity, which although no easy task, is extremely important. Highlighting the natural features in urban landscapes, rather than hiding them, provides an opportunity not only to protect the city's natural assets, but also to create a more livable urban environment for residents. As such, the task should be not only to conserve, but also to better express the environmental assets of the city.

Poughkeepsie has 19 parks ranging from less than half an acre to over 50 acres. The five largest parks – Waryas, Wheaton, Mansion Square, Eastman, Bartlett, and College Hill Park - provide important green spaces for the surrounding communities. A significant tree canopy, made up by plantings on city streets, publicly owned land, and private property, also covers the city. Interestingly, vacant lots in the city have also begun to create unconventional green spaces. Local residents already use such lots for recreation, and if improved, these spaces could offer an easy, innovative way to improve the natural landscape of the city. As a whole, the city's green spaces are important not only as urban expressions of nature, but also as public spaces for the communities they border.

Water resources are also important. The Hudson River is the largest of Poughkeepsie's aquatic resources, and serves as both a recreational and economic asset. It is also the source of the city's drinking water. There are three other distinct rivers that cross into the city and town: Wappinger Creek, Casperkill Creek, and Fall Kill Creek, in addition to a number of smaller un-named creeks. These rivers, however, are not contained to Poughkeepsie; their watersheds, which feed Poughkeepsie's aquifers, draw heavily from surrounding locales. Additionally, the city is located within the larger regional watershed of the Greater Lower Hudson Estuary, which demands considerable attention when planning for environmental protection. The city has one large water body, Morgan Lake, and a number of smaller, un-named ponds, all of which are surrounded, often extensively, by wetlands and floodplains. Like urban green space, the city's aquatic resources are both environmental and cultural assets; if appropriately acknowledged and improved, these urban water bodies promise a more habitable urban landscape for both wildlife and people.

Poughkeepsie is also home to significant biotic resources. The city is heavily used by common wildlife species (pigeons, starlings, gray squirrels, raccoons, rodents), all of which are adapted to urban life. However, some uncommon species are also known to inhabit or travel through the city. Bats and certain species of uncommon birds (eastern screech owl, barn owl, and Cooper's hawk) can be found in trees and built structures in the city. Peregrine falcons have nested on the Mid-Hudson Bridge, and the Indiana bat occasionally uses Poughkeepsie as a base for maternity colonies<sup>28</sup>. Like the green

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<sup>28</sup> SIGNIFICANT HABITATS IN THE TOWN OF POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK. By

space and water assets above, these biotic resources must be considered when planning for environmental protection in the City.

### **3. ACTUAL AND POTENTIAL POLLUTION SOURCES**

The ecological future of the planet is constantly being shaped by its geophysical history by continuing forces of sun, rain, wind, water, seismic, volcanic, the carbon cycle, and the diverse biological evolution built upon them - and by humans, corporations, and governments.<sup>29</sup> These latter three items are very recent arrivals on the global scene and although these are relatively trivial in mass they have proved to have remarkable capacity for causing planetary effects, for good and ill, and it is upon them that this report focuses on.

#### **3.1 Air Pollution**

Air pollution comes from many different sources such as factories, power plants, dry cleaners, auto repair shops, cars, buses, trucks and even windblown dust and wildfires threatening the health of human beings, trees, lakes, crops, and animals.<sup>30</sup> This section of the Community-Based Environmental Justice Report identifies some of the most prevalent sources of air pollution in the Poughkeepsie area. In an attempt to depict a clear picture of some of the effects associated with the emissions these facilities release into the ambient air, it also includes a section on the air pollutants commonly associated with the identified sources and their known consequences on human health and the environment.

Although air quality issues have been the subject of public and private nuisance actions since the nineteenth century, state legislation to safeguard air quality was, until recently, rudimentary. Public concern in the 1960s over industrial air pollution and urban smog from motor vehicle exhaust became serious enough to attract the attention of Congress.<sup>31</sup>

Today, air quality in most areas of New York meets standards that are much more rigorous than those of 1970. As new information on the health and environmental effects of air pollution has become available, new state and federal standards have been established and early limits tightened to protect health and environment. By requiring the use of effective pollution control technology and enforcing compliance with permit

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Tabak and Stevens. 2008

<sup>29</sup> Plater, Abrams, et al. *Environmental Law and Policy: Nature, Law and Society*, Ch.1 Basic Themes in the Legal Process of Environmental Law, 2004 Aspen Pub., Third Ed., p. 3.

<sup>30</sup> US Environmental Protection Agency. "Air." [www.epa.gov/ebtpages/air.html](http://www.epa.gov/ebtpages/air.html).

<sup>31</sup> Weinberg & Reilly. "Understanding Environmental Law". 2007. Second Ed, p 77.

conditions, DEC's air permitting program has been a vital means of reducing emissions to meet ever more stringent standards.<sup>32</sup>

Although national air quality has improved over the last 20 years, many challenges remain in protecting public health and the environment from air pollutants.

### **Regulatory Framework**

For nearly four decades, state and federal governments have controlled the emission of pollutants through permits with enforceable requirements, and have measured and monitored pollution levels in the air.<sup>33</sup> Under the Clean Air Act (CAA) of 1970, the EPA sets limits on how much of a pollutant is allowed to be released into the air anywhere in the United States.<sup>34</sup> At the state level NYS DEC is the agency that carries out both the state and federal air pollution control and monitoring programs.<sup>35</sup>

New York's air permitting program identifies and controls sources of air pollution. These sources range in size from large industrial facilities and power plants to small commercial operations, such as dry cleaners and auto repair shops. While smaller sources of air pollution are covered by NYS DEC's air source registration program, most large sources require full air pollution permits.<sup>36</sup>

The two most common types of permit for air contamination sources described in 6 NYCRR Part 201 are: Air State facility (ASF) permits and Title V facility (ATV) permits. The first type of permits, ASF, are issued to facilities that are not considered to be major (as defined in the department's regulations), but that meet the criteria of 6 NYCRR Subpart 201-5. These are generally large facilities with the following characteristics:

- (a) actual emissions exceed 50 percent of the level that would make them major, but their potential to emit as defined in 6NYCRR Part 200 does not place them in the major category;
- (b) they require the use of permit conditions to limit emissions below thresholds that would make them subject to certain state or federal requirements;
- (c) they have been granted variances under the department's air regulations, or
- (d) they are new facilities that are subject to New Source Performance Standards (NSPS) or that emit hazardous air pollutants.<sup>37</sup>

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<sup>32</sup> New York State Department of Environmental Conservation. "Air-NYS DEC." [www.dec.ny.gov/chemical/281.html](http://www.dec.ny.gov/chemical/281.html)

<sup>33</sup> *Ibid.*

<sup>34</sup> US Environmental Protection Agency, "Air," *op. cit.*

<sup>35</sup> New York State Department of Environmental Conservation, "Air-NYS DEC," *op. cit.*

<sup>36</sup> *Ibid.*

<sup>37</sup> New York State Department of Environmental. "Air Facility Permits and Registrations." [www.dec.ny.gov/chemical/8569.html](http://www.dec.ny.gov/chemical/8569.html)

The second type of permit, Title V permits, are issued to facilities considered to be “major sources” under applicable law.<sup>38</sup> A “major source” has been construed to include any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit considering controls, in the aggregate, 10 tons per year or more of any hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants.<sup>39</sup> As per applicable law, the Administrator of the EPA may establish a lesser quantity, or in the case of radionuclides different criteria, for a major source than that specified in the previous definition, on the basis of the potency of the air pollutant, persistence, potential for bioaccumulation, other characteristics of the air pollutant, or other relevant factors.<sup>40</sup>

### **National Ambient Air Quality Standards (NAAQS) and Criteria Pollutants**

The Clean Air Act (CAA) requires EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants. These commonly found air pollutants or criteria pollutants are found all over the United States. Of the six pollutants, particle pollution and ground-level ozone are the most widespread health threats.<sup>41</sup> These pollutants are commonly called “criteria” air pollutants because EPA regulates them by developing human health-based and/or environmentally-based criteria, science-based guidelines, for setting permissible levels. The set of limits based on human health are called primary standards. Another set of limits intended to prevent environmental and property damage are called secondary standards.<sup>42</sup>

The six criteria pollutants and some of the consequences of exposure to these pollutant identified by EPA are listed below.<sup>43</sup>

- Carbon monoxide, exposure to which reduces central nervous system function and has cardiovascular impacts;<sup>44</sup>
- Lead, which accumulates in bones, blood, and soft tissue, can have neurological, cardiovascular, autoimmune, and developmental impacts, especially in young children;<sup>45</sup>
- Ground level ozone, which is smog caused from a combination of cars, industrial sites, and chemicals. Exposure to these pollutants can cause inflammation of the

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<sup>38</sup> 42 U.S.C. 7412. 2010 and 6 NYCRR Subpart 201-6.

<sup>39</sup> New York State Department of Environmental, “Air Facility Permits and Registrations,” *op. cit.*.

<sup>40</sup> 6 NYCRR Subpart 201-6. 2010.

<sup>41</sup> The United States of America Environmental Protection Agency. “Six Common Air Pollutants.” 17 Nov. 2009. [www.epa.gov/air/urbanair/](http://www.epa.gov/air/urbanair/).

<sup>42</sup> *Ibid.*

<sup>43</sup> *Ibid.*

<sup>44</sup> The United States of America Environmental Protection Agency. “Six Common Air Pollutants, Carbon Monoxide Health and Environmental Impacts of CO.” 17 Nov. 2009. [www.epa.gov/air/urbanair/co/hlth1.html](http://www.epa.gov/air/urbanair/co/hlth1.html).

<sup>45</sup> The United States of America Environmental Protection Agency. “Lead in Air, Health and Environment.” 17 Nov. 2009. [www.epa.gov/air/lead/health.html](http://www.epa.gov/air/lead/health.html).

lungs, reduced lung function, and respiratory symptoms such as a cough, chest pain, and shortness of breath;<sup>46</sup>

- Particulate matter, which is defined by the EPA as "a complex mixture of extremely small particles and liquid droplets,"<sup>47</sup> causes increased risk of mortality from heart and lung diseases, as well as extensive respiratory impacts and decreased lung function, particularly in children and adults with asthma;<sup>48</sup>
- Nitrogen dioxide, which is associated with decreased lung function, increased respiratory symptoms or illness, and increased symptoms in children with asthma;<sup>49</sup> and
- Sulfur dioxide, which causes symptoms such as wheezing, chest tightness, or shortness of breath, and, similar to many of the previous pollutants, poses a particular threat to those with asthma.<sup>50</sup> These pollutants are known as "criteria pollutants," because the EPA uses health indicators to set their permissible atmospheric levels.<sup>51</sup>

### **Non-Attainment and Attainment Zones**

Section 107(d)1 of the CAA governs the designation process by which the Governor of each State submit to the Administrator a list of all areas, or portions thereof, in the State, to designate as non-attainment, attainment or unclassifiable. For these purposes the CAA defines a non-attainment zone as any area that does not meet or that contributes to ambient air quality in a nearby area that does not meet the national primary or secondary ambient air quality standard for the pollutant. An attainment zone is any area, other than an area identified as a non-attainment area, that meets the national primary or secondary ambient air quality standard for the pollutant. Additionally, the CAA also defines an unclassifiable zone as any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.<sup>52</sup>

The City of Poughkeepsie is currently in attainment for all the criteria pollutants except for Ozone for which the City is in severe non-attainment.

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<sup>46</sup> The United States of America Environmental Protection Agency. "Ground-level Ozone, Health and Environment." 17 Nov. 2009. [www.epa.gov/air/ozonepollution/health.html](http://www.epa.gov/air/ozonepollution/health.html).

<sup>47</sup> The United States of America Environmental Protection Agency. "Particulate Matter." 28 Dec. 2009. [www.epa.gov/oar/particulatepollution/](http://www.epa.gov/oar/particulatepollution/).

<sup>48</sup> The United States of America Environmental Protection Agency. "Particulate Matter, Health and Environment." 9 May 2008. [www.epa.gov/air/particulatepollution/health.html](http://www.epa.gov/air/particulatepollution/health.html).

<sup>49</sup> The United States of America Environmental Protection Agency. "Nitrogen Dioxide, Health." 29 June 2009. [www.epa.gov/air/nitrogenoxides/health.html](http://www.epa.gov/air/nitrogenoxides/health.html).

<sup>50</sup> The United States of America Environmental Protection Agency. "Sulfur Dioxide, Health." 17 Nov. 2009. [www.epa.gov/air/sulfurdioxide/health.html](http://www.epa.gov/air/sulfurdioxide/health.html).

<sup>51</sup> The United States of America Environmental Protection Agency. "Six Common Air Pollutants," *Op. cit.*

<sup>52</sup> United States Environmental Protection Agency. "Attainment and Non-attainment areas." [www.epa.gov/OCEPAterms/nterms.html](http://www.epa.gov/OCEPAterms/nterms.html)

### 3.2 Industrial Facilities in Poughkeepsie and Adjacent Areas as Sources of Air Pollution

The most notable polluter in Poughkeepsie is IBM. The facility, which is located on 2455 South Road, Poughkeepsie, lies between Route 9 and the Hudson River in a residential area. The site consists of 423 acres, with the manufacturing complex occupying two-thirds of this area. The facility manufactures, tests, and assembles computers along with conducting research and development. In the past, there have been breaks in underground pipes and negligent disposal practices that have led to accidental releases of the pollutants into soil and groundwater. As of 1999, remediation was underway for a site on the facility known as "Former Equipment Crusher lower release pathway."<sup>53</sup>

In 1988, just a few years before IBM closed many of its operations in Poughkeepsie, the facility was producing 122,010 lbs of air pollutants. By 2002, almost 10 years after the closure of much of the factory, pollution released to the air was cut by 95% to 6,067 lbs. This newest figure includes chemicals such as (in decreasing order) xylene, ethylbenzene, n-methyl-2-pyrrolidone, and lead. Xylene (also known as polycyclic aromatic compounds) is suspected of being a cardiovascular and reproductive toxicant, among other toxicants. Ethylbenzene is a recognized carcinogen in addition to also being a suspected toxin to bodily functions. n-methyl-2-pyrrolidone is an established developmental toxicant as is lead, which is also a well known carcinogen and reproductive toxicant. In 2010, only 3.3 lbs of lead and 1.11 lbs of polycyclic aromatic compounds were released, with the other pollutants no longer being emitted.<sup>54</sup>

This IBM facility pales in comparison to its sister facility, located on 2070 St Rte 52, in Hopewell Junction, 14 miles southeast, which ranks 11th in New York for pollution emitted.<sup>55</sup> The facility is required to operate under a Title V Permit, issued on January 1, 2008 and expiring December 3, 2011, because emissions, including Sulfur Dioxide, Oxides of Nitrogen (NOx) and Volatile Organic Compounds (VOCs) are above major source thresholds as defined by the Federal Clean Air Act. The facility is engaged in the development and manufacturing of semiconductors for computers and electronics.<sup>56</sup>

In 2002, the plant introduced 26,823 lbs of pollutants to the air, in addition to 823,914 of pollutants to water. Pollutants to the air included over 6,000 lbs of ammonia, over 5,000 lbs of hydrofluoric acid, and over 1,000 pounds of methanol, sulfuric acid, and nitric acid in addition to 10 lbs of ozone and 3 lbs of lead. Compared to the Poughkeepsie facility, emissions were not greatly reduced by 2010. Ammonia pollution decreased to 2,300 lbs and hydrogen fluoride pollution decreased to 1,900 lbs. However methanol pollution increased to 2,600 lbs and sulfuric acid to 3,500 lbs. Lead and ozone each comprised

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<sup>53</sup> [www.epa.gov/region2/waste/ibm\\_p725.pdf](http://www.epa.gov/region2/waste/ibm_p725.pdf)

<sup>54</sup> <http://oaspub.epa.gov>

<sup>55</sup> <http://scorecard.goodguide.com/>

<sup>56</sup> [http://www.dec.ny.gov/dardata/boss/afs/permits/prr\\_313280002501028\\_r1.pdf](http://www.dec.ny.gov/dardata/boss/afs/permits/prr_313280002501028_r1.pdf)

10 lbs of the pollution. Ammonia, in addition to negatively affecting the balance of the environment, also is a suspected respiratory and skin toxin. Hydrofluoric acid and sulfuric acid, aside from contributing to acid rain, are also suspected of being bodily toxins. Methanol and ozone are well known greenhouse gases that contribute to global warming.

Aside from IBM, there are a handful of other small facilities in the Poughkeepsie area that contribute to air pollution. Conklin Corp., a communication equipment manufacturer in Pleasant Valley, produced 4.01 lbs of lead released as air pollution. Philips Semiconductors Manufacturing Inc., in Hopewell Junction, contributed 5,700 pounds of pollution to the air in 2010. These included ammonia, hydrogen fluoride, n-methyl-2-pyrrolidone, and various nitrate compounds including nitric acid. Finally, Schatz Manufacturing, Inc., in Poughkeepsie, released 0.71 pounds of lead to the air in 2010.<sup>57</sup>

### **3.3 Power Plants as Sources of Air Pollution**

The Roseton Power Plant, ran by Dynegy, is in between Poughkeepsie and Newburgh, on the west bank of the Hudson. The 992 River Road plant, technically in Newburgh, is required to operate under a Title V permit. The plant consists of two 600-megawatt generating boilers.<sup>58</sup> It is a natural gas and “No. 6 Fuel Oil” fired power plant that ranked eighth in the Northeast for the most carbon dioxide emissions in 2004. Based on 2004 data, it produced over 3 million metric tons of carbon dioxide, 23,161 tons of sulfur dioxide, and 5,115 tons of nitrogen oxides. These figures do not include the mercury, a neurotoxin, released into the air as a byproduct.<sup>59</sup>

### **3.4 Solid Waste Storage Facilities as Sources of Air Pollution**

While there are no solid waste landfills in the immediate area of Poughkeepsie there is a trash incineration plant. The Dutchess County trash burning plant is located on 98 Sand Dock Road in Poughkeepsie. An incinerator is an enclosed device using controlled flame combustion to break down solid waste to ash. The combustion of the trash is used to generate steam or electricity.<sup>60</sup> It is operated by the Dutchess County Resource Recovery Agency, and in 2009 it burned 150,925 tons of garbage, generating enough power for 10,000 homes. Although this plant meets state emissions standards, it undoubtedly contributes to the air pollution of the surrounding area.<sup>61</sup>

There is also an extinct landfill near the Dutchess County Airport. The landfill occupied 36 acres on 275 Van Wagner Road, before it was forced to closed due to the attraction it

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<sup>57</sup> <http://oaspub.epa.gov/>

<sup>58</sup> [http://www.dec.ny.gov/dardata/boss/afs/permits/prr\\_333460007500008\\_r2.pdf](http://www.dec.ny.gov/dardata/boss/afs/permits/prr_333460007500008_r2.pdf)

<sup>59</sup> <http://www.newenglandclimate.org/files/moreheatthanlight.pdf>

<sup>60</sup> <http://www.dec.ny.gov/chemical/23683.html>

<sup>61</sup> [http://www.dec.ny.gov/docs/materials\\_minerals\\_pdf/wtelist.pdf](http://www.dec.ny.gov/docs/materials_minerals_pdf/wtelist.pdf)

had to birds, creating a hazard to planes. Before 1976, about 90% of Poughkeepsie's waste was placed here. Poughkeepsie decided to ship its garbage out to other counties' landfills, primarily Ulster County.<sup>62</sup>

### 3.5 Traffic

Cars, buses and trucks are a big source of air pollution. When their engines burn petroleum-based fuels (gasoline or diesel), they produce large amounts of chemicals that are emitted in engine exhaust. In addition, some of the gasoline used by engines vaporizes into the air without having burned, and this also creates pollution.<sup>63</sup> Approximately 16% of U.S. housing units are located within 300 ft of a major highway, railroad, or airport (approximately 48 million people). This population likely includes a higher proportion of non-white and economically disadvantaged people.<sup>64</sup>

Some of the main pollutants produced by road traffic: nitrogen oxides, carbon monoxide, volatile organic compounds (VOCs), fine PM and ground level ozone. Exposure to these contaminants may cause adverse impacts to humans and the environment (see Section 4.6).

In the City of Poughkeepsie one issue that has been identified by community members as a priority is truck traffic and vehicle idling, particularly along the Arterial and in the city's northern industrial district. Diesel exhaust particulate matter (PM) is a toxic air contaminant. Diesel engines contribute to fine particulate matter (PM 2.5) air quality problems. Those most vulnerable are children whose lungs are still developing and the elderly who may have other serious health problems.<sup>65</sup> Residents of Poughkeepsie have also been critical of the aesthetic and safety issues caused by the volume of truck traffic passing through their neighborhoods.

### 3.6 Environmental and Health Effects Associated with Exposure to Air Pollutants Produced by Local Sources

This section of the report identifies some of the air pollutants released to the ambient air by the facilities listed earlier. It also identifies some of the environmental and health effects commonly associated with the selected contaminants

#### Nitrogen Oxides (NOx)

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<sup>62</sup> <http://blogs.vassar.edu/casperkill/2010/06/29/the-history-of-the-fica-landfill-i-1976-to-mid-1977-the-town-of-poughkeepsie-contracts-with-%E2%80%9Cjoe-garbage%E2%80%9D-of-dutchess-sanitation/>

<sup>63</sup> Health Canada. "The Health Effects of Traffic-Related Air Pollution." [www.hc-sc.gc.ca/hl-vs/iyh-vs/v/environ/traf-eng.php#th](http://www.hc-sc.gc.ca/hl-vs/iyh-vs/v/environ/traf-eng.php#th).

<sup>64</sup> U.S. Environmental Protection Agency. "Nitrogen Dioxide: Health." (2010). [www.epa.gov/air/nitrogenoxides/health.html](http://www.epa.gov/air/nitrogenoxides/health.html).

<sup>65</sup> Air Quality Department. "Consequences of Diesel Idling" [www.maricopa.gov/air/aq/divisions/compliance/air/Diesel\\_Idling/ConsequencesOfDieselIdling.aspx](http://www.maricopa.gov/air/aq/divisions/compliance/air/Diesel_Idling/ConsequencesOfDieselIdling.aspx)

These chemicals are produced by industrial processes and vehicle engines. When engines burn fuel, the nitrogen present in the air and nitrogen compounds found in fossil fuels produce NOx. Nitrogen oxides can irritate airways, especially lungs.

NOx react with ammonia, moisture, and other compounds to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death.<sup>66</sup> Nitrogen dioxide (NO<sub>2</sub>), one of several highly reactive nitrogen oxides,<sup>67</sup> is a reddish-brown toxic gas that has a characteristic sharp, biting odor and is a prominent air pollutant.

While EPA's National Ambient Air Quality Standard covers this entire group of NOx, NO<sub>2</sub> is the component of greatest interest and the indicator for the larger group of nitrogen oxides. NO<sub>2</sub> forms quickly from emissions from cars, trucks and buses, power plants, and off-road equipment. In addition to contributing to the formation of ground-level ozone, and fine particle pollution, NO<sub>2</sub> is linked with a number of adverse effects on the respiratory system.<sup>68</sup>

NO<sub>2</sub> concentrations in vehicles and near roadways are appreciably higher than those measured at monitors in the current network. In-vehicle concentrations can be 2-3 times higher than measured at nearby area-wide monitors.<sup>69</sup>

Near-roadway (within about 50 meters) concentrations of NO<sub>2</sub> have been measured to be approximately 30 to 100% higher than concentrations away from roadways. Individuals who spend time on or near major roadways can experience short-term NO<sub>2</sub> exposures considerably higher than measured by the current network.<sup>70</sup>

Current scientific evidence links short-term NO<sub>2</sub> exposures, ranging from 30 minutes to 24 hours, with adverse respiratory effects including airway inflammation in healthy people and increased respiratory symptoms in people with asthma. Also, studies show a connection between breathing elevated short-term NO<sub>2</sub> concentrations, and increased visits to emergency departments and hospital admissions for respiratory issues, especially asthma.<sup>71</sup>

Emissions that lead to the formation of NO<sub>2</sub> generally also lead to the formation of other NOx. Emissions control measures leading to reductions in NO<sub>2</sub> can generally be expected to reduce population exposures to all gaseous NOx. This may have the

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<sup>66</sup> *Ibid.*

<sup>67</sup> Other nitrogen oxides include nitrous acid and nitric acid.

<sup>68</sup> U.S. Environmental Protection Agency. "Nitrogen Dioxide." [www.epa.gov/air/nitrogenoxides/](http://www.epa.gov/air/nitrogenoxides/).

<sup>69</sup> U.S. Environmental Protection Agency. "Nitrogen Dioxide: Health," *op. cit.*.

<sup>70</sup> *Ibid.*

<sup>71</sup> *Ibid.*

important co-benefit of reducing the formation of ozone and fine particles both of which pose significant public health threats.<sup>72</sup> (See Ozone and PM environmental and health effects below)

### **Volatile Organic Compounds (VOCs)**

VOCs are emitted as gases from certain solids or liquids. These are a large group of organic chemicals that include any volatile compound of carbon (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate) and that participate in atmospheric photochemical reactions.<sup>73</sup> VOCs are of particular interest to regulators in part because they contribute to ozone formation.

As shown in previous sections VOCs are produced by a myriad of sources, including motor vehicles, chemical manufacturing facilities, refineries, factories, consumer and commercial products, and natural (biogenic) sources (mainly trees). One of the most common VOCs released into the ambient air is benzene. Benzene is an air toxic emitted from gasoline service stations, motor vehicle exhaust and fuel evaporation, the burning of coal and oil, and various other sources.<sup>74</sup> Urban areas generally have higher ambient air concentrations of benzene than other areas; it may also contaminate water.<sup>75</sup>

Other anthropogenic sources of VOCs are:

- (1) "Fuel combustion," which includes emissions from coal-, gas-, and oil-fired power plants and industrial, commercial, and institutional sources, as well as residential heaters and boilers;
- (2) "Other industrial processes," which includes chemical production, petroleum refining, metals production, and processes other than fuel combustion;
- (3) "On-road vehicles," which includes cars, trucks, buses, and motorcycles; and "Nonroad vehicles and engines," such as farm and construction equipment,
- (4) lawnmowers, leaf blowers, chainsaws, boats, ships, snowmobiles, aircraft and others.<sup>76</sup>

Some of the health effects associated with exposure to benzene at sufficient concentrations are cancer and damage to the immune system, as well as neurological,

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<sup>72</sup> *Ibid.*

<sup>73</sup> U.S. Environmental Protection Agency. "Report on the Environment: Volatile Organic Compounds Emission." <http://cfpub.epa.gov/eroe/index.cfm?fuseaction=detail.viewInd&lv=list.listByAlpha&r=209842&subtop=341>.

<sup>74</sup> U.S. Environmental Protection Agency. "Report on the Environment: Ambient Concentrations of Benzene." <http://cfpub.epa.gov/eroe/index.cfm?fuseaction=detail.viewInd&ch=46&subtop=341&lv=list.listByChapter&r=201745>.

<sup>75</sup> *Ibid.*

<sup>76</sup> U.S. Environmental Protection Agency. "Report on the Environment: Volatile Organic Compounds Emission," *op. cit.*

reproductive (e.g., reduced fertility), developmental, respiratory, and other health problems. Plants and animals may also be harmed by exposures to benzene (U.S. EPA, 2003).<sup>77</sup>

Ozone (O<sub>3</sub>): Ozone is a gas composed of three oxygen atoms. It is not usually emitted directly into the air, but at ground-level is created by a chemical reaction between oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOC) in the presence of sunlight.<sup>78</sup> Children, the elderly, people with lung diseases such as asthma, and people who work or exercise outside are at risk for adverse effects from ozone. These include reduction in lung function and increased respiratory symptoms as well as respiratory-related emergency department visits, hospital admissions, and possibly premature deaths.<sup>79</sup>

Ozone has the same chemical structure whether it occurs miles above the earth or at ground-level and can be "good" or "bad," depending on its location in the atmosphere. In the earth's lower atmosphere, ground-level ozone is considered "bad."<sup>80</sup> As mentioned above motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents as well as natural sources emit NO<sub>x</sub> and VOCs that help form ozone. Depending on the location of ozone in the atmosphere it is considered good or bad. At ground-level, ozone is the primary constituent of smog. Sunlight and hot weather cause ground-level ozone to form in harmful concentrations in the air more common in urban areas.<sup>81</sup>

People with lung disease, children, older adults, and people who are active can be affected when ozone levels are unhealthy. Numerous scientific studies have linked ground-level ozone exposure to a variety of problems, including:

- airway irritation, coughing, and pain when taking a deep breath;
- wheezing and breathing difficulties during exercise or outdoor activities;
- inflammation, which is much like a sunburn on the skin;
- it can worsen bronchitis, emphysema, asthma and cause increased susceptibility to respiratory illnesses such as pneumonia and bronchitis, and reduce the immune system's ability to fight off bacterial infections in the respiratory system;<sup>82</sup> and,
- permanent lung damage with repeated exposures.

Ground-level ozone can also have detrimental effects on plants and ecosystems. Some of these adverse effects include:

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<sup>77</sup> U.S. Environmental Protection Agency. "Report on the Environment: Ambient Concentrations of Benzene," *op. cit.*

<sup>78</sup> U.S. Environmental Protection Agency. "Ground-level Ozone." [www.epa.gov/air/ozonepollution/](http://www.epa.gov/air/ozonepollution/)

<sup>79</sup> *Ibid.*

<sup>80</sup> *Ibid.*

<sup>81</sup> *Ibid.*

<sup>82</sup> Ozone and Your Health. EPA-452/F-99-003. USEPA, Air and Radiation. Washington, DC 20460.

- interfering with the ability of sensitive plants to produce and store food, making them more susceptible to certain diseases, insects, other pollutants, competition and harsh weather;
- damaging the leaves of trees and other plants, negatively impacting the appearance of urban vegetation, as well as vegetation in national parks and recreation areas; and
- reducing forest growth and crop yields, potentially impacting species diversity in ecosystems.<sup>83</sup>

### **Carbon Monoxide (CO)**

Carbon monoxide is a colorless, tasteless, odorless, and non-irritating gas formed when carbon in fuel is not burned completely. All engine exhaust contains a certain amount of carbon monoxide, but the amount will increase if your vehicle engine is poorly maintained.

Carbon monoxide enters the bloodstream through the lungs and attaches to hemoglobin (Hb), the body's oxygen carrier, forming carboxyhemoglobin (COHb) and thereby reducing oxygen (O<sub>2</sub>) delivery to the body's organs and tissues. High COHb concentrations are poisonous. Central nervous system (CNS) effects in individuals suffering acute CO poisoning cover a wide range, depending on severity of exposure: headache, dizziness, weakness, nausea, vomiting, disorientation, confusion, collapse, and coma.<sup>84</sup> It is a common cause of death in enclosed spaces.

At lower concentrations, CNS effects include reduction in visual perception, manual dexterity, learning, driving performance, and attention level. 5% would be sufficient to produce visual sensitivity reduction and various neurobehavioral performance deficits.<sup>85</sup>

### **Particulate Matter (PM)**

PM is a complex mixture of extremely small particles and liquid droplets. These tiny particles contain many substances, including metals, acids and related chemicals (such as nitrates and sulfates), carbon, and polycyclic aromatic hydrocarbons and organic chemicals.<sup>86</sup>

The size of particles is directly linked to their potential for causing health problems. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the

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<sup>83</sup> U.S. Environmental Protection Agency. "Ground-level Ozone: Health and Environment." [www.epa.gov/air/ozonepollution/health.html](http://www.epa.gov/air/ozonepollution/health.html).

<sup>84</sup> Carbon Monoxide and the Nervous System. Raub, J. A., and V. A. Benignus. Carbon Monoxide and the Nervous System. *NEUROSCIENCE AND BIOBEHAVIORAL REVIEWS* 26(8):925-940, (2002).

<sup>85</sup> *Ibid.*

<sup>86</sup> U.S. EPA. "Air Quality Criteria for Particulate Matter." (Final Report, Oct 2004). U.S. Environmental Protection Agency, Washington, DC, EPA 600/P-99/002aF-bF, 2004.

lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. EPA groups particle pollution into two categories:

- "Inhalable coarse particles," such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter.
- "Fine particles," such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air.<sup>87</sup> Particles less than 2.5 micrometers in diameter are so small that they can easily get into the lungs, potentially causing serious health problems

Vehicle engine exhaust may include all the substances described above. Ultrafine particles are observed in the emissions from spark, diesel, and jet engines.<sup>88</sup> In these cases, it seems likely that organic compounds, ammonia and sulfuric acid from sulfur in the fuel, as well as metal additives in the fuel or fuel oil, may contribute to the formation of ultrafine particles.<sup>89</sup> While some of these particles are emitted in vehicle exhaust, others are formed in the atmosphere through chemical reactions between the various pollutants found in exhaust. Particulates are known to aggravate symptoms in individuals who already suffer from respiratory or cardiovascular diseases. Particle pollution, especially fine particles, contains microscopic solids or liquid droplets that are so small that they can get deep into the lungs and cause serious health problems.

Numerous scientific studies have linked particle pollution exposure to a variety of problems, including:

- increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing, for example;
- decreased lung function;
- aggravated asthma;
- development of chronic bronchitis;
- irregular heartbeat;
- nonfatal heart attacks; and
- premature death in people with heart or lung disease.<sup>90</sup>

People with heart or lung diseases, children and older adults are the most vulnerable and likely to be affected by particle pollution exposure. However, even if you are healthy, you may experience temporary symptoms from exposure to elevated levels of particle pollution.

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<sup>87</sup> U.S. EPA. "Particulate Matter." [www.epa.gov/pm/](http://www.epa.gov/pm/).

<sup>88</sup> U.S. EPA. "Air Quality Criteria for Particulate Matter," *op. cit.*.

<sup>89</sup> *Ibid.*

<sup>90</sup> U.S. EPA. "Particulate Matter," *op. cit.*

Fine particles (PM<sub>2.5</sub>) are the major cause of reduced visibility (haze) in parts of the United States, including many of our treasured national parks and wilderness areas.<sup>91</sup> Particles can be carried over long distances by wind and then settle on ground or water making lakes and streams acidic; changing the nutrient balance in coastal waters and large river basins; depleting the nutrients in soil; and damaging sensitive forests.<sup>92</sup>

### **Landfill Gas and Methane**

Landfill gas has an unpleasant odor that can cause headaches or nausea. The odor, however, is more irritating than a hazard to health. Although some compounds that make up landfill gas could be hazardous if present in large amounts, they should not cause adverse health effects if present in very small amounts.<sup>93</sup>

Methane is the main chemical in landfill gas and it is highly flammable. If a spark is present and enough methane is mixed into the air, a fire may occur. Breathing methane, however, is only hazardous if it is present at levels high enough to decrease the amount of oxygen in the air. The adverse health effects are due to a lack of oxygen, not by breathing the methane gas itself. In a building, methane would be a fire hazard at levels much lower than those that could cause breathing problems.<sup>94</sup>

Methane burns very easily and often is used as natural gas for cooking and heating. It is lighter than air and collects at the top of enclosed spaces. When it rises through the soil and enters buildings, it gets trapped in the lower parts of a building, such as the basement. As more methane enters the building, the level in the air increases.<sup>95</sup>

In addition to methane, hydrogen sulfide (H<sub>2</sub>S) contributes to the odor of landfill gas, with a smell similar to that of rotten eggs.

## **4. WATER POLLUTION**

### **4.1 Clean Water Act (CWA)**

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal

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<sup>91</sup> Haze is caused when sunlight encounters tiny pollution particles in the air, which reduces the clarity and color of what is seen, particularly during humid conditions.

<sup>92</sup> U.S. EPA. "Particulate Matter: Health and Environment." [www.epa.gov/air/particlepollution/health.html](http://www.epa.gov/air/particlepollution/health.html)

<sup>93</sup> Illinois Department of Public Health: Environmental Health Fact Sheet. "Landfill Gas."  
[www.idph.state.il.us/envhealth/factsheets/landfillgas.htm](http://www.idph.state.il.us/envhealth/factsheets/landfillgas.htm).

<sup>94</sup> *ibid.*

<sup>95</sup> *ibid.*

Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1977.<sup>96</sup> It is the cornerstone of surface water quality protection in the United States.<sup>97</sup>

The statute employs a variety of regulatory and non-regulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."<sup>98</sup>

Evolution of CWA programs over the last decade have also included something of a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach equal emphasis is placed on protecting healthy waters and restoring impaired ones.<sup>99</sup> A full array of issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining state water quality and other environmental goals is another hallmark of this approach.<sup>100</sup>

The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained. EPA's National Pollutant Discharge Elimination System (NPDES) permit program controls discharges.

Phase I of the National Pollution Discharge Elimination System (NPDES) Stormwater program began in 1990 and required medium and large municipal separate storm sewer systems (MS4s) to obtain NPDES coverage. Municipalities that are designated as "MS4 Communities" through the NYSDEC Phase II Stormwater Permit Program must develop, implement, and enforce a "Stormwater Management Program" (SWMP) to reduce pollution to the "maximum extent practicable" (MEP) to protect water quality. An area is automatically designated if the population is at least 50,000 and has an overall population density of at least 1,000 people per square mile based on the 2000 Census. This City of Poughkeepsie is an MS4 Community.

## **4.2 National Pollutant Discharge Elimination System (NPDES)**

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<sup>96</sup> U.S. EPA. "Laws and Regulations: Summary of the Clean Water Act."  
[www.epa.gov/regulations/laws/cwa.html](http://www.epa.gov/regulations/laws/cwa.html).

<sup>97</sup> The Act does not deal directly with ground water nor with water quantity issues.

<sup>98</sup> U.S. EPA. "Watershed Academy Web: Introduction to the Clean Water Act."  
[www.epa.gov/owow/watershed/wacademy/acad2000/cwa/](http://www.epa.gov/owow/watershed/wacademy/acad2000/cwa/).

<sup>99</sup> *Ibid.*

<sup>100</sup> *Ibid.*

Title IV, Permits and Licenses, of the FWPCA Act created the system for permitting wastewater discharges (Section 402), known as the National Pollutant Discharge Elimination System (NPDES). Under the NPDES program, all facilities which discharge *pollutants* from any *point source* into *waters of the United States* are required to obtain an NPDES permit.<sup>101</sup> Understanding how each of the key terms ("pollutant," "point source," and "waters of the United States") have been defined and interpreted by the regulations is the key to defining the scope of the NPDES Program.

### **Pollutants**

The term *pollutant* is defined very broadly by the NPDES regulations and litigation and includes any type of industrial, municipal, and agricultural waste discharged into water. For regulatory purposes, pollutants have been grouped into three general categories under the NPDES Program: *conventional*, *toxic*, and *non-conventional*. There are five *conventional pollutants*, and defined in Section 304(a)(4) of the CWA). *Toxic pollutants*, or *priority pollutants*, are those defined in Section 307(a)(1) of the CWA and include metals and man-made organic compounds. *Non-conventional pollutants* are those which do not fall under either of the above categories, and include such chemicals as ammonia, nitrogen, phosphorus, and parameters such as chemical oxygen demand (COD), and whole effluent toxicity (WET).

### **Point Source**

Pollutants can enter waters of the United States from a variety of pathways including agricultural, domestic, and industrial sources. For regulatory purposes these sources are generally categorized as either *point sources* or *non-point sources*. Typical *point source* discharges include discharges from publicly owned treatment works (POTWs), discharges from industrial facilities, and discharges associated with urban runoff. These are discrete conveyances such as pipes or man-made ditches. While provisions of the NPDES Program do address certain specific types of agricultural activities (i.e., concentrated animal feeding operations), the majority of agricultural facilities is defined as *non-point sources* and is exempt from NPDES regulation.<sup>102</sup>

Pollutant contributions to waters of the United States may come from both *direct* and *indirect* sources. *Direct* sources discharge wastewater directly into the receiving water body, whereas *indirect* sources discharge wastewater to a POTW, which in turn discharges into the receiving water body.<sup>103</sup> Under the national program, NPDES permits are issued only to direct point source discharges. The National Pretreatment Program addresses industrial and commercial indirect dischargers. As indicated above, the primary focus of the NPDES permitting program is municipal and non-municipal

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<sup>101</sup> Kovalic, J. M. The Clean Water Act of 1987, 2nd edition; The Water Pollution Control Federation (W.P.C.F); Alexandria, VA, 1987.

<sup>102</sup> U.S. EPA NPDES Permit Writers' Manual; U.S. Environmental Protection Agency, Office of Water, December, 1996; EPA-833-B-96-003, pp 1-28.

<sup>103</sup> *Ibid.*

(industrial) direct dischargers. Within these major categories of dischargers, however, there are a number of more specific types of discharges that are regulated under the NPDES Program.

The Hudson River itself has been designated as a 200-mile Superfund site under CERCLA, due to contamination from discharges of 1.3 million pounds of polychlorinated biphenyls (PCBs) from two General Electric manufacturing sites in Hudson Falls and Fort Edward from 1947-1977. PCB-containing sediments, which have washed downstream to NY/NJ Harbor and beyond, are known to bioaccumulate in the food chain and may be one of several contaminants in Hudson River fin and shellfish, which are caught along the shores in Poughkeepsie as a source of protein for subsistence, or for cultural or recreational reasons. The remediation of 40 miles of highly contaminated 'hotspots' of the Upper Hudson between Fort Edward and Troy began in May 2009 and after a year-long peer review process will resume in May 2011, with the intention of restoring the Hudson closer to its natural state before it received this massive contamination, allowing PCB levels in fish to drop to a safer level for human consumption.

### **Municipal Sources**

Municipal sources are POTWs that receive primarily domestic sewage from residential and commercial customers. Larger POTWs will also typically receive and treat wastewater from industrial facilities (indirect dischargers) connected to the POTW sewerage system. The types of pollutants treated by a POTW will always include conventional pollutants, and may include non-conventional pollutants and toxic pollutants depending on the unique characteristics of the commercial and industrial sources discharging to the POTW. The treatment provided by POTWs typically includes physical separation and settling (e.g., screening, grit removal, primary settling), biological treatment (e.g., trickling filters, activated sludge), and disinfection (e.g., chlorination, UV, ozone).<sup>104</sup>

These processes produce the treated effluent (wastewater) and a biosolids (sludge) residual, which is managed under the Municipal Sewage Sludge Program. Some older POTWs have an additional concern of combined sewer overflow (CSO) systems that can release untreated effluent during storm events. CSOs were an economic way for municipalities to collect both sanitary sewage and storm water and are controlled under the NPDES program.<sup>105</sup>

A number of municipalities have MS4s that are also subject to NPDES requirements. Specific NPDES program areas applicable to municipal sources are: the National

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<sup>104</sup> Environmental Protection Agency, Office of Wastewater Management. Water Permitting 101, available here: [http://cfpub.epa.gov/npdes/home.cfm?program\\_id=45](http://cfpub.epa.gov/npdes/home.cfm?program_id=45).

<sup>105</sup> *Ibid.*

Pretreatment Program, the Municipal Sewage Sludge Program, Combined Sewer Overflows (CSOs), and the Municipal Storm Water Program.<sup>106</sup>

### **Non-Municipal Sources**

Non-municipal sources, which include industrial and commercial facilities, are unique with respect to the products and processes present at the facility. Unlike municipal sources, at industrial facilities the types of raw materials, production processes, treatment technologies utilized, and pollutants discharged vary widely and are dependent on the type of industry and specific facility characteristics.<sup>107</sup>

The operations at industrial facilities are generally carried out within a clearly defined plant area; thus, the collection systems are typically less complex than those for POTWs. Industrial facilities may have storm water discharges contaminated by manufacturing activities, contact with raw materials or product storage activities, and may have non-process wastewater discharges such as non-contact cooling water.<sup>108</sup>

The NPDES Program addresses these potential wastewater sources for industrial facilities. Residuals (sludge) generated by industrial facilities are not currently regulated by the NPDES Program. Specific NPDES program areas applicable to industrial sources are: Process Wastewater Discharges, Non-process Wastewater Discharges, and the Industrial Storm Water Program.

### **Types of Permits**

A permit is typically a license for a facility to discharge a specified amount of a pollutant into receiving water under certain conditions; however, permits may also authorize facilities to process, incinerate, landfill, or beneficially use sewage sludge.<sup>109</sup> The two basic types of NPDES permits issued are individual and general permits.

An *individual permit* is a permit specifically tailored to an individual facility. Once a facility submits the appropriate application(s), the permitting authority develops a permit for that particular facility based on the information contained in the permit application (e.g., type of activity, nature of discharge, receiving water quality). The authority issues the permit to the facility for a specific time period (not to exceed five years) with a requirement that the facility reapply prior to the expiration date.<sup>110</sup>

A *general permit* covers multiple facilities within a specific category. General permits may offer a cost-effective option for permitting agencies because of the large number of

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<sup>106</sup> *Ibid.*

<sup>107</sup> U.S. EPA NPDES Permit Writers' Manual; U.S. Environmental Protection Agency, Office of Water, December, 1996; EPA-833-B-96-003, pp 1-28

<sup>108</sup> *Ibid.*

<sup>109</sup> *Ibid.*

<sup>110</sup> *Ibid.*

facilities that can be covered under a single permit.<sup>111</sup> General permits may only be issued to dischargers within a specific geographical area such as city, county, or state political boundaries; designated planning areas; sewer districts or sewer authorities; state highway systems; standard metropolitan statistical areas; or urbanized areas. These permits allow the permitting authority to allocate resources in a more efficient manner to provide more timely permit coverage.<sup>112</sup>

### **4.3 State Pollutant Discharge Elimination System (SPDES)**

EPA is authorized under the CWA to directly implement the NPDES Program. EPA, however, may authorize States, Territories, or Tribes to implement all or parts of the national program. States, Territories, or Tribes applying for authorization may seek the authority to implement the base program and additional parts of the national program including: permitting of federal facilities; administering the National Pretreatment Program; and/or administering the Municipal Sewage Sludge Program.<sup>113</sup>

New York State has a state program, which has been approved by the EPA for the control of wastewater and storm-water discharges in accordance with the Clean Water Act. Under New York State law the program is known as the State Pollutant Discharge Elimination System (SPDES) and is broader in scope than that required by the Clean Water Act in that it controls point source discharges to groundwaters as well as surface waters.<sup>114</sup> The program is designed to eliminate the pollution of New York waters and to maintain the highest quality of water possible -- consistent with public health, public enjoyment of the resource, protection and propagation of fish and wildlife and industrial development in the state through a permit system.<sup>115</sup>

### **4.4 Industrial Surface Water Pollution Sources in Poughkeepsie and Adjacent Areas**

The smaller IBM facility, located at 2455 South Rd, Poughkeepsie, has a SPDES permit and ranks third among industrial facilities for compliance violations, ten as of 2009.<sup>116, 117</sup>

Effron Oil Terminal also has a SPDES permit and ranks number one for Poughkeepsie industrial facilities for compliance violations with 44. Effron Oil Co. is located on the banks of the Hudson at Foot of Prospect St.

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<sup>111</sup> U.S. EPA. "Office of Wastewater Management. Water Permitting 101"  
[http://cfpub.epa.gov/npdes/home.cfm?program\\_id=45](http://cfpub.epa.gov/npdes/home.cfm?program_id=45).

<sup>112</sup> *Ibid.*

<sup>113</sup> *Ibid.*

<sup>114</sup> NYS Department of Environmental Conservation. "State Pollutant Discharge Elimination System."  
[www.dec.ny.gov/permits/6054.html](http://www.dec.ny.gov/permits/6054.html).

<sup>115</sup> NYS Department of Environmental Conservation. "P/C/I State Pollutant Discharge Elimination System Permit Program: Introduction." [www.dec.ny.gov/permits/6308.html](http://www.dec.ny.gov/permits/6308.html).

<sup>116</sup> <http://projects.nytimes.com/toxic-waters/polluters/new-york/poughkeepsie>

<sup>117</sup> [http://www.dec.ny.gov/docs/water\\_pdf/ebpsfinal2011.pdf](http://www.dec.ny.gov/docs/water_pdf/ebpsfinal2011.pdf)

Clinton Point Quarry, located on Sheafe Rd, Poughkeepsie has a SPDES permit and ranks second for compliance violations, with fifteen total.

Ashby Fuel Co, another fuel terminal, is located at 37 Peckham Rd in Poughkeepsie and has a SPDES permit, but only two violations.

#### **4.5 Power Plants in Poughkeepsie and Adjacent Areas as Sources of Water Pollution**

Roseton Generating Station, located in Newburgh, is a 1,200-megawatt natural gas and oil fired steam facility sited along the Hudson River in Newburgh that became operational in 1974. The power plant released 7lbs of chromium compounds, 1lb of copper compounds, 6.6 pounds of lead compounds, 92lbs of manganese compounds, 13lbs of nickel compounds, and 11lbs of zinc compounds in 2010 alone.<sup>118</sup> The plant is operating on an SPDES permit that expired in 1992. As a result of lawsuits brought by Riverkeeper, a new draft permit was created, but there is still no final permit.<sup>119</sup>

#### **4.6 Wastewater Facilities**

The Poughkeepsie Water Pollution Control Plant (WPCP) is located at 205 N. Water Street, Poughkeepsie. The plant treats approximately seven million gallons per day of raw water in addition to 30,000 gallons/day of septic tank waste by truck. After preliminary filtering, water is disinfected by chlorine before discharge into the Hudson River.<sup>120</sup>

Poughkeepsie WPCP uses a combined sewer system, which is particularly dangerous to the surrounding environment and its inhabitants. Combined sewer systems are designed to transport sewage, industrial wastewater, and rainwater runoff in the same pipes to the treatment plant. These plants are common in older cities, built with anachronistic technology. Most of the time, combined sewer systems are able to transport all of the wastewater to a treatment plant. However, when there is excess rainfall or snowmelt, the volume of wastewater traveling through a combined sewer system can exceed the capacity of the sewer. Hence, combined sewer systems are designed to overflow and discharge excess wastewater directly to nearby streams, rivers, lakes, or other water bodies.

These overflows, called combined sewer overflows (CSOs), contain not only storm water, which can contain oil, grease and toxic substances, picked up as rain washes

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<sup>118</sup> [http://oaspub.epa.gov/enviro/multisys2.get\\_list\\_tri?tri\\_fac\\_id=12550RSTNG992RA](http://oaspub.epa.gov/enviro/multisys2.get_list_tri?tri_fac_id=12550RSTNG992RA)

<sup>119</sup> <http://www.newenergychoices.org/maps/homepage/post/421>

<sup>120</sup> [http://data.rtknet.org/rmp/rmp.php?facility\\_id=100000113799&database=rmp&detail=3&datatype=T](http://data.rtknet.org/rmp/rmp.php?facility_id=100000113799&database=rmp&detail=3&datatype=T)

across ground surfaces, but also pollutants such as untreated human and industrial waste materials. These pathogens, solids, and toxic pollutants flow directly into local waters when it rains, resulting in water that does not meet quality standards. Exposure to polluted water from CSOs can cause waterborne infections including hepatitis, gastroenteritis, as well as skin, wound, respiratory, and ear infections. Although, generally, waterborne diseases result from ingesting contaminated water, they may also be contracted through inhalation of water vapors, eating contaminated fish and shellfish, and swimming.<sup>121</sup>

#### **4.7 Environmental and Health Effects Associated with Exposure to Water Pollutants Produced by Local Facilities**

##### **Wastewater Treatment Plants (WWTP)**

###### **Pathogens**

High levels of pathogens may result from inadequately treated sewage discharges. Sewage pathogens have been linked to many illnesses, ranging from mild flu-like symptoms to serious disease, organ failure, and sometimes even death.

Viruses are believed to be the major cause of disease contracted through direct contact with sewage, and are responsible for gastroenteritis, hepatitis, respiratory illness, and other health problems. One of the most common, the Norwalk Virus, is representative of a heterogeneous group of viruses, also called small round structured viruses (SRSVs) or the Norwalk-like family of agents. Common names of the illness caused by the Norwalk and Norwalk-like viruses are viral gastroenteritis, acute nonbacterial gastroenteritis, food poisoning, and food infection.

The protozoan *Cryptosporidium parvum* causes cryptosporidiosis, a gastrointestinal disease that affects people and animals. Upon infection, this protozoan resides principally in the gastrointestinal tract and goes through its life stages as an intracellular parasite. In the intestines, it forms oocysts (similar to parasite eggs) that are shed in feces and which are the source of infection for new susceptible people.<sup>122</sup>

Bacteria in sewage, such as *Escherichia coli* (*E. coli*) and enterococci, can cause many diseases and illnesses. Enterococci are bacteria that normally live in the bowel, intestines and digestive tracts of humans. The bacteria help to break down wastes in the body, but can cause urinary tract infections, wound infections and blood infections if they get out of their normal environment. Today, new strains of the bacteria, called VRE (Vancomycin Resistant Enterococcus), have developed a resistance gene to most antibiotics.<sup>123</sup> Since enterococci are found normally in the intestines, every time an

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<sup>121</sup> <http://www.epa.gov/region2/water/sewer-report-3-2011.pdf>

<sup>122</sup> *Ibid.*

<sup>123</sup> *Ibid.*

antibiotic is taken, the bacteria are exposed. This resistance gene makes it very difficult for doctors to treat a VRE patient. Those most at risk from VRE are people who are already seriously ill.<sup>124</sup>

### **Phosphorus**

The effluent, the discharge from a WWTP, may contain higher levels of pollutants than the waterbody it is flowing into.<sup>125</sup>

Because phosphorus stimulates algal growth, when this growth is excessive, other aquatic forms of life are endangered. Algae blooms limit recreational use by reducing water clarity and aesthetic qualities. Factors that limit algal growth include available forms of nitrogen and phosphorus, sunlight, and temperature. Algae and other microorganisms in the water greatly affect dissolved oxygen. Under algae bloom conditions, the algae have a negative effect on reservoir fisheries because of periodic oxygen depletion associated with algae respiration and decomposition.<sup>126</sup>

### **Chlorine**

Chlorination remains the most common form of wastewater disinfection in North America due to its low cost and long-term history of effectiveness. One disadvantage is that chlorination of residual organic material can generate chlorinated-organic compounds that may be carcinogenic or harmful to the environment. Residual chlorine or chloramines may also be capable of chlorinating organic material in the natural aquatic environment. Further, because residual chlorine is toxic to aquatic species, the treated effluent must also be chemically dechlorinated, adding to the complexity and cost of treatment.<sup>127</sup>

Effects of chlorine on human health and the environment depend on how much chlorine is present and the length and frequency of exposure. Effects also depend on the health of a person or condition of the environment when exposure occurs. Chlorine irritates the skin, the eyes, and the respiratory system. These effects are not likely to occur at levels of chlorine that are normally found in the environment.

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<sup>124</sup> *Ibid.*

<sup>125</sup> Westchester County Department of Planning. "Westchester County Croton Watershed Water Quality Conditions Report For Development of the Comprehensive Croton System Water Quality Protection Plan in Westchester County." March 2002.  
[www.westchestergov.com/planningdocs/CrotonPlan/Appendix%20B%20Water%20Quality%20Conditions.pdf](http://www.westchestergov.com/planningdocs/CrotonPlan/Appendix%20B%20Water%20Quality%20Conditions.pdf)

<sup>126</sup> Shock and Pratt. "Phosphorus Effects on Surface Water Quality and Phosphorus TMDL Development."  
[http://cropandsoil.oregonstate.edu/sites/default/files/WERA103/2003\\_proceedings/p211\\_Shock\\_Phosphorus\\_TMDL1.pdf](http://cropandsoil.oregonstate.edu/sites/default/files/WERA103/2003_proceedings/p211_Shock_Phosphorus_TMDL1.pdf)

<sup>127</sup> U.S. EPA. "Office of Pollution, Prevention, and Toxics: Chemicals in the Environment- Chlorine." (1994).  
[www.epa.gov/chemfact/f\\_chlori.txt](http://www.epa.gov/chemfact/f_chlori.txt).

Human health effects associated with breathing or otherwise consuming small amounts of chlorine over long periods of time are not known. Some studies show that workers develop adverse effects from repeat inhalation exposure to chlorine, but others do not.<sup>128</sup> Laboratory studies show that repeat exposure to chlorine in air can adversely affect the immune system, the blood, the heart, and the respiratory system of animals.<sup>129</sup> Chlorine can also cause low level environmental harm but is especially harmful to organisms living in water and in soil.<sup>130</sup>

## 5. TOXIC RELEASE FACILITIES

### 5.1 Emergency Planning and Community Right-to-Know Act (EPCRA) and the Toxic Release Inventory (TRI) Program

In 1984, a deadly cloud of methyl isocyanate killed thousands of people in Bhopal, India. Shortly after this incident, a serious chemical release took place at a plant in West Virginia. These events accelerated demands by industrial workers, communities, and public interest and environmental organizations for information on toxic chemicals being released outside of the facility.<sup>131</sup>

Against this background Congress enacted the Emergency Planning and Community Right-to-Know Act (EPCRA) in 1986. The Act's primary purpose is to inform communities and citizens of chemical hazards in their areas, it requires facilities in certain industries, which manufacture, process, or use significant amounts of toxic chemicals, to report annually on their releases of these chemicals. These reports contain information about the types and amounts of toxic chemicals that are released each year to the air, water, and land as well as information on the quantities of toxic chemicals sent to other facilities for further waste management. Section 313 of the Act requires EPA and the States to collect data annually on releases and transfers of certain toxic chemicals from industrial facilities and make the data available to the public in the Toxics Release Assessment (TRI).<sup>132</sup> Moreover, in 1990 Congress passed the Pollution Prevention Act which requires facilities to report additional data on waste management and source reduction activities to EPA under the TRI.<sup>133</sup>

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<sup>128</sup> *Ibid.*

<sup>129</sup> *Ibid.*

<sup>130</sup> *Ibid.*

<sup>131</sup> U.S. EPA. "What is the Toxics Release Assessment Program." [www.epa.gov/tri/triprogram/whatis.htm](http://www.epa.gov/tri/triprogram/whatis.htm)

<sup>132</sup> Reports must be submitted on or before July 1st each year and must cover activities that occurred at the facility during the previous calendar year.

<sup>133</sup> *Ibid.*

The current TRI toxic chemical list contains 593 individually listed chemicals and 30 chemical categories, including three delimited categories containing 62 chemicals.<sup>134</sup> Releases of approximately 650 chemicals and chemical categories covering about 23,000 industrial and federal facilities are required by law to be report annually to the EPA through the TRI program.<sup>135</sup> If the members of the three delimited categories are counted as separate chemicals then the total number of chemicals and chemical categories is 682.<sup>136</sup>

On November 26, 2010, EPA finalized a rule, which was effective on November 26, 2010, to provide communities with additional information about toxic chemicals being released to the environment. This rule was the first expansion of the TRI program in decades; it added 16 chemicals to the TRI list of reportable chemicals. This action is part of EPA's ongoing efforts to examine the scope of TRI chemical coverage and provide more complete information on toxic chemical releases.<sup>137</sup>

The chemical added by this rule have been classified as “reasonably anticipated to be a human carcinogen” by the National Toxicology Program (NTP) in their Report on Carcinogens (RoC) document.<sup>138</sup> Based on a review of available studies, EPA concluded that these 16 chemicals could cause cancer in humans and therefore meet the EPCRA section 313(d)(2)(B) statutory listing criteria. Four of the chemicals are being added to TRI under the polycyclic aromatic compounds (PACs) category. The PACs are of special concern because they are persistent, bioaccumulative, toxic (PBT) chemicals and as such, are likely to remain in the environment for a very long time, are not readily destroyed, and may build up or accumulate in body.<sup>139</sup>

The TRI program empowers citizens, through information, to hold companies and local governments accountable in terms of how toxic chemicals are managed. The data often spurs companies to focus on their chemical management practices since they are being measured and made public.<sup>140</sup>

## 5.2 Toxic Release Inventory Facilities in the Poughkeepsie Area<sup>141</sup>

IBM Corp: Lead, polycyclic aromatic compounds, and benzo(g,h,i)perylene.

Marco Manufacturing: Lead.

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<sup>134</sup> Methyl mercaptan, hydrogen sulfide, and 2,2-dibromo-3-nitropropionamide are under administrative stays and are not currently reportable.

<sup>135</sup> U.S. EPA. “TRI Chemical List.” [www.epa.gov/tri/trichemicals/index.htm](http://www.epa.gov/tri/trichemicals/index.htm).

<sup>136</sup> *Ibid.*

<sup>137</sup> U.S. EPA. “Addition of National Toxicology Program Carcinogens -- Final Rule.” [www.epa.gov/tri/lawsandregs/ntp\\_chemicals/final.html](http://www.epa.gov/tri/lawsandregs/ntp_chemicals/final.html).

<sup>138</sup> *Ibid.*

<sup>139</sup> *Ibid.*

<sup>140</sup> U.S. EPA. “TRI for Communities.” (2010). [www.epa.gov/tri/stakeholders/communities/index.htm](http://www.epa.gov/tri/stakeholders/communities/index.htm)

<sup>141</sup> <http://toxmap.nlm.nih.gov/>

### 5.3 Environmental and Health Effects Associated with Exposure to Toxic Release

#### **Lead**

Exposure to lead occurs when lead dust or fumes are inhaled or ingested via contaminated hands, food, water, cigarettes or clothing. There is no known safe level of exposure to lead—that is, there is no known amount of lead that is too small to cause the body harm.<sup>142</sup>

Lead entering the respiratory and digestive systems is released to the blood and, therefore, distributed throughout the body. More than 90% of the total body burden is accumulated in the bones, where it is stored. Lead in bones may be released into the blood, re-exposing organ systems long after the original exposure.<sup>143</sup>

Lead's toxic nature is well documented. It affects all organs and functions of the body to varying degrees. The frequency and severity of symptoms among exposed individuals depends upon the amount of exposure and the subject being affected. The list below includes some of the key lead-induced health effects.<sup>144</sup>

- Neurological Effects
- Peripheral neuropathy
- Fatigue / Irritability
- Impaired concentration
- Hearing loss
- Wrist / Foot drop
- Seizures
- Encephalopathy
- Gastrointestinal Effects
- Nausea
- Dyspepsia
- Constipation
- Colic
- Lead line on gingival tissue
- Reproductive Effects
- Miscarriages/Stillbirths
- Reduced sperm count & motility
- Abnormal sperm
- Heme Synthesis
- Anemia
- Erythrocyte protoporphyrin elevation
- Renal Effects
- Chronic nephropathy with proximal tubular damage
- Hypertension
- Arthralgia
- Myalgia

Take home lead (lead brought into the home and family vehicle on work clothes and equipment) can harm anyone who is exposed. Due to the fact that blood-borne lead crosses the placenta, a pregnant woman with an elevated blood lead level may expose her fetus to the toxic effects of lead. Children's exposure to lead is especially dangerous because it can cause learning problems and serious illness.<sup>145</sup>

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<sup>142</sup> [http://en.wikipedia.org/wiki/Lead\\_poisoning](http://en.wikipedia.org/wiki/Lead_poisoning)

<sup>143</sup> New York State: Department of Health. "Lead Exposure in Adults- A Guide for Health Care Providers." [www.health.state.ny.us/publications/2584/](http://www.health.state.ny.us/publications/2584/).

<sup>144</sup> *Ibid.*

<sup>145</sup> *Ibid.*

### **Hydrochloric Acid**

Hydrochloric acid is used in the production of chlorides, fertilizers, and dyes, in electroplating, and in the photographic, textile, and rubber industries. It is also for refining ore in the production of tin and tantalum, for pickling and cleaning of metal products, in removing scale from boilers, for the neutralization of basic systems, as a laboratory reagent, as a catalyst and solvent in organic syntheses, and for hydrolyzing starch and proteins in the preparation of various food products.<sup>146</sup>

It is corrosive to the eyes, skin, and mucous membranes. Short-term inhalation and exposure may cause eye, nose, and respiratory tract irritation and inflammation, and pulmonary edema and irritation, lesions of the upper respiratory tract, and laryngeal, and have been reported in rodents acutely exposed by inhalation. Acute oral exposure may cause corrosion of the mucous membranes, esophagus, and stomach and dermal contact may produce severe burns, ulceration, and scarring in humans.

Long-term occupational exposure has been reported to cause gastritis, chronic bronchitis, dermatitis, and photosensitization in workers. Prolonged exposure to low concentrations may also cause dental discoloration and erosion. Chronic inhalation exposure has also been reported to cause hyperplasia of the nasal mucosa, larynx, and trachea. EPA has not classified hydrochloric acid for carcinogenicity.<sup>147</sup>

### **Polycyclic Aromatic Compounds**

Also known as Polycyclic Aromatic Hydrocarbons (PAHs), these compounds represent a combination of over 100 organic compounds that are grouped together because it is rare that just one found alone, but rather in a mixture of two or more. PAHs generally enter the body through breathing polluted air. These substances are products of combustion that occur when organic substances, such as coal or garbage, are incompletely burned. PAHs are reproductive toxins, meaning any “defects in the progeny and injury to male and female reproductive function” are possible.<sup>148</sup> The EPA also lists these compounds as probable human carcinogens.<sup>149</sup> Animal studies have also shown that PAHs can affect the ability of an individual to fight off disease after both short and long term exposure.<sup>150</sup>

### **Benzo(g,h,i)perylene**

Benzo(g,h,i)perylene is a specific type of PAH. It has the same risks associated with the other PAHs including being a carcinogen and causing reproductive problems.<sup>151</sup>

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<sup>146</sup> *Ibid.*

<sup>147</sup> U.S. EPA. “Hydrochloric Acid (Hydrogen Chloride).” [www.epa.gov/ttnatw01/hlthef/hydrochl.html](http://www.epa.gov/ttnatw01/hlthef/hydrochl.html).

<sup>148</sup> <http://hazmap.nlm.nih.gov/>

<sup>149</sup> <http://www.mass.gov/dep/toxics/pahs.htm>

<sup>150</sup> <http://www.atsdr.cdc.gov/toxfaqs/faq.asp?id=121&tid=25#bookmark05>

<sup>151</sup> <http://www.epa.gov/osw/hazard/wastemin/minimize/factshts/benzoper.pdf>

## **Mercury**

Mercury is a naturally occurring element that is found in air, water and soil. It exists in several forms: elemental or metallic mercury, inorganic mercury compounds, and organic mercury compounds. Pure mercury is a liquid metal, sometimes referred to as quicksilver that volatilizes readily. It has traditionally been used to make products like thermometers, switches, and some light bulbs.<sup>152</sup>

In the United States, people are mainly exposed to methylmercury, an organic compound, when they eat fish and shellfish that contain methylmercury. Whether an exposure to the various forms of mercury will harm a person's health depends on a number of factors. People may be exposed to mercury in any of its forms under different circumstances. As stated by EPA, the factors that determine how severe the health effects are from mercury exposure include these:

- the chemical form of mercury;
- the dose;
- the age of the person exposed (the fetus is the most susceptible);
- the duration of exposure;
- the route of exposure -- inhalation, ingestion, dermal contact, etc.; and
- the health of the person exposed.<sup>153</sup>

No human data indicate that exposure to any form of mercury causes cancer, but the human data currently available are very limited. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. Scientists only observed these health effects at extremely high doses, above levels that produced other effects. When EPA revised its Cancer Guidelines in 2005, the Agency concluded that neither inorganic mercury nor methylmercury from environmental exposures are likely to cause cancer in humans.<sup>154</sup>

High exposures to inorganic mercury have been found to cause damage to the gastrointestinal tract, lungs, the brain and the nervous system, and the kidneys. Both inorganic and organic mercury compounds are absorbed through the gastrointestinal tract and affect other systems via this route. However, organic mercury compounds are more readily absorbed via ingestion than inorganic mercury compounds. Symptoms of high exposures to inorganic mercury include: skin rashes and dermatitis, hair loss, mood swings, memory loss, mental disturbances, and muscle weakness.<sup>155</sup>

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<sup>152</sup> U.S. EPA. "Mercury: Health Effects." [www.epa.gov/hg/effects.htm](http://www.epa.gov/hg/effects.htm).

<sup>153</sup> *Ibid.*

<sup>154</sup> More technical information is available in volume V of the 1997 Mercury Study Report to Congress. Available here: U.S. EPA. "Mercury: Health Effects." [www.epa.gov/hg/effects.htm](http://www.epa.gov/hg/effects.htm).

<sup>155</sup> U.S. EPA. "Mercury: Health Effects." *Op. cit.*

## 6. LAND USE IMPACTS

### 6.1 Stormwater Runoff

Stormwater runoff is generated when precipitation from rain and snowmelt events flows over land or impervious surfaces and does not percolate or infiltrate into the ground. As the runoff flows over the land or impervious surfaces (paved streets, parking lots, building rooftops, compact soil), it accumulates debris, chemicals, sediment, fertilizers, dirt, pesticides, oil and grease, and many others on the way to our rivers, lakes, and coastal waters adversely affecting water quality if the runoff is discharged untreated.<sup>156</sup>

Stormwater pollution from point sources and non-point sources is a challenging water quality problem. As mentioned by EPA, unlike pollution from industry or sewage treatment facilities, which is caused by a discrete number of sources, stormwater pollution is caused by the daily activities of people everywhere.<sup>157</sup> Stormwater runoff is one of the most common causes of water pollution.

### 6.2 Other Nonpoint Sources (NPS) of Pollution

Non-point source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification. The term "non-point source" is defined to mean any source of water pollution that does not meet the legal definition of "point source" in Section 502(14) of the Clean Water Act.<sup>158</sup>

The term "point source" means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged.<sup>159</sup> This term does not include agricultural storm water discharges and return flows from irrigated agriculture.

Unlike pollution from industrial and sewage treatment plants, nonpoint source (NPS) pollution comes from many diffuse sources. As mentioned above (see "Stormwater Runoff Section) NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters and ground waters.<sup>160</sup>

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<sup>156</sup> U.S. EPA. "NPDES: Stormwater Program." [http://cfpub.epa.gov/npdes/home.cfm?program\\_id=6](http://cfpub.epa.gov/npdes/home.cfm?program_id=6).

<sup>157</sup> U.S. EPA. "NPDES: Stormwater Outreach Materials and Reference Documents."  
<http://cfpub.epa.gov/npdes/stormwatermonth.cfm>.

<sup>158</sup> U.S. EPA. "Polluted Runoff (Nonpoint Source Pollution): NPS Categories."  
[www.epa.gov/owow\\_keep/NPS/categories.html](http://www.epa.gov/owow_keep/NPS/categories.html).

<sup>159</sup> U.S. EPA. "Polluted Runoff (Nonpoint Source Pollution): Basic Information."  
[www.epa.gov/owow\\_keep/NPS/whatis.html](http://www.epa.gov/owow_keep/NPS/whatis.html).

<sup>160</sup> *Ibid.*

Non-point source pollution can include:

- Excess fertilizers, herbicides and insecticides from agricultural lands and residential areas
- Oil, grease and toxic chemicals from urban runoff and energy production
- Sediment from improperly managed construction sites, crop and forest lands, and eroding streambanks
- Salt from road salting, irrigation practices and acid drainage from abandoned mines
- Bacteria and nutrients from livestock, pet wastes and faulty septic systems
- Atmospheric deposition and hydromodification

States report that non-point source pollution is the leading remaining cause of water quality problems.<sup>161</sup> The effects of non-point source pollutants on specific waters vary and may not always be fully assessed. However, EPA has pointed out that these pollutants have harmful effects on drinking water supplies, recreation, fisheries and wildlife.<sup>162</sup>

### **6.3 Marinas and Boating**

Marinas and recreational boating are very popular uses of coastal waters. The growth of recreational boating, along with the growth of coastal development in general, has led to an increased awareness of the need to protect the environmental quality of our waterways. Because marinas are located right at the water's edge, there is a strong potential for marina waters to become contaminated with pollutants generated from the various activities that occur at marinas—such as boat cleaning, fueling operations and marine head discharge—or from stormwater runoff from parking lots and hull maintenance and repair areas into marina basins.

The Coastal Zone Act Reauthorization Amendments of 1990, known as CZARA, require that EPA describe sets of management measures to be used for the control of pollution from various nonpoint sources, including marinas and recreational boating. States will incorporate these measures into their own non-point source pollution control programs to help achieve water quality standards.

#### ***Shadows Marina***

Located on 176 Rinaldi Boulevard, Poughkeepsie, this marina is coincidentally located on a former brownfield site.

#### ***Poughkeepsie Yacht Club***

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<sup>161</sup> U.S. EPA. "Polluted Runoff (Nonpoint Source Pollution): NPS Categories," *Op. cit.*

<sup>162</sup> *Ibid.*

Located on 100 Yacht Club Road, Staatsburg.

**Hyde Park Marina**

Located on 33 River Point Road, Poughkeepsie.

**6.4 Roads, Highways, and Traffic**

Runoff controls are essential to preventing polluted runoff from roads, highways and bridges from reaching surface waters. Erosion during and after construction of roads, highways and bridges can contribute large amounts of sediment and silt to runoff waters, which can deteriorate water quality and lead to fish kills and other ecological problems.<sup>163</sup>

Heavy metals, oils, other toxic substances and debris from construction traffic and spillage can be absorbed by soil at construction sites and carried with runoff water to lakes, rivers and bays.<sup>164</sup>

Runoff control measures can be installed at the time of road, highway and bridge construction to reduce runoff pollution both during and after construction. Such measures can effectively limit the entry of pollutants into surface and ground waters and protect their quality, fish habitats and public health. Pesticides and fertilizers used along roadway rights-of-way and adjoining land can pollute surface waters and ground water when they infiltrate into soil or are blown by wind from the area where they are applied.

**Table 1. Typical pollutants found in runoff from roads and highways.**

	<b>Pollutant</b>	<b>Source</b>
Sedimentation	PM	Pavement wear, vehicles, atmosphere, maintenance activities
Nutrients	Nitrogen & Phosphorus	Atmosphere and fertilizer application
Heavy Metals	Lead	Residues from leaded gasoline from auto exhausts and tire wear
	Zinc	Tire wear, motor oil and grease

<sup>163</sup> U.S. EPA. "Polluted Runoff (Nonpoint Source Pollution): Roads, Highways, and Bridges." [www.epa.gov/owow\\_keep/NPS/roadshwys.html](http://www.epa.gov/owow_keep/NPS/roadshwys.html).

<sup>164</sup> *Ibid.*

	<b>Pollutant</b>	<b>Source</b>
	Iron	Auto body rust, steel highway structures such as bridges and guardrails and moving engine parts
	Copper	Metal plating, bearing and brushing wear, moving engine parts, brake lining wear, fungicides and insecticides
	Cadmium	Tire wear and insecticides application
	Chromium	Metal plating, moving engine parts and brake lining wear
	Nickel	Diesel fuel and gasoline, lubricating oil, metal plating, brushing wear, brake lining wear and asphalt paving
	Manganese	Moving engine parts
	Cyanide	Anti-caking compounds used to keep deicing salt granular
	Sodium, calcium & chloride	Deicing salts
	Sulphates	Roadway beds, fuel and deicing salts
Hydrocarbons	Petroleum	Spills, leaks, antifreeze and hydraulic fluids and asphalt surface leachate

## 6.5 Brownfields

A brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.<sup>165</sup> It is estimated that there are more than 450,000 brownfields in the United States. Cleaning up and reinvesting in these properties increases local tax bases, facilitates job growth, utilizes existing infrastructure, takes development pressures off of undeveloped, open land, and both improves, reduces blight, and takes development pressures off greenspaces and working lands, protects the environment and health of the communities.<sup>166</sup>

Nearly every community in New York State is affected by contaminated and abandoned properties, or brownfield sites. Left untouched, brownfields pose environmental, legal

<sup>165</sup> U.S. EPA. "Brownfields and Land Revitalization." [www.epa.gov/brownfields/mission.htm](http://www.epa.gov/brownfields/mission.htm)

<sup>166</sup> *Ibid.*

and financial burdens on a community and its taxpayers. However, after cleanup, these sites can again become the powerful engines for economic vitality, jobs and community pride that they once were.<sup>167</sup>

### ***DeLaval Property***

13.4 acres of polluted land on the Hudson River located at the intersection of Rinaldi Boulevard and Pine Street had nine million dollars earmarked for its cleanup in 2006. It is adjacent to a former brownfield site success story that contains a popular restaurant, “Shadows on the Hudson.”<sup>168</sup> Until the 1960s, the lot was occupied by Moline Plow Company, which manufactured artillery shells and chemical fertilizers.<sup>169</sup> A preliminary inspection of the site found volatile and semi-volatile organic compounds as well as “metals in the soil and groundwater.” Such compounds not only cause discomfort, but can also cause cancer.<sup>170</sup> Remediation activities include removing “source areas of contamination” and “implementation of site controls” such as a barrier to prevent exposure to pathways.

### ***A.C. Dutton Lumber Yard***

The site, located on One Dutchess Avenue, Poughkeepsie began remediation in fall 2011. It yet another urban site located along the waterfront of the Hudson River. The factory included a variety of chemical tanks used to treat wood. Remediation of the site will entail removing the sludge of the leftover chemicals in addition to safely demolishing the old buildings, which contain asbestos. The site is currently being considered for proposed condominiums and office/retail space.<sup>171</sup>

## **7. POUGHKEEPSIE HEALTH PROFILE**

### **7.1 Introduction**

Any environmental justice assessment must consider the health status of the environmental justice community and the potential human health effects of current and increased environmental burdens. A population with a lower health status, whether the lower health status is caused by environmental or other factors, may be more vulnerable to the effects of increased environmental exposures.

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<sup>167</sup> NYS Department of Environmental Conservation. “Environmental Cleanup and Brownfields.” [www.dec.ny.gov/chemical/brownfields.html](http://www.dec.ny.gov/chemical/brownfields.html).

<sup>168</sup> <http://www.dec.ny.gov/environmentdec/18823.html>

<sup>169</sup> [http://cicnysb.firstdaystory.com/full.php?sid=870&current\\_edition=2008-09-01](http://cicnysb.firstdaystory.com/full.php?sid=870&current_edition=2008-09-01)

<sup>170</sup> <http://www.epa.gov/iaq/voc.html>

<sup>171</sup> <http://nyinc.com/bookmark/15833699>

The NYS DEC and NYS DOH—through a joint Health Outcome Data Work Group (HODWG) specified the criteria required to evaluate the health status of a community. The HODWG identified five medical conditions that should be included in an analysis of a community’s health status:

- 1) respiratory diseases,
- 2) cardiovascular diseases,
- 3) cancer,
- 4) prenatal health, and
- 5) lead exposure

Health outcome data, both counts and rates, for these five health related events, are available from reliable, publicly available data sources at the zip code level, thus allowing for a focused analysis of a community’s health status.

It is important to note that the health outcomes based on acute exposures, such as asthma or lead poisoning, may be more relevant to where people currently live than those, such as cancer, that are based on a more chronic exposure. Therefore, data based on acute exposures may be more relevant to an assessment of the impacts of current and future environmental burdens for the COC. The findings below offer greater detail.

## 7.2 Respiratory Diseases

Chronic obstructive pulmonary disease includes bronchitis, chronic bronchitis, emphysema, asthma, bronchiectasis, and extrinsic allergic alveolitis.

<u>Chronic Obstructive Pulmonary Disease&amp;Allied Cond(490-496) Diagnosis - ICD-9 Codes (3-digit) - Hospi</u>	<u>City Poughkeepsie</u>
490 - Bronchitis Nos	1
491 - Chronic Bronchitis	32
492 - Emphysema	1
493 - Asthma	25
494 - Bronchiectasis	0
495 - Extrinsic Allergic Alveolitis	0
496 - Chronic Airway Obstruction Nec	1

Chronic Obstructive Pulmonary Disease&Allied Cond(490-496) Diagnosis - ICD-9 Codes (3-digit) - Hospi	Town Poughkeepsie
490 - Bronchitis Nos	4
491 - Chronic Bronchitis	87
492 - Emphysema	1
493 - Asthma	79
494 - Bronchiectasis	0
495 - Extrinsic Allergic Alveolitis	0
496 - Chronic Airway Obstruction Nec	3

Year	Single Year	3-Year Average	Upstate New York
2005	45.7		50.7
2006	53.6	51.0	51.0
2007	53.6	55.0	49.8
2008	57.7	54.9	50.2
2009	53.5		53.8

**Table 2. Poughkeepsie Population = 32,736. COPD & Allied Conditions (490-496) Diagnosis - Average Hospital Admissions Over 2009<sup>172</sup>**

	Admissions (% of total) Poughkeepsie	Admissions (% of total) Dutchess Avg.
490 - Bronchitis Nos	2.00	1.40
491 - Chronic Bronchitis	49.00	58.10
492 - Emphysema	0	0.70
493 - Asthma	46.90	38.30

<sup>172</sup> [infoshare.org](http://infoshare.org)

494 – Bronchiectasis	0	0.50
495 - Extrinsic Allergic Alveolitis	0	0
496 - Chronic Airway Obstruction Nec	2.00	1

As seen in table 2, there is more asthma in Poughkeepsie than the in the rest of Dutchess County, a tell tale sign of increased urban pollution levels.

**Table 3a. Death due to chronic obstructive pulmonary disease by Age Category for 2001 in Poughkeepsie.**<sup>173</sup>

<u>Pulmonary - Deaths 2001 (excludes NYC)</u>	<u>City Poughkeepsie</u>	<u>%</u>
Death due to chronic obstructive pulmonary dis under 1 - '01	0	0.00
Death due to chronic obstructive pulmonary dis 1-14 - '01	0	0.00
Death due to chronic obstructive pulmonary dis 15-24 - '01	0	0.00
Death due to chronic obstructive pulmonary dis 25-34 - '01	0	0.00
Death due to chronic obstructive pulmonary dis 35-44 - '01	0	0.00
Death due to chronic obstructive pulmonary dis 45-54 - '01	0	0.00
Death due to chronic obstructive pulmonary dis 55-64 - '01	0	0.00
Death due to chronic obstructive pulmonary dis 65-74 - '01	3	50.00
Death due to chronic obstructive pulmonary dis 75-84 - '01	3	50.00
Death due to chronic obstructive pulmonary dis > 84 - '01	0	0.00

<sup>173</sup> [infoshare.org](http://infoshare.org)

**Table 3b.**

<u>Pulmonary - Deaths 2001 (excludes NYC)</u>	<u>Dutchess</u>	<u>%</u>
Death due to chronic obstructive pulmonary dis under 1 - '01	0	0.00
Death due to chronic obstructive pulmonary dis 1-14 - '01	0	0.00
Death due to chronic obstructive pulmonary dis 15-24 - '01	0	0.00
Death due to chronic obstructive pulmonary dis 25-34 - '01	0	0.00
Death due to chronic obstructive pulmonary dis 35-44 - '01	3	2.80
Death due to chronic obstructive pulmonary dis 45-54 - '01	3	2.80
Death due to chronic obstructive pulmonary dis 55-64 - '01	7	6.50
Death due to chronic obstructive pulmonary dis 65-74 - '01	28	25.90
Death due to chronic obstructive pulmonary dis 75-84 - '01	38	35.20
Death due to chronic obstructive pulmonary dis > 84 - '01	29	26.90

**Table 4. Asthma Emergency Department (ED) Visit Rate per 10,000 Population for area code 12601 (City of Poughkeepsie). The average rate for age group of Dutchess County is also included/<sup>174</sup>**

ED Visits	Annual Population	Poughkeepsie Rate	Dutchess County Rate	Age
148	2,563	192.5	91.1	0-4

<sup>174</sup> [http://www.health.ny.gov/statistics/ny\\_asthma/index.htm](http://www.health.ny.gov/statistics/ny_asthma/index.htm)

393	7,659	171	73.8	0-14
454	9,473	159.8	68.9	0-17
1,634	29,002	187.8	57.2	18-64
99	5,499	60	19.9	65+
2,187	43,974	165.8 (avg)	62.8	Total

**Table 5. Asthma Hospital Discharge Rate per 10,000 Population for 12601 (City of Poughkeepsie).<sup>175</sup>**

Discharges 2007-2009	Annual Population 2008	Poughkeepsie Discharge Rate	Dutchess County Discharge Rate	Age Group
89	2,563	115.7	52.1	0-4
135	7,659	58.8	27.6	0-14
142	9,473	50	23.2	0-17
200	29,002	23	8.9	18-64
52	5,499	31.5	15.5	65+
394	43,974	29.9 (avg)	25.46 (avg)	Total

As seen above, asthma is significantly worse in Poughkeepsie as compared to the Dutchess County average.

### 7.3 Cardiovascular Diseases

**Table 6. Cardiovascular and Other Diseases of the Circulatory System (390-459) Diagnosis - Hospital Admissions in Poughkeepsie.<sup>176</sup>**

Circulatory System (390-459) Diagnostic Category - ICD-9 Chap/Sect.(1,2-digit) - Hospital Admissions	City Poughkeepsie
Acute Rheumatic Fever (390-392)	0
Chronic Rheumatic Heart Disease (393-398)	3
Hypertensive Disease (401-405)	14

<sup>175</sup> [http://www.health.ny.gov/statistics/ny\\_asthma/index.htm](http://www.health.ny.gov/statistics/ny_asthma/index.htm)

<sup>176</sup> [infoshare.org](http://infoshare.org)

Ischemic Heart Disease (410-414)	31
Diseases of Pulmonary Circulation (415-417)	6
Other Forms of Heart Disease (420-429)	67
Cerebrovascular Disease (430-438)	37
Diseases of Arteries, Arterioles, and Capillaries (440-448)	11
Diseases of Veins & Other Diseases of Circ System (451-459)	13

Total= 183 persons.

**Table 7. Death due to all Cardiovascular Disease by Age Category for 2001.**<sup>177</sup>

Poughkeepsie		Dutchess County		
Age Group	Deaths (Total=80)	% of Total Mortality	Deaths (Total=2000)	% of Total Mortality
<1	0	0	0	0
1-14	0	0	3	0.15%
15-24	0	0	0	0
25-34	0	0	3	0.15%
35-44	0	0	10	0.50%
45-54	3	3.75%	28	1.40%
55-64	3	3.75%	66	3.30%
65-74	6	7.50%	135	6.75%
75-84	9	11.25%	239	11.95%
>84	11	13.75%	348	17.40%
Total	32	40.00%	832	41.60%

As table 7 shows, Poughkeepsie was very close to the Dutchess County averages for death by Cardiovascular Disease. However, Poughkeepsie had nearly twice the occurrence of deaths due to Cardiovascular Disease compared to Dutchess County as a whole for the age group of 45-54. Poughkeepsie also had a higher percentage of death between 55 and 74, but these differences were all less than 1%. However, Dutchess County had higher occurrences of death from ages 1-14, 25-44 and 75 and older.

**Table 8. All Diseases of the Heart (390-398, 402, 404-429) Diagnosis - Hospital Admissions**<sup>178</sup>

	Poughkeepsie	Dutchess County
390 - Rheumatic Fever	0	3

<sup>177</sup> infoshare.org

<sup>178</sup> infoshare.org

391 - Rheumatic Fever W/heart Involvement	0	0
392 - Rheumatic Chorea	0	0
393 - Chronic Rheumatic Pericarditis	0	0
394 - Diseases of Mitral Valve	0	8
395 - Aortic Valve Disease	0	0
396 - Disease of Mitral and Aortic Valve	1	32
397 - Diseases of Endocardial Structure	0	0
398 - Rheumatic Heart Disease	0	3
402 - Htn Heart Disease	1	21
404 - Hypertensive Heart/renal Disease	1	21
405 - Secondary Hypertension	0	2
410 - Acute Myocardial Infarction	13	439
411 - Ischemic Heart Disease	0	19
412 - Old Myocardial Infarction	0	0
413 - Angina Pectoris	1	9
414 - Chronic Ischemic Heart Disease	17	551
415 - Acute Pulmonary Heart Disease	6	126
416 - Chronic Pulmonary Heart Disease	0	5
417 - Pulmonary Circulation Diseases	0	0
420 - Acute Pericarditis	0	12
421 - Acute and Subacute Endocarditis	0	17
422 - Acute Myocarditis	0	1
423 - Diseases of Pericardium	0	15
424 - Diseases of Endocardium	3	90
425 - Cardiomyopathy	0	7
426 - Conduction Disorder	1	47
427 - Cardiac Dysrhythmias	24	641
428 - Heart Failure	38	868
429 - Ill-defined Heart Disease	0	6

**Table 9. Death due to all Heart Disease by Age Category for 2001<sup>179</sup>**

Poughkeepsie		% of Total Mortality	Dutchess County	
Age Group	Deaths (Total=80)		Deaths (Total=2000)	% of Total Mortality
<1	0	0	0	0
1-14	0	0	3	0.15%
15-24	0	0	0	0

<sup>179</sup> infoshare.org

25-34	0	0	3	0.15%
35-44	0	0	8	0.40%
45-54	3	3.75%	27	1.35%
55-64	3	3.75%	55	2.75%
65-74	5	6.25%	109	5.45%
75-84	7	8.75%	192	9.60%
>84	10	12.50%	288	14.40%
Total	28	35.00%	685	34.25%

Once again Poughkeepsie has higher instances of death due to all types of heart disease than the Dutchess County average for the older aged group of 45-74. For ages 45-54, Poughkeepsie has nearly twice the average occurrence of death and a full percent more than Dutchess County from 55 to 64. Again, Dutchess County had higher occurrences of death from ages 1-14, 25-44, and 75 and older.

#### 7.4 Cancer

**Table 10. Deaths due to all malignant cancer for Poughkeepsie and the Dutchess County average in 2001.**<sup>180</sup>

All Malignant Neoplasms	Poughkeepsie		Dutchess County Avg	
	Deaths (Total=80)	% of Total Mortality		% of Total Mortality
<1	0	0	0	0
1-14	0	0	3	0.15%
15-24	0	0	0	0
25-34	0	0	3	0.15%
35-44	0	0	16	0.80%
45-54	3	3.75%	36	1.80%
55-64	3	3.75%	71	3.55%
65-74	3	3.75%	115	5.75%
75-84	3	3.75%	133	6.65%
>84	3	3.75%	65	3.25%

Poughkeepsie has a lower percent of cancer in most age groups. The exceptions are 45-54, 55-64 and >84. The only significant difference is age group 45-54, where Poughkeepsie has more than twice the percent of cancer than the Dutchess County average.

<sup>180</sup> infoshare.org

## 7.5 Perinatal Health

**Table 11a. Perinatal health related admissions for 2009 in Poughkeepsie.<sup>181</sup>**

<u>Other Conditions Originating in Perinatal Period (764-779) Diagnosis - ICD-9 Codes (3-digit) - Hospi</u>	<u>City Poughkeepsie</u>	<u>%</u>
764 - Slow Fetal Growth, Malnutrition	0	0.00
765 - Short Gestation Disorder	0	0.00
766 - Long Gestation Disorder	0	0.00
767 - Birth Trauma	0	0.00
768 - Intrauterine Hypoxia/birth Asphyxia	0	0.00
769 - Respiratory Distress Syndrome	0	0.00
770 - Fetus/newborn Respiratory Condition	2	40.00
771 - Perinatal Infections	0	0.00
772 - Fetal and Neonatal Hemorrhage	0	0.00
773 - Hemolytic Disease of Fetus/newborn	0	0.00
774 - Perinatal Jaundice	2	40.00
775 - Endocrine and Metabolic Disturbance	0	0.00
776 - Hematologic Disorder, Fetus/newborn	0	0.00
777 - Perinatal Digestive System Disorder	0	0.00
778 - Perinatal Integument Condition	0	0.00
779 - Ill-defined Perinatal Condition	1	20.00

<sup>181</sup> infoshare.org

**Table 11b. Perinatal health related admissions for 2009 in Dutchess County, on average.<sup>182</sup>**

<u>Other Conditions Originating in Perinatal Period (764-779) Diagnosis - ICD-9 Codes (3-digit) - Hospi</u>	<u>Dutchess</u>	<u>%</u>
764 - Slow Fetal Growth, Malnutrition	0	0.00
765 - Short Gestation Disorder	4	4.10
766 - Long Gestation Disorder	0	0.00
767 - Birth Trauma	0	0.00
768 - Intrauterine Hypoxia/birth Asphyxia	2	2.00
769 - Respiratory Distress Syndrome	2	2.00
770 - Fetus/newborn Respiratory Condition	27	27.60
771 - Perinatal Infections	6	6.10
772 - Fetal and Neonatal Hemorrhage	1	1.00
773 - Hemolytic Disease of Fetus/newborn	0	0.00
774 - Perinatal Jaundice	36	36.70
775 - Endocrine and Metabolic Disturbance	0	0.00
776 - Hematologic Disorder, Fetus/newborn	0	0.00
777 - Perinatal Digestive System Disorder	2	2.00
778 - Perinatal Integument Condition	1	1.00
779 - Ill-defined Perinatal Condition	17	17.30

## 7.6 Lead Poisoning

Poughkeepsie is in the 90<sup>th</sup> percentile nationally for percentage of lead in drinking water. Currently, phosphoric acid is being added to remove the lead, leading to even more chemicals being introduced to the environment. Lead poisoning is also more likely to take place in older homes, which many of the homes in downtown Poughkeepsie are, from corrosion of outdated pipes. This means that every house in Poughkeepsie will have different amounts of lead in their water and experience different degrees of risk. In fact, Poughkeepsie recommends that if a household has not used water for a few hours,

<sup>182</sup> infoshare.org

they run their tap for 30 seconds to 2 minutes before they use the water. This information needs to become more public.<sup>183</sup> In addition, the median age of housing stock in Poughkeepsie is 59 years, so almost all homes were built before 1978 when lead paint was banned for residential uses.

## 7.7 Emerging Issues Requiring Further Research

### ***Salt Front***

Another side effect of climate change in Poughkeepsie could be the moving location of the salt front, the location where the salt water from the sea meets the fresh water of the Hudson River estuary. During especially dry periods, the salt front can shift north causing increased salt levels up the Hudson River. It is not known how climate change will affect the salt front, which is dependent on sea level, weather, season and tides.<sup>184</sup> Potentially, this could cause problems for the Poughkeepsie drinking water supply, due to increased sodium chloride levels and other imbalances.<sup>35</sup>

### ***Diabetes***

The national increase in rates of diabetes and the resultant personal health risks and the burden on local health care resources could also be a factor to evaluate within an Environmental Justice consideration. Also, early research has shown a possible connection to exposure to environmental chemicals in the development of diabetes and obesity.<sup>185</sup>

## 7.8 Conclusion

The health profile of the City of Poughkeepsie is comparable across most indicators with Dutchess County as a whole. However, asthma rates are significantly higher in the city, which is a common issue for urban centers, due to emissions from vehicles and the heat island effect. Programs to lessen vehicular traffic, encourage walkable districts, and a street tree planting program are some ways the city can help improve air quality and the burden on residents.

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<sup>183</sup> [www.cityofpoughkeepsie.com/download/151/&ei=V2cIT-oGKnm0QGm6p3RCA&usg=AFQjCNFgty0rBNrQuhzZCZzSyPTMV0Dngw](http://www.cityofpoughkeepsie.com/download/151/&ei=V2cIT-oGKnm0QGm6p3RCA&usg=AFQjCNFgty0rBNrQuhzZCZzSyPTMV0Dngw)

<sup>184</sup> [http://www.ldeo.columbia.edu/edu/k12/snapshotday/activities/HREP%20Lessons/FindingSaltFront\\_StudentSection.pdf](http://www.ldeo.columbia.edu/edu/k12/snapshotday/activities/HREP%20Lessons/FindingSaltFront_StudentSection.pdf)

<sup>185</sup> <http://ntp.niehs.nih.gov/?objectid=49816013-0B2A-A27F-F52812A4D0CEE150>

## **8. FINDINGS AND RECOMMENDATIONS**

### **8.1 Findings**

The City of Poughkeepsie and its surrounding area has a number of unique physical and demographic characteristics that make it highly vulnerable to the risks of climate change.

Although the city does not face any single, significant, industrial polluter, residents still face a number of threats to human health, such as air pollution, drinking water contamination, exposure to toxins at brownfields and vacant lots, and lead and asbestos exposure in their own homes. Any one of these sources alone may cause a burden to the community, but collectively the impact is likely to be more significant due to cumulative and potentially synergist effects.

### **8.2 Recommendations**

The following recommendations were the results of an interactive process between Clearwater and the members of the PCJC. The group focused much of their attention to preserving Poughkeepsie's assets and resources and creating a more sustainable future. Some of the ideas may have seemed very idealist or unattainable, but with focused research it is likely that most are achievable – especially if funding and other resources can be found. Next steps will include prioritizing and looking for funding.

#### Preserving Environmental Assets and Resources

- Protect clean water and clean air, or restore where degraded
- Protect trees and forests (especially useful for water quality and carbon sequestration)
- Assure riverfront access, including Waryas and Kaal Rock Parks, and Upper Landing.
- Work with the Fall Kill Watershed Committee to promote watershed awareness and protection.
- Hyde Park, Town of Poughkeepsie, City of Poughkeepsie, Clinton, and Pleasant Valley work together at a watershed scale.
- Map the wetlands, beyond existing federal and state maps, which need to be field verified.
- Continue to monitor outfalls and illicit discharges to the Fall Kill as part of MS4 compliance.
- Utilize Green Infrastructure to reduce stormwater flow and improve water quality; identify potential projects and funding.
- “Green” municipal building, vehicles, and heavy equipment but upgrading to energy efficient alternatives and renewable energy.

## Food Justice and Health

- More frequent and better advertising of local farmers' markets.
- Support the Poughkeepsie Farm Project, Fall Kill Partnership Gardens, and new CSA groups.
- Have a year-round Farmers Market (indoors monthly in winter).
- Create community gardens in accessible locations, especially in the urban areas to provide green space and nutritious food.

## Preventing or Mitigating Pollution Impacts and Other Environmental Burdens

### Traffic

- Establish bike lanes to promote sustainable transportation and recreational uses of roadways
- Support and find funding for a solar-powered trolley to reduce traffic in downtown
- Install roundabouts to prevent stopping and unnecessary idling

### Health

- Continue to problem-solve ways to reduce exposures and to promote health through good nutrition, exercise and education.
- Support and work with existing agencies that are providing care and education.

### Other

- Establish programs to test indoor air quality, lead, and radon.
- Prevent or mitigate the spread of invasive species such as plants and insects
- Flooding problems: can be severe during and after torrential downpours; storm sewer covers can actually become dislodged with water rushing out. This may become worse as climate change worsens.

## **9. CONCLUSION**

*“Environmental justice is not an issue we can afford to relegate to the margins. It has to be part of our thinking in every decision we make.”* ~ Lisa Jackson, Administrator, United States Environmental Protection Agency, 2009.

Environmental justice can be furthered by adopting policies to encourage and facilitate public participation in decisions, clean energy programs to improve efficiency and clean energy deployment, and targeted programs that ensure environmental justice communities are included in the transition to a clean energy economy.

Increasing opportunities for public participation in the decision making process would allow for greater transparency in agency decision making, and would reduce the likelihood that communities will be excluded from the decision making process. Fair and meaningful public involvement would include, among other things, availability of information, continual transparency, and early consultation and collaboration.

Encouraging and facilitating community involvement improves communication and embraces problem solving techniques that foster strong and trustworthy relationships between the community, regulatory agencies, and industries in the energy sector. Greater involvement in the decision making process increases community confidence in agency decisions and ensures that potential problems and possible solutions are addressed early in the process. Increased community involvement provides greater potential for addressing community concerns in siting decisions before disputes arise, improves agency relations with communities throughout the state, and helps communities move towards environmental equity.

When siting new facilities, assessing disproportionate health risks and environmental impacts could help identify overburdened communities and help develop measures to avoid or mitigate potential impacts in these communities. As mentioned in the Environmental Justice Issue Brief, this could be achieved by:

- (a) enhancing siting and permitting processes to require a comprehensive environmental and cumulative impact review;
- (b) improving emissions criteria to reduce health and environmental risks to burdened populations; and
- (c) providing early and consistent public participation in siting decisions.



## **C. CLIMATE JUSTICE ASSESSMENT**

### **1. CLIMATE JUSTICE**

According to the Mobilization for Climate Justice, “Climate justice is a vision to dissolve and alleviate the unequal burdens created by climate change. As a form of environmental justice, climate justice is the fair treatment of all people. It is the freedom from discrimination with the creation of policies and projects that address climate change, as well as the systems that create climate change and perpetuate discrimination.”<sup>1</sup> The unequal burden refers to people of color and low-income located in urban communities across the United States. These communities are the first to experience the negative impacts of climate change such as heat-related illness and death, respiratory illness, infectious diseases, unaffordable rises in energy costs, and extreme

#### **1.1 Climate Justice in the Hudson Valley**

##### ***Hudson River Sloop Clearwater, Inc. Hosts Climate Justice Conference in the Hudson Valley***

On May 21, 2012 Hudson River Sloop Clearwater introduce the concept of Climate Justice to participating communities with an intermunicipal workshop on climate justice called "Finding Opportunity in the Climate Crisis." This well-attended and enthusiastic workshop brought together municipal leaders, community members, youth, and environmental/conservation committee members. Participants learned about environmental justice, how climate change will affect the Hudson Valley, and what current initiatives are taking place. After the speakers presented, the group split into breakout sessions to brainstorm on topics such as energy, food and water, transportation, disaster prevention, response and recovery, and economic opportunities/green jobs. At the end of the day, participants left with knowledge, ideas, and tools to bring back to their own cities.<sup>2</sup>

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<sup>1</sup> Mobilization for Climate Justice. “What is Climate Justice?” (2009). Retrieved October 7, 2011 from <http://www.actforclimatejustice.org/about/what-is-climate-justice/>

<sup>2</sup> New York House. [http://www.upstatehouse.com/view/full\\_story/14345709/article-Climate-Justice-Initiatives-Set-for-Hudson-Valley-Cities-July-6--7--12--14](http://www.upstatehouse.com/view/full_story/14345709/article-Climate-Justice-Initiatives-Set-for-Hudson-Valley-Cities-July-6--7--12--14). Upstate House.

## 2. CLIMATE CHANGE

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Climate change is one of the most controversial science issues of the 21st century and is a real and urgent challenge that is already affecting people and the environment worldwide. It is undeniable that the Earth's climate is changing. In this section we will present some key scientific facts that explain the causes and effects of climate change (see section C.3) in an attempt to demystify this sometimes misunderstood phenomenon.

### 2.1 What is Climate Change?

Climate change may result from:

- natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun;
- natural processes within the climate system (e.g. changes in ocean circulation);
- human activities that change the atmosphere's composition (e.g. fossil fuel combustion) and the land surface (e.g. deforestation, reforestation, urbanization, desertification, etc.)

Although the Earth's climate has changed many times throughout its history, natural processes alone cannot explain the rapid warming seen today. Evidence of human influences on climate change has become increasingly clear and compelling.

### Science

#### Climate or Weather

Weather is the way the atmosphere is behaving, mainly with respect to its effects upon life and human activities.

The difference between weather and climate is that weather consists of the short-term (minutes to months) changes in the atmosphere.

NASA. [www.nasa.gov](http://www.nasa.gov)

#### Climate Change and Global Warming

**Climate change** refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change might result from natural factors and processes or from human activities.

The term "climate change" is often used interchangeably with the term global warming. **Global warming** refers to an average increase in the temperature of the atmosphere near the Earth's surface, which can contribute to changes in global climate patterns. However, rising temperatures are just one aspect of climate change.

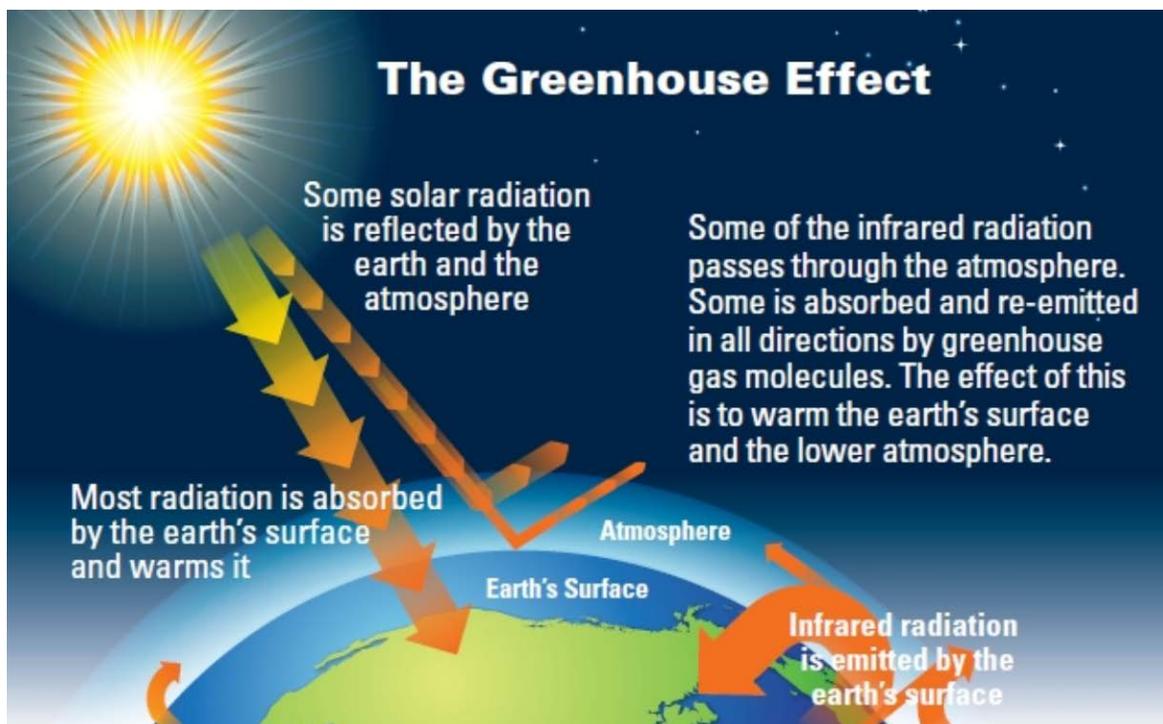
According to the National Academy of Sciences, "the phrase 'climate change' is growing in preferred use to 'global warming' because it helps convey that there are [other] changes in addition to rising temperatures."

(US EPA. Climate Change Indicators in the United States.  
[www.epa.gov/climatechange/indicators.html](http://www.epa.gov/climatechange/indicators.html))

Energy from the sun drives the Earth's weather and climate. The Earth absorbs some of the energy it receives from the sun and radiates the rest back toward space. However, certain gases in the atmosphere, called greenhouse gases, absorb some of the energy radiated from the Earth and trap it in the atmosphere. (See Figure C.1 for an Image Illustrating the Greenhouse Effect). These gases essentially act as a blanket, making the Earth's surface warmer than it would be otherwise. (US EPA)

Since the Industrial Revolution (around 1750), human activities have substantially added to the amount of heat-trapping greenhouse gases in the atmosphere. The burning of fossil fuels, such as coal and oil, and biomass (living matter such as vegetation) has also resulted in emissions of aerosols that absorb and emit heat, and reflect light.<sup>3</sup> Some amount of greenhouse gases is necessary for making it possible for life as we know it to exist on Earth because they trap heat in the atmosphere keeping the planet warm and maintaining a healthy equilibrium. Therefore, an increase in the amount of greenhouse gases in the atmosphere changes its composition and influences climate. The natural greenhouse effect is being strengthened as human activities add more of these gases to the atmosphere.

**Figure C.1. The Greenhouse Effect.**



Source: US Environmental Protection Agency (EPA), "Frequently Asked Questions About Global Warming and Climate Change: Back to Basics," [www.epa.gov](http://www.epa.gov) (Feb. 5, 2012)

<sup>3</sup> EPA. "Causes of Climate Change." <http://www.epa.gov/climatechange/science/causes.html>

## Greenhouse Gases

As mentioned before the Earth's climate is changing. Right now it is getting warmer, very likely<sup>4</sup> the result of human activities.<sup>5</sup> Although some greenhouse gases are almost entirely man-made and others come from a combination of natural sources and human activities (See Carbon Dioxide below) their concentration in the atmosphere is changing the amount of radiation coming into and leaving the atmosphere, likely contributing to changes in climate.<sup>6</sup>

The major greenhouse gases emitted into the atmosphere through human activities are carbon dioxide, methane, nitrous oxide, and fluorinated gases.<sup>7</sup>

- **Carbon dioxide (CO<sub>2</sub>)** is emitted primarily through the burning of fossil fuels (oil, natural gas, and coal), solid waste, and trees and wood products. Changes in land use, such as growing new forests or disturbing soils, can lead to the addition or removal of carbon dioxide to/from the atmosphere. Carbon dioxide occurs naturally because of volcanoes, forest fires, and biological processes (such as breathing), but is also produced by burning fossil fuels in power plants and automobiles.

CO<sub>2</sub> concentrations in the atmosphere increased from approximately 280 parts per million (ppm) in pre-industrial times to 382 ppm in 2006, according to the National Oceanic and Atmospheric Administration's (NOAA) Earth Systems Research Laboratory; a 36 percent increase.<sup>8</sup> According to the 2007 IPCC, almost all of the increase is due to human activities.<sup>9</sup> The current rate of increase in CO<sub>2</sub> concentrations is about 1.9 ppm/year. Present CO<sub>2</sub> concentrations are higher than any time in at least the last 650,000 years.<sup>10</sup> (See Figure 1 for a record of CO<sub>2</sub> concentrations from about 420,000 years ago to present).

- **Methane (CH<sub>4</sub>)** is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and agricultural practices and from the decay of

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<sup>4</sup> EPA using language from: IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning (eds.)]. (Use of "very likely" conveys a 90-99% chance the result is true. Other terms used to communicate confidence include "extremely likely" (greater than 95% chance the result is true); "likely" (greater than 66% chance the result is true) and "extremely unlikely" (less than 5%). The term "virtually certain" conveys that there is a greater than 99% chance that a result is true.)

<sup>5</sup> Id.

<sup>6</sup> Atmosphere Changes. <http://www.epa.gov/climatechange/science/recentac.html>

<sup>7</sup> US EPA. Climate Change Indicators in the United States. Greenhouse Gases. at 9.

<sup>8</sup> <http://www.esrl.noaa.gov/gmd/ccgg/trends/index.html#global>

<sup>9</sup> IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning (eds.)]

<sup>10</sup> Id.

organic waste in municipal solid waste landfills. In the United States, the largest methane emissions come from the decomposition of wastes in landfills, ruminant digestion and manure management associated with domestic livestock, natural gas and oil systems, and coal mining.<sup>11</sup>

Methane is more abundant in the Earth's atmosphere now than at any time in at least the past 650,000 years.<sup>12</sup> Methane concentrations increased sharply during most of the 20th century and are now 148% above pre-industrial levels. In recent decades, the rate of increase has slowed considerably.<sup>13</sup>

- **Nitrous oxide (N<sub>2</sub>O)** is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.

N<sub>2</sub>O has increased approximately 18 percent in the past 200 years and continues to increase. For about 11,500 years before the industrial period, the concentration of N<sub>2</sub>O varied only slightly. It increased relatively rapidly toward the end of the 20th century.<sup>14</sup>

- **Fluorinated gases**, such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, are emitted from a variety of industrial processes and commercial and household uses. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances such as chlorofluorocarbons (CFCs).

Many of these gases can remain in the atmosphere for tens to hundreds of years after being released.<sup>15</sup> Thus, to get a more complete picture of the amount of greenhouse gases in the atmosphere, both emissions (how much of a given greenhouse gas is produced and emitted into the air) and concentrations (the amount of a greenhouse gas present in a certain volume of air) are measured. Long-lived greenhouse gases become globally mixed in the atmosphere, reflecting both past and recent contributions from emission sources worldwide.<sup>16</sup> Some short-lived greenhouse gases, such as tropospheric ozone and aerosols, as well as particulates in the atmosphere, such as black carbon and sulfates, are relevant to climate change.<sup>17</sup> Other major

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<sup>11</sup> US EPA. Sources and Emissions: Where Does Methane Come From? <http://www.epa.gov/methane/sources.html>

<sup>12</sup> EPA, Causes of Climate Change. <http://www.epa.gov/climatechange/science/causes.html#ref3>

<sup>13</sup> EPA. Greenhouse Gases: Methane. <http://www.epa.gov/climatechange/science/recentac.html>

<sup>14</sup> *Ibid*

<sup>15</sup> *Id.*

<sup>16</sup> *Id.*

<sup>17</sup> *Id.*

sources of greenhouse gases include industrial and agricultural processes, waste management, and land use changes.

## 2.2 Climate Change Indicators

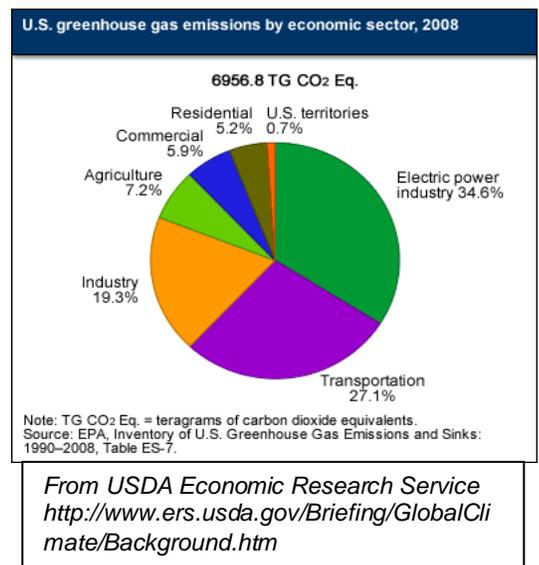
As reported by the IPCC, the buildup of greenhouse gases in the atmosphere is likely the cause of most of the recent observed increase in average temperatures, and contributes to other factors of climate change.<sup>18</sup>

Collecting and interpreting environmental indicators has played a critical role in our increased understanding of climate change and its causes.<sup>19</sup> An indicator represents the state of certain environmental conditions over a given area and a specified period of time.<sup>20</sup> Scientists, analysts, decision-makers, and others use environmental indicators, including those related to climate, to help track trends over time in the state of the environment, key factors that influence the environment, and effects on ecosystems and society.<sup>21</sup>

The EPA selected the 24 indicators presented in this report from a broader set of 110 indicators, many of which were identified at an expert workshop (November 30 to December 1, 2004) on climate change indicators convened by the National Academy of Sciences and funded by the EPA. The indicators in this report were chosen using a set of screening criteria that considered usefulness, objectivity, data quality, transparency, ability to show a meaningful trend, and relevance to climate change.

### U.S. Greenhouse Gas Emissions

Greenhouse Gas Emissions in the United States have risen 14 percent from 1990 to 2008.<sup>22</sup> These greenhouse gases include carbon dioxide, methane, nitrous oxide, and several fluorinated compounds, and are released into the



<sup>18</sup> IPCC (Intergovernmental Panel on Climate Change). 2007. Summary for Policymakers. In: Climate change 2007: The physical science basis (Fourth Assessment Report). Cambridge, United Kingdom: Cambridge University Press.

<sup>19</sup> US EPA, Climate Change Indicators Report. Available here [www.epa.gov/climatechange/indicators.html](http://www.epa.gov/climatechange/indicators.html). Feb 20, 2012.

<sup>20</sup> Id.

<sup>21</sup> Id.

<sup>22</sup> Id.

atmosphere by human-related commercial, industrial and household activities.<sup>23</sup> Electricity generation accounts for 32% of U.S. emissions since 1990, followed by transportation (27%).<sup>24</sup>

### Global Greenhouse Gas Emissions and Atmospheric Concentrations

From 1990 to 2005, global green house gas emissions have risen by 26 percent.<sup>25</sup> These emissions are increasing faster in some parts of the world that are highly industrialized and have high amounts of pollution. Before the industrial era around 1780, carbon dioxide concentrations measured about 270-290 parts per million (ppm) as compared to 387 ppm in 2009 - a 38 percent increase.<sup>26</sup>

### Climate Forcing

Climate or 'radiative' forcing is a measurement of how substances like greenhouse gases affect the amount of energy naturally absorbed by the atmosphere. An increase in this forcing leads to climate warming and from 1990 to 2008 the cumulative greenhouse gases in the Earth's atmosphere caused climate forcing to increase by 26 percent.<sup>27</sup> Most of this increase is due to an increase in carbon dioxide emissions and in this eighteen year period, radiative forcing due to carbon dioxide increased by 35 percent.<sup>28</sup>

### U.S. and Global Temperature

By looking at average monthly and yearly temperatures in the past century, we can see how increases in average temperatures coincide with patterns of climate change. Since 1901, global average surface temperatures have risen at an average rate of 0.13 °F per decade.<sup>29</sup> Prior to 1970, the U.S. rate of temperature increase was in line with the global trend but since then the United States has warmed at almost twice the global rate. Trends show that 2000-2009 was the warmest decade on record worldwide.<sup>30</sup>

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<sup>23</sup> Id  
<sup>24</sup> Id  
<sup>25</sup> Id  
<sup>26</sup> Id  
<sup>27</sup> Id  
<sup>28</sup> Id  
<sup>29</sup> Id  
<sup>30</sup> Ibid

## Heat Waves

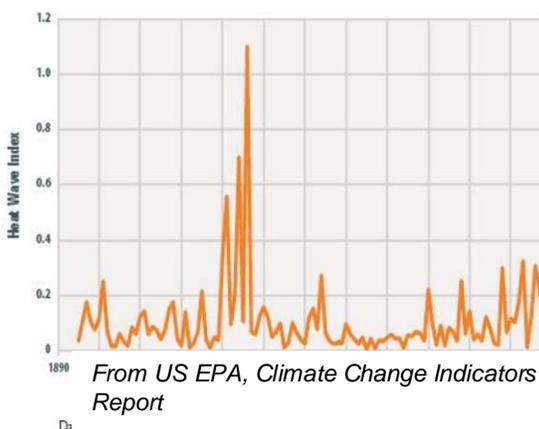
Heat waves in the United States have increased since the 1960s and 1970s, but the highest frequency of heat waves

occurred during the 1930s 'Dust Bowl.'<sup>31</sup>

Heat waves are typically in conjunction with periods of intense drought when little soil moisture cannot regulate the evaporation process. Heat waves are known to kill or injure crops and livestock and can lead to power outages when high demand for air conditioning can short-circuit the power grid.<sup>32</sup>

**Figure 1. U.S. Annual Heat Wave Index, 1895–2008**

*This figure shows the annual values of the U.S. Heat Wave Index from 1895 to 2008. These data cover the lower 48 states.*



## Drought

As average surface temperatures rise, the Earth's water cycle speeds up and increases evaporation. An increase in evaporation usually results in a decrease of precipitation, causing drought. From 2000 to 2009, roughly 30 to 60 percent of U.S. land areas experienced drought conditions.<sup>33</sup> Data regarding patterns of drought have not been recorded long enough to determine any long-term trend, yet average increases in surface temperature suggest that drought has increased with climate change.<sup>34</sup>

## U.S. and Global Precipitation

Total rainfall and precipitation have significant effects on human and ecosystem life. Since 1901 global precipitation has increased at an average of 1.9 percent per century, while precipitation has increase by 6.4 percent per century in the United States.<sup>35</sup> While the increase in precipitation rates are in direct reflection of the climate change, shifting weather patterns have decreased the total precipitation in some areas, including Hawaii and parts of the south-west.<sup>36</sup>

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<sup>31</sup> Ibid

<sup>32</sup> Id

<sup>33</sup> Id

<sup>34</sup> Id

<sup>35</sup> Id

<sup>36</sup> Id

### Heavy Precipitation

Climate change can influence the intensity as well as the incidence of precipitation. Warmer oceans increase the amount of water evaporated into the air and this warmer air can hold more moisture that is released in the form of heavy rain and snowstorms.<sup>37</sup> Not only have precipitation rates per century increased, but incidences of heavy short-term precipitation have also increased since 1990. Eight of the top ten years for extreme one-day precipitation have occurred in the past two decades.<sup>38</sup>

### Tropical Cyclone Intensity

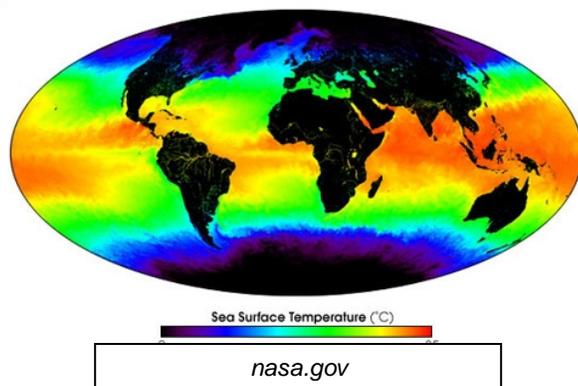
Tropical cyclones are cyclones that garner their energy from warm tropical oceans. A cyclone's intense rains and winds can cause property damage, soil erosion, and flooding.<sup>39</sup> Increased sea surface temperatures that result from climate change are the primary cause of cyclone formation and behavior. While there is no clear trend of cyclone intensity in the past half century, levels of intensity have risen in the past 20 years or so, and six of the ten most intense years have occurred since the mid-1990s.<sup>40</sup>

### Ocean Heat

When sunlight hits the ocean's surface, some of the energy is captured and stored as heat and affects both the deep ocean's temperature as well as the surface temperatures. Ocean heat has substantially increased since 1950 and has affected not only surface temperatures, but also sea levels and currents.<sup>41</sup>

### Sea Surface Temperature

Sea surface temperatures have significantly increased in the past century, and from 1901 to 2009 the average temperature rose at a rate of 0.12 degrees per decade. In the past 30 years, sea surface temperatures have been shown to rise more quickly at 0.21 degrees per decade.<sup>42</sup>



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<sup>37</sup> Id  
<sup>38</sup> Id  
<sup>39</sup> Id  
<sup>40</sup> Id  
<sup>41</sup> Id  
<sup>42</sup> Id

### Sea Level

Changes in sea surface temperature affect sea levels. From 1870 to 2008, absolute sea level increased at an average rate of 0.06 inches per year but in the past decade or so, from 1993 to 2008, average sea level rose at a rate of 0.11 to 0.13 inches per year - almost twice as fast as the long-term pattern.<sup>43</sup> Regional trends in sea level vary and have actually decreased in some places because the sea level is relative to the height of the land, which itself has shifted in the past few decades.

### Ocean Acidity

Changes in ocean waters develop over a period of time. Over the past decades studies show that the acidity level in oceans has increased substantially due to the abundant level of carbon dioxide. As levels of carbon dioxide increase in the atmosphere the ocean waters absorb more carbon dioxide in order to keep a balance.<sup>44</sup> Although carbon dioxide can be stored in oceans to help lessen climate change caused by human activity the significant increase has caused a chemical imbalance, which can change the biodiversity and productivity of the ocean's ecosystem.<sup>45</sup> Sensitive organisms such as plankton and corals can be greatly affected due to the reduced level of calcium carbonate to harden their skeletons and shells. This balance between the atmosphere and the ocean can take up to hundreds of years to correct itself.

### Arctic Sea Ice

During the cold winter months sea ice covers nearly all of the Arctic Ocean, but in the summer months with warm temperatures the sea ice begins to melt. The extent of the sea ice has, even in winter months, begun to decrease over the past century. Since sea ice is reflective, this region usually helps regulate the global climate keeping the polar region cold.<sup>46</sup> However, due to the decrease in sea ice caused by the increase in temperatures, the balance of the Earth's climate is reduced.<sup>47</sup> The decreased amount of sea ice can be harmful to Arctic mammals such as polar bears and walruses. These animals strongly rely on the existence of sea ice to hunt,

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<sup>43</sup> Id  
<sup>44</sup> Id  
<sup>45</sup> Id  
<sup>46</sup> Id  
<sup>47</sup> Id

breed, and migrate.<sup>48</sup> In 2007, the lowest extent of sea ice was recorded as 490,000 square miles, which is an area larger than Texas and California combined.<sup>49</sup>

### Glaciers

A glacier is a large body of ice that has accumulated over a period of time and is present year round.<sup>50</sup> Glaciers naturally flow like a river, but much slower. Higher elevations build up snow which is compressed into ice over time, and water flows at lower elevations until volume is eventually lost.<sup>51</sup> A balance between higher and lower elevations with the presence of fresh snow is always met resulting in glaciers neither growing nor shrinking.<sup>52</sup> Therefore, the appearance of glaciers changing or melting and breaking off relates to the change in climate. Observations over a period time are calculated to indicate the mass balance of glaciers around the world. A negative mass balance will determine that glaciers are losing ice and snow.<sup>53</sup> Therefore, a cumulative negative mass balance signifies that glaciers are melting faster than they can be recharged by snow precipitation.<sup>54</sup> Since 1960, glaciers worldwide have lost more than 2,000 cubic miles of water, which correlates with the increase in sea levels.<sup>55</sup>

### Lake Ice

The disappearance of winter ice in the spring relates to climate factors such as temperature, wind, and cloud cover.<sup>56</sup> A shorter lifespan of lake ice in the spring months may be a sign that the climate is warming.<sup>57</sup> Changes in lake ice can affect the life cycles of the plant and animal species present there. A decrease in ice cover can cause higher water temperatures, lower water levels, higher light penetration, and increased evaporation.<sup>58</sup> These conditions all correlate with the thaw dates trending toward earlier ice break up in the spring.

### Snow Cover

Snow cover is influenced by many climate factors, most importantly the changes in global temperature and precipitation over time. The amount of snow cover can affect heating and cooling trends globally. Snow has a higher albedo because it is light and reflective causing

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<sup>48</sup> Id  
<sup>49</sup> Id  
<sup>50</sup> Id  
<sup>51</sup> Id  
<sup>52</sup> Id  
<sup>53</sup> Id  
<sup>54</sup> Id  
<sup>55</sup> Id  
<sup>56</sup> Id  
<sup>57</sup> Id  
<sup>58</sup> Id

cooler temperatures in these areas, whereas darker surfaces such as asphalt or open waters have a lower albedo retaining more heat causing warmer temperatures. Snow cover is also important in replenishing local streams and rivers, and plants and animals rely on the snow for insulation and protection. Over a climate period trends have indicated that snow cover has decreased throughout North America.<sup>59</sup>

### Snow Pack

Snow pack is the amount of snow that is accumulated on the ground over a period of time.<sup>60</sup> As temperature increases, precipitation levels also change, resulting in more rainfall than snowfall, and causing the snow pack to decrease and melt earlier in the spring. Snow pack is vital for mountainous areas because during the winter months the snowfall stores water that melts in the spring and is used for drinking supplies, irrigation, and power.<sup>61</sup> If these trends occur earlier, agriculture, tourism, and wildlife will be greatly affected.<sup>62</sup> Certain species of plants and animals that rely on the snow pack for insulation from the freezing temperatures may be negatively affected by its decrease.

### Heat-Related Deaths

Heat-related deaths in the United States are the leading cause of weather-related fatalities. This can be prevented through outreach interventions, education, air quality management, and health care. Extreme temperatures can cause serious illnesses such as heat stroke, hyperthermia, heat cramps, and heat exhaustion.<sup>63</sup> Recently, with increased temperatures, heat wave events are becoming more prevalent. The number of people over the age of 65 has increased at a steady rate due to the baby boomers, and this age group is at the highest risk of heat-related deaths.<sup>64</sup> Elderly people are more sensitive to excessive heat conditions, and people who have serious cardiovascular and respiratory diseases are more susceptible to be affected as well.

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<sup>59</sup> Id  
<sup>60</sup> Id  
<sup>61</sup> Id  
<sup>62</sup> Id  
<sup>63</sup> Id  
<sup>64</sup> Id

### Length of Growing Season

The length of growing season is defined by the number of days when plant growth takes place, ranging usually from the last frost of the spring to the first frost of the fall.<sup>65</sup> Many climate factors are taken into consideration when defining this term due to the maturity of plants, daylight hours, temperature, rainfall, and frost days.<sup>66</sup> Warming climates can have a positive or negative effect on crop yield depending on location and type of crop. Also, invasive species or weed growth can alter the length of growth season. Throughout North America, over the last climate period, there has been a steady increase in the growing season, more so in the western US than the east.<sup>67</sup>

### Plant Hardiness Zones

Plant hardiness zones are regional designations that help farmers and gardeners determine which plant species are expected to survive a typical winter.<sup>68</sup> This designation is determined based on the average low temperatures recorded each winter due to the fact that low temperatures affect plants more so than do higher temperatures. Therefore, as temperatures increase globally plant species are able to thrive in areas that were previously too cold. This can have many affects on growing patterns and agriculture production. Animal species may migrate or emigrate depending on climate change and new invasive plant species can harm native plants.<sup>69</sup> Plant hardiness zones have shifted northward over time from 1990 to 2006 due to warmer winter temperatures.<sup>70</sup>

### Leaf and Bloom Dates

The natural events of leaf and bloom dates (when plants begin letting out their leaves and flowers in spring) are affected by climate change. Some factors that can affect these events are temperature, light, rainfall, and humidity.<sup>71</sup> Warming trends have been correlated with the earlier arrival of spring and this has many impacts on ecosystems and human society.<sup>72</sup> The earlier spring arrives, the longer the growing season is, which means a longer allergy season, more invasive species and pests. The early occurrence of lilacs and honeysuckles is a great

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<sup>65</sup> Id

<sup>66</sup> Id

<sup>67</sup> Id

<sup>68</sup> Id

<sup>69</sup> Id

<sup>70</sup> Id

<sup>71</sup> Id

<sup>72</sup> Id

indicator of climate change because they have such a large geographical range that over the years blooming has occurred a few days earlier. Plants in New York are blooming as much as eight days earlier than they did in 1970.<sup>73</sup>

### Bird Wintering Ranges

Animal behavior is a strong indicator of climate change, especially among birds. Birds' life cycles can be altered by climate change events particularly during reproduction and migration.<sup>74</sup> Birds have been observed over a long period of time because they are easy to count and identify. Most birds migrate north to breed and feed for the summer and during the winter months migrate south to warmer temperatures. Changes in habitat choice of certain bird species can be an indicator of climate change due to the fact that conditions in these habitats have changed, causing them to become more or less favorable for the species. Precipitation and temperature fluctuations have caused many bird species to move further north for the summer and less south for the winter. Birds that traditionally breed in New York have migrated as much as forty miles further north in the past two decades.<sup>75</sup> Also, climate change can alter the timing of life cycle changes, and birds that do not adapt to the change can suffer a decline in population.<sup>76</sup>

## **3. ACTUAL AND POTENTIAL CLIMATE CHANGE IMPACTS**

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If global warming emissions continue to grow unabated, New York State can expect dramatic changes in climate during the course of this century, with substantial impacts on the state's economy and character.<sup>77</sup>

### **3.1 Temperature**

Average temperatures across the Northeast have risen more than 1.5 degrees Fahrenheit (°F) since 1970, with winters warming most rapidly. Due to emissions in the recent past, average temperatures across the Northeast are projected to rise another 2.5 to 4 degrees Fahrenheit (°F) in winter and 1.5°F to 3.5°F in summer above historic levels over the next several decades.

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<sup>73</sup> NYS DEC, "Climate Change Basics." <http://www.dec.ny.gov/energy/63848.html>.

<sup>74</sup> EPA, Climate Change Indicators Report. [www.epa.gov/climatechange/indicators.html](http://www.epa.gov/climatechange/indicators.html).

<sup>75</sup> Id

<sup>76</sup> Id

<sup>77</sup> Frumhoff, P.C., J.J. McCarthy, et. al. July 2007. *Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions*. Synthesis report of the Northeast Climate Impacts Assessment (NECIA). Cambridge, MA: Union of Concerned Scientists (UCS).

The extent and severity of climate change beyond the mid-21<sup>st</sup> century, however, will be determined by emissions choices we make now—in the Northeast and around the world.<sup>78</sup>

If heavy reliance on fossil fuels and heat-trapping emissions continue, New York cities can expect a dramatic increase in the number of days over both 90°F and 100°F. Cities across the Northeast are projected to average 20 days per summer over 100°F and some (such as Philadelphia and Hartford, CT) could average nearly 30 such days. The length of the winter snow season could be cut in half across Maine, New Hampshire, northern New York, and Vermont.<sup>79</sup>

**Figure C.2 - Changes in Regional Average Summer Temperature**

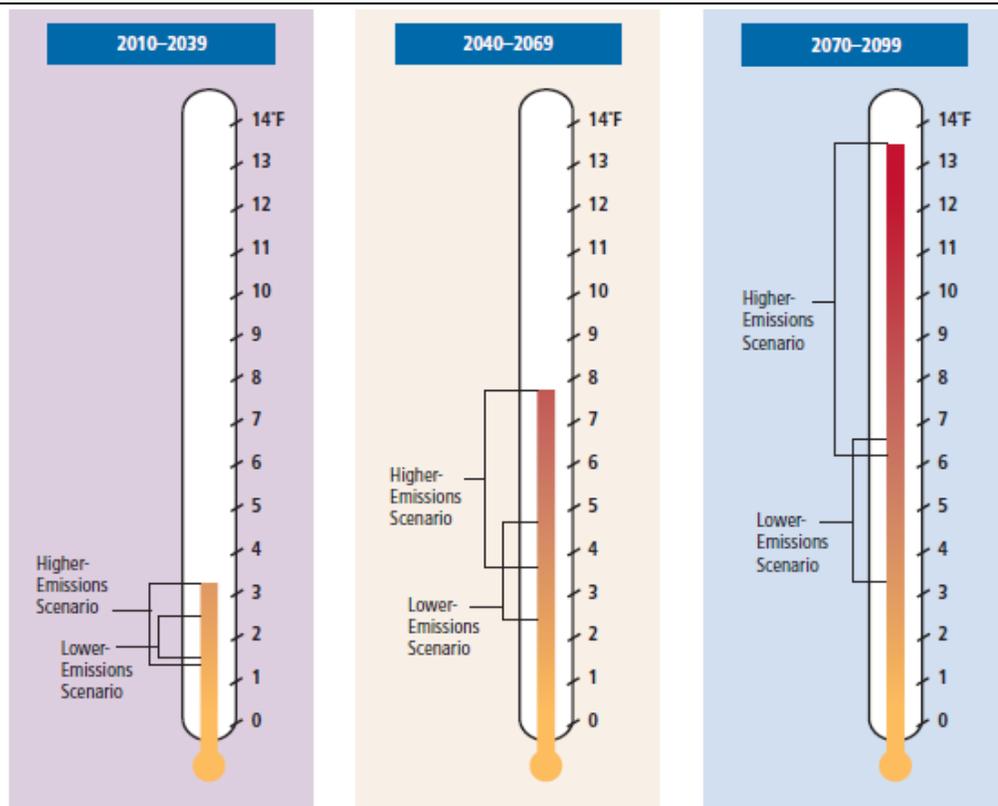


Figure C.2 shows projected increases in regional average temperatures for three time periods. Image taken from: [www.climatechoices.org](http://www.climatechoices.org).

### 3.2 Health Impacts

<sup>78</sup> Id.  
<sup>79</sup> Id.

Climate change affects human beings in many different ways; directly through changing weather patterns, and indirectly through its impact on the quality and quantity of the food and water we consume, the air we breathe, and the natural environment in which we live.<sup>80</sup>

One large impact of climate change is the actual changing of temperature on the planet. Since 1901, global average surface temperatures have risen at an average rate of 0.13°F per decade, but since 1970 this warming has occurred at nearly twice this rate.<sup>81</sup> An increase in temperature could lead to direct and adverse effects on human health, ranging from increased heat waves and incidents related to them, to climate-sensitive vector-borne diseases.

Heat waves are a serious effect of climate change, especially in urban areas. The IPCC predicts that extreme heat events will increase in frequency and duration due to global warming and that these events will have greater effects on humans due to factors such as continued urbanization and heat island effects, a larger proportion of the population being over 65 years old, and the number of people living alone.<sup>82</sup>

Another serious health-related impact of climate change is the increase in climate-sensitive diseases. The term “climate-sensitive disease” refers to food-borne, water-borne, or animal-borne diseases caused by the transmission of pathogens through these three vectors, which can all be affected by change in climate.<sup>83</sup> Climate-sensitive diseases are very prevalent in warm areas around the planet, particularly those that are carried by mosquitoes and other relevant insects. A few examples of climate-sensitive diseases are malaria, yellow fever, encephalitis, and dengue fever. Also, in these warmer climates where the temperatures are much higher, there are usually much higher rainfall patterns which cause the disease to be more prolonged and frequent. Flooding and runoff caused by stormwater can cause contamination of drinking water and crops by pathogen-containing sewage. Lyme disease and

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<sup>80</sup> IPCC: Intergovernmental Panel on Climate Change document (IPCC, 2007)

<sup>81</sup> EPA, “U.S. and Global Temperature”. <http://www.epa.gov/climatechange/science/indicators/weather-climate/temperature.html>

<sup>82</sup> EPA, “Aging Initiative – Extreme Heat Events”.  
<http://www.epa.gov/aging/resources/climatechange/extremeheatevents.htm>

<sup>83</sup> EPA, “Human Health Impacts & Adaptation”. <http://www.epa.gov/climatechange/impacts-adaptation/health.html#impactsdiseases>

West Nile virus are two other examples of animal-borne diseases, both of whose vectors (ticks and mosquitoes, respectively) are positively affected by increased temperatures.<sup>84</sup>

### 3.3 Sea Level Rise

One of the most dramatic effects of climate change is its impact on sea level rise.

Over the past century, sea level rose by an average rate of 1.7 millimeters a year, or 0.7 inches a decade, and based on recent observations, it is believed that this rate is accelerating<sup>85</sup>.

Conservative projections estimate a rise of 7 to 23 inches by the year 2100, while more recent studies, which take a closer look at the rapid melting of land-based ice sheets (namely Antarctica and Greenland), suggest that the sea level could rise as much as 55 inches by the same year.<sup>86</sup>

Increasing sea level has a number of impacts on human beings, directly and indirectly, as well as numerous impacts on the natural environment. Human-related impacts of sea level rise in the United States include increased flooding of populated coastal cities and towns and the infrastructure damage that results, potential contamination of salt water into freshwater and drinking water sources, as well as an increased risk of waterborne illnesses due to sewage overflows and pollutants entering the water supply. There are several other non-human related impacts of sea level rise as well, which are also important to consider, namely coastal erosion, and the destruction of important coastal ecosystems such as beaches, tidal marshes, swamps, bogs, mangroves, and other coastal wetland habitats.<sup>87</sup>

New York State, having a large amount of its population living in coastal areas, would therefore be greatly affected by this drastic increase in sea level. According to the NYS Sea Level Rise Task Force, 62% of the state's population lives in coastal areas, or areas that would be directly affected by sea level rise, including, geographically, the Capital Region/Upper Hudson Valley, the Mid-Hudson Valley (including Poughkeepsie), the Lower Hudson Valley, New York City, and Long Island.<sup>88</sup> The Task Force also projects the sea level in New York Harbor to rise by as

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<sup>84</sup> Ibid

<sup>85</sup> NYS DEC, "Sea Level Rise", <http://www.dec.ny.gov/energy/45202.html>

<sup>86</sup> Ibid

<sup>87</sup> EPA "Climate Change – Northeast Impacts and Adaptation", <http://www.epa.gov/climatechange/impacts-adaptation/northeast.html#ImpactsPrecipitation>

<sup>88</sup> NYS Sea Level Rise Task Force – Report to the Legislature Dec. 2010. [http://www.dec.ny.gov/docs/administration\\_pdf/slrtffinalrep.pdf](http://www.dec.ny.gov/docs/administration_pdf/slrtffinalrep.pdf)

much as fifteen inches in the next 150 years, which would in turn affect the entire Hudson River estuary area.<sup>89</sup> Based on the ClimAID Integrated Assessment 2010, this could cause a potential water-level rise of 5-10 inches for the majority of the Hudson Valley as soon as the year 2020.<sup>90</sup>

The City of Poughkeepsie, being located right on the Hudson River and part of the tidal estuary area, is therefore clearly at risk of being affected by sea level rise. The city's main industrial buildings, both current and old, are mostly located near the riverfront and as a result, much of the physical land of the waterfront has started to erode. Many of the city's public recreation areas, including Waryas Park, are also located in proximity to the waterfront, and could be damaged or lost with an increase in the river level. As seen by the dramatic flooding of Hurricane Irene in 2011, which caused large-scale flooding of the city's waterfront area, the rising water level of the Hudson, in this case due to storm surge, can have a large impact on the city. The effects of this temporary storm surge can be used to help understand how Poughkeepsie would thus be affected by the sea level rise that is projected, and hopefully help the city prepare for such an issue in the future.

### **3.4 Environmental Effects**

#### Water Quality and Climate Change

Freshwater resources are highly sensitive to variations in weather and climate. The changes in global climate that are occurring as a result of global warming will affect patterns of freshwater availability and will alter the frequencies of floods and droughts.<sup>91</sup> Climate model simulations suggest that "total flows, probabilities of extreme high or low flow conditions, seasonal runoff regimes, groundwater-surface water interactions, and water quality characteristics could all be significantly affected by climate change over the course of the coming decades."<sup>92</sup>

Although changes in the climate are certain to occur, there are significant uncertainties regarding the specific nature of the local and regional impacts of climate change on hydrologic regimes. Nevertheless, some types of changes can be foreseen with relatively high confidence.

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<sup>89</sup> Ibid

<sup>90</sup> NYSERDA, "Responding to Climate Change in New York State – Technical Report", <http://www.nyserda.ny.gov/Publications/Research-and-Development/Environmental/EMEP-Publications/~media/Files/Publications/Research/Environmental/EMEP/climaid/11-18-response-to-climate-change-in-nys-introduction.ashx>

<sup>91</sup> Dr. Kathleen Miller. Climate Change Impacts on Water. [http://www.isse.ucar.edu/water\\_climate/impacts.html](http://www.isse.ucar.edu/water_climate/impacts.html)

<sup>92</sup> Id.

For example, it is currently projected that in watersheds where stream-flow currently depends on snowmelt, warmer temperatures will increase the percentage of precipitation falling as rain rather than as snow, causing the annual spring peak in runoff to occur earlier.<sup>93</sup> Depending on changes in the amount and seasonal distribution of precipitation, these watersheds may experience an increased likelihood of winter flooding and reduced late summer flows. Also, saltwater intrusion into coastal aquifers is likely to become an increasing problem as a result of sea-level rise, and for many watersheds, there will be an increased likelihood of warmer summer water temperatures with associated impacts on aquatic ecosystems and water quality.

The City of Poughkeepsie sits primarily in the Fall Kill Creek Watershed. Located less than 90 miles from New York City, the watershed has experienced intense growth over the past thirty years. Pre-colonial Dutchess County was predominantly forested, but by the mid-1800s much of the county had been converted to farmland and by 2004 much of the farmland had been converted to residential, commercial, and forested landscapes.<sup>94</sup>

The Fall Kill Creek Watershed contains cold (headwater) and warm (closer to Hudson) water habitats that may be adversely impacted by projected increased temperatures. Although the main stem of the Fall Kill Creek is mainly non or slightly-impacted in its upstream reaches, it is severely impacted in its confluence with the Hudson River.

### Air Quality and Climate Change

In the Environmental Section of this report we have discussed the effect air quality has on the Earth's climate. This section explores climate impacts from air pollution.

As previously discussed, ozone and particle pollution are strongly influenced by shifts in the weather (e.g., heat waves or droughts). Based on projected future climate scenarios, and in the absence of additional emissions reductions, the IPCC projected "declining air quality in cities" in the future as a result of climate change. Furthermore, the EPA concluded in 2009 that greenhouse gas emissions "may reasonably be anticipated both to endanger public health and to endanger public welfare." This finding was based, in part, on the potential for climate change

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<sup>93</sup> Water Cycle Study Group (K. Miller member), A Plan for a New Science Initiative on the Global Water Cycle, U.S. Global Change Research Program, Washington, D.C., 2001.

<sup>94</sup> <http://www.dutchesswatersheds.org>

to worsen air quality in the U.S., and the accompanying public health impacts that would result.<sup>95</sup>

Climate change could have the following impacts on national air quality levels:

- “produce 2-8 ppb increases in summertime average ground-level ozone concentrations in many regions of the country.
- further exacerbate ozone concentrations on days when weather is already conducive to high ozone concentrations
- lengthen the ozone season
- produce both increases and decreases in particle pollution over different regions of the U.S.”<sup>96</sup>

Given these potential impacts of climate change on air quality, regional and local governments should consider implementing mitigation and adaptation measures.

### Agriculture and Climate Change

Agriculture is highly sensitive to climate variability and weather extremes. Increases in temperature and carbon dioxide (CO<sub>2</sub>) can be beneficial for some crops in some places, but to realize these benefits, nutrient levels, soil moisture, water availability, and other conditions must also be met. Climate change could make it more difficult to grow crops, raise animals, and catch fish in the same ways and same places humans have done in the past.<sup>97</sup> Projected temperature increase could directly threaten livestock. A number of states have each reported losses of more than 5,000 animals from just one heat wave.<sup>98</sup> Over time, heat stress can increase vulnerability to disease, reduce fertility, and reduce milk production, and drought may threaten pasture and feed supplies.<sup>99</sup>

New York is a leading agricultural state, worth \$4.42 billion in 2008. This income is then added to the economy in a variety of ways, including: \$427 million in employee compensation, \$343

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<sup>95</sup> United States Environmental Protection Agency. *Climate Change and Air Quality*. [www.epa.gov.airtrends](http://www.epa.gov.airtrends).

<sup>96</sup> Id.

<sup>97</sup> United States Environmental Protection Agency. *Agriculture*. [www.epa.gov](http://www.epa.gov).

<sup>98</sup> United States Environmental Protection Agency. *Climate Change Impacts and Adapting to Change*. [www.epa.gov](http://www.epa.gov).

<sup>99</sup> Id.

million in energy cost, \$236 million in property taxes, \$188 million in maintenance & repairs, and \$133 million in marketing & transportation.<sup>100</sup>

Farms in Dutchess County have a very diverse array of agricultural commodities including: tree fruits, berries, grapes, field crops, maple syrup, dairy products, meat, poultry, eggs, vegetables, bedding and garden plants, Christmas trees, biofuel crops, horses, and other horticultural products. Small and large farms in Dutchess County contribute to the local economy, food security, locally-grown food availability, healthy communities, and the environment.<sup>101</sup>

### Energy and Climate Change

Changes in temperature, precipitation, sea level, and the frequency and severity of extreme events will likely affect how much energy is produced, delivered, and consumed in the United States.

The U.S. Department of Energy led the development of a report published by the U.S. Global Change Research Program that investigates the impact of climate change on energy production and use in the United States.<sup>102</sup> The report summarizes the ways climate change will affect how Americans produce and use energy by answering the three questions found below, included here with a brief summary of the answers provided in the report:

*“How might climate change affect energy consumption in the United States?”*

Studies indicate that climate warming will mean reductions in total U.S. heating requirements and increases in cooling requirements for buildings varying by region and season, but they will affect household and business energy costs and their demands on energy supply institutions. Generally, changes will imply increased demands for electricity, which supplies virtually all cooling energy services but only some heating services.<sup>103</sup>

*“How might climate change affect energy production and supply in the United States?”*

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<sup>100</sup> Farm Bureau of New York. About New York Farm Bureau. <http://www.nyfb.org>. This information is provided by USDA's National Agricultural Statistics Service and the NYS Department of Agriculture and Markets.

<sup>101</sup> Cornell Cooperative Extension. Dutchess County. *Agriculture*. [www.ccedutchess.org](http://www.ccedutchess.org)

<sup>102</sup> United States Environmental Protection Agency. *Energy Impacts and Adaptation*. [www.epa.gov](http://www.epa.gov).

<sup>103</sup> Wilbanks, Bhatt et.al. *Effects of Climate Change on Energy Production and Use in the United States*. A Report by the U.S. Climate Change Science Program and the subcommittee on Global change Research. Department of Energy, Office of Biological & Environmental Research, Washington, DC., USA, 160 pp (2007).

Climate change could affect energy production and supply (a) if extreme weather events become more intense, (b) where regions dependent on water supplies for hydropower and/or thermal power plant cooling face reductions in water supplies, (c) where temperature increases decrease overall thermoelectric power generation efficiencies, and (d) where changed conditions affect facility siting decisions. Most effects are likely to be modest except for possible regional effects of extreme weather events and water shortages.”<sup>104</sup>

*Might climate change have other effects that indirectly shape energy production and consumption in the United States?*

It appears that climate change is likely to affect risk management in the investment behavior of some energy institutions, and it is very likely to have some effects on energy technology investments and energy resource and technology choices. In addition, climate change can be expected to affect other countries that in turn affect U.S. energy conditions through their participation in global and hemispheric energy markets. U.S. energy policy can be expected to suffer some changes too.

*Other Potential Impacts.*

- Climate change could affect the amount of water available to produce electricity or extract fuel. In areas where water is already scarce, competition for water between energy production and other uses could increase.
- Sea level rise and more frequent intense storms could disrupt energy production and delivery by damaging electricity infrastructure, fuel delivery infrastructure and equipment, power plants, or storage facilities.<sup>105</sup>

## **4. Conclusions and Recommendations**

The potential effects and impacts of climate change are clearly widespread and encompass a great variety of issues that affect both human beings and their natural environment. Whether it be the physical effects on humans, such as the threat of increasing sea levels and its impact on coastal cities and their infrastructures, the health effects that come along with climate-sensitive

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<sup>104</sup> Id. at 1.

<sup>105</sup> *Supra*, note 14.

diseases, changes in agriculture and nutrition, and food-borne diseases, or the effects climate change has on the world's natural ecosystems, it is clear that this is an issue that cannot be overlooked.

Community education is one of the most important measures that needs to be taken in dealing with climate change. The fact that climate change is occurring is more or less unanimously agreed upon by the scientific community, and it is important now, more than ever, to continue to further educate the public and increase understanding of these issues, and help local communities prepare for the impacts of climate change.

In terms of local communities, such the City of Poughkeepsie, it is vital to realize that dealing with climate change on the city level is not only possible, but extremely important. This could entail developing new projects and/or refining old projects directed at local scale climate change adaptation and mitigation (see section D). These projects could be implemented by cities throughout the world on a regional scale to help communities focus on and realize their true potential in helping deal with the effects of climate change.

Another important step in helping the public to realize the issues related to climate change and the impacts it has on their daily lives and futures is to make the information more easily accessible. This means not only providing the documents and data containing the information, but helping to make it more easily understandable, and helping to convey the information in a way that the public can more easily relate to.

Finally, it is vital to educate and expand on the knowledge of local decision makers and politicians of the impacts of climate change on both the global and local levels. It is key to get the support of these people in local communities who have the actual ability to implement these ideas and projects in their cities.

Climate change, though a global issue, has definite solutions on a regional, even local, scale. Dealing with climate change through mitigation and adaptation projects at the local level is beneficial due to the fact that each city or local community feels and handles the repercussions of climate change in different ways. This allows the community to address its own specific needs in terms of climate resilience and deal with them on an individual basis. Through these mitigation/adaptation projects, increased community and public education and awareness on the impacts of climate change, and providing city officials and decision makers with the ways

and means to implement the changes in their community, climate change can continue to be combated throughout the United States, and the world as a whole.

## **D. CITY OF POUGHKEEPSIE CLIMATE CHANGE MITIGATION AND ADAPTATION PROJECTS**

### **1. INTRODUCTION**

“Climate change is no longer a thing of the future.”<sup>106</sup> The character and economy of the Northeast are defined in no small part by its dramatically changeable climate: the pronounced seasonal cycle that produces snowy winters, verdant springs, pleasant summers, and colorful autumns; the year-to-year and day-to-day variability that includes extreme events such as nor’easters, ice storms, and heat waves; and the moderating influence of offshore currents such as the Gulf Stream. As mentioned in a report prepared by the Northeast Climate Impacts Assessment Synthesis Team of the Union of Concerned Scientists, “[i]f emissions of heat-trapping gases continue to grow unabated, the Northeast can expect dramatic temperature increases over the course of the century.”<sup>107</sup>

Since it is clear that some additional warming is inevitable, it is now essential to prepare to adapt to the changes that cannot be avoided. However, at the same time, science supports that deep reductions in emissions in the Northeast and across the world can reduce the extent and severity of global warming.<sup>108</sup> This scientific consensus supports that national, regional, and local governments create adaptation and mitigation plans to create climate resilience, assuming the long term effects of global warming could have a dramatic impact on the planet which society cannot afford.

To advance climate resiliency and awareness in the City of Poughkeepsie, the Climate Justice Council (PCJC), formed for the purposes of this project and developed two project proposals to advance the City’s climate adaptation and mitigation. In the course of year 2011 the PCJC met as a whole to identify priorities for Poughkeepsie. After careful examination of the potential climate change impacts and vulnerabilities, the group engaged in a prioritization process that led to the selection of the city’s two projects. (See Section C for Poughkeepsie’s Potential Climate Change Vulnerabilities)

A series of 3 PCJC meetings were held to brainstorm, prioritize, and select mitigation and adaptation projects. Meeting attendees comprised a wide cross-section of the community, and

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<sup>106</sup> Breakthrough Strategies and Solutions, LLC. *Climate Solutions for a stronger America: A Guide for Engaging and Winning on Climate Change and Clean Energy*. Maryland 2012.

<sup>107</sup> Frumhoff, McCarthy, et.al. 2007. *Confronting Climate Change in the US Northeast: Science Impacts, and Solutions*. Synthesis Report of the Northeast Climate Impacts Assessment (NECIA). Cambridge, MA: Union of Concerned Scientists. 1: 2.

<sup>108</sup> Supra, at 13.

included residents, politicians, and representatives from local non-profits (environmental, housing, energy, labor) and academia.

The first meeting consisted of an overview of the project, background on known environmental issues facing the City of Poughkeepsie, and an extensive and lively brainstorm on potential mitigation and adaptation project. Subsequent meetings focused on prioritizing focus areas, refining project ideas, and outlining resources needed.

The PCJC quickly came to consensus on focusing on two main issues facing the City: flooding of the Fall Kill and the Hudson River at Waryas Park, and the need for access to energy efficiency and renewable energy incentive programs and job training. The PCJC identified education, particularly youth education, as a top priority for any initiatives undertaken. In addition, the PCJC identified the need to phase in the campaigns with quick community and press events to garner attention, followed by medium and long term projects that would require more planning and resources.

## **1.1 Climate Change Mitigation and Adaptation**

In dealing with climate change, there are two main approaches: mitigation and adaptation. These two concepts, though different, are interrelated and can often be applied together to best combat climate change. As defined by the Intergovernmental Panel on Climate Change Third Assessment Report (IPCC TAR), mitigation refers to “an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases.”<sup>109</sup> This refers to society’s attempt to reduce its “carbon footprint” at its sources as a preventative measure to lessen or slow down climate change. Adaptation, on the other hand, is defined (by the IPCC TAR) as “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.”<sup>110</sup> Adaptation then, refers to society’s actions in coping and adapting to the damage that has already been brought on, or could potentially be brought on in the near future, by climate change.

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<sup>109</sup> IPCC TAR WG3 (2001), Metz, B.; Davidson, O.; Swart, R.; and Pan, J., ed., *Climate Change 2001: Mitigation*, Contribution of Working Group III to the Third Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, [http://www.grida.no/publications/other/ipcc%5Ftar/?src=/climate/ipcc\\_tar/wg3/index.htm](http://www.grida.no/publications/other/ipcc%5Ftar/?src=/climate/ipcc_tar/wg3/index.htm)

<sup>110</sup> IPCC TAR WG2 (2001), McCarthy, J. J.; Canziani, O. F.; Leary, N. A.; Dokken, D. J.; and White, K. S., ed., *Climate Change 2001: Impacts, Adaptation and Vulnerability*, Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, [http://www.grida.no/publications/other/ipcc%5Ftar/?src=/climate/ipcc\\_tar/wg2/index.htm](http://www.grida.no/publications/other/ipcc%5Ftar/?src=/climate/ipcc_tar/wg2/index.htm).

The two concepts are clearly related, as improving mitigation (lessening the effects, both positive and negative, of climate change) could potentially reduce the need for adaptation. However, adaptation and mitigation can be implemented together on a regional level, such as in the Hudson Valley, to create climate resilience. Although mitigation more often has global effects, i.e. reducing a nation's carbon emissions and its effect on CO<sub>2</sub> levels on a global scale, it can still have a great impact on regional and state-wide communities. Adaptation, on the other hand, is much more regional in scale, as it is most often implemented by local communities based on their decisions of how to best deal with climate change in relation to their own specific set of issues.

The benefits of a mitigation approach over an adaptation approach are much more easily seen, as the results can be physically reported through data such as actual levels of atmospheric greenhouse gases, whereas adaptation has no comparable source of data, because it is often implemented on a more regional or local scale where communities often have different social, economic, and political values. However, adaptation may have greater time-sensitive benefits, as its effects are often immediately effective and yield benefits in helping to reduce a community's vulnerability to constantly changing climate, whereas the benefits of mitigation are often not even evident for decades after.<sup>111</sup>

Based on an assessment made by Working Group III of the Fourth Assessment Report the current rate of global climate change mitigation is not sufficient to lead to the stabilization in concentration of atmospheric greenhouse gases.<sup>112</sup> Furthermore, Working Group I of the AR4 has also claimed that no mitigation effort whatsoever could help prevent climate change from occurring in the upcoming decades.<sup>113</sup> These scientific conclusions, together with the data that reflects that climate change is still occurring even through the implementation of mitigation-based tactics, are promoting a shift in how an adaptation-based approach to climate change is being perceived. Perhaps, adaptation measures are now being perceived as more practical and beneficial by the public.

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<sup>111</sup> Chapter 17, IPCC AR4 WG2 (2007), Adger, W.N., S. Agrawala, M.M.Q. Mirza, C. Conde, K. O'Brien, J. Pulhin, R. Pulwarty, B. Smit and K. Takahashi, 2007: Assessment of adaptation practices, options, constraints and capacity. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 717-743.

<sup>112</sup> IPCC AR4 WG3 (2007), B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer, ed., *Mitigation of Climate Change*, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

<sup>113</sup> IPCC AR4 WG1 (2007), Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller, ed., *The Physical Science Basis*, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

## **2. CLIMATE CHANGE MITIGATION PROJECT: Mitigating Climate Change by Promoting Green Job Training and Energy Efficiency Programs**

### **2.1 Methodology**

The goal of the PCJC was to identify and design a project that would reduce the amount of CO<sub>2</sub> produced locally while promoting environmental justice awareness within City limits. After participating in brainstorming sessions, the group decided to focus on energy efficiency education and training as a way to achieve the goal of lowering Poughkeepsie's carbon footprint.

### **2.2 Overview**

This campaign aims to serve the dual needs of City of Poughkeepsie residents of 1) lowering their energy costs and carbon footprint by taking advantage of energy saving measures in their homes and businesses and 2) creating sustainable local green job opportunities for city youth. Phased project components include a community clean up and educational event at Nubian Direction Inc.'s (NDI) proposed Green Job Training Center, an energy efficiency outreach initiative focused on low-income and Spanish-speaking populations, and working with the city to adopt DEC's Climate Smart Community Pledge.

### **2.3 Project Proposal**

This campaign is categorized in 3 complimentary but phased projects, meant to initially raise awareness and garner attention, provide widespread education to communities in need, and engage municipal support for long-term sustainability of the Council.

#### **1) Green Job Training Center Community Event (Short Term)**

The overall goal of this project is to highlight and provide support for NDI's proposed Green Job Training Center. NDI has acquired a 30,000 sq ft former warehouse from the city and is in process of converting it to a state of the art training center for energy efficiency and renewable energy technology.

Project partners, led by NDI and Clearwater, will organize a kick-off community clean up and educational event, which will include basic rehabilitation of the facility, educational displays and materials, and a press conference. The goal is to prepare the facility for future use, educate the community, and garner widespread attention and support.

### 2) Energy Efficiency Outreach Initiative (Medium Term)

This project will address a clearly identified need to increase awareness about state and utility company-sponsored incentive programs for energy efficiency and renewable energy, particularly to low-income and Spanish-speaking residents.

Project partners, led by Clearwater, UnWaste, RUPCO, and Mid-Hudson Energy Smart Communities, will plan and organize community forums and door-to-door outreach initiatives in target communities.

### 3) Climate Smart Community Pledge (Long Term)

The goal of this long-term ongoing project is to encourage City of Poughkeepsie leadership to take the NYS DEC Climate Smart Community Pledge, and follow through with the prescribed steps to appoint a climate coordinator or establish an energy or climate task force to assess local resources and issues, galvanize community support, develop an energy or climate plan, identify sources of greenhouse gases in the community, set goals for emission reduction and develop a climate action plan, and implement the plan.

#### **Project Partners:**

- Clearwater: Green Cities Staff
- Nubian Directions Inc: Robert Wright, Mario Johnson
- Hudson River Housing/Middle Main Revitalization: Elizabeth Celaya
- Public Service Commission, UnWaste Campaign: Wilson Martinez, Jeremy Schneider
- RUPCO: Meridith Neirenberg
- City of Poughkeepsie: Mayor's Office and Common Council

#### **2.4 Conclusion**

This 3-tiered approach of working with city government, local non-profits, and residents, with a focus on youth, although ambitious, will provide the most viable long term mitigation measures within the city.

## **2.5 Next Steps**

Clearwater is currently developing an official partnership with RUPCO to deliver energy efficiency education outreach to city residents, and has applied for funding from the Dutchess County Chamber of Commerce to begin rehabilitation of the future Green Job Training Center facility. Clearwater, RUPCO, and Nubian Directions will continue to work together to acquire resources and funding to implement our shared vision.

Once momentum is gained through outreach initiatives and the opening of the center, outreach to city officials will become the priority.

## **3. CLIMATE CHANGE ADAPTATION PROJECT: Adapting to Flooding of the Fall Kill and the Hudson River through Education and Preparedness Training**

### **3.1 Methodology**

The goal of the PCJC was to identify and design a project that would reduce the negative impacts of climate change while promoting environmental justice awareness within city limits. After participating in brainstorming sessions, the group decided to focus on reducing the negative impacts from flooding as a way to lessen the burden's of climate change on Poughkeepsie's EJ communities.

### **3.2 Overview**

This campaign aims to educate and prepare City of Poughkeepsie residents for future flooding of the Fall Kill and the Hudson River at Waryas Park, through Red Cross Emergency Preparedness Training and an Oral History research project and outreach initiative.

The Fall Kill Creek is located in the City of Poughkeepsie. Under President F.D. Roosevelt, the creek was channelized through a series of stone walls during the "New Deal Era". Approximately, 2.5 miles of stone walls were built on both sides of the creek's full length (3.1 miles).

For decades and years to come, the Fall Kill Creek plays an important role in the city's combined sewer system. Under normal conditions both sewer water and storm water flow to a water treatment facility. However, during heavy rainstorms the excess water overflows directly into the Fall Kill Creek.

On August 28, 2011, Hurricane Irene dumped more 7-9 inches of rain in the Mid-Hudson/Dutchess County region. One of the hardest hit areas in the City of Poughkeepsie was the densely populated Northside community. The overflow of rain and storm water forced the evacuation of hundreds of low income city residents from their homes and apartments.

On August 31, 2011, President Obama issued disaster declaration # FEMA- 4020-DR Hurricane Irene for the State of New York that triggered the release of Federal funds to help individuals and communities. Dutchess County was designated as an Individual Assistance (IA) and a Public Assistance (PA) county.

The extensive flooding of the creek during Hurricane Irene has forced local residents, city officials, and community groups to address the need to repair the Fall Kill Creek stonewalls and watershed areas. It is safe to say that the flooding will be more severe and will cause greater property damage.

### **3.3 Project Proposal**

This campaign seeks to educate and prepare City of Poughkeepsie residents for future flooding of the Fall Kill and the Hudson River at Waryas Park through a number of complimentary initiatives.

#### Emergency Preparedness Training (Short Term)

Flooding from the Fall Kill impacted hundreds of Poughkeepsie residents, but in a very limited geographic area of the city. This area is predominantly made up of renters, and has a high percentage of low-income and minority families. As a result, many families were severely burdened by the flooding, and lacked sufficient resources to recover from damages.

As a first step to alleviate this burden, this project seeks to educate residents and landlords with emergency preparedness training through the American Red Cross. The American Red Cross

training, which is provided free of charge, will be targeted to local residents and landlords, and coordinated with Nubian Directions YouthBuild Program and the local Clergy Association.

#### Oral History and Education (Medium Term)

As a first step towards education about flooding, this project seeks to collect stories from city residents about their history with the Fall Kill, and in particular their experiences with flooding and Hurricane Irene. The goal is to paint a picture of both the good and the bad of the Fall Kill, and use the stories to garner attention and funding towards the ultimate rehabilitation of the creek.

Project partners include Bard College's Environmental and Urban Studies program, which is dedicating a class to research and implement the Oral History component, including surveying residents on the impacts of Hurricane Irene.

#### Green Infrastructure Improvements (Long Term)

Along with education about flooding and preparedness training, adaptation to flooding from the Fall Kill will ultimately require changing the way the municipalities in the watershed manage stormwater. A long term, ongoing, project of this campaign is to promote green infrastructure improvements through the Fall Kill watershed to reduce the amount of water reaching the Fall Kill in storm events.

#### **Project Partners:**

- Clearwater: Green Cities Staff
- Nubian Directions Inc: Robert Wright, Mario Johnson
- Hudson River Housing/Middle Main Revitalization: Elizabeth Celaya
- American Red Cross
- Poughkeepsie Clergy Association: Rev Pastor Bottoms
- Bard College: Environmental and Urban Studies Program
- City of Poughkeepsie: Mayor's Office, Common Council, Engineering Dept.

### **3.4 Conclusion**

This 3-tiered approach of education, emergency preparedness, and infrastructure improvements, although ambitious, will provide the most viable long term flooding adaptation measures within the City.

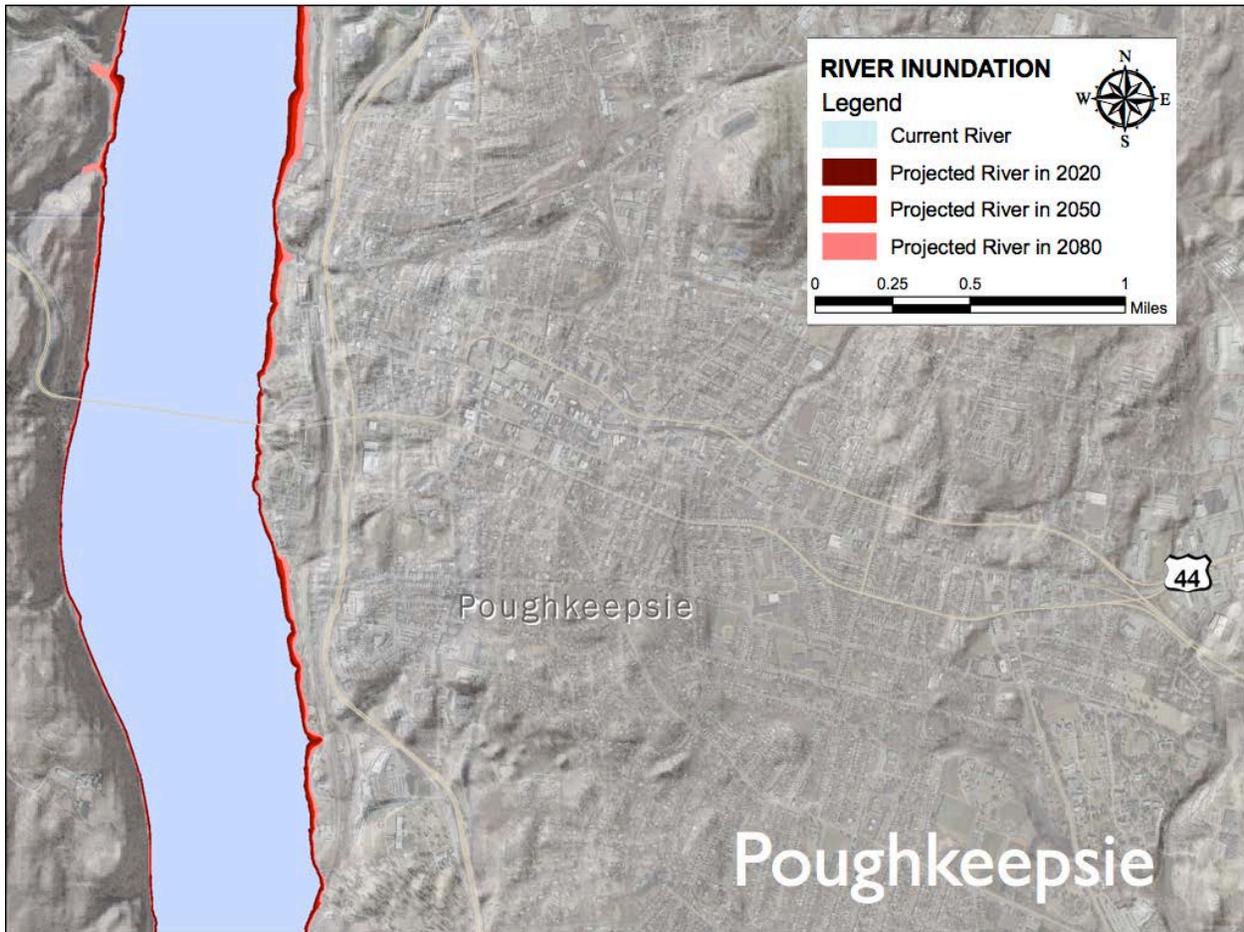
### **3.5 Next Steps**

Clearwater is currently working with Bard College's Environmental and Urban Studies Program to implement a pilot of the Oral History project, and will continue to host a Fall Practicum course focused on the Fall Kill.

Project partners for the emergency preparedness component need to work together to coordinate and schedule a training with the American Red Cross that will well-attended and effective for the community.

Clearwater is actively working to promote green infrastructure improvements in the Fall Kill watershed. Clearwater prepared "The Fall Kill Plan" in 2012, as a collaborative work by project partners Urban Landscape Lab, Landmine Studio, eDesign Dynamics. The plan "establishes design and urban planning guidelines for transforming the Fall Kill Creek into a vibrant community resource," and describes eleven pocket parks and one of five areas to be designated as pocket parks with green infrastructure. Clearwater and partners have also received funding to build a demonstration green infrastructure system at the historic Underwear Factory, in the heart of Poughkeepsie's Middle Main district. And finally, in 2013-2014 Clearwater will be conducting green infrastructure workshops for residents, a job training course for youth, and constructing a rain garden at Nubian Direction's Green Job Training Center, all with support from the USEPA Urban Waters Program.

## Poughkeepsie River Inundation Projection



## New York State Potential Environmental Justice Area (PEJA) Map

