North Carolina
Clean Smokestacks Plan

The People's Plan for Clean Air

March 2001

The North Carolina Clean Smokestacks Plan was developed by a coalition of environmental, public health, and citizen groups. It was inspired by the 11,000 North Carolina citizens who expressed their desire for clean air and strict reductions in smokestack emissions during public hearings on air quality held during the summer of 2000. The state and local organizations that participated in developing the Clean Smokestacks Plan were the following:

Environmental Defense
Appalachian Voices
Blue Ridge Environmental Defense League
Canary Coalition
Clean Water Fund of North Carolina
Conservation Council of North Carolina
North Carolina Conservation Network
North Carolina Public Interest Research Group
North Carolina Solar Energy Association
Sierra Club
Southern Environmental Law Center
Western North Carolina Alliance

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Executive Summary

From the mountains to the sea, North Carolina has long been recognized for its natural beauty and high quality of life, a reputation that makes it difficult to accept that the state's air quality is now on the decline.

The North Carolina Clean Smokestacks Plan documents the serious public health and environmental problems resulting from coal-fired power plants and other sources of air pollution. It then offers a policy framework for executive and legislative action to reduce emissions from coal-fired power plants and clean up North Carolina's air.

Consequences of Dirty Air

Emissions of nitrogen oxides (NO_x), sulfur dioxide (SO_2), mercury, and carbon dioxide (CO2) undermine public health, the environment, and the economy of North Carolina in the following ways:

- **Public Health.** North Carolina's air quality consistently ranks among the least healthy in the nation; for example, in 1999, the state had the fifth highest number of unhealthy air days. The American Lung Association found the Charlotte metropolitan area to have the eighth smoggiest air in the nation, and the Raleigh–Durham area ranked seventeenth. It is estimated that NO_x pollution from power plants triggers more than 200,000 asthma attacks across the state each year and SO_2 pollution causes more than 1,800 premature deaths, ranking North Carolina as the fourth worst state in the nation for power-plant related deaths. Airborne mercury falls into the state's rivers and estuaries, contaminating freshwater and saltwater fish populations. Mercury compounds bioaccumulate in the food chain, making king mackerel, bass (in some areas), and bowfin unfit for human consumption by children and women of childbearing age.

- **Visibility.** Visibility in the southeast has declined by 75% from natural levels. One should be able to see out 93 miles on an average day in the Smoky Mountains, but now air pollution has reduced this to an average of 22 miles. On any given summer day in the mountains, there is a good chance that views may be entirely obscured by pollution.

- **Ecosystems.** Air pollution causes acid rain and nitrogen deposition, which make vegetation more susceptible to disease and pests, contributing to stunted growth and significant declines in populations of dogwood, spruce, fir, beech, and other tree species. Rainfall in the Great Smoky Mountains National Park is five to ten times more acidic than normal rainfall. In the east, airborne nitrogen adds to nutrient pollution in sensitive coastal watersheds, contributing to algal blooms and fish kills.

- **Economic Consequences.** North Carolina's dirty air threatens the vitality of the state's economy. Dirty air is estimated to cost the state over $3.0 billion annually in morbidity and mortality costs. Air pollution also reduces crop yields, which causes North Carolina farmers to lose more than $175 million each year. Frequent smog alerts atop the Great Smoky Mountains discourage hiking and other outdoor activities. The impairment of visibility undermines North Carolina's $12 billion tourism industry. The loss in economic activity in the area around the Great Smoky Mountains National Park is estimated to cost more than $200 million each year.

- **Global Climate Change.** Carbon dioxide pollution from power plants and other sources is one of the primary pollutants that contributes to global warming, which over the next thirty years is expected to raise sea levels off the North Carolina coast by 7.5 inches, a rise that could completely inundate or change the coastline at Wrightsville Beach, Topsail Beach, and the Outer Banks.

Sources of Air Pollution

The sources of air pollution of greatest concern in North Carolina are coal-fired power plants, followed by mobile sources. Power plants emit 82% of all sulfur dioxide air emissions, 45% of nitrogen oxides, and 65% of mercury. Automobiles and other mobile sources emit 48% of the nitrogen oxides.

Technologies and Clean Energy

Technologies to control both NO_x and SO_2 emissions from old, coal-fired power plants are both affordable and available:

- **Selective Catalytic Reduction (SCR).** SCRs can reduce NO_x emissions by more than 80% from uncontrolled levels.
- **Flue Gas Desulfurization (Scrubbers).** Scrubbers are able to reduce sulfur dioxide emissions by more than 90% from uncontrolled levels.
- **Clean Energy Sources.** Renewable energy sources such as wind power essentially eliminate all air pollution from power generation. Efficiency, conservation, and switching to cleaner fuels also substantially reduce air pollution.

Currently, only three of the fourteen major power plants in the state have committed to installing SCR systems, and no facilities use scrubbers. Installation of scrubbers combined with SCR systems can reduce mercury emissions by up to 95% from uncontrolled levels. Carbon injection and other cutting-edge technologies also are being used to control mercury from other combustion sources, such as municipal waste and medical waste incinerators. These technologies show promise in substantially reducing mercury emissions from power plants, although the widespread implementation of such technologies at coal-fired power plants may require further work. Switching fuels to natural gas or using other cleaner sources of energy such as wind power achieve even higher NOx, SO2, and mercury reduction levels and reduce carbon dioxide as well.

Solutions

North Carolina could easily make dramatic strides toward cleaner air. We know the consequences of dirty air and its principal sources, and we have technologies to reduce emissions from coal-fired power plants.

North Carolina's power plants must meet modern standards for NO_x and SO_2 and drastically lower their emissions of mercury and CO2 in order to protect the public health, the environment, and the economy. Table A outline the kinds of specific reduction targets that are both feasible and vital to public health and environmental protection. It is important that new laws and regulations be phased in over a reasonable length of time to enable the utility companies to plan and retrofit their power plants as cost effectively as possible. The large size of the reductions needed is a testament to the amount of pollution spewing forth from the so-called grandfathered power sector, whose plants are largely uncontrolled.

Federal and state strategies to reduce emissions from cars and other "mobile sources" also are needed to clean our air. Emissions from the power plants, however, remain the chief obstacle to clean, healthy air for all North Carolinians.

Table A. Achievable Reduction Targets from the Power Plant Sector

- ✓ **Summertime Nitrogen Oxides.** Cap summertime NO_x emissions at 23,000 tons, an 80% reduction over 1998 levels. These reductions should be phased in by 2007.
- ✓ **Year-Round Nitrogen Oxides.** Cap year-round NO_x emissions at 50,000 tons, an 80% reduction over 1998 levels. The reductions should be phased in by 2007.
- ✓ **Sulfur Dioxide.** Cap emissions of SO_2 at 85,000 tons annually, an 82% reduction over 1998 levels. The reductions should be phased in by 2007.
- ✓ **Mercury.** Reduce year-round emissions of mercury by 90% from 1998 levels. The reductions should be phased in by 2007.
- ✓ **Carbon Dioxide.** Cap new CO2 emissions at 1990 levels, as called for by the United Nations Framework Convention on Climate Change, which has been ratified by the United States.

Costs and Benefits

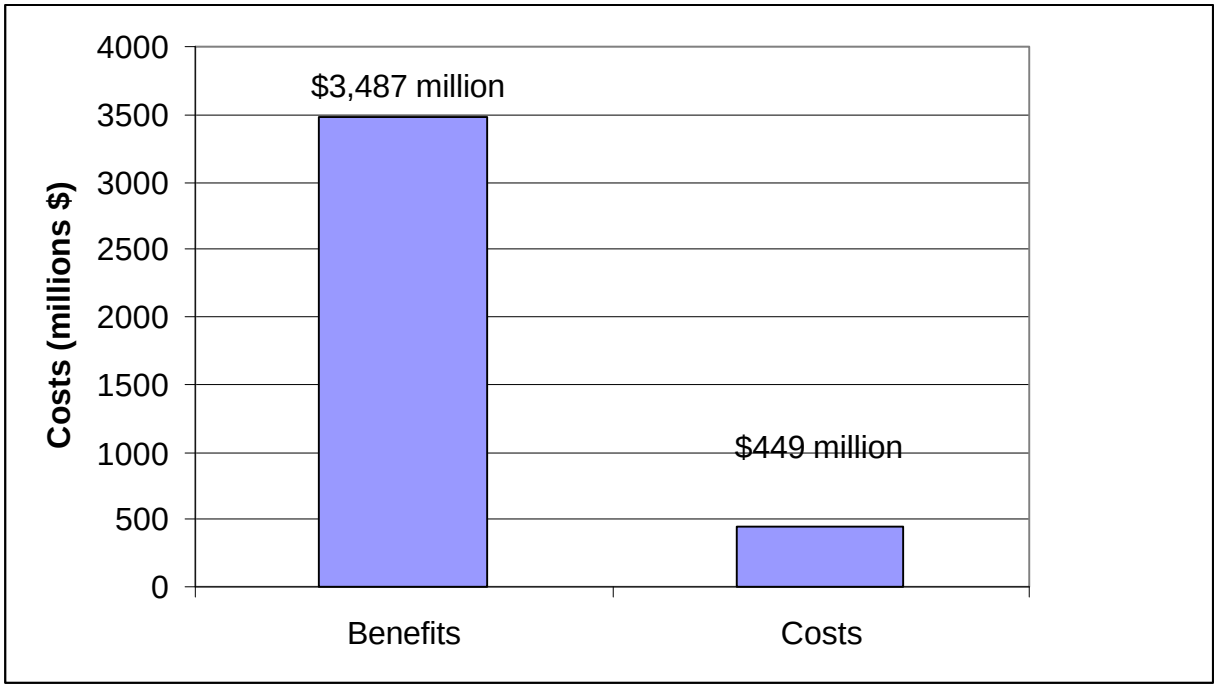
If the compliance costs for NOx, SO2, and mercury were passed on to consumers, the total cost to reduce emissions to the levels recommended in the North Carolina Clean Smokestacks Plan would raise an average household's power bill by $4.09 per month. However, power companies must request a rate review from the North Carolina Utility Commission before they can pass on the costs of these controls to consumers, which means that in the end rates may not be increased at all.

Overall, the benefits of improved air quality far outweigh the costs (see Table B and Figure A). That is, the cost savings resulting from reducing the coal-fired power plant emissions by the amounts called for in the North Carolina Clean Smokestacks Plan would be $3.5 billion annually, compared with the utilities' cost of compliance, which is $450 million. The difference is a net economic benefit of more than $3.0 billion each year. Note that benefits and costs of CO2 are not included in this analysis, as climate change issues will be dealt with more fully in a later report.

Table B. Benefits and Costs of Reducing Smokestack Pollution

Benefits or Cost Savings (million $)		**Cost of Compliance (million $)**	
Ozone reduction (health, forests, and agriculture)	$292	Summertime NO_x	$112
Particulate matter (health)	$3,108	Year-round NO_x	$22
Visibility (tourism)	$87	SO_2	$315
Benefits not quantified (e.g., cancer, ecosystem damage)	—	Mercury	*No marginal cost beyond NO_x and SO_2 controls*
Total	**$3,487 million or $3.5 billion**	**Total**	**$449 million**

Figure A. Benefits versus Costs of Controlling Smokestack Pollution



Primary Recommendation

The General Assembly should pass -- and Governor Mike Easley should sign into law -- a comprehensive clean smokestacks bill requiring the state's power plants to meet aggressive clean emission standards for NO_x and SO_2 and also to drastically lower mercury emissions. The bill should be based on achievable reduction targets -- 80% for NO_x, 82% for SO_2, and 90% for mercury. Controlling air emissions from power plants is the single most important action that North Carolina can take to clean its dirty air and thereby ensure the health of its citizens, environment, and economy for future generations.

Summary of Recommendations

Reducing the amount of pollution emitted by power plants will require strong leadership by Governor Easley, legislators, members of the Environmental Management Commission, and other state officials. The North Carolina Clean Smokestacks Plan calls for the following:

Governor Easley

- Persuade the General Assembly to adopt a clean smokestacks bill requiring the state's power plants to meet aggressive clean-up targets for NO_x, SO_2 , mercury, and CO2.
- Upon cleaning up North Carolina's power plants, take advantage of federal laws (such as Section 126 of the Clean Air Act) to encourage upwind states such as Tennessee, Georgia, Kentucky, and Ohio to reduce the air pollution they contribute to North Carolina.
- Direct the North Carolina Department of Environment and Natural Resources to finalize Phase III of the Governor's Clean Air Plan to ensure that the state sufficiently reduces NO_x emissions year-round from both point and mobile sources to meet health standards. Phase III should also map out strategies to reduce SO_2 and mercury emissions.
- Direct the North Carolina Energy Office to develop a plan by December 2001 for increasing the use of renewable sources of energy to 10% of all power generation by 2010 and 20% by 2020. This plan should also outline strategies to improve energy efficiency and increase conservation.
- Urge the U.S. Environmental Protection Agency to adopt strong particulate matter and NO_x emission standards for non-road heavy-duty diesel engines.

General Assembly

- Pass a clean smokestacks bill requiring the state's power plants to meet aggressive clean-up targets for NO_x, SO_2 , mercury, and CO2.
- Require utilities to disclose publicly through quarterly inserts in their electricity bills the sources of energy, emissions, and wastes generated from energy production.
- Create a greenhouse gas registry program so that power companies can receive credit for early reductions in carbon dioxide and other greenhouse gases.
- Create tax incentives for residents to buy low- and zero-emission vehicles.

Environmental Management Commission

- Pass rules to cap utility summertime NO_x emissions at 23,000 tons and to reduce NO_x emissions to 50,000 tons year-round, complementing any actions that the General Assembly may take.
- Pass rules to cap SO_2 emissions at 85,000 tons year-round, complementing any actions that the General Assembly may take.
- Pass rules to reduce year-round emissions of mercury by 90% from 1998 levels, complementing any actions that the General Assembly may take.

North Carolina Utilities (Duke Energy and Progress Energy)

- Develop and implement plans for reducing emissions of NO_x, SO_2, mercury, and CO2 to meet North Carolina's public health, environmental, and economic needs.
- Commit to phasing out outdated power plants and increasing the use of less polluting sources of energy such as natural gas and renewable sources.

North Carolina
Clean Smokestacks Plan

1 Introduction

Each year, the air pollution from North Carolina's coal-fired power plants causes thousands of premature deaths, hundreds of thousands of asthma attacks, critical damage to ecosystems statewide, and severe reductions in visibility in the mountains. This smokestack pollution not only harms North Carolina's public health and environment, but also undermines its economic health and quality of life. Although technologies, clean fuels, and other innovative strategies and practices are now available to control the pollution from power plants, North Carolina's utilities have so far made only modest commitments to reduce their emissions of nitrogen oxides (NO_x), and no plants in North Carolina have installed equipment to control their emissions of sulfur dioxide (SO_2) or mercury. In sum, North Carolina will not be able to clean its air unless power plant smokestack emissions are reduced dramatically.

Governor Mike Easley has stated his commitment to bringing back cleaner, healthier air to North Carolina. The North Carolina Clean Smokestacks Plan outlines the health, environmental, and economic consequences air pollution, and it presents economically feasible solutions to reduce emissions of NO_x, SO_2, CO2, and mercury. Clean energy, efficiency, conservation, and fewer emissions from automobiles also are critical to improving the state's air quality., so these issues are discussed as well. It then offers a policy framework for executive and legislative action to reduce emissions from coal-fired power plants and clean up North Carolina's air.

2 Consequences of Dirty Smokestacks

The smokestack pollutants of greatest immediate concern to North Carolina are NO_x, SO_2, mercury, and carbon dioxide (CO_2). Their effects are summarized in Table 1.

Table 1. Smokestack Pollutants of Greatest Immediate Concern

Smokestack Pollutant	Product of Conversion	Major Effects
Nitrogen oxides (NO_x)	• Ozone • Acid deposition • Particulate matter	• Public health • Acidification of terrestrial and aquatic ecosystems • Eutrophication of coastal waters • Haze (reduced visibility) • Economy
Sulfur dioxide (SO_2)	• Particulate matter • Acid deposition	• Public health • Acidification of terrestrial and aquatic ecosystems • Haze (reduced visibility) • Economy
Mercury	Methylmercury	• Public health • Toxic contamination of fish species
Carbon dioxide (CO_2)		• Climate change

2.1 Public Health

- **Smog or Ozone.** NO_x pollution is emitted from power plants, cars, and other sources. It reacts with chemicals in the atmosphere in the presence of sunlight, creating ground-level ozone, the major constituent of smog. North Carolina citizens have become familiar with Code Red and Code Orange air quality alerts on smoggy days (Table 2); indeed, the number of unhealthy air days

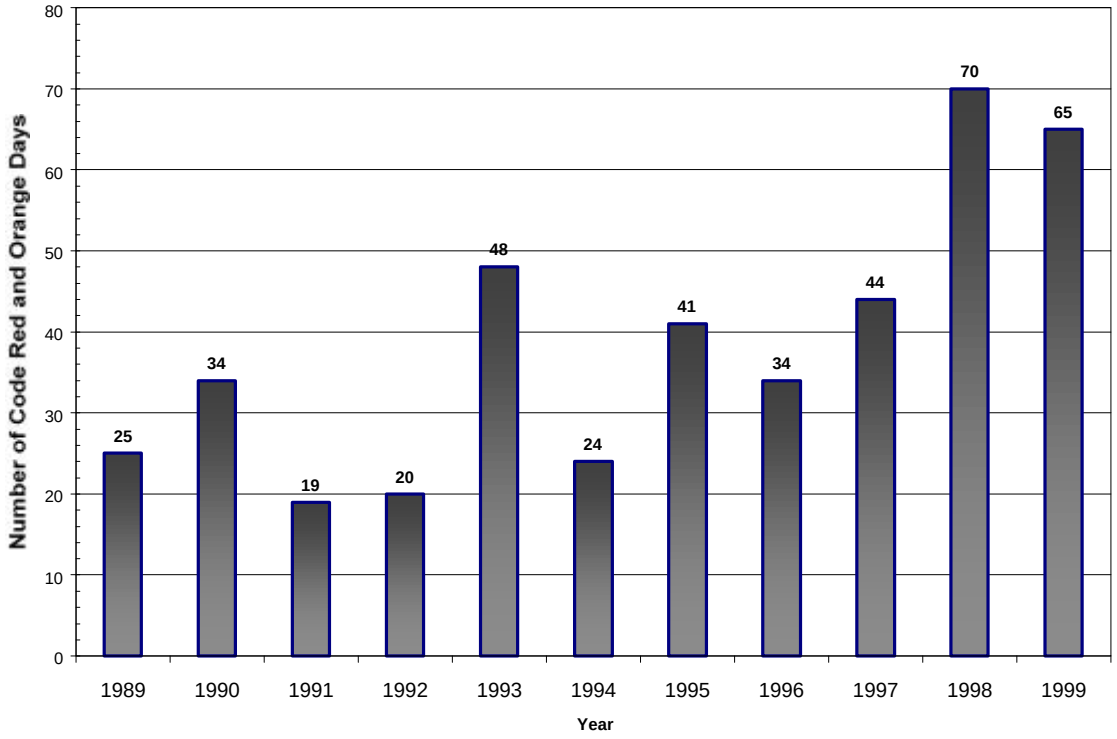
Table 2. Air Quality Color Code Guide

Code	Health Impacts
Purple	Very unhealthy; everyone, especially children, should limit outdoor activities.
Red	Generally unhealthy; everyone, especially children, should limit outdoor activities.
Orange	Unhealthy for sensitive groups
Yellow	Moderate air quality
Green	Healthy air

has nearly doubled over the last ten years (Figure 1). In 2000 Charlotte even experienced a code purple day. In 1999, North Carolina ranked fifth in the United States in number of unhealthy air days.[1] On such days, many people experience the symptoms of a dry throat and a burning sensation in the lungs. As smog levels rise, more segments of the population are warned to avoid the outdoor air.

Smog is not confined to urban areas of the state. Because air pollution is transported through the atmosphere, the air quality in some rural counties is among the least healthy. Even the Great Smoky Mountains National Park is not immune to bad air days. In the summer of 1999, the park experienced fifty-two unhealthy air days, even more than Raleigh.[2]

Figure 1. Unhealthy Air Days in North Carolina
(based on an eight-hour standard)



Source: North Carolina Department of Environment and Natural Resources, Air Quality Planning Section, October 2000.

[1] Clean Air Network, "Danger in the Air: Unhealthy Smog Days in 1999," January 2000.
[2] Personal Communication, Jim Renfroe, Air Quality Specialist, Great Smoky Mountains National Park, February 2000.

Ozone causes chest pain, coughing, throat irritation, and congestion, in addition to the following health problems:

- Smog in North Carolina is estimated to have caused 1,900 respiratory hospital admissions, 630 asthma emergency room visits, and 240,000 asthma attacks during the summer months of 1997.[3]
- Smog exacerbates the severity and frequency of asthma cases. Nationally, asthma rates jumped by 75% between 1980 and 1994, and among children under four years old, asthma rates mushroomed by 160%.[4]
- Exposure to ozone hurts children the most, because they breathe more air per pound of body weight than adults do and their respiratory systems are still developing.
- Ozone has negative health effects even at "safe" levels. One study reported 28% more emergency room visits for asthma when ozone levels were above 60 parts per billion (ppb), a value well below the current health standard.[5]
- Smog harms everyone who breathes, not just children and the elderly. For example, in the summer, the lung function of even healthy people who exercise or work outdoors, like construction workers, may be reduced by 15% when exposed to low levels of ozone over several hours.

The Need for Year-Round NOx Reductions

The adverse impacts of NOx are not confined to summertime ozone. Other serious consequences of NOx pollution (as presented in Table 1) threaten public health and the environment year-round. Year-round NOx produces:

- Fine particulate matter formation which is breathed deeply into the lungs, causing hospitalization and premature deaths
- Acid rain in forests, lakes, and streams
- Nutrient overloading of sensitive coastal waters
- Haze and reduced visibility

Resources for the Future found that the marginal costs of compliance for controlling NOx emissions year-round is 20%, while the health benefits of such controls are at least twofold compared to a summertime only program.

- **Particulate Matter (PM).** NO_x and SO_2 pollutants react in the atmosphere to form tiny particles called *fine particulate matter*. This matter is breathed deeply into the lungs where it clogs the body's air intakes or is absorbed into the bloodstream. Major epidemiological studies have associated even moderate concentrations of fine particles with a variety of serious health effects, including hospitalization and death. Particulate matter is estimated to be responsible for 1,800 premature deaths each year in North Carolina**,** earning the state the dubious ranking of fourth worst in the nation for PM-related mortality.[6] On a per capita basis, Asheville is rated sixth in the nation among cities for premature deaths

[3] Abt Associates for the Clean Air Task Force, "Adverse Health Effects Associated with Ozone in the Eastern United States," October 1999.
[4] Pew Environmental Health Commission, "Attack Asthma: Why America Needs a Public Health Defense System to Battle Environmental Threats," June 200, p. 4.
[5] Weisel, "Relationship between Summertime Ambient Ozone Levels and Emergency Department Visits for Asthma in Central New Jersey," *Environmental Health Perspectives* 103, suppl. 2 (1995): 97–102.

due to power plant particulate matter, with an estimated 69 such deaths each year.[7]

- **Toxics and Mercury.** The average power plant in North Carolina releases more than 2 million pounds of toxic pollutants into the air.[8] Most of these toxic emissions consist of hydrochloric and sulfuric acids which cause lung irritation in the short term and bronchitis and emphysema in the long term. Although it is emitted in much smaller quantities than the other toxics, mercury is one of the most poisonous pollutants coming out of power plant smokestacks. Less than a teaspoon of mercury deposited into a 25-acre lake can make the fish unsafe to eat. Moreover, once released into the environment, mercury does not break down, and it cannot be destroyed. Mercury emissions settle into water bodies across North Carolina, where mercury compounds are absorbed by aquatic life.[9] Mercury accumulates in fish tissue at concentrations as much as one million times greater than that in the surrounding water. As a result, each year, hundreds or even thousands of North Carolinians are exposed to unsafe mercury levels in the fish they eat. Currently, advisories have been issued in North Carolina to limit the consumption of king mackerel, bowfin, and bass. When ingested by pregnant or nursing women, methylmercury can cause neurological damage, including delayed development, in the fetus and young children. The National Academy of Sciences estimates that nationally 60,000 children (roughly 1,800 in North Carolina) are born each year with neurological damage because their mothers were exposed to mercury during pregnancy.[10]

2.2 Visibility/Haze

Fine particulate matter not only harms health but also creates haze that impairs visibility, especially in the mountains. Haze reduces visibility in the Southern Appalachians by more than 75% over natural levels (Figure 2). The average annual visibility in the southeastern United Stated declined by 60% between 1948 and 1983, with an 80% decline during the summer months.[11] North Carolinians have long been used to beautiful outdoor scenery and vistas. The drop in visibility undermines North Carolinians aesthetics and sense of heritage. On any given day, there is now a good chance that mountain views will be obscured, especially in the summer, which discourages tourists, thereby creating a direct economic consequence of dirty air.

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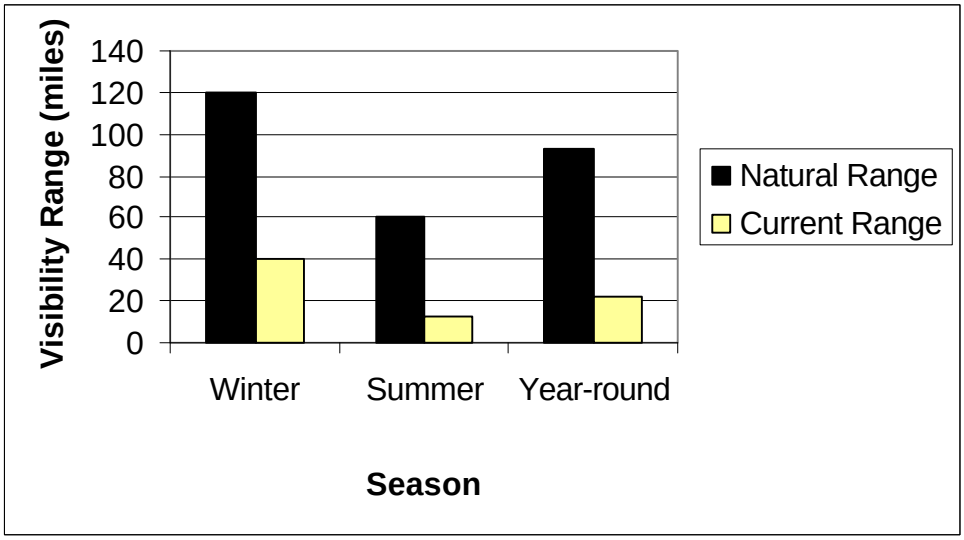
[6] The Clean Air Task Force, "Death, Disease, and Dirty Power,**"** October 2000.
[7] Ibid.
[8] National Environmental Trust and Clear the Air, "Toxic Power**,"** August 2000.
[9] Rodney Foushee, "Mercury Rising," *Wildlife in North Carolina*, November 2000, pp. 5-11.
[10] National Academy of Sciences, *Toxicological Effects of Methylmercury* (Washington, DC: National Academy Press, 2000).
[11] The National Park Service, "Clearing the Air at Great Smoky Mountains National Park, September 1999. See http//www2.nature.nps.gov/ARD/parks/grsm/litctamr.htm

Figure 2. Average Decline in Visibility in the Southern Appalachians



Source: Southern Appalachians Mountains Initiative, "Visibility in the Southern Appalachian Mountains" (fact sheet).

2.3 Ecosystem Health

- **Acid Rain/Deposition.** Because of the atmospheric pollution of sulfur and nitrogen compounds, rain, snow, and fog can become unnaturally acidic. Acidic compounds can also be deposited as dry particles, changing the soil chemistry and creating an unhealthy environment for native plant species. This acidification makes plant life more susceptible to disease, pests, and extreme weather conditions. Acid deposition also contributes to significant declines in populations of flowering dogwood, red spruce, Fraser fir, yellow birch, sugar maple, and American beech,[12] turning the once lush peaks of many mountaintops into wastelands. The average acidity of rainfall in the Great Smoky Mountains National Park is five to ten times more acidic than normal rainfall.[13] Furthermore, the acidity of clouds can be even higher than that of rain, shrouding the mountaintops for hours or days in an acid mist.

- **Ozone.** Ground-level ozone hampers the ability of plants to produce and store food, thus compromising their growth, reproduction, and overall health. Most visibly, ozone causes leaves to brown, spot, or fall off.[14] Such damage has been identified in dozens of plant species in the Great Smoky Mountains National Park alone.[15]

[12] Ayers, Harvard, "Polluted Parks in Peril," Appalachian Voices, October 2000, pp. 5.
[13] Southern Appalachian Mountains Initiative, "Air Quality," *Great Smoky Mountains National Park Management Folia*, no. 2
[14] U.S. Environmental Protection Agency, "Fact Sheet: Health and Environmental Effects of Ground-Level Ozone."
[15] Southern Appalachian Man and the Biosphere, *Southern Appalachian Assessment: Atmosphere*, July 1996.

- **Nitrogen Deposition.** Nitrogen deposition is a problem statewide. In the eastern watersheds of North Carolina, NO_x pollution, ammonia from hog farms, and other sources are responsible for overloading nutrient-sensitive watersheds such as the Neuse and Tar-Pamlico. The nitrogen overstimulates algae growth, which depletes aquatic oxygen levels, and causes fish kills. In the mountains, many soil and stream ecosystems have become artificially saturated with nitrogen, which in high concentrations locks up critical nutrients (e.g., calcium and magnesium), making them unavailable to vegetation and aquatic organisms.[16]

2.4 Climate Change

North Carolina's climate has risen by 1.2 degrees Fahrenheit over the last century,[17] and there is strong scientific evidence that the temperature in North Carolina will rise 4.5 to 9.5 degrees over the next 100 years.[18] A warming planet is expected to raise the sea level by 7.5 inches on the North Carolina coast by 2030, which could completely inundate or change the coastline at Wrightsville Beach, Topsail Beach, and the Outer Banks. In addition, global warming is expected to increase coastal flooding, increase ground-level ozone and the number of unhealthy air days, add to the incidence of mosquito-borne diseases, lower crop yields, damage ecosystems, and possibly lead to stronger and more frequent hurricanes. One of the main pollutants contributing to global warming is carbon dioxide (CO_2) which is emitted predominantly from power plants and automobiles. A document from Appalachian State University, "North Carolina's Sensible Greenhouse Gas Reduction Strategies," provides a starting point for considering the environmental and economic risks of a warming planet to North Carolina and the state's role in reducing the emissions of greenhouse gases.[19]

2.5 Economic Consequences

The economic consequences of dirty air in North Carolina include the following:

- **Health Costs.** The North Carolina Department of Health and Human Services estimated that summertime respiratory-related hospital admissions due to elevated ozone levels in 1997 cost the state more than $19 million.[20] It is estimated that total summertime ozone costs North Carolina about $296 million a year in health costs or $37 per citizen,[21] and reducing particulate matter to meet federal standards would

[16] Ayers, Harvard, "Polluted Parks in Peril," Appalachian Voices, October 2000, pp. 4-5.
[17] U.S. Environmental Protection Agency, "Climate Change and North Carolina," EPA 236-F-98-007q, September 1998.
[18] Mid Atlantic Regional Assessment, "Preparing for a Changing Climate: The Potential Consequences of Climate Variability and Change," January 2001, p. 179. See http://www.essc.psu.edu/mara/index.html.
[19] See www.geo.appstate.edu.
[20] Luanne Williams, North Carolina Department of Health and Human Services, "Estimated Number of Respiratory-Related Hospital Admissions," memorandum, January 11, 2000.
[21] Orie L. Loucks, "Background Paper on Nitrogen Oxide Sources As a Cause of Ozone and Smog in North Carolina and Surrounding States," Miami University of Ohio, February 1999. The documents estimate of national ozone health costs of $37 per person was multiplied 8.04 million, the population of North Carolina according to the 200 U.S. Census.

save the state 3.2 billion annually in morbidity and mortality costs.[22]

- **Agriculture.** Ozone's effect on plants (Section 2.3) is "a significant stress factor in agricultural production."[23] Losses in yields are estimated to average 15% for soybeans and are serious for other signature North Carolina crops such as tobacco and peanuts. The damage to crops caused by ozone is calculated to cost North Carolina well over $175 million annually, equivalent to $25 per person per year.[24] Southeastern pine forests may also lose $110 million each year from lower yields due to ozone exposure.[25]

- **Tourism.** Loss of visibility directly threatens tourism, a $12 billion industry and vital sector of North Carolina's economy. Tourism supports 190,000 jobs[26] in the state, and it depends on clean air, beautiful scenery, and healthy forests. Frequent smog alerts atop the Great Smoky Mountains discourage hikers. Improving visibility would increase visitation to the Great Smoky Mountains National Park, bringing in more than $200 million in additional sales and more than $20 million in additional tax revenues.[27]

- **Quality of Life.** A loss of air quality clearly diminishes the quality of life for all North Carolinians, but putting a price tag on it is difficult. Nonetheless, some indirect measures are possible. For example, the Keenan Institute found that quality of life is a major factor in locating new businesses in the state,[28] which implies that as air quality declines, it will be harder for the state to attract new investment and jobs.

The preceding numbers are not comprehensive, as the economic effects of acid rain, eutrophication, mercury exposure, and other environmental problems are not included. Thus, the actual costs of dirty air are much higher than those reflected by the dollar amounts just cited. Finally, no economic calculation can truly quantify the pain experienced by a child who suffers from asthma or a grandparent with cardiopulmonary disease who is hospitalized or dies from exposure to high levels of fine particulate matter.

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[22] Abt Associates, "The Particulate-Related Health Benefits of Reducing Power Plant Emissions," October 2000. This document sites the benefits of cleaning up power plants to modern emission standards would be $111 billion per year nationwide. This figure is apportioned to North Carolina based on its population compared with that of the entire United States. The calculation is as follows: ($111 billion benefit) x (.028% NC population compared to total US population) = $ 3,108 million

[23] National Acid Precipitation Assessment Program, "NAPAP Biennial Report to Congress: An Integrated Assessment," May 1998, p. 63.

[24] Orie L. Loucks, "Background Paper on Nitrogen Oxide Sources As a Cause of Ozone and Smog in North Carolina and Surrounding States," Miami University of Ohio, February 1999.

[25] U.S. Environmental Protection Agency, "Benefits and Costs of the Clean Air Act," November 1999.

[26] North Carolina Office of Tourism, Department of Commerce. See http://www.commerce.state.nc.us/tourism/econ/.

[27] Abt Associates, "Out of Sight: The Science and Economics of Visibility Impairment," August 2000.

[28] James Johnson, J. Kasarda, and D. Rondenelli, "The Changing Forces of Urban Economic Development," Chapel Hill, NC: Keenan Institute, 2000).

3 Focus on Clean Smokestacks

3.1 Emission Levels

Air pollution comes from many sources: power plants, cars, off-road construction equipment, factories, agriculture, boats, planes, and trains. So why does the North Carolina Clean Smokestacks Plan focus on the smokestacks of coal-fired power plants? The reason is that power plants emit most of the sulfur dioxide and mercury and almost half the NO_x pollution (Figures 3, 4, 5).[29] For example, fourteen of the top twenty emitters of mercury in North Carolina are power plants.[30] Automobiles and other mobile sources also are a significant and growing source of nitrogen oxides. In order to solve the ozone/smog problems, emissions from these sources must be reduced as well, to complement reductions by the utilities.

Figure 3. SO2 Emission Sources

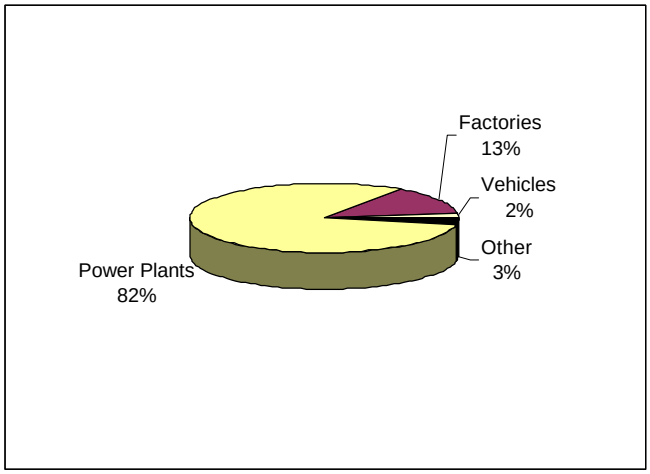


Figure 4. NOx Emission Sources

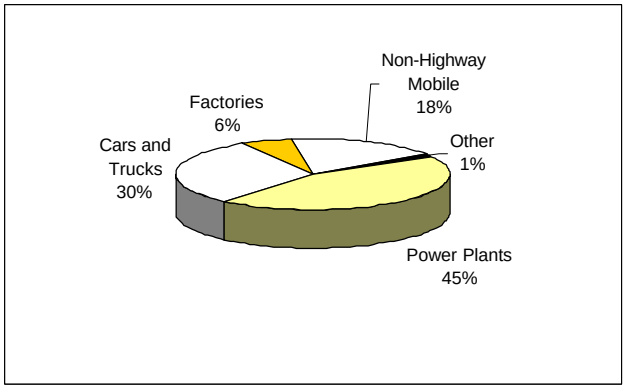
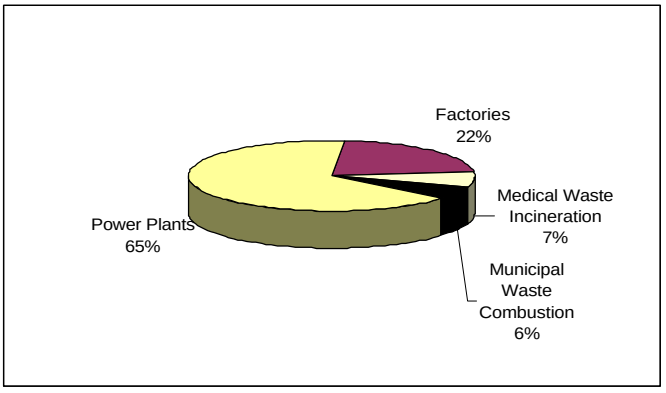


Figure 5. Mercury Emission Sources



[29] The sources for the three pie charts are as follows:SO_2: Southern Appalachian Mountains Initiative, "Air Quality." Figures represent sources in the southeast. NO_x: Governor Jim Hunt's Clean Air Plan, 2000. See http://www.enr.state.nc.us/files/cleanair.htm. Data are based on 1995 estimates. Mercury: Jeff Haywood, North Carolina Department of Environment and Natural Resources, "Atmospheric Mercury Emission Sources in North Carolina," memorandum, June 7, 2000. Data are based on 1997 estimates.

[30] Ibid.

3.2 Grandfathering Loophole

The federal Clean Air Act and implementing regulations require major new industrial sources of air pollution such as coal-fired power plants to install state-of-the-art control technologies to reduce NO_x and SO_2 pollution. At the same time, the long-standing Clean Air Act programs that apply to new sources exempted, or "grandfathered," existing power plants from meeting modern pollution control requirements. The proponents of this exemption argued that these older plants would soon be retired and replaced with modern facilities which would, in turn, have to meet the strict new pollution control requirements. In fact, however, the older, "grandfathered" facilities are still operating years later. Indeed, their exemption has led to a perverse state of affairs in which electric utilities continue operating their old, inefficient, and high-polluting facilities as long as possible to avoid having to meet the strict air quality standards for new facilities. All of North Carolina's fourteen major power plants are more than 25 years old, and some have been in operation for 60 years. The high levels of pollution from the grandfathered plants creates an opportunity to make significant emission reductions at affordable rates. Furthermore, requiring these facilities to bear the true clean-up costs of the amount of pollution they generate would help remedy the inequitable barriers to new, cleaner sources of generation.

3.3 Technologies

Selective catalytic reduction (SCR) technology can reduce NO_x emissions by more than 80% over uncontrolled levels. Flue gas desulfurization systems, more commonly known as *scrubbers*, can reduce sulfur dioxide emissions by more than 90% over uncontrolled levels.

Just three of the fourteen power plants in North Carolina have committed to invest in the best available technology (SCR systems) for summertime controls of NO_x, only a modest step forward to reduce summertime smog. Equally alarming, not one of these plants has invested in scrubbers or other control equipment for SO_2 or mercury.[31] Yet the technologies that could easily control the emissions of NO_x and SO_2 from these power plants are widely available and have been on the commercial market for years. Moreover, power plants that invest in controls for NO_x and SO_2 (SCR and scrubber systems, respectively) can expect collateral reductions of mercury from 50 to 95% below uncontrolled levels.[32] In addition, carbon injection systems can be used to control mercury emissions from municipal waste incinerators, and this technology is close to coming on the commercial market for coal-fired power plants. These systems are estimated to be able to reduce mercury emissions by between 80 and 98%.[33] Table 3

[31] U.S. Environmental Protection Agency, "Emission Data for Power Plants, North Carolina, 1999." See http://www.epa.gov/acidrain/emission/index.htm.

[32] Northeast States for Coordinated Air Use Management, "Assessment of Mercury Control Strategies for Electricity-Generating Boilers," June 2000, p. 7. This study estimates a 50% - 80% control level. The upper range of a 95% reduction is based on a personal communication with Peter Tsaragotis, Clean Air Markets Division, U.S. Environmental Protection Agency, February 2001.

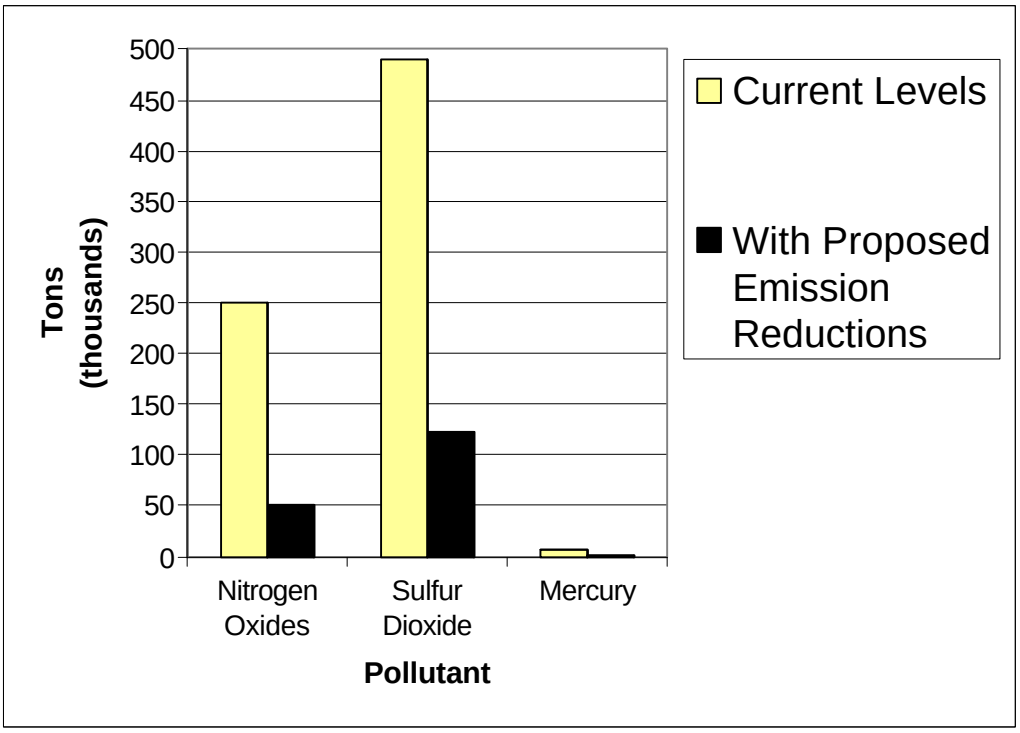
[33] Ibid.

presents technologies commonly used to control smokestack pollution. Figure 6 shows the quantity of pollution that would be reduced if power plants were required to meet standards based on the capacity of existing affordable technologies.

Table 3. Control Technologies		
Pollutant	**Primary Control Technology**	**Control Level Achievable**
NOx	Selective catalytic reduction (SCR)	80 to 90%[34]
SO2	Scrubber (flue gas desulfurization)	90% or higher[35]
Mercury	Scrubbers combined with SCR systems	50 to 95% [36]
Mercury	Carbon injection	80 to 98% [37]
NOx, SO2, CO2 and Mercury	Technologies exist to employ conservation, energy efficiency and cleaner energy sources including renewables (see Section 3.7).	

[34] Presentation by Progress Energy, Raleigh, North Carolina, February 2, 2001. Also see US Environmental Protection Agency, "Controlling SO2 Emissions: A Review of Technologies," Office of Research and Development, November 2000, EPA/600/R-00/093.
[35] U.S. Environmental Protection Agency, "Controlling SO2 Emissions: A Review of Technologies," EPA/600/R-00/093, November 2000.
[36] 50%-to-80% control is estimated by the Northeast States for Coordinated Air Use Management, "Assessment of Mercury Control Strategies," p. 7. The upper range of a 95% reduction is based on a personal communication with Peter Tsaragotis, February 2001.
[37] Ibid.

Figure 6. Potential Reduction of Pollution from NC Coal-Fired Power Plants



3.4 Costs and Benefits

The average cost of reducing pollutants from power plants by the target levels of the North Carolina Clean Smokestacks Plan is estimated to be $4.09 per a residential monthly utility bill (see Table 4). These compliance costs are based on statewide caps, allowing utilities flexibility on which facilities to target for reductions. It should also be noted that power companies must request a rate review from the North Carolina Utility Commission before they can pass on the costs of these emission reductions to consumers, which means that in the end rates may not be increased at all.

It is quite common for the actual costs to be considerably lower than the original estimates as, in a free market, industry often develops innovative technologies and cost-effective approaches. For example, the power generation industry initially figured that the compliance cost of the Acid Rain Program would be three to four times higher than the eventual actual cost.[38]

[38] Northeast States for Coordinated Air Use Management, "Environmental Regulation and Technology Innovation," September 2000.

Table 4. Cost of Reducing Power Plant Pollution						
Pollutant	**Quantity Emitted in 1998 (tons)**	**Proposed Cap (tons)**	**Proposed Reduction (%)**	**Cost to Reduce Pollution ($ / pound)**	**Annualized Cost of Compliance**	**Cost per Household per Month[39]**
NO_x (summer only)	115,000	23,000	80%[40]	$.60 / pound[41]	$112 million	$1.02
NO_x (Year-round)	250,000[42]	50,000	80%	—	$22 million[43]	$0.20
SO_2	489,000[44]	85,000	82%	—	$315 million[45]	$2.87
Mercury	7096 pounds	—	90%	$0 - $38,000[46]	$0 to $160 million	$0[47]
				Total Cost per Household per Month		***$4.09***

[39] The cost per household per month was calculated for each of the pollutants using summertime NO_x as an example: ($112 M cost of compliance / year) x (38% power going to residential sector / 3,474,000 residential customers) x (1 year / 12 months) = $1.02 per residential customer per month. Electric power statistics came from the Energy Information Administration, "Electric Power Annual 1999: Volume II, U.S. Department of Energy, October 2000.

[40] Note that a North Carolina Environmental Management Commission rule passed in 2000 calls for only a 65% reduction based on 1998 emission levels.

[41] Estimate by the North Carolina Department of Environment and Natural Resources Economic Analysis of the cost of reducing NO_x pollution. See North Carolina Environmental Management Commission packet, January 14, 2000.

[42] U.S. Environmental Protection Agency, "The Emission and Generation Resources Integrated Database (E-GRID)," Clean Air Markets Programs, 2000. See http://www.epa.gov/airmarkets/emissions/.

[43] Resources for the Future, "Cost Effective Reduction of NO_x Emissions from Electricity Generation," 2000, p. 31. This analysis found that the compliance cost of going from seasonal to annual would rise by less than 20% but that the benefits would increase at least twofold. This analysis estimated that the marginal costs of year-round NO_x controls would be only 20% greater than controlling NO_x only in the summertime. The calculation is as follows: ($112 M) x (20%) = $22 million.

[44] U.S. Environmental Protection Agency. "Emission Data for Power Plants, North Carolina, 1999." See http://www.epa.gov/acidrain/emission/index.htm.

[45] This figure was calculated by the U.S. Environmental Protection Agency, Clean Markets Division, January 2001, based on a statewide emission cap and a combination of control technologies including installation of scrubbers and use of low sulfur fuels.

[46] The low end of this range assumes no marginal cost for mercury controls beyond the cost of installing SCR and scrubber controls for NO_x and SO_2 as presented in Table 3. This assumption is based on a personal communication with Peter Tsaragotis, Clean Air Markets Division, US Environmental Protection Agency, February 2001. The high end of this estimate comes from Northeast States for Coordinated Air Use Management, "Assessment of Mercury Control Strategies for Electricity-Generating Boilers," June 2000, p. 7.

[47] Assume no marginal cost beyond the control of NO_x and SO_2, according to a personal communication with Peter Tsaragotis, Clean Air Markets Division, US Environmental Protection Agency, February 2001.

Overall, the benefits of improved air quality far outweigh the costs. That is, the cost savings of reducing emissions from coal-fired power plants by the amounts called for in the North Carolina Clean Smokestacks Plan would be more than $3,480 million annually or $3.5 billion, compared with the utilities' cost of compliance, which is about $450 million (Table 5). This adds up to a net economic benefit of over $3.0 billion each year. This benefit analysis was calculated from national figures apportioned to North Carolina based on population, which actually underestimates the potential cost savings for the state, owing to its high number of power plants. For example, the benefits do not take into account the transport of pollution across state boundaries. The benefits assume that North Carolina does its part to clean up pollution effecting both itself and surrounding states' citizens and that other states will follow North Carolina's lead and make similar reductions. The ozone figures are based on the total costs imposed on society by this pollutant, and the proposed reduction levels may or may not result in all the benefits presented. The benefit analysis does not include difficult-to-quantify cost savings such as:

- Premature aging of lungs
- Cancer
- Ecosystem damage
- Damage to grass, flowers, shrubs, and other ornamental plants

The cost-benefit ratio of a year-round NO_x reduction program has been shown to be especially high compared with reduction in the summertime only. Resources for the Future found that the marginal cost of compliance for controlling NO_x emissions year-round is 20% but that the health benefit of such controls would be at least twice as large, compared with a summertime-only program.[48] It is also worth noting that the new emission standards impose essentially no long-term additional implementation costs on the North Carolina Department of Environment and Natural Resources or other state agencies, since inspectors already visit these plants. The benefits and costs of CO2 are not included in this analysis, as climate change issues will be dealt with more fully in a later report.

[48] Burtraw, Dallas, Palmer, Karen, Bharvirkar, Ranjit, and Paul, Anthony, "Cost-Effective Reduction of NO_x Emissions from Electricity Generation," *Resources for the Future*, 2000, p. 31.

Table 5. Benefits and Costs of Reducing Smokestack Pollution

Benefits or Cost Savings (million $)	
Ozone reductions (health and agriculture)	$292[49]
Particulate matter (health)	$3,108[50]
Visibility (tourism)	$87[51]
Benefits not quantified (e.g., cancer, ecosystem damage)	—
Total	**$3,487 million or $3.5 billion**

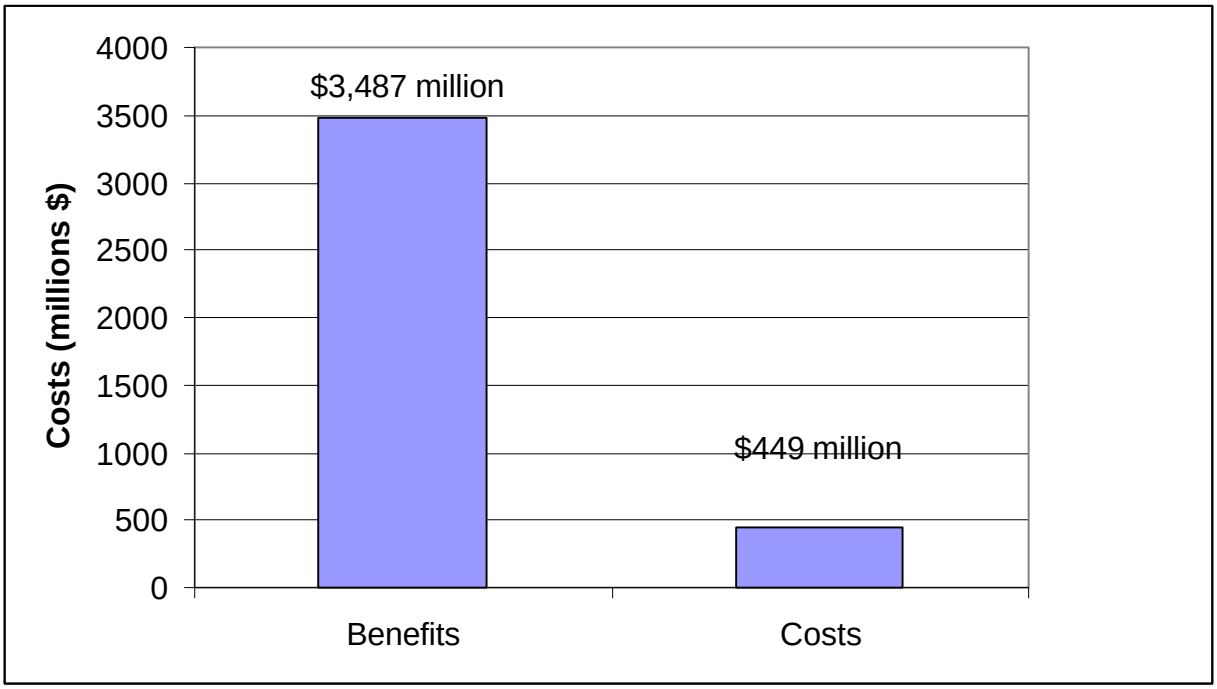
Costs of Compliance (million $)	
Summertime NO_x	$112
Year-round NO_x	$22
SO_2	$315
Mercury	*No marginal cost beyond NO_x and SO_2 controls*
Total	**$449 million**

[49] Values calculated based on Orie L. Loucks, "Background Paper on Nitrogen Oxide Sources As a Cause of Ozone and Smog in North Carolina and Surrounding States," Miami University of Ohio, February 1999. The document estimates national per capita ozone-related costs as follows: human health at $37 / person; agricultural crop damage at $25 per person; and forest losses at $19 per person. The total cost is $81 per person. According to the 2000 U.S. Census, the population of North Carolina is 8.04 million. The calculation is as follows: ($81 / person) x (8 million people in NC) x (45% of NO_x emissions from power plant) = $292 million.

[50] Abt Associates, "The Particulate-Related Health Benefits of Reducing Power Plant Emissions," October 2000. This document sites the benefits of cleaning up power plants to modern emission standards would be $111 billion per year nationwide. This figure is apportioned to North Carolina based on its population compared with that of the entire United States. The calculation is as follows: ($111 billion benefit) x (.028% NC population compared to total US population) = $ 3,108 million.
Also see U.S. Environmental Protection Agency, *Regulatory Impact Analyses for the Particulate Matter and Ozone National Ambient Air Quality Standards and Proposed Regional Haze Rule* chap. 12, table 12.17. See http://www.epa.gov/ttn/oarpg/naaqsfin/ria.html.

[51] Ibid. Calculation is the same as the preceding: ($6.2 billion visibility benefit of PM2.5 standard) x (.028% NC population compared with total US population) x (at least 50% of PM pollution attributable to power plants) = $87 million.

Figure 7. Benefits versus Costs of Reducing Smokestack Pollution



3.5 Regional Transport

Air pollution does not respect state boundaries. North Carolina contributes significantly to air pollution in states to the northeast, and it also receives air pollution from states to the west and south. Nonetheless, some of North Carolina's air pollution is manufactured at home. Easterly winds occasionally carry pollution from the Piedmont to southern Appalachia, and pollution is especially evident in the vicinity of coal-fired power plants. The percentage of North Carolina's air quality problems produced by in-state, compared with out-of-state, sources is currently not known.

A comprehensive strategy to clean North Carolina's air must both reduce in-state emissions and those from upwind sources. The Southern Appalachian Mountains Initiative is a collaborative interstate process established to encourage the regional improvement of air quality, and so by participating in this initiative, North Carolina can influence its neighboring upwind states. But in order to persuade Tennessee, Georgia, and other states to control their power plant pollution, North Carolina must first reduce the emissions from its own sources.

3.6 Progress to Date

In October 2000, North Carolina passed a rule to reduce summertime NO_x emissions. During public hearings on the draft rule in the summer of 2000, the public overwhelmingly supported an 80% reduction from 1998 levels[52] in NO_x pollution from power plants, as called for by a coalition of environmental organizations. More than 1,200 citizens from across the state attended the hearings, and 11,000 comments were submitted on the draft rules, 97% of which supported strict smokestack pollution controls. But in the end, following heavy lobbying efforts by North Carolina's utilities, the Environmental Management Commission approved only a 65% reduction from 1998 levels in summertime NO_x, compared with the 80% reduction that is needed. In addition to the state's NO_x rule, the U.S. Environmental Protection Agency (EPA) is requiring North Carolina to reduce summertime NO_x emissions from a broad range of sources. The Environmental Management Commission is developing a state implementation plan (SIP) to demonstrate how North Carolina will meet the federally required reductions. The draft SIP will likely require a summertime NOx emission cap from utilities of roughly 28,000 tons or a 76% reduction from 1998 emission levels. Regulatory standards have prompted North Carolina utilities to start reducing NOx emissions, which have been cut by 18% between 1995 and 1999.[53]

North Carolina's power plant emissions of SO_2 increased by 36% between 1990 and 1999, but they decreased by a modest 11% between 1997 and 1999.[54] Over the last decade, there have been minimal, if any, reductions of mercury emissions.

3.7 Enhancing Reliance on Cleaner Energy Sources

- **Clean Energy.** The best way to reduce power plant pollution is to consume less energy from these sources. It is estimated that North Carolina could generate between 8 and 20% of its electricity from renewable sources.[55] Polls indicate that 51% of North Carolinians would like to buy clean electricity, and 11% would be willing to pay a premium of $20 a month for it.[56] Unfortunately, alternative clean energy sources, such as hydropower and wood-waste fuel, currently produce only about 1% of North Carolina's electricity.

  Some progress has been made, however, to increase the use of nonpolluting renewable energy sources -- solar, wind, small hydropower -- as well as methane gases from landfill and biomass. In 2000, the North Carolina General Assembly unanimously passed one of the nation's most comprehensive renewable energy tax

[52] An 80% reduction is equivalent to capping summertime NO_x emissions from North Carolina's 14 power plants at 23,000 tons.
[53] U.S. Environmental Protection Agency, "Air Emission Data for Power Plants", Clean Air Market Programs, February 2000, see http://www.epa.gov/acidrain/emission/index1.htm.
[54] Ibid.
[55] Richard Harkrader, "Coming Changes to North Carolina's Electric Utility Industry," North Carolina Solar Energy Association, July 1999.
[56] University of North Carolina School of Journalism, "Carolina Poll" (Chapel Hill: University of North Carolina, Fall 1998).

credits. North Carolina cannot wait for possible deregulation to increase the incentives to create clean energy sources. Rather, the state must develop policies now (e.g., net metering, green energy–pricing programs, and disclosure on customers' bills[57]) that enable the renewable clean energy industry to grow to its potential.

- **Conservation/Efficiency.** Energy conservation and efficiency both reduce smokestack pollution and directly benefit customers financially. Although the North Carolina Clean Smokestacks Plan focuses on emission reduction targets for outdated power plants, it is equally important for all users of electricity to cut their consumption of energy. For example, power plants and factories should ensure that their equipment is operating efficiently, and residential users should turn off the lights when leaving a room. There are countless examples of ways to save energy.[58] Also, the current pricing structure for electricity does not necessarily promote conservation. At present, large-scale users are given cheaper rates. Reversing such policies would provide economic incentives for conservation and would also make the largest consumers pay a fairer share of the cost of emission reductions.

4 Mobile Sources

4.1 Background

The reduction of power plant pollution is necessary, cost effective, and long overdue. But to fully protect the state's public health, pollution reduction cannot stop with the power sector. Policymakers must also address North Carolina's other large source of air pollution: mobile sources. Although mobile sources are not the focus of the NC Clean Smokestacks Plan, this brief background provides context for more detailed analysis in the future.

Recent census figures indicate that North Carolina has grown by more than 20% since 1990, and residents are traveling more miles in their cars, vans, and trucks than ever before. The North Carolina Department of Transportation predicts that between 1995 and 2007, the state's population will grow by 17% and that the number of vehicle miles of travel will grow at an even faster rate -- 40% over the same time period.[59]

Modeling results from the North Carolina Division of Air Quality (DAQ) confirm the need to limit pollution from cars, sport utility vehicles, large diesel trucks, and buses, as well as non-road mobile sources such as construction equipment. According to the DAQ, even if each of the state's power plants meets the current standards for NO_x pollution,

[57] Contact the North Carolina Solar Energy Association for information about incentives to promote the availability and use of green energy.
[58] See Environmental Defense's webpage for a list of energy-saving opportunities, http://www.environmentaldefense.org/Want2Help/b_gw20steps.html.
[59] D'Ignazio, Janet, "Growing Smart About Transportation", *Popular Government"*, Institute of Government: Chapel Hill, p. 54.

North Carolina will still need to reduce mobile source emissions significantly to bring ozone concentrations to acceptable levels statewide.[60]

In 1999, the EPA established its "Tier II" tailpipe emissions standards, which will require a 77% reduction in emissions from cars and as much as a 95% drop in emissions from sport utility vehicles and light trucks in the next six years, a move that the Hunt administration supported. In December 2000, the EPA also issued rules to tighten particulate matter and NO_x emission standards for large diesel trucks and buses by 90 to 95%, respectively, over the standards for today's engines. These steps are in the right direction, but even further reductions are necessary. For example, heavy-duty non-road vehicles such as construction equipment are not regulated for NO_x emissions, even though they contribute 18% of this ozone-forming pollutant in North Carolina (Figure 4).

To achieve the necessary reductions in smog and particulate matter pollution, policymakers must move car manufacturers away from models that rely on fossil fuels. Other states have adopted measures that (1) require all new cars to be 92% cleaner than they are today, (2) require manufacturers to sell a minimum percentage of zero- and low-emission vehicles, and (3) create tax incentives for consumers to buy very low- and zero-emission vehicles. In addition to such technological solutions, North Carolina must also work to reduce dependence on automobiles and travel fewer miles in motor vehicles each year. North Carolina must offer transportation options, create communities that do not require a car, avoid sprawl, and pursue many other recommendations suggested by the North Carolina Smart Growth Commission report.

4.2 Progress to Date at the State Level

State decision-makers have set some precedents for clean car policies that bode well for the enactment of programs to reduce mobile source emissions. In 1999, the North Carolina General Assembly passed a bill to raise the number of counties in which emissions testing is required of all automobiles and to lower the sulfur content of gasoline. This legislation will frame the debate for future reductions of automobile emissions. For example, the legislation sets a 75% goal for the number of low- and zero-emission vehicles that state agencies should acquire by 2004, and it directs the Department of Transportation and the Department of Public Instruction to draw up a plan for converting both school buses and transit buses from diesel fuel to low-emission alternatives. The legislation also directs the state agencies of environment, transportation, and commerce to recommend to the legislature possible incentives for buying alternative-fuel vehicles. Recently, North Carolina joined with thirteen other states to develop draft state-level rules to close a loophole in the federal regulations for diesel emissions from trucks and buses. The North Carolina Smart Growth Commission delivered its final report and recommendations to the General Assembly this year. The implementation of its recommendations will offer citizens more transportation options and lessen their dependence on the automobile.

[60] North Carolina Department of Environment and Natural Resources, Division of Air Quality, "North Carolina 8-hour Ozone Modeling Project Status Report," August 2000.

5 Recommendations

The North Carolina Clean Smokestacks Plan presents achievable emission reduction targets needed for power plants to help clean up North Carolina's air. Specific responsibilities of the governor, the General Assembly, and the Environmental Management Commission to advance North Carolina towards these targets are presented in the Actions portion of the recommendations.

5.1 Emission Reduction Targets

North Carolina's power plants must drastically cut their emissions (see Table 6) in order to progress toward protecting the public health, the environment, and the economy. The large size of the reductions needed is a testament to the amount of pollution spewing forth from the "grandfathered" power plants and the lack of controls on these sources. It is important that new laws and regulations should be phased in over a reasonable length of time to enable the utilities to plan and retrofit their power plants cost effectively.

Table 6. Achievable Reduction Targets from the Power Plant Sector

- ✓ **Summertime Nitrogen Oxides.** Cap summertime NO_x emissions at 23,000 tons, an 80% reduction over 1998 levels. These reductions should be phased in by 2007.
- ✓ **Year-Round Nitrogen Oxides.** Cap year-round NO_x emissions at 50,000 tons, an 80% reduction over 1998 levels. The reductions should be phased in by 2007.
- ✓ **Sulfur Dioxide.** Cap emissions of SO_2 at 85,000 tons annually, an 82% reduction over 1998 levels. The reductions should be phased in by 2007.
- ✓ **Mercury.** Reduce year-round emissions of mercury by 90% from 1998 levels. The reductions should be phased in by 2007.
- ✓ **Carbon Dioxide.** Cap new CO2 emissions at 1990 levels, as called for by the United Nations Framework Convention on Climate Change, which has been ratified by the United States.

5.2 Actions

Reducing the pollution from power plants will require strong leadership by Governor Easley, legislators, members of the Environmental Management Commission, and other state officials. The North Carolina Clean Smokestacks Plan calls for the following:

Governor Easley

- Persuade the General Assembly to adopt a clean smokestacks bill requiring the state's power plants to meet aggressive clean-up targets for NO_x, SO_2 , mercury, and CO2.
- Upon cleaning up North Carolina's power plants, take advantage of federal laws (such as Section 126 of the Clean Air Act) to encourage upwind states such as Tennessee, Georgia, Kentucky, and Ohio to reduce the air pollution they contribute to North Carolina.
- Direct the North Carolina Department of Environment and Natural Resources to finalize Phase III of the Governor's Clean Air Plan to ensure that the state sufficiently reduces NO_x emissions year-round from both point and mobile sources to meet health standards. Phase III should also map out strategies to reduce SO_2 and mercury emissions.
- Direct the North Carolina Energy Office to develop a plan by December 2001 for increasing the use of renewable sources of energy to 10% of all power generation by 2010 and 20% by 2020. This plan should also outline strategies to improve energy efficiency and increase conservation.
- Urge the U.S. Environmental Protection Agency to adopt strong particulate matter and NO_x emission standards for non-road heavy-duty diesel engines.

General Assembly

- Pass a clean smokestacks bill requiring the state's power plants to meet aggressive clean-up targets for NO_x, SO_2 , mercury, and CO2.
- Require utilities to disclose publicly through quarterly inserts in their electricity bills the sources of energy, emissions, and wastes generated from energy production.
- Create a greenhouse gas registry program so that power companies can receive credit for early reductions in carbon dioxide and other greenhouse gases.
- Create tax incentives for residents to buy low- and zero-emission vehicles.

Environmental Management Commission

- Pass rules to cap utility summertime NO_x emissions at 23,000 tons and to reduce NO_x emissions to 50,000 tons year-round, complementing any actions that the General Assembly may take.
- Pass rules to cap SO_2 emissions at 85,000 tons year-round, complementing any actions that the General Assembly may take.
- Pass rules to reduce year-round emissions of mercury by 90% from 1998 levels, complementing any actions that the General Assembly may take.

North Carolina Utilities (Duke Energy and Progress Energy)

- Develop and implement plans for reducing emissions of NO_x, SO_2, mercury, and CO2 to meet North Carolina's public health, environmental, and economic needs.
- Commit to phasing out outdated power plants and increasing the use of less polluting sources of energy such as natural gas and renewable sources.

6 Conclusion

The silver lining of the air pollution cloud in North Carolina is that the citizens and officials of the state can solve this environmental problem. All the ingredients for success are in place:

- A good scientific understanding of the public health, environmental, and economic consequences of dirty air.
- Knowledge of the sources of the air pollution, with power plant smokestacks being the predominant emitter of pollution into the atmosphere.
- Readily available and cost-effective technologies to control nitrogen oxide and sulfur dioxide pollution and very promising technologies to control mercury.

The only thing that stands in the way of clean air now is leadership. The utilities may vigorously oppose the statewide caps and reductions called for in the North Carolina Clean Smokestacks Plan in an attempt to continue avoiding strict emission standards. However, the people of North Carolina have clearly expressed their desire for cleaner air. North Carolina must have the political will and long-term economic foresight to set long overdue standards for its fourteen grandfathered coal-fired power plants. Through strong leadership and decisive action, North Carolina will not only responsibly address its own air quality problems but it will also strengthen its negotiating position to require reductions from upwind states.

The time has come for North Carolina to finally and fully reduce coal-fired power plant smokestack emissions to clean its air and thereby ensure the health of its citizens, environment, and economy for future generations.