Strengthening RGGI to Improve Public Health

Greater Ambition for Cleaner Air

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Acadia Center
Advancing the Clean Energy Future

Changes to the global climate are bringing new threats to human health, and Northeast and Mid-Atlantic states can reduce these threats by strengthening the Regional Greenhouse Gas Initiative (RGGI). Adopting strong limits on CO_2 emissions under RGGI could produce $2.1 billion in avoided health impacts, with greater benefits produced by steeper emissions reductions.

Intersection of Climate Action and Public Health

Within the Northeast and Mid-Atlantic, increased extreme weather events like severe storms and heat waves have caused significant physical damages and increased health risks such as heat strokes. Shorter, milder winters have led to thriving tick populations and longer pollen seasons, causing greater incidence of Lyme disease and exacerbating asthma cases.[i] While climate change is driven by global factors, local action to curb climate pollution can have direct and immediate impacts on local health. This is particularly apparent in the electric sector, where measures taken to reduce CO_2 emissions from power plants result in reduced emissions of harmful co-pollutants, including SO_2, NO_X, mercury, ozone and particulate matter. The public health benefits of avoided co-pollutant emissions are substantial, strengthening the case for ambitious climate policy.

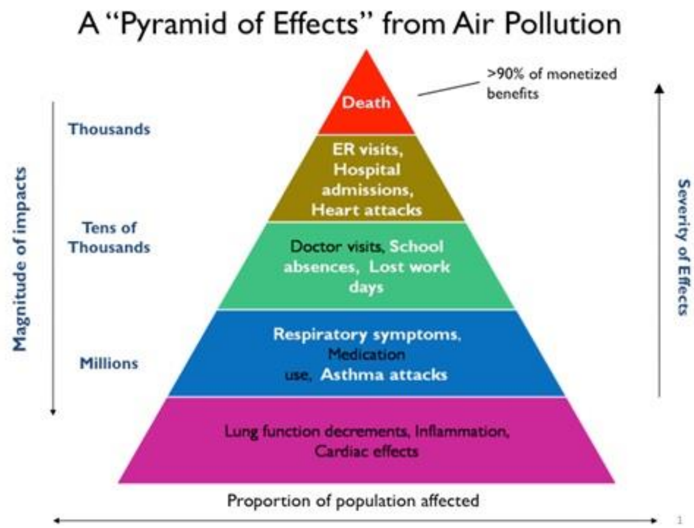
The Regional Greenhouse Gas Initiative (RGGI) is an example of successful climate policy delivering public health and other benefits. RGGI is a cap-and-invest program designed to reduce CO_2 emissions from power plants across nine Northeast and Mid-Atlantic states.[ii] Since 2008, the year before RGGI began, electric sector CO_2 emissions have fallen by 40% across the region.[iii] The factors behind that success (renewable energy growth, improved energy efficiency, fuel switching from coal and oil to natural gas)[iv] have also led to substantial reductions in co-pollutant emissions.

A recent study from Abt Associates analyzed how RGGI-driven reductions in criteria air pollutants[v] from 2009-2014 have impacted public health, and the findings of this study provide a clear assessment of RGGI's value to the well-being of the region:[vi]

> *"The RGGI program improved air quality throughout the Northeast states and created major benefits to public health and productivity, including avoiding hundreds of premature deaths and tens of thousands of lost work days. . . . The economic value of RGGI's health and productivity benefits is estimated at a cumulative $5.7 billion."*

Building on RGGI's success to date by establishing ambitious cap levels through 2030 will yield continued health benefits for the region. Our analysis, described below, shows that **a RGGI cap declining by 3.9 million tons per year (5% of the 2020 baseline) from 2020 through 2030 would result in $2.1 billion in health benefits, more than double the benefits of a less ambitious, 2.5% annual reduction in the cap.**

Strengthening RGGI



Source: EPA Benefits Mapping and Analysis Program

In determining RGGI's future level of ambition, states should take account of potential public health impacts. The current Program Review, which began in November 2015, has centered around the states' desired emissions reductions from 2020 to 2030 and policy proposals to achieve those reductions.[vii] To understand the broader impacts of these cap levels and program design elements, the RGGI states conduct modeling to determine impacts on wholesale power prices, electric ratepayer bills and regional economic activity. Weighing these factors – in addition to climate impacts – is an important step in determining the program's total costs and benefits, but analyses to date have not accounted for projected health impacts.

Most recently, the RGGI states have proposed three cap scenarios that would achieve varying levels of emissions reductions through 2030, referred to as Policy Scenarios #1, #2 and #3.[viii] Policy Scenarios #1 and #3 include cap levels that are nearly identical to previously modeled scenarios that require annual reductions of 2.5%[ix] and 3.5%,[x] respectively, from a 2020 baseline of 78.2 million tons (the Policy Scenario #2 cap falls between Scenarios #1 and #3, and is not included in this analysis). Another previously modeled cap scenario included a 5% annual reduction from the 2020 baseline,[xi] but despite receiving broad stakeholder support,[xii] this scenario was not included among the most recent policy proposals.

Comparative Health Impacts of Potential Cap Scenarios

Acadia Center's analysis compares the expected health impacts of four post-2020 cap scenarios:

- Reference case: cap level remains constant at 2020 levels (78.2 million tons) through 2030;
- 2.5% annual reduction (1.95 million tons per year) through 2030, representing Policy Scenario #1;
- 3.5% annual reduction (2.74 million tons per year) through 2030, representing Policy Scenario #3; and
- 5% annual reduction (3.91 million tons per year) through 2030

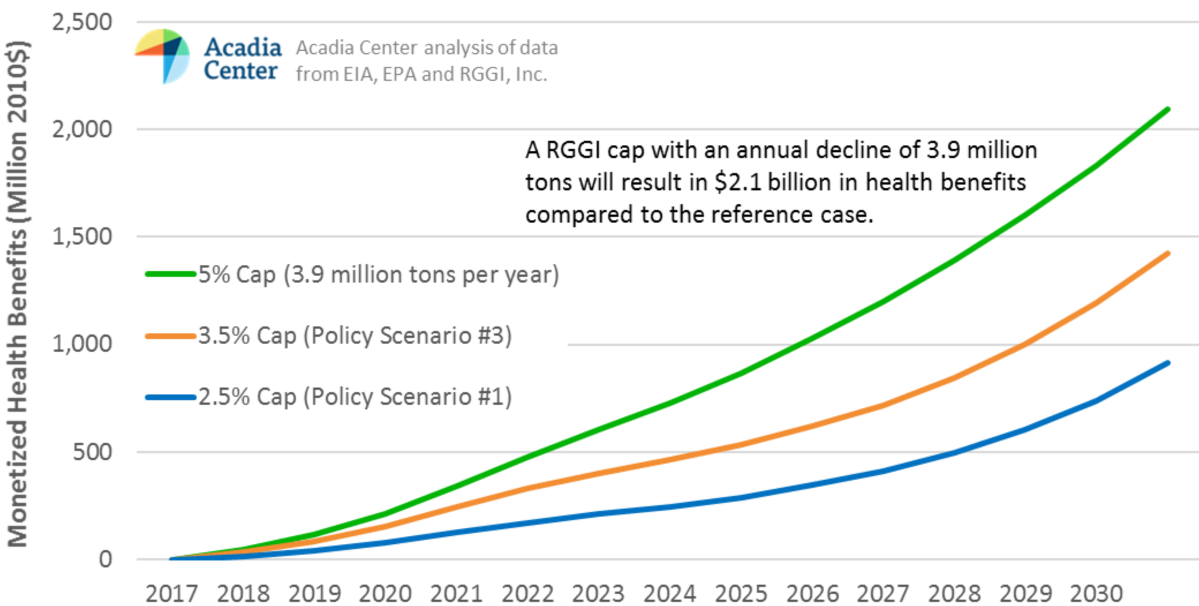
Modeling conducted for the RGGI states finds that tighter caps result in less electricity generation from fossil fuels in the region, as the electric sector moves towards cleaner sources of electricity. Less fossil fuel combustion reduces CO_2 emissions, and also reduces harmful emissions of SO_2 and NO_X. Applying EPA's Benefit Per Ton (BPT) metrics to projections of emissions shows that the RGGI cap decision will have a significant impact on public health. **The difference in monetized health impacts from avoided SO_2 and NO_X emissions in the RGGI states between the reference case and 5% scenario amounts to $2.1 billion. The difference between the 2.5% scenario and the 5% scenario is $1.2 billion.**

Quantifying Benefits of Potential RGGI Caps Relative to Reference Case

Figure 1: Monetized Benefits from Avoided Co-Pollutant Emissions: 2017-2030

RGGI Cap	Decrease in Emitting Generation (MWh)	Pollutant	Decreased Emissions (Tons)	Monetized Impact (2010$)	Total Monetized Impact (2010$)
2.5% (Policy Scenario #1)	208,856,317	SO_2	21,405	$ 841,984,765	**$ 912,404,937**
		NO_X	12,425	$ 70,420,172	
3.5% (Policy Scenario #3)	268,200,566	SO_2	34,022	$ 1,327,213,425	**$ 1,424,475,432**
		NO_X	17,215	$ 97,262,007	
5%	384,218,031	SO_2	50,386	$ 1,955,400,852	**$ 2,096,588,636**
		NO_X	25,051	$ 141,187,784	

Figure 2: Cumulative Monetized Benefits from Avoided Co-Pollutant Emissions



The RGGI states have been leaders on climate action since launching the first-in-the-nation program. RGGI has demonstrated that emissions reductions and economic growth can go hand in hand; since RGGI began, member states have reduced CO_2 emissions 16% faster than the rest of the country while experience 3.6% greater economic growth.[xiii] As states consider the future of the program, the opportunities to improve public health must be considered alongside economic, electric rate and climate impacts. While RGGI only regulates CO_2 emissions, the program's effect on harmful co-pollutants is significant. And, unlike CO_2, whose impacts occur on a global level, these co-pollutants have dangerous effects on public health in the region. Co-pollutants are responsible for increased incidence of asthma, heart attacks, and premature death, and burdens fall disproportionately on low-income communities and communities of color. The societal costs of these health hazards, including hospital visits and missed time from work and school, can be mitigated by establishing a stronger RGGI cap.

Methodology

Modeling conducted for RGGI, Inc. provides projected electricity generation by fuel type in each RGGI state under the reference case and each policy scenario through 2031.[xiv] Analysis of 2015 EIA data yields a volume-weighted emissions rate of SO_2 and NO_X for each fuel type for power plants in the RGGI states.[xv] Multiplying projected generation (MWh) by the regional emissions rate for that fuel type (lbs/MWh) results in a mass value (tons) of each co-pollutant. These calculations do not account for the health impacts of changes in electricity imports/exports under the various policy scenarios due to data limitations.[xvi]

In order to understand the health costs of those co-pollutants (or health benefits achieved by avoiding those emissions), emissions are multiplied by EPA's Benefit per Ton metrics.[xvii] This yields the monetized health impact of avoided SO_2 and NO_X emissions for each cap scenario relative to the reference case, as depicted in Figures 1 and 2. Due to data limitations, this analysis only accounts for the health impacts of SO_2 and NO_X, though particulate matter, ground level ozone and other pollutants also have additional harmful effects on human health.[xviii]

Additional information on RGGI's performance to date and needed reforms through the 2016 Program Review are described in Acadia Center's RGGI Status Report:

- Part I: Measuring Success
- Part II: Achieving Climate Commitments

For more information:

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Endnotes

[i] For more information on the health impacts of climate change, see the Center for Disease Control's webpage, *Climate Effects on Health*, available at: https://www.cdc.gov/climateandhealth/effects/
[ii] RGGI consists of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont. New Jersey participated in the program from 2009-2011.
[iii] RGGI emissions data is available at: http://rggi.org/market/tracking/public-reporting
[iv] Brian Murray and Peter Maniloff, Duke Nicholas Institute, *Why Have Greenhouse Emissions in RGGI States Declined? An Econometric Attribution to Economic, Energy Market, and Policy Factors,* August 2015. For more information, see: https://nicholasinstitute.duke.edu/environment/publications/why-have-greenhouse-emissions-rggi-states-declined-econometric-attribution-economic
[v] "Criteria air pollutants" refer to the six most common air pollutants in the United States: carbon monoxide (CO), lead, ground-level ozone (O3), nitrogen oxides (NOx), particulate matter (PM), and sulfur dioxide (SO2). The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS), which are maximum allowable concentrations for these pollutants that are protective of public health.
[vi] Michele Manion, et al, Abt Associates, *Analysis of the Public Health Impacts of the Regional Greenhouse Gas Initiative*, 2009-2014, January 2017. For more information, see: http://abtassociates.com/RGGI
[vii] For more information on the 2016 Program Review, see: http://rggi.org/design/2016-program-review
[viii] Proposed IPM Policy Cases and Next Steps, RGGI, Inc., April 20th 2017, available at: http://rggi.org/docs/ProgramReview/2017/04-20-17/Proposed_Policy_Cases_Next_Steps_04_20_17.pdf.
[ix] Draft IPM Modeling Results 2.5% Cap Decline (CPP N+E), RGGI Inc, June 17th 2016, available at: http://rggi.org/docs/ProgramReview/2016/06-17-16/Draft_Results_RGGI_2.5pc_N+E_2016_06_17.xlsx
[x] Draft IPM Modeling Results 3.5% Cap Decline (CPP N+E), RGGI Inc, November 22nd 2016, available at: http://rggi.org/docs/ProgramReview/2016/11-21-16/Draft_Results_RGGI_3.5pc_N+E_2016_11_22.xlsx
[xi] Draft IPM Modeling Results 5% Cap Decline (CPP N+E), RGGI Inc, June 17th 2016, available at: http://rggi.org/docs/ProgramReview/2016/06-17-16/Draft_Results_RGGI_5pc_N+E_2016_06_17.xlsx
[xii] Stakeholder comments submitted to RGGI, Inc. are posted at: http://rggi.org/design/2016-program-review/stakeholder-comments-2016
[xiii] Acadia Center, RGGI Status Report Part I: Measuring Success, July 2016, available at: http://acadiacenter.org/document/measuring-rggi-success/
[xiv] Modeling results for Reference Case and Policy Scenarios (CPP N+E) available at: http://rggi.org/design/2016-program-review/rggi-meetings. Modeling conducted by ICF.
[xv] EIA form 923: Power Plant Operations report, available at: http://www.eia.gov/survey/#eia-923. This analysis does not treat generation from bioenergy as zero-emission.
[xvi] Net changes in electricity imports are included in the modeling results provided RGGI, Inc., but necessary data on imported and exported electricity (i.e. fuel type used, state of generation) is not included.
[xvii] EPA Technical Support Document: Estimating the Benefit per Ton of Reducing $PM_{2.5}$ Precursors from 17 Sectors, available at: https://www.epa.gov/sites/production/files/2014-10/documents/sourceapportionmentbpttsd.pdf. Our analysis uses the Krewski et al. (2009) mortality estimate and a 3% discount rate. We apply the 2016 BPT estimates for emissions generated from 2017-2019, the 2020 BPT estimates for emissions generated from 2020-2024, the 2025 BPT estimates for emissions generated from 2025-2029, and the 2030 BPT estimates for emissions generated in 2030.
[xviii] These air pollutants also lead to ozone formation, which is damaging to health. Exposure to ground-level ozone is associated with numerous health effects, such as asthma attacks and chronic respiratory damage. A recent study has examined the link between fine particulate matter and premature birth, finding billions of dollars in health costs attributable to air pollution exposure. Leonardo Trasande, et al, NYU School of Medicine, *Particulate Matter Exposure and Preterm Birth: Estimates of U.S. Attributable Burden and Economic Costs,* December 2016. For more information, see: https://ehp.niehs.nih.gov/15-10810/