Air Quality and Climate Change Policy Briefs

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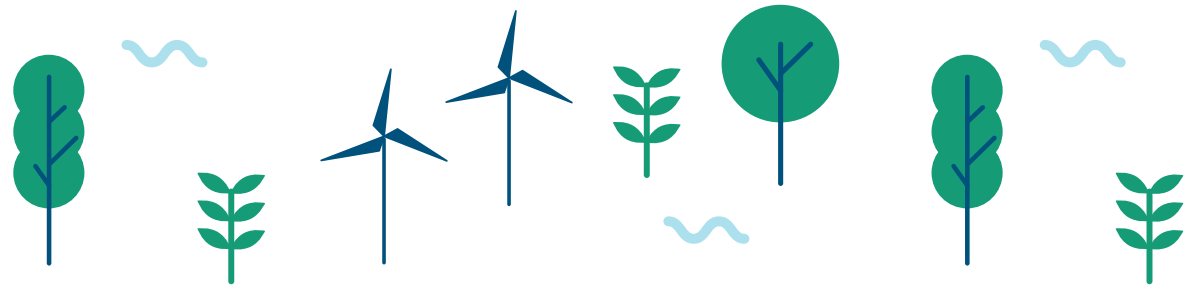
Air pollution and climate change are closely related. Many sources of planet-warming greenhouse gases (GHGs) also emit health-damaging air pollutants. Addressing climate change, however, does not always result in cleaner air. What's more, some climate policy solutions can actually make local air quality worse.

But it doesn't have to be this way—change and air pollution can be tackled together. With equity at the center, policy approaches that deal with both issues can address long-standing inequalities and deliver near-term local health benefits, as well as longer-term global climate impacts.

This brief is the first of a series that gives an overview of how we got here, major challenges, and potential solutions for equity-based climate and air quality policies.

THE Climate + Clean Energy EQUITY FUND



A short history of how air quality regulations started

To understand the policy solutions that can address the current air quality and climate crisis, it is important to understand the regulatory context of air quality and how air quality policies began as separate from climate change policymaking.

The Clean Air Act (CAA) is the primary federal law that regulates air pollution throughout the United States. States have the authority to implement more stringent requirements for certain sources, and state approaches vary widely. The modern Clean Air Act was passed in 1970 and strengthened in 1977 and 1990 in response to high levels of air pollution across the nation. The CAA "requires the [U.S. Environmental Protection Agency (EPA)] to set health-based standards for ambient air quality, sets deadlines for the achievement of those standards by state and local governments, and requires the EPA to set national emission standards for large or ubiquitous sources of air pollution, including motor vehicles, power plants, and other industrial sources."[1]

Generally, air pollutants (also known as air contaminants) are broken into two categories under the CAA: criteria air pollutants and hazardous air contaminants (see **Glossary 1**).

At the time of the CAA's creation and subsequent amendments, greenhouse gases were not recognized as a significant threat and not explicitly included as their own category. For the most, air pollution regulations have been separate from climate change policy. This approach has changed somewhat over the past decade; greenhouse gases are now regulated in a limited manner under the CAA. **Box 1A** describes the overlap and differences between greenhouse gases and criteria air pollutants.

"Addressing climate change does not always result in cleaner air—some climate policy solutions can actually make local air quality worse."

In Baltimore, Maryland, a predominantly Black community is breathing the toxic and harmful pollution mix from a nearby trash incinerator. Because the trash incinerator captures some of its own methane for energy, the state classifies the facility as "renewable" and counts it towards green energy goals.[2]

In Springfield, Massachusetts, a community surrounded by power plants spent years fighting off a large biomass facility—another type of energy classified as "green"—that would have made their already toxic air worse.[3]

2 https://www.baltimoresun.com/news/environment/bs-md-trash-incineration-20171107-story.html

3 https://www.wbur.org/earthwhile/2021/04/02/springfield-biomass-permit-revoked

1 https://www.everycrsreport.com/reports/RL30853.html

Box 1A:
What is the difference between GHGs and criteria air pollutants?

Criteria air pollutants and greenhouse gases (GHGs) are both major contributors to harmful emissions, but they do so in distinctly different ways. Criteria air pollutants are responsible for unhealthy air quality, which damages human health as well as the local environment. GHG emissions cause global warming, and while needed to regulate the planet's temperature, their exponential increase is driving today's climate change impacts. Several gases, such as nitrous oxide (N_2O) and methane, are both air pollutants and GHGs, causing dire health impacts and global warming.

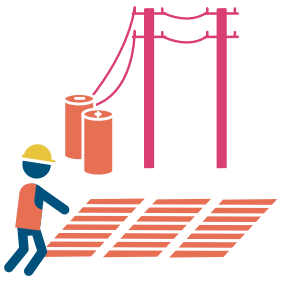
Many air pollutants that contribute to local health impacts are co-emitted with GHGs that contribute to climate change. However, not all air pollutants contribute to climate change. And not all greenhouse gases are air pollutants. For example, direct exposure to carbon dioxide (CO_2), the major GHG contributor, does not affect human health directly but has other indirect health impacts through climate change. Lastly, some GHGs have a stronger greenhouse gas effect, trapping heat at higher rates. They are known as **short-lived climate pollutants** (see **Glossary 2**) and are starred in **Table 1**, below.

Table 1. List of air pollutants and greenhouse gases

	Air pollutant	Greenhouse gas	Impacts human health directly
Particulate matter (PM2.5)	✓	X	✓
Sulphur dioxide	✓	X	✓
Nitrogen dioxide	✓	X	✓
Ground-level ozone	✓	✓	✓
Carbon monoxide	✓	X	✓
Carbon dioxide	X	✓	X
Nitrous oxide	X	✓	X
Lead	✓	X	✓
Particulate matter (PM10)	✓	X	✓
Methane*	✓	✓	✓
Black carbon* (soot)	✓	✓	✓

* These are short-lived climate pollutants.

How mainstream climate policies fall short of local impacts



Traditional climate policy has failed to adequately integrate and consider local air quality improvements. Traditional climate policy has focused on reducing major greenhouse gases responsible for the planet's warming, such as carbon and methane emissions. From a climate perspective, location is less important because a greenhouse gas emitted anywhere in the world contributes to climate change globally. Moreover, the impacts of climate change are rarely tied to the emission source. The worst climate impacts—resulting in severe economic, health, ecological, and social consequences—are happening in countries that emit the least greenhouse gases, which also reflects major inequities.

At the same time, because many health-damaging pollutants and GHGs overlap, climate policies should be able to benefit local air quality. In climate policy, contaminants that are known to cause local air pollution are called "co-pollutants" to GHGs. The air quality improvements—and other public health benefits more broadly—achieved through climate change policy are often called the "co-benefits" of climate policy. So, theoretically, reducing greenhouse gas emissions would also achieve co-benefits like improved air quality and improved public health, as well as additional economic benefits from the cost savings of confronting these issues.[4]

But in practice, local air quality improvements tend to fall through the cracks. Because climate change is seen as a global issue not a local one, policies tend to look at emissions in the aggregate, examining what is happening with GHGs on a sector, state, national, or global level. Traditional climate policies, such as carbon pricing, rarely focus on emissions from specific facilities, and GHG reduction is generally tracked and analyzed on the aggregate level. Traditional climate policies also favor indirect emission reductions—such as "carbon offsets"—over direct emission reductions, which may reduce GHG emissions in the aggregate but do not reduce local health-damaging pollutants (see **Glossary 3**). For example, a steel mill interested in reducing its GHG footprint may buy carbon offsets (an indirect reduction), instead of installing pollution control technology or upgrading their infrastructure (a direct reduction). The carbon offset could be based on forest restoration in Indonesia, which means that the communities around the steel mill do not actually benefit from the emission reduction.[5]

As a result, the focus on the aggregate can deprioritize local air quality improvements and reductions at direct emission sources, which impact low-income communities of color the most. While there are many valid reasons to track GHGs at the aggregate level, especially for global cooperation and negotiations, the downside is that polluters are less likely to be held accountable, and marginalized communities seldom receive clean air and climate benefits. This inequity needs to change. A growing body of research documents the correlation and simultaneous release of GHGs and co-pollutants.[6] By addressing air quality and climate change together, we can achieve equitable policies and plans that address today's environmental and climate crises.

"The focus on aggregate GHG levels can deprioritize local air quality improvements and reductions at direct emission sources, which impact low-income communities of color the most."

4 https://www.nrdc.org/sites/default/files/boosting.pdf

5 How the carbon offsets are valued is also up for debate, and many environmental justice advocates argue that carbon offset programs often overestimate climate benefits. See, for example, https://www.pnas.org/content/117/39/24188.

6 https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002604

Major sources of air pollutants and GHGs

There are four general categories for sources of air pollutants and GHGs (see Figure 1). The two largest sources are **mobile** (cars, buses, trucks, etc.) and **stationary** (power plants, industrial facilities, etc.). Other sources include **area** sources, such as methane from agricultural areas (see **Box 1B**), and **natural** sources, such as smoke from wildfires and wind-blown dust (see **Box 1C**).

Mobile sources are the single-largest source of GHG emissions in the United States, accounting for 29 percent of all emissions in 2019.[7] The percentage can be much higher depending on location. Mobile sources are also significant contributors to air pollution, largely due to the release of diesel particulate matter as well as other air toxics.[8]

Low-income communities and communities of color face most of the environmental burden from the movement of goods across the country. Low-income communities and communities of color are more likely to live near highways, ports, and rail facilities, which transport massive quantities of goods on a daily basis using diesel trucks and trains. The country's 100 largest metropolitan areas are the major hubs of U.S. freight activity, "moving more than $8.1 trillion, or 60 percent, of all the nation's goods that travel by truck."[9] The "goods movement industry" relies on diesel fuel, which has higher levels of health-endangering air contaminants.

While each source requires slightly different solutions (covered in Brief 3), the bottom line is that reducing both greenhouse gas emissions and local air contaminants is critically important for achieving environmental justice.

7 https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

8 https://www.epa.gov/mobile-source-pollution/how-mobile-source-pollution-affects-your-health

9 https://www.brookings.edu/wp-content/uploads/2015/06/srvy_gcifreightmodes_june12.pdf

Box 1B:
Agriculture and air quality

The agricultural industry is a significant contributor to climate change and poor air quality. The conventional model of large-scale industrialized agriculture dominant in the United States is highly resource intensive and has multiple environmental impacts, from climate to air and water quality. The industry overall has extremely poor working conditions and few labor protections for farm workers, as well.

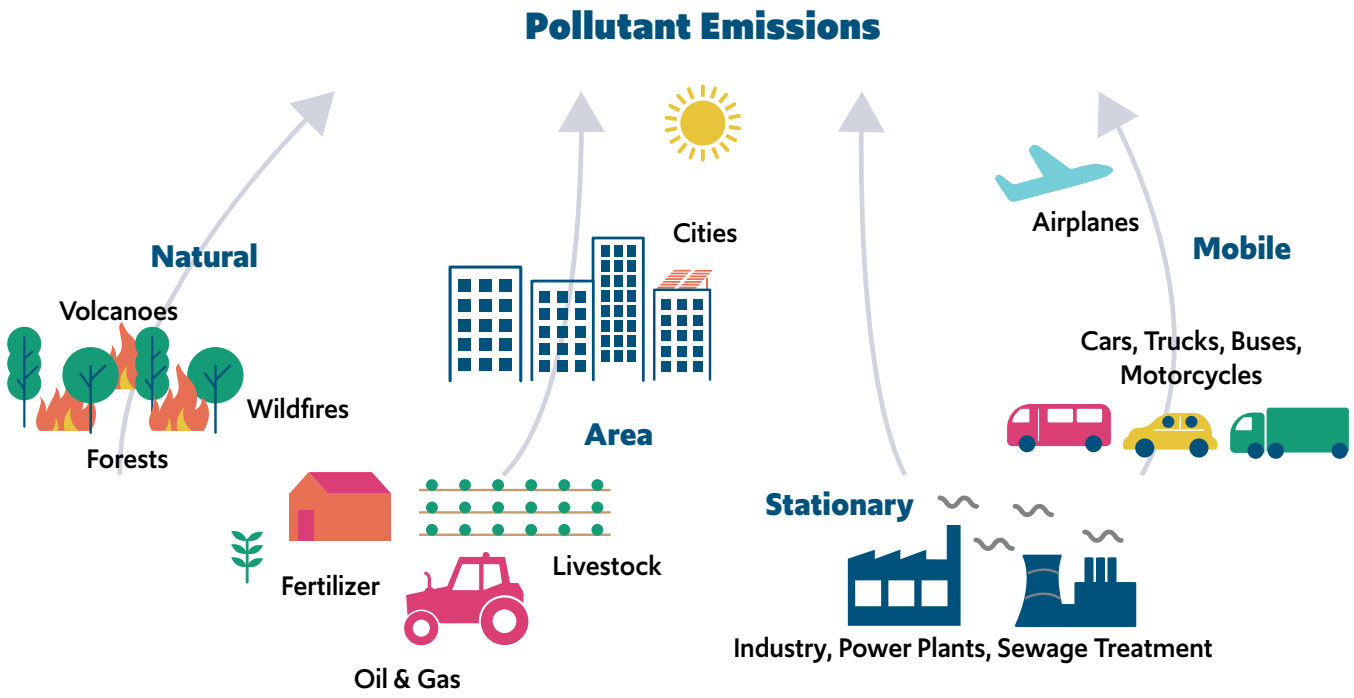
In 2019, U.S. agriculture contributed 10 percent of overall GHG emissions throughout the nation.[10] The largest source of direct agricultural emissions are methane from livestock, both in the form of enteric fermentation (digestion) and management of manure. Application of synthetic fertilizers and fossil-fuel-powered farm machinery and irrigation are the two other main sources of emissions.[11] These activities collectively release large quantities of methane, nitrous oxide (N_2O), and nitric oxide (NOx). All of these emissions have significant impacts on air quality and human health: methane is a precursor to ozone, which is the main ingredient to smog, and both nitrous and nitric oxide are main constituents of particulate matter, a very harmful air pollutant.[12] A few solutions include regulations on methane and fertilizer application, improved soil and manure management, and transitioning farms to renewable energy.

10 https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

11 http://www.fao.org/news/story/en/item/216137/icode/

12 https://www.earth.columbia.edu/articles/view/3281

Figure 1: **The four major sources of air pollutants and GHGs**



Source: https://www.nps.gov/subjects/air/sources.htm

Box 1C:
Wildfires, air quality, climate change and equity

Climate change is leading to increased wildfires. Many western states have already broken records for the duration, quantity, and size of wildfires, and these fires are only projected to increase.[13] Hot, dry weather increases the likelihood of wildfires starting, and degraded forest ecosystems create conditions for fires to easily spread and gain intensity. Wildfires can lead to the loss of life and billions of dollars in property damage.

Wildfires also emit large quantities of GHGs, including both carbon dioxide and black carbon (soot). For example, the 2018 wildfire season in California released emissions equivalent to about 15 percent of all California emissions (equal to the emissions produced by generating enough electricity to power the entire state for a year).[14]

Wildfires cause increasingly significant air quality impacts that harm health and quality of life by releasing large quantities of particulate matter and creating smoky days where outdoor activities are hazardous and unhealthy. The increased rates of wildfires raise numerous policy and equity issues, from disaster response, to liability, to post-fire rebuilding. Some key populations to consider include outdoor workers, non-English-speaking populations, households without access to AC and air filtration systems, and housing-insecure folks at most risk of displacement.

Note: Climate resilience, disaster preparedness, and relevant equity considerations will be discussed in depth in a future brief.

13 https://www.c2es.org/content/wildfires-and-climate-change/

14 https://www.doi.gov/pressreleases/new-analysis-shows-2018-california-wildfires-emitted-much-carbon-dioxide-entire-years

Glossaries

Glossary 1. The two categories of air pollutants used in the Clean Air Act

Criteria Air Pollutants	These pollutants harm health and the environment. The U.S. Environmental Protection Agency (EPA) has set acceptable levels for how much of these pollutants can be in the air, otherwise known as "ambient levels." Areas that are at or below this level of concentration are in "attainment" of air quality standards, and areas that are above this level are in "nonattainment." In other words, most criteria pollutants must stay below a certain level in order to keep local air quality healthy. For some criteria pollutants, such as particulate matter, there is no known safe level. The six criteria pollutants are: ▪ Ground-level ozone, such as from vehicle exhaust and industrial activities; ▪ Particulate matter, such as from car engines and smoke; ▪ Carbon monoxide, such as from burning coal, oil, and wood; ▪ Lead, such as from industrial activities; ▪ Sulfur dioxide, such as from coal plants; and ▪ Nitrogen dioxide, such as from burning fuels and vehicle exhaust.
Hazardous Air Contaminants	These air pollutants can cause serious health effects from exposure at extremely low levels, and there may be no safe level of exposure. Examples of hazardous air contaminants include: ▪ Benzene, found in gasoline; ▪ Asbestos, used for construction and insulation; ▪ Perchloroethylene, emitted from some dry cleaning facilities; and ▪ Chloroform, often used in building industries and pesticides.

Glossary 2. Short-lived climate pollutants

Short-lived climate pollutants are emissions that stay in the environment for a shorter period of time than carbon dioxide but have a much more intense impact on global warming and, sometimes, air pollution. Often called "super pollutants," the main short-lived climate pollutants include the following.

- **Black carbon**, also known as soot, is a main constituent of particulate matter, which is the air pollutant that is most harmful to human health and the primary driver of air-pollutant-induced mortality. It comes from the burning of fuels such as coal, diesel, and biomass, as well as from various forms of non-fuel burning of woody wastes and wildfires. Modern air quality regulations have reduced black carbon from many industrial processes, but emissions from mobile sources persist. Solutions that reduce black carbon as an air pollutant are discussed in **Brief 3**.
- **Methane** contributes to the creation of ozone, one of the major components of urban smog. Methane is 28 to 34 times more potent at warming than carbon dioxide over a 20-year period.[15]
- **Hydrofluorocarbons (HFCs)** are a group of chemicals used for refrigeration and cooling that make significant contributions to the depletion of the atmospheric ozone layer and are being phased out under the Montreal Protocol, an international treaty to protect the ozone layer.[16] Additional improvements in energy efficiency and industrial production are reducing the need for HFCs, although increased attention to recycling and disposal of HFCs in older appliances is needed. Both of these goals can also be enhanced or achieved through statewide policies.

Glossary 3. Direct vs. indirect emissions

Direct emissions refers to emissions from sources that are owned or controlled by the reporting entity. They include fossil fuel facilities, freight facilities, ports, private gas-powered vehicles, and trash incinerators—anything that directly releases GHGs and/or health-damaging air pollutants into the environment. In other words, direct emissions come from the entities directly responsible for air pollution, and policies targeting **direct emission reductions** usually direct specific facilities to reduce their emissions below a certain level. A regulatory agency sets a limit on pollution, and polluters must comply or face a penalty of some sort. Many aspects of the Clean Air Act utilize direct regulation, such as New Source Review[17] or the Prevention of Significant Deterioration.[18]

On the other hand, the term **indirect emissions** refers to pollution caused by one entity, even though the pollution is actually emitted elsewhere, at a source owned or controlled by another entity. They include GHG emissions from purchased electricity or heat in buildings and warehouses from the burning of fossil fuels. **Indirect emission reductions** may reduce GHG emissions in the aggregate but may not always reduce local emissions. Sometimes, indirect emission reductions may even increase local emissions in trade for an emission reduction elsewhere. This arrangement can be very problematic for environmental justice communities that most often bear the brunt of costs for a marginally beneficial "trade-off" (further discussed in **Brief 2**).

15 https://pubs.acs.org/doi/full/10.1021/acs.est.6b00705

16 https://www.ccacoalition.org/en/slcps/hydrofluorocarbons-hfc

17 https://www.epa.gov/nsr

18 https://www.epa.gov/nsr/prevention-significant-deterioration-basic-information