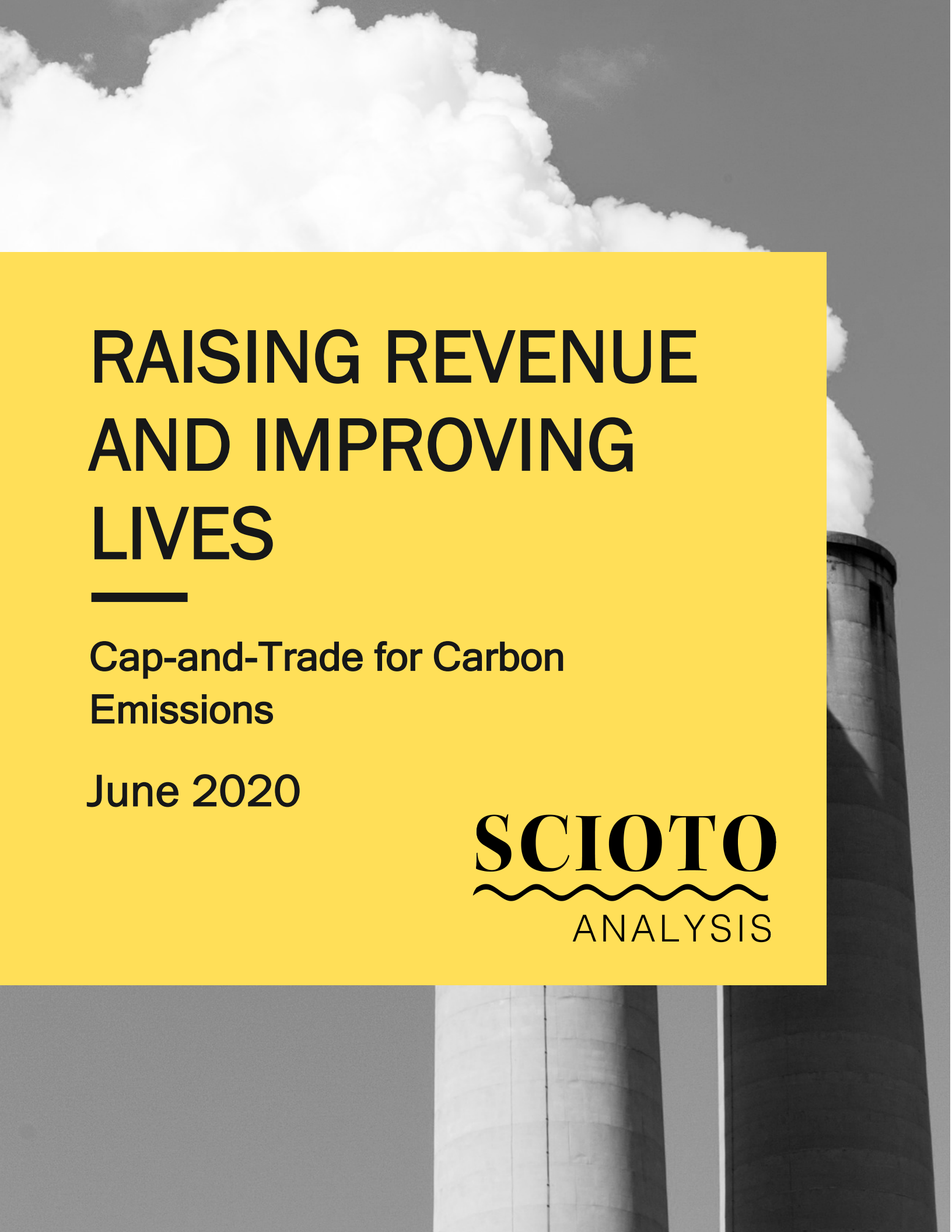


RAISING REVENUE AND IMPROVING LIVES

Cap-and-Trade for Carbon Emissions

June 2020

SCIOTO ANALYSIS

Executive Summary

Ohio's environmental indicators have slowed the growth of its economy throughout the 2010s. A cap-and-trade system for carbon emissions, where firms that emit carbon can trade allowances to emit carbon, will reward firms that reduce emissions and exact costs on those that do not efficiently reduce emissions. We project that a cap-and-trade system for carbon emissions in Ohio could substantially lower carbon emissions while raising $2.3-4.1 billion in annual revenue by 2030.

Ohio's Environmental Challenge

According to our most recent calculation of the Ohio's Genuine Progress Indicator (GPI), Ohio's economy increased only by 1.3% between 2009 and 2018. This suggests the economic wellbeing of Ohio residents has improved little over the past decade despite significant increase in per-capita consumption. Over this time period, economic and social indicators as a whole have either increased or held steady in the last decade. However, the environmental component of Ohio's economy has deteriorated over this time period.

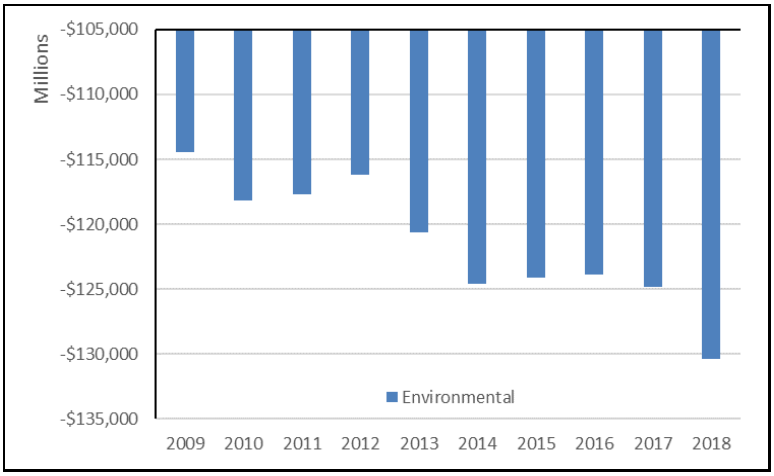


Figure 1: Environmental indicators in Ohio's GPI (Millions of USD 2009)

An efficient and effective way to improve Ohio citizens wellbeing would be to improve the environmental components of GPI. It is important to acknowledge that a policy intended to improve one indicator of GPI could have unintended consequences on other indicators, and offset any benefits on the overall GPI. Therefore, challenge facing policymakers is to enact policy that improves the state's environment while at the same time minimizing economic side-effects of the policy.

Cap-and-trade for Carbon Emissions

"Cap-and-trade" is a policy option that has the potential to increase GPI by reducing carbon emissions without having a significant effect on economic activity. Cap-and-trade sets property rights over pollutants and, as a result, incentivizes emitters of carbon to trade those rights away when they become economically burdensome or buy more when they can be economically advantageous.

Cap-and-trade reduces total carbon emissions by setting a limit or "cap" on the amount of carbon that each company can emit. Since the limit is reduced every year, total emissions are decreased over time

while firms transition towards low-emission alternatives. However, different firms face different costs for reducing emissions. Thus, cap-and-trade allows a firm to trade this right to emit carbon with other firms to promote more efficient economic activity.

Under cap-and-trade, firms with lower costs associated with carbon emission abatement have an incentive to reduce emissions more than they would without the market for emissions and sell the surplus of emission rights to other firms. Firms that reduce emissions at a higher cost must then purchase emissions rights from more efficient firms, thus saddling them with a cost of higher emissions. Thus, firms that more efficiently reduce carbon emissions are rewarded and firms that less efficiently reduce carbon emissions incur costs, which incentivizes economically-efficient reduction of total carbon emissions.

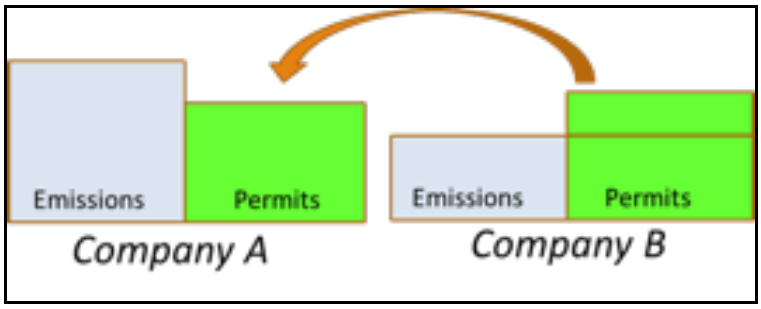


Figure 2: Company B can trade its excess right to emit carbon to company A, thus rewarding company B for low emissions and requiring company A to pay a fee for excess emissions.

Emissions trading systems like cap-and-trade are not new policy options. Different versions of this approach have existed for more than 30 years in the United States with one of the most prominent examples being the Environmental Protection Agency's leaded gasoline phasedown in the 1980s. During the last 15 years, cap-and-trade has garnered the attention of policymakers around the world interested in reducing carbon emissions to slow climate change. Different models of cap-and-trade are being used by countries including Australia, Canada, China, the European Union, and several states in the United States including California, Maryland, and New York.

Cap and Trade vs Taxation

Another reason for increased interest in cap-and-trade by policymakers is the increased interest in carbon taxation to reduce emissions. Both alternatives are addressing the market imperfection of negative externalities that generate economically-inefficient levels of carbon emissions. Carbon emissions are a negative externality, which means activities that cause carbon emissions have a social cost higher than their private cost. Thus, markets in energy and transportation that cause carbon emissions inefficiently allocate goods and services touched by these markets.

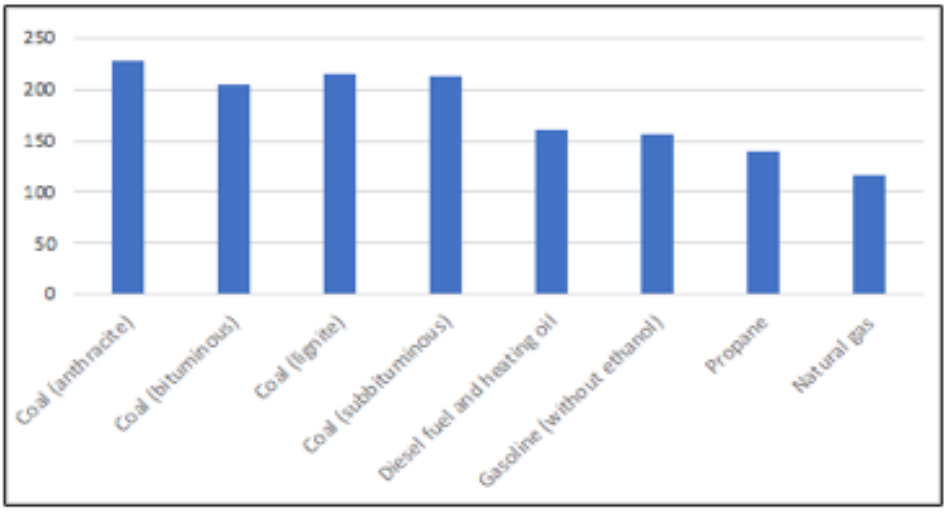
When a tax on carbon is introduced, the quantity demanded of products that require carbon emissions is reduced since less potential buyers have a willingness to pay the resulting price of these goods. Thus, a carbon tax sets a price on carbon resulting in a reduction in quantity of carbon emitted. Conversely, cap-and-trade sets a limit on the quantity of carbon that can be emitted, and the corresponding price is set in the market for emissions permits. Thus, cap-and-trade more directly changes emissions levels, which is helpful if the goal emission level is known. A tax more directly impacts price, which is more useful if the external cost of carbon emissions is known.

	Cap and Trade	Taxes
Emissions	Set by government	Set by market
Price	Set by market	Set by government

Figure 3: Cap and Trade vs Taxes

Projecting Outcomes: Impact of Cap-and-Trade in Ohio's GPI

The two main sources of energy consumption in Ohio, coal and natural gas, produce different amounts of carbon emissions. According to the US Energy Information Administration, generating the energy equivalent of one million British Thermal Unit (Btu) with coal produces on average 216 pounds of carbon dioxide while the same amount of energy using natural gas produces 117 pounds of CO2. Additionally, the Energy Information Administration reports that producing one kilowatt per hour requires 2.21 pounds of coal or 0.92 pounds of natural gas.



(Source) The U.S. Energy Information Administration (EIA)

Figure 4: Pounds of CO2 emitted per million British thermal trillion units

Cap-and-trade can affect the economy directly through the cost of carbon emissions, which is considered in the environmental impact calculation of GPI. It also has an indirect impact by its potential to reduce the consumption of non-renewables by increasing the production of more efficient fuels. This estimation can be considered modest because it assumes that there is no reduction in the consumption of non-renewables and the only gain for GPI is the reduction of CO2.

	Cap at 2000 levels	Cap at 2010 levels
Cost of CO2	-8,673	-10,189
Increase in GPI w.r.t. 2018	1,520	3.7
Improvement % GPI	0.53%	0.0013%

Table 2: Cap & Trade Impact on GPI by 2030

These results reflect what would occur under a constant cost of carbon emissions increase and GPI improvement. They are estimated by comparing the cost of CO2 with the more recent data available for GPI in 2018. The estimation considers two scenarios: one where carbon emissions are reduced to year 2000 and one where they are reduced to 2010 levels. In both scenarios the goal is achieved by 2030. At these rates, we project the total revenue raised by the state at auction would be $2.3-4.1 billion in 2030.

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