

A Review of the Effects and Changes in Air Pollution in the State of Georgia

Katie Farr

Faculty Mentor: Laine A. Scott, PhD
Humanities, English

Abstract

This report examines how air pollution has affected the state of Georgia over the years, specifically since 1990. Although Georgia began a fight against air pollution in the early 20th century, it was not until the Clean Air Act was passed by the federal government in 1970 that real changes began to take place and air quality started to improve consistently. Since then, it has only become clearer how harmful the effects of air pollution can be on the human body as well as on the environment. Pollutants can cause serious respiratory and cardiovascular issues when inhaled, even in small concentrations. Moreover, poor air quality is a major contributor to environmental issues such as climate change and pollen count. Even though pollution in Georgia has decreased since 1990, it is still not at a healthy level in several regions. Therefore, it is important to continue to strive for advancements until the whole state consistently maintains healthy air.

Introduction

Background

Air pollution has been an issue around the globe for centuries. However, it was not always understood as the problem that it is. In Rome, air pollution was called *gravioris caeli*, which translates to “heavy heaven.” It was considered part of Rome’s charm, along with the noisy streets and tremendous wealth. Air pollution was a concern wherever wood was burned and craftsmen worked. When the Industrial Revolution began, air pollution became even more prevalent. It caused serious health issues, but no one attributed those health issues to the rise in the use of products such as coal. Many people saw those products as a solution to air pollution. Moreover, in many of the large, industrial cities, smoke was symbolic of wealth and progress (Kovarik).

It wasn’t until the turn of the 20th century that people began to realize the effects that their actions were having on air quality. In 1915, the state of Georgia filed a suit against the Tennessee Copper Co., claiming that their Copper Basin smelters were causing environmental problems and health issues on the Georgia border. As a result of this case, the federal government ruled that sulfur and other toxic emissions could be limited (Kovarik).

In 1970, the air pollution issue took a drastic turn when the Clean Air Act was put in place. This act involved the beginning of federal regulation of the major air pollutants as well as the creation of National Ambient Air Quality Standards

(NAAQS). States were to implement individual strategies to reach NAAQS by a specified date (“Air Quality Act”).

Problem

Air pollution is of serious concern regarding human and environmental health in the state of Georgia, but it is often overlooked since it is not always visible (“Air Quality Policy,” 2019). About 200 pollutants have been identified across Georgia (“Learn About Air”; “Georgia’s Air Monitoring”). While air quality has improved overall since 1990, it has begun to decrease again since 2016, and Atlanta still ranks as one of the U.S. cities with the top air pollution numbers, suggesting that Georgia’s air quality policies may need to be revisited in order to continue striving for improvement (“Facing the Facts,” 2005; Miller, 2019; Rhone, 2020).

Purpose

The purpose of this report is to show how air quality in the state of Georgia has changed over the past 30 years. Following the guidelines set forth by the Clean Air Act as well as Georgia’s own air quality policies has positively impacted air health. However, future actions should be taken to further increase the air quality in Georgia.

Scope

This report examines issues surrounding air pollution in the state of Georgia and how air pollution has changed in recent decades. It suggests future changes that could be

implemented in order to decrease air pollution more and reverse the negative changes that have appeared in the past several years. Understanding these issues and implementing the changes suggested can lead to an increase in air quality along with a decrease in lung disease and ozone deterioration.

Discussion

Causes

There are several common factors to blame for the prevalence of air pollution. It is often caused by the use of energy by industries and manufacturing companies. Many industries burn fossil fuels for energy, which releases particles and gases into the atmosphere (Mackenzie, 2016). Driving is one of the leading causes of air pollution. Particles that enter the air from vehicle exhaust can be full of heavy metals that can cause cancer (“Air Quality Policy,” 2019). Air pollution is typically worse in heat, meaning that Georgia summers may be even more dangerous. Moreover, air pollutants such as carbon dioxide can further increase the Earth’s temperature, creating a cycle that can lead to consistently worse effects of pollution if strict regulations are not maintained (Mackenzie, 2016).

Environmental Concerns

One major environmental concern that is a result of air pollution is climate change. The Earth’s ozone layer helps regulate the amount of ultraviolet radiation that enters from the sun (“Air Pollution”). When air pollutants are released into the atmosphere, they can cause heat from the sun to be trapped on Earth, leading to higher temperatures (Mackenzie, 2016). They can also cause chemical reactions in the ozone that can destroy that layer of the stratosphere. Man-made ozone depletion takes place faster than natural ozone creation, leading to less protection from ultraviolet radiation and further increase of temperatures on the Earth (“Air Pollution”). The pollutants that cause warmer temperatures are known as greenhouse gases. Carbon dioxide and methane make up the majority of greenhouse gases. Carbon dioxide is released when fossil fuels are burned, a common practice among industries. Methane is released by other industrial practices, such as drilling oil (Mackenzie, 2016).

Climate change is also expected to lead to an increase in harsh weather conditions such as hurricanes, floods, droughts, and wildfires. It causes changes to the oceans, increasing sea level and the amount of acid in the water (Bai et al. 2018; Mackenzie, 2016). These environmental issues could lead to food scarcity in certain regions of the world, leading to further health problems and even death, and may cause political and trade issues for the United States in the process. The environmental damages caused by climate change over the years have already caused serious economic loss for the United States, along with the natural harm to various ecosystems (Mackenzie, 2016).

Another environmental concern impacted by air pollution is the increase of allergens produced by carbon dioxide consuming plants. Studies show that plants that grow in a carbon dioxide rich environment produce significantly more pollen than do trees in an environment with good air quality. This means that on top of the health effects caused by breathing air pollution itself, people suffer more pollen allergy symptoms such as runny noses and fevers (Mackenzie, 2016).

Health Concerns

Research shows that air pollution is positively correlated with heart disease and risk of lung cancer as well as other serious health issues (“Facing the Facts,” 2005). When the NAAQS were set in 1970, six main pollutants were identified, and limits were set in order to regulate emissions. The six pollutants were carbon monoxide, lead, nitrogen dioxide, ozone, sulfur dioxide, and particulate matter, or PM (Anderson, Thundiyil, & Stolbach, 2012). Each of these pollutants can cause serious health problems after entering into the lungs.

For example, PM is “a complex mixture of extremely small particles and liquid droplets made up of acids, organic chemicals, metals, and soil or dust particles” that can be created by industries and machines (Anderson, Thundiyil, & Stolbach, 2012). Inhalation of PM has been associated with atherosclerosis due to inflammation as well as heart attacks. It can also cause the development of blood clots, which leads to coronary artery disease. PM can also lead to oxidative stress and asthma (Anderson, Thundiyil, & Stolbach, 2012). Moreover, ground-level ozone can cause lung and trachea muscles to constrict, resulting in air trapped in the lungs. This can lead to a variety of symptoms, including shortness of breath, coughing, and infection (“Health Effects”).

People with preexisting cardiovascular or respiratory illnesses are more susceptible to the negative effects of air pollution. Children and the elderly are also at a higher risk for adverse effects (“Annual Report,” 2019; Pope 3rd, 2000). When ground ozone levels are higher than usual in Atlanta, emergency room visits increase significantly (“Facing the Facts,” 2005). In addition, hazardous air pollutants (HAPs) can cause cancer (“Learn about Air”). It is estimated that 800,000 early deaths each year are due to air pollution, making it the 13th most common cause of death in the world (Anderson, Thundiyil, & Stolbach, 2012). Surprisingly, these deaths are not always a result of long-term exposure to air pollution. Acute exposure to heavily concentrated pollutants can cause serious health problems as well and often leads to fatalities (Pope 3rd, 2000). Moreover, studies suggest that even lower levels can lead to health problems in the healthiest people (“Air Quality Policy,” 2019).

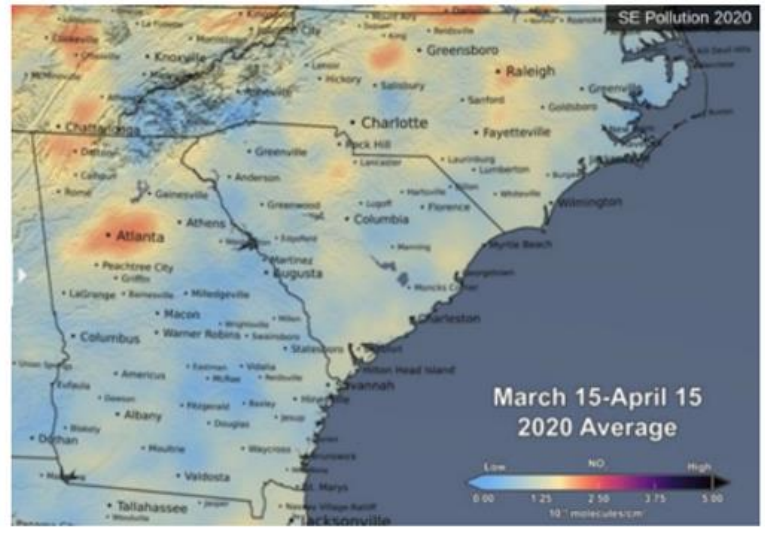
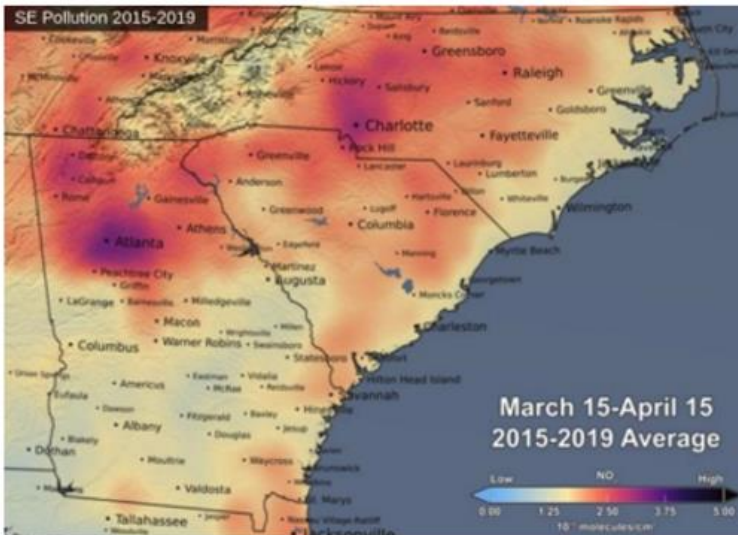


Figure 1. *Source: Dunston, Mike. (2020) Coronavirus closures cause big drop in Georgia pollution. CBS46.*
https://www.cbs46.com/news/coronavirus-closures-cause-big-drop-in-georgia-pollution/article_621636be-8a80-11ea-93db-a78f8866cf5e.html

Figure 2. *Source: Dunston, Mike. (2020) Coronavirus closures cause big drop in Georgia pollution. CBS46.*
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Effects of Quarantine (COVID-19)

A recent Harvard study has linked areas with more air pollution to a greater number of COVID-19 related deaths. The study included a sample of over 3,000 counties in the United States and found a positive correlation between small particulate matter (PM-2) particles in the air and COVID-19 death rates (King, 2020). This is likely due to the fact that breathing in pollutants harms the same parts of the body as COVID-19, worsening the overall effects of the virus (Rhone, 2020).

However, a drastic change in air quality in the state of Georgia has been noted as a side effect of the shelter-in-place order made on April 2. Even before the order, people were beginning the practice of “social distancing,” choosing to remain at home when possible and avoiding large gatherings. Some businesses and industries began to cut back on hours, while others shut down completely. Then, with the administration of a shelter-in-place order, the rest of the state was forced to shut down, causing traffic to reduce immensely. This decrease in travel and energy usage has led to a significant reduction of nitrogen dioxide, a common pollutant that comes from vehicles, plants, and industries (Rhone, 2020). There has also been a decrease in ground-level ozone in several Georgia counties, such as Cobb, DeKalb, and Fulton (Dunston, 2020). Images from NASA show the average air pollution from 2015 to 2019 in Figure 1, while Figure 2 shows the decrease in air pollution during the April 2020 shelter-in-place order (Dunston, 2020).

The sudden decrease in air pollution will likely be short-lived, though, since pollutant numbers are expected to

rise back to normal levels as soon as travel restrictions are lifted (King, 2020; Rhone, 2020).



Figure 3. Georgia's Air Monitoring Program. *Ambient Air Monitoring Program.*
<https://airgeorgia.org/georgiasairmonitoringprogram.html>

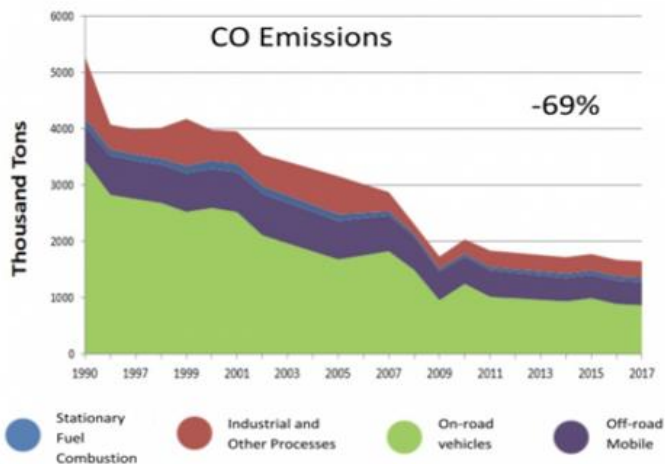


Figure 4. Source: Georgia's Air Quality Trends. Environmental Protection Division. <https://epd.georgia.gov/outreach-educational-programs/georgias-air-quality-trends>

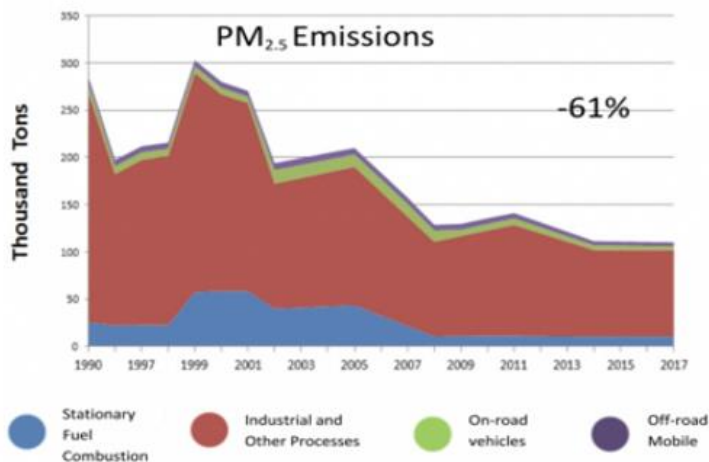


Figure 5. Source: Georgia's Air Quality Trends. Environmental Protection Division. <https://epd.georgia.gov/outreach-educational-programs/georgias-air-quality-trends>

Interventions

The Ambient Monitoring Program (AMP) of the Georgia's Environmental Protection Division's (EPD) Air Protection Branch monitors air quality in about 40 different places across the state of Georgia. Figure 3 shows where these monitors are located. AMP collects data from each monitoring site and tests the air for pollutants. The data is then published for public use within a live map. This information is also used to alert the public when pollution levels are especially high and dangerous ("Georgia's Air Monitoring").

The Mobile and Area Sources program within the EPD regulates vehicle emissions as well as area emission sources. It also enforces the inspection and maintenance of vehicles. The Stationary Source Compliance Program and the Stationary Source Permitting Program of the EPD oversee stationary sources of emissions and work to ensure that they remain within state and federal guidelines ("Air Branch Programs").

Recent Trends

Air quality has greatly improved since 1990, but it is still not at a healthy level in many regions of the state of Georgia. Each of the six main air pollutants has been significantly reduced. Carbon monoxide emissions have decreased by 69%, as shown by Figure 4. Nitrogen oxide emissions have decreased by 60%. Particulate matter (PM_{2.5}) emissions have decreased by 61%, as shown by Figure 5 ("Georgia's Air Quality Trends"). Figures 6-9 depict data for the four other main air pollutants: particulate matter, nitrous oxide, sulfur dioxide, and volatile organic compounds.

According to the American Lung Association's "State of the Air" report, Atlanta had the 25th highest ozone level in the nation. However, in the 2020 report, Atlanta has improved and now has the 33rd highest ozone level in the nation. Augusta

also saw similar improvements in ozone levels ("Georgia's Air Quality Improved," 2020).

The Clean Air Act is the primary reason for these impressive overall reductions in air pollution. This federal intervention led to increases in controls over smokestacks and fuel usage, as well as to the initiation of practices and guidelines specific to the state of Georgia. However, the Clean Air Act does not include policies regarding actions such as people's typical preference for driving instead of using transits, walking, or riding bicycles. Therefore, further reducing air pollution has proven challenging, meaning that Georgia should continue to strive toward cleaner air ("Air Quality Policy," 2019).

Conclusion

Air pollution has been a serious concern for the state of Georgia for many years. The situation has greatly improved since Georgia's suit against the Tennessee Copper Co. in 1915 and the approval of the Clean Air Act in 1970. Overall, pollutant levels in Georgia have dropped significantly over the past 30 years, but it is clear that even the smaller amount of pollution in the air today is having an effect on the environment and human health. While previous research already supported the idea that a reduction of vehicle emissions can decrease air pollution, the current shelter-in-place in Georgia is providing more evidence that the idea is true. Unfortunately, any improvements that have occurred due to the shelter-in-place order are likely to reverse once the order is completed and all social and work contexts return to normal. Current intervention

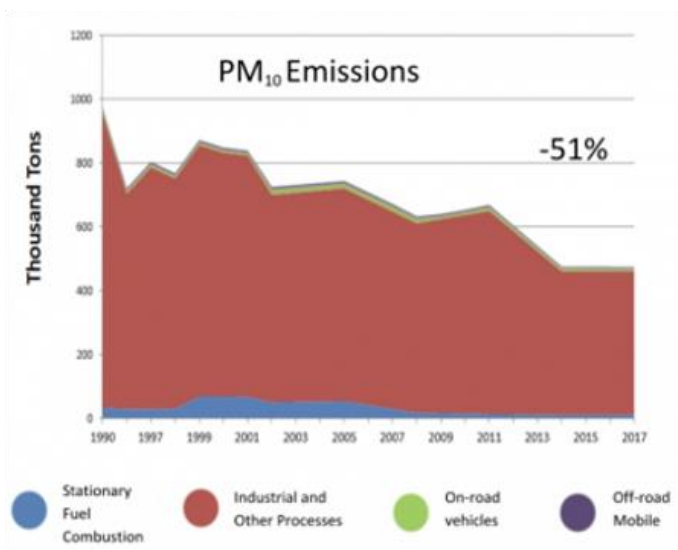


Figure 6. Particulate Matter (PM10)

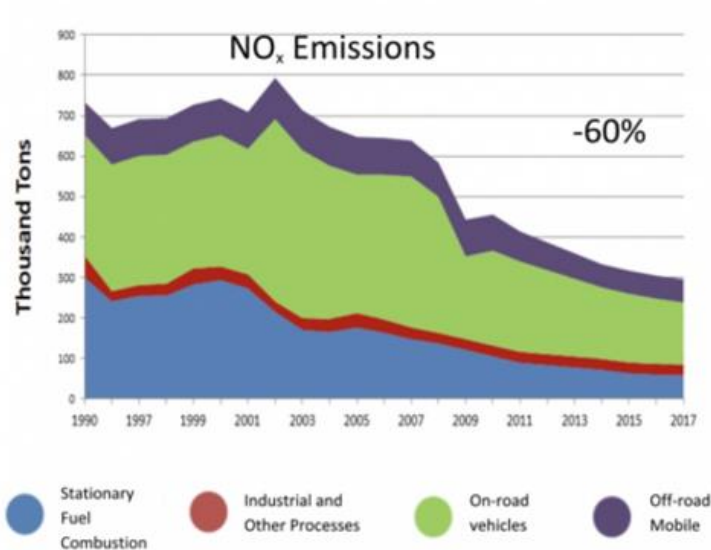


Figure 7. Nitrogen Oxide Levels 1990-2017

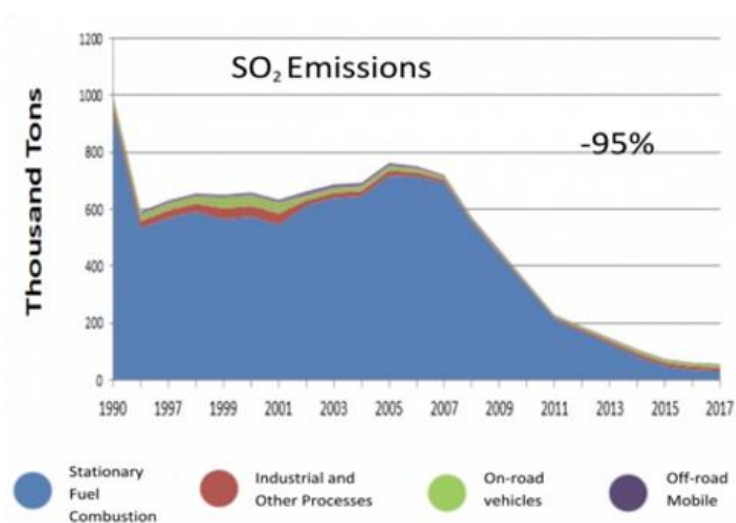


Figure 8. Sulfur Dioxide Levels 1990-2017

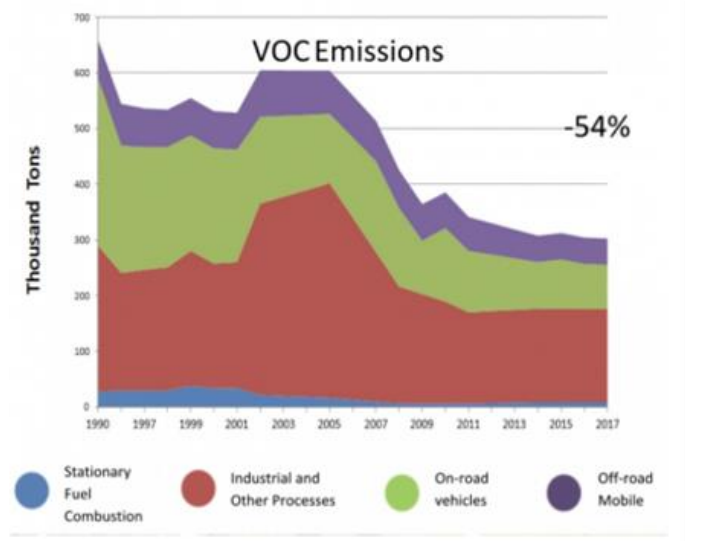


Figure 9. Volatile Organic Compound Levels 1990-2017

Source: Georgia's Air Quality Trends. Environmental Protection Division.
<https://epd.georgia.gov/outreach-educational-programs/georgias-air-quality-trends>

plans are certainly helping reduce air pollution, but there are still several areas of life that are challenging to change. Activities such as driving as well as pollution-producing industries are top causes of the unhealthy air that still exists today. It is important to continue working on new intervention plans that address these issues until the air quality in Georgia reaches a healthy, stable level.

Recommendations

One step that the state of Georgia can take in order to address the issue of air pollution is to implement an education plan. Unfortunately, many Georgia residents are unaware of the damages that even acute exposure to pollutants can cause ("Air Quality Policy," 2019). Many residents may not even

realize that the air they are breathing is unclean at all. Several organizations such as Georgia's Clean Air Force and the Georgia Conservancy are already taking steps to increase awareness about air pollution. However, these organizations are not reaching across the state like a middle school or high school education plan would. I suggest implementing a public-school program that would reach every public school in the state and begin educating children and adolescents while they are still at such an impressionable age.

For people already in the workforce, awareness campaigns should be increased and prioritized in the state. Providing education could be a great way for Georgia residents to understand their impact on the air quality in their home state and encourage them to make healthier decisions, such as using

transit systems more often. These campaigns should also encourage people to stay updated on air pollution levels so that they can avoid going outside on heavily polluted days.

I would also suggest continued and even increased funding for research on the causes and effects of air pollution. Much has been learned about air pollution, but there is still much left to be learned. New research may be able to direct us toward more effective strategies for reducing pollution. Moreover, new monitoring technology can help reduce the cost of monitoring air pollution while providing accurate data to keep Georgia residents informed (“History of Air Pollution”).

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