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Nutrient Trading to Target Chesapeake Bay's Water Quality: *Will the latest pollution 'solution' hurt minorities and the poor?*

By **Rena Steinzor and Nick Vidargas**

The decades-long push to clean up the badly polluted Chesapeake Bay has been a case study in the realities of life at the intersection of policy and politics. Over and over, policymakers in the Bay region have entered into agreements they hoped would be both effective and politically inoffensive to most voters. For the most part, though, policymakers have achieved only the latter. Meanwhile, the Bay has continued to degrade, and all those who depend upon it for their livelihood or for recreation have suffered as a result.

The latest push to clean up the Bay relies on a mechanism that has at different points enjoyed great political support from both ends of the political spectrum. It is a credit-trading scheme like the one used two decades ago to reduce acid-rain-causing emissions from power plants, and that has been proposed more recently as a way to reduce greenhouse gas emissions. Under this approach, polluters would be awarded pollution "credits" for lowering their total discharges significantly below permit levels by, for example, purchasing cleanup technologies that keep harmful nutrients out of the water. They could then sell those credits to other polluters in the

state who expect to exceed their limits because they do not want to install such technologies. These market-based trades should mean that sources that can reduce pollution most efficiently are subsidized by others for whom such reductions would be quite expensive, thus lowering the overall expense of cleaning up the Bay.

A fierce debate is taking shape over how and whether such an approach will actually reduce pollution given the particular mix of polluters in the region, and the problems with reducing pollution from sources that don't have permits to begin with—small farms or homeowners who use too much fertilizer, for example. That question will be examined in a court case recently filed by environmentalists in federal court in Washington, D.C.

In the meantime, a new white paper from the Center for Progressive Reform (CPR), *Fairness in the Bay: Environmental Justice and Nutrient Trading (Fairness in the Bay)*, examines another potential pitfall with trading. According to the white paper, unless policymakers take great care in designing the program, trading could result in the creation of pollution "hotspots," specific areas with particularly excessive pollution. Such hotspots would likely take a particularly harsh toll on poor and minority communities in the region because

such communities are often situated near significant pollution sources.

The Path to 'Nutrient Trading'

By every measure, and indeed by official measures, the Bay is an "impaired waterway," meaning that it is too polluted to support the various recreational, environmental, and business uses that it once did, and still should.

After years of false starts, President Obama issued an Executive Order in 2009 directing the Environmental Protection Agency (EPA) to get on the case. The agency has worked diligently to harness the states' good intentions, putting them on a sort of pollution "diet" by working with them to establish a Total Maximum Daily Load of pollution, or TMDL, for the region and for each state, and requiring the states to develop plans to drive—and keep—pollution below those limits.

Understandably, the states have been eager to find ways to minimize the economic impact of the TMDL on the industries and residents within their borders. Because the Clean Water Act gives states considerable leeway in arriving at the pollution limits dictated by the TMDL, states are free to experiment with novel approaches to reducing pollution. So Pennsylvania, Maryland, and Virginia

have all developed plans to administer, with the EPA's blessing, credit-trading schemes that seek to harness market forces to reduce pollution.

Here's how the plans would work. "Point source" polluters—municipal, industrial, and commercial polluters that discharge pollution from a discrete point—are typically required to seek a permit to pollute. The permit specifies both the types and quantities of pollutants the permittee may discharge. Polluters are not allowed to exceed their permitted levels without risking penalties. But they are encouraged to under-pollute—to emit less pollution than their permit allows. That gap—the pollution allowed, but not emitted—is the leverage for trading schemes. Polluters who emit less pollution than their permit allows would earn a pollution credit that they could then sell to some other polluter who is unable to get under their pollution limit. In the case of the Bay, the program would be aimed principally at "nutrient" pollution, which is discharged into the Bay in excessive quantities in the form of untreated animal manure from farms, sewage that includes treated human waste, and fertilizer runoff from farms.

Trading schemes have been tried in other contexts. The approach is commonly credited with defeating the problem of acid rain, for example. But acid rain is a different animal than pollution in the Bay, and the trading regime designed to address it targeted pollution emitted by power plants across a wide geographic range. The

pollutants from those power plants can travel great distances, rather than linger where emitted. Then, under the right circumstances, these pollutants return to the earth mixed into rain, again across a wide geographic area, although not necessarily the same region where they were emitted. Therefore, hotspots are not a significant problem with acid rain as a result. Bay pollution, on the other hand, is chiefly a water pollution problem, and because those pollutants are carried along rivers and streams before ending up in the Bay, hotspots are very much a concern.

Still, the approach is politically palatable, so if litigation does not derail the plan, the states are likely to implement it.

Disproportionate Impact on Minorities and the Poor

If the credit-trading plans go forward, it could very well add to the burdens of the Bay states' poor and minority residents, according to *Fairness in the Bay*, by the Center for Progressive Reform's Rena Steinzor, J.D., and Nick Vidargas, J.D. In developing their programs, Bay states appear to be largely ignoring the likely creation of hotspots of pollution, as well as the varying opportunities for exposure to high levels of pollutants that would disproportionately affect these communities. For example, many such communities depend on fish, crabs, oysters, and plants harvested from local rivers, lakes, and estuaries, while others rely on nearby waters for a swim or other recreational activities. For these communities, the ongoing

decline of the Bay's waters threatens a central part of their identity and livelihoods and, in some instances, their health. If state regulators do not take care to equitably distribute pollution reductions geographically, particular tributaries and specific parts of the Bay could end up with more pollution than they can handle.

Fairness in the Bay, prepared with support from The Abell Foundation, details how trading programs threaten these communities, many of which already face disproportionate environmental harms. The white paper identifies potential health threats and offers policy recommendations aimed at avoiding environmental injustice in water-quality trading.

Fairness in the Bay focuses on three specific environmental justice concerns about a water-quality trading approach:

- **Disproportionate health and environmental impacts on low-income and minority communities.** If trading programs are not carefully designed and monitored, the additional discharges of nitrogen, phosphorus, and accompanying contaminants may become locally concentrated. Such "hotspots" of nutrients—much of them in the form of untreated animal manure—can lead to algal blooms and other threats to human health and aquatic ecosystems. Under a trading regime, a sewage treatment plant could address its additional pollution by either purchasing reductions elsewhere or by installing control

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measures on-site. However, if the plant purchases credits, it would be able to discharge more sewage, possibly creating hotspots of pollution in adjacent waterways that could expose local fishermen and their communities to pathogens and harmful co-pollutants.

- **Failure of governments to ensure that low-income and minority communities enjoy the potential benefits of trading.** If successful, nutrient trading will improve water quality throughout the watershed, fostering ample credit-generating activities—pollution reductions. Municipalities may generate credits by implementing storm-water best management practices (BMPs) such as urban revegetation, bioswale construction, and greenspace expansion. Such BMPs have secondary benefits for the communities in which they are implemented, including flood control, temperature moderation, and increased property values. BMPs also create more opportunities for exercise and recreation, and have aesthetic value. Such benefits should be enjoyed equally, throughout the watershed, not concentrated in just some parts of the region.
- **Failure of governments to provide opportunities for full and fair participation by low-income and minority communities.** Excluding low-income and minority communities from the discussion—about trading program design, safeguards to avoid environmental injustice, and the potential to improve

neighborhoods—increases the likelihood that these communities will experience negative or harmful impacts of trading. One reason that low-income and minority populations have historically suffered from disproportionate exposure to hazardous waste and toxic pollution is because governments have ignored them during the decision-making process. These vulnerable communities have reasons to participate and have their voices heard and valued that are no less valid than other stakeholders in the process.



*“Excess nitrogen
and phosphorus—
both of them nutrients—
now flood the Bay.”*



Fairness in the Bay argues that as Bay states develop and implement their trading programs, they must keep environmental justice principles in mind. Improving Bay waters is a paramount goal, but so too is ensuring that the most marginalized citizens in the Bay are not forced to bear a disproportionate burden of pollution. Bay states can both improve Bay waters and protect low-income and minority communities by explicitly incorporating environmental justice principles into their trading plans, by adopting a number of specific design elements, and by extending opportunities to influence market design and implementation to all citizens.

The Sources of Bay Pollution

The Bay has suffered for decades from the effects of excessive emissions of three specific pollutants: phosphorus, nitrogen, and sediment. Nearly 40 percent of the nitrogen and 50 percent of the phosphorus in the Bay come from agricultural sources in the state, much of it from untreated manure from chicken and hog operations. Lesser but still significant sources include sewage treatment plants, vehicle exhaust that begins as air pollution but ends up in the Bay, and various industrial sources. In addition, sediment pollution—dirt, sand, silt, and clay—flows into the Chesapeake, often after it has been dislodged as a result of development, land-use changes, and poorly managed agricultural operations.

Centuries and even decades ago, smaller quantities of such pollution were manageable, but the gradual sacrifice of forest land for development and agriculture, and the decline of the Bay’s once-substantial wetlands have robbed the ecosystem of the natural filters that once protected the Bay.

The net result is that excess nitrogen and phosphorus—both of them nutrients—now flood the Bay. Algae feed on them and become so abundant that it blocks sunlight from reaching underwater grasses, and when the algae die, the bacteria that consumes it also sucks up much of the oxygen that other Bay creatures need to survive, including fish, blue crabs, oysters, and more. In its most dramatic form, these algal blooms manifest as an annual “dead zone” that spreads across as much as one-third of the Bay. Other toxic algae and micro-organisms such as *Pfiesteria* and cyanobacteria also bloom, adding to the problems facing the Bay and creating human health threats. Moreover, sewage effluent, a

significant source of the Bay's nutrient pollution, carries harmful co-pollutants such as endocrine-disrupting chemicals and prescription drugs, which also appear in any hotspots that may form.

Water-Quality Trading Elsewhere

The TMDL, or “pollution diet,” set out for the Bay states in 2009 by the EPA places mandatory limits on the amounts of nitrogen, phosphorus, and sediment that can enter the Bay and creates welcome pressure to address pollution from the largely unregulated agricultural sector. But the Bay states' reliance on water-quality trading as a means of staying within the pollution diet is something of a leap of faith. The proposed trading schemes will be the first efforts in those states to implement widespread trading. Moreover, as *Fairness in the Bay* observes, previous trading regimes in other states have shown little progress on water quality.

Bay States are not the first to embrace water-quality trading regimes, only the latest. Indeed, states have been experimenting with water-quality trading since Wisconsin initiated a pilot project on the Fox River in the 1980s. More recently, the idea has gained significant momentum, with dozens of pilot and experimental programs implemented around the country including successful temperature credit trading on Oregon's Tualatin River and Connecticut's relatively robust nitrogen trading on Long Island Sound.

Trading markets align *buyers*—typically regulated point sources—that are legally obligated to meet a specific environmental standard with

sellers—typically nonpoint sources, but also some point sources—that can meet that standard at a significantly lower cost. Buyers are allowed to offset existing and increased discharges in exchange for obtaining reduced discharges elsewhere. Those reductions, which advocates expect to be mostly on agricultural land, can be a fraction of the cost of reductions at industrial facilities where expensive on-site compliance can drive the price of nutrient reductions to more than \$200 per pound. In comparison, some estimate that the cheapest nutrient reductions, like planting winter cover crops on farms, can cost as little as \$4.70 per pound. Trading advocates argue that this cost disparity creates a significant financial incentive for the under-regulated agricultural industry to begin reducing their pollution.



“The Bay states’ reliance on water-quality trading as a means of staying within the pollution diet is something of a leap of faith.”



On paper, it sounds rational and economically efficient: The agricultural operator earns a premium for behavior society would like to encourage in the first place; the regulated polluter achieves compliance with its permit; and nutrient levels in the Bay are reduced. In practice, however, trading can create unintended consequences that harm human health and the environment.

Bay states and the EPA would benefit from a careful study of what went wrong in these other efforts. One lesson that stands out is that, especially when trading seeks participation from sources that do not require a permit to pollute and that are therefore difficult to corral, state and local governments have expended substantial resources only to discover that unregulated agricultural operations are not interested in participating. Economists from the U.S. Department of Agriculture (USDA) found, for example, that of 15 trading programs that promote trades between point sources—identifiable sources of pollution subject to permits—and agricultural “nonpoint” sources—those not within the permit structure, only four programs have experienced any trades and just two have experienced more than a handful. Meanwhile, EPA contractors who performed an evaluation of trading programs say that, “[the] EPA has been undertaking [trading] activities at the headquarters and regional level for over a decade [yet]... only 100 facilities have participated in trading, and 80 percent of trades have occurred within a single trading program.”

To be clear, the term “nutrient trading” masks an unpleasant reality. The vast majority of trades contemplated by planners will involve excess animal manure generated by industrial-scale agriculture, storm-water runoff from urban sprawl, and sewage discharges and overflows from treatment plants. These discharges contain more than simply nutrients or sediment. Pathogens such as fecal coliform and cryptosporidium, antibiotics, cleaning fluids, heavy metals, synthetic fertilizers, and pesticides accompany nutrient pollution. When such “co-pollution” flows into local waterways and ultimately the Bay,

myriad human health and ecosystem impacts are inevitable.

Nutrient Trading Could Trigger Environmental Inequities

Poorly designed trading programs may lead to the creation of localized concentrations of nutrients and co-pollutants that threaten public health and an unequal distribution of the benefits of trading. These adverse effects could be exacerbated if vulnerable communities are excluded from the design and implementation of trading regimes.

A major problem in water-quality trading programs arises when nutrients become concentrated in certain areas, causing hotspots. This phenomenon occurs because some sources could simply offset their additional discharges by purchasing credits, rather than reducing their pollution on-site. Hotspots are especially problematic when a seller is downstream of the discharger, resulting in no reduction of nutrient pollution in the segment between the two trading partners. Additionally, co-pollutants such as antibiotics and cleaning fluids that are not regulated by the TMDL, and therefore only reduced indirectly, will also show up in hotspots.

For affected communities, such hotspots can put an end to clean water; economic growth; and days spent fishing, crabbing, swimming, and boating in and on the Bay and its tributaries. Excess nutrients in the Bay already drive algal blooms that support the growth of toxic algae, antibiotic-resistant bacteria, and other pathogens. Hotspots may also put low-income and minority communities, and especially subsistence fishermen, at heightened risk of the

human health impacts that might decline elsewhere in the Bay. If Bay states and the EPA allow hotspots to form near low-income and minority communities, further environmental injustice will be perpetrated on people already forced to suffer disproportionate environmental harms.

The potential health impacts from localized concentrations of nutrient pollution are many. In one particularly worrisome instance, a 35-year-old scientist who was exposed to toxins while studying toxic *Pfiesteria* in the lab “reverted to a 7-year-old’s reading level for about three months.” Exposure to *Pfiesteria* in the open water has led to similar cognitive impacts in fishermen. The chart on page 6 summarizes just a few of the most common or harmful potential health impacts from hotspots of nutrient pollution.

A corollary to the inequitable distribution of environmental *burdens* from trading is the unequal distribution of environmental *benefits*—in this case, water-quality improvements throughout the Bay. Nutrient trading programs also have the potential to create secondary ecological and aesthetic benefits that should be extended to low-income and minority communities. In addition to improving water quality, urban stormwater best management practices—bioswales, revegetated urban spaces, oyster aquaculture, and stormwater retention projects—that generate credits can provide flood control, enhanced opportunities for exercise and recreation, increased property values, and quality-of-life improvements in the communities where they are implemented. But under a trading regime, such benefits might be doled out in disproportionate measure to upper-income areas, leaving lower-income

communities with only a tiny share of whatever environmental benefits trading generates.

Finally, the disproportionate distribution of environmental impacts or benefits from trading can be exacerbated by governmental failure to involve low-income and minority communities in the decision-making process. The EPA and Bay states have reached out extensively to environmental groups and the agricultural industry, giving both stakeholders an opportunity to influence trading programs. To date, Bay states and the EPA have not done the same for low-income and minority communities.

Keeping Environmental Justice in Mind

Fairness in the Bay recommends that the EPA and Bay states ensure that low-income and minority communities are protected by building formal consideration of environmental justice principles into trading programs. In designing their programs, Bay states should document and clearly describe what elements of environmental justice they will consider and the extent to which they will rely on input from affected communities. Only Pennsylvania mentions environmental justice in its trading policies, and the EPA’s recent review of Bay states’ trading programs did not consider environmental justice issues. Bay states should also consider opportunities to redress past injustices through trading. Many low-income and minority communities already suffer from declining water quality, past regulatory failures, and decisions about where to site pollution-generating facilities made with only the interests of more affluent communities in mind. Trading could allow the EPA and Bay states to prioritize

Health Threats Potentially Exacerbated by Nutrient Trading

Problem	Description	Impact on Human Health or the Environment
<i>Pfiesteria</i>	<p>A toxic micro-organism that is found throughout the Bay, including such Eastern Shore tributaries as the Chicamacomico, Manokin, and lower Pocomoke rivers.</p> <p><i>Pfiesteria</i> produces toxins that numb fish, and then preys on them. Blooms of <i>Pfiesteria</i> occur during periods of high nutrient levels.</p>	<p>During particularly large blooms of <i>Pfiesteria</i>, fish may develop deep lesions that lead to death, releasing the toxin into the water. In the late 1990s, these blooms caused several significant fish kills on the Eastern Shore of Maryland and the Middle River.</p> <p><i>Pfiesteria</i> toxins can harm humans by causing skin irritations or lesions. At worst, the toxins can cause respiratory problems, short-term memory loss, confusion, and other cognitive impairments.</p>
<i>Vibrio</i>	<p>A family of bacteria that have a symbiotic relationship with zooplankton called copepods. These bacteria are native to warm, low-salinity waters worldwide.</p> <p>When nutrient levels rise in the Bay, they trigger algal blooms that copepods consume, causing copepod populations to explode. When the copepods die, <i>Vibrio</i> enters the water.</p>	<p>In high concentrations, <i>Vibrio</i> causes illness in people who consume or expose open cuts or wounds to the water. Some species of <i>Vibrio</i> can cause life-threatening skin and blood infections, gangrene, intestinal illness, and vomiting.</p> <p><i>Vibrio</i> infections have been on the rise in Maryland since 2001.</p>
Toxic Cyanobacteria, or Blue-green Algae	<p>Warm water and high nutrient levels promote the algal blooms seen throughout the Bay every year. Toxic cyanobacteria also use photosynthesis to produce energy, and bloom under the same conditions.</p> <p>Toxic algae, including cyanobacteria, are increasing as invasive algae from other parts of the world enter the Bay.</p>	<p>Contact with cyanobacteria blooms—usually through swimming or boating—can cause nausea, fevers, and skin rashes. In the worst cases, cyanobacteria exposure can lead to liver and kidney disease.</p> <p>Cyanobacteria have been associated with bird and livestock deaths and significant fish kills throughout the Bay.</p>
Fecal Coliform	<p>Fecal coliform is a class of bacteria commonly found in human and animal feces. Although generally not a direct threat to human health, fecal coliform is associated with dangerous pathogens such as <i>Escherichia coli</i>, <i>Staphylococcus aureus</i>, and enterococci.</p>	<p>Swimming and eating contaminated shellfish from waters where fecal coliform is high can be a health risk. Exposure to high levels of fecal coliform can lead to ear infections, bacterial gastroenteritis, hepatitis A, typhoid fever, and dysentery.</p>
Antibiotics, Toxics, and Endocrine Disruptors	<p>Sewage contains not only human waste but also everything else that people flush down their toilets. This includes antibiotics, pharmaceuticals, toxic compounds, and endocrine-disrupting chemicals.</p> <p>Trading programs are focused on nutrient pollution, not other types of pollution. So if hotspots form, they will not only contain nutrients but also high levels of all the other compounds found in human sewage and urban runoff.</p>	<p>Studies have not confirmed many of the hazards of pharmaceuticals in drinking water, but some studies have found that chemicals, including endocrine disruptors and some pharmaceuticals, can cause birth defects, lower sperm counts in humans, and damaged fins and premature spawning in fish and amphibians.</p> <p>A recent study found that pregnant women in the U.S. are exposed to a host of toxic chemicals including PBDEs, PCBs, dioxins, and phthalates. Exposure to chemicals, including toxins and pharmaceuticals, in drinking water raises the risk of adverse health effects in fetuses.</p>

water-quality improvements in areas that have historically suffered disproportionately. The following are further recommendations from the CPR's white paper:

- Bay states can incorporate design elements that would help avoid disproportionate impacts from hotspots, including regulatory restrictions on trading that limit the geographic scope and seasonal implementation of trades. In addition, regulators could restrict trades when impacts on low-income and minority communities are imminent or likely. For example, trading in a watershed necessarily means that one party will be downstream of its trading partner. If a wastewater treatment plant (a point source) that is discharging nutrient-laden effluent buys credits from a downstream farmer (a nonpoint source), the segment between the point source and the farmer will not benefit from reduced pollution. Such “downstream trading” can cause local water-quality violations, lead to degradation in the interim segment, and create the conditions that are likely to produce hotspots of pollution. Thus, geographic restrictions, such as prohibiting or restricting downstream trades, can create the best chance for water-quality improvement and help avoid disproportionate impacts.
- Interstate trading can also be problematic, generating a “race to the bottom” as sources seek the weakest regulatory baseline for their credit purchases. Virginia has proposed regulations that prohibit trades

that would lead to water-quality violations by specifically limiting downstream and inter-basin trading. The EPA and the other Bay states should restrict interstate trading by at least requiring that the most stringent regulations of any interstate trade apply, and limit the number and scope of interstate trades they will allow.



*“‘Downstream trading’
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- Other design elements include requiring net improvements from trades to decrease the chances of creating hotspots through trading. If the trading program does not produce net reductions in total pollution, it could literally end up doing nothing more than just move pollution around, thereby redistributing the risk in ways that would likely disfavor poor and minority communities. If trading is to be a tool that will help achieve the TMDL and protect all residents of the region, Bay states should require that all trades lead to net improvements in water quality. To ensure net improvement and offer an additional buffer of protection against uncertainty, Bay states should adopt trading ratios greater than 1:1—essentially requiring buyers to purchase more

credits than they need to just offset their pollution. A goal should be requiring at least 2 pounds of credits purchased for every pound offset. Bay states should also require that a percentage of all credits generated is permanently retired rather than used, thereby ensuring that the total amount of pollution decreases over time.

- Low-income and minority communities should be kept informed of how trading programs may impact them. Bay states should also extend to those communities the opportunity to participate in trading decisions, soliciting their input on programs and practices that affect them and ensuring that their input is valued and explicitly incorporated into the decision-making process. Funding for outreach to improve participation is vital to ensuring that communities are able to take advantage of opportunities to influence trading programs.
- Because urban stormwater best management practices can benefit neighborhoods in which they are implemented, the EPA can provide technical assistance for green infrastructure development in low-income and minority communities. Urban best management practices such as green development will likely play a role in trading markets. The EPA already gives grants for green infrastructure planning. The agency should make an effort to provide such grants and guidance to low-income and minority communities so that they receive the benefits of credit-generating activities in their communities.

- Bay states can help create a foundation for environmental justice by improving data gathering to better understand how communities use the Bay and its tributaries. Improving knowledge of how low-income and minority communities use the Bay and its resources will allow public officials to better identify pathways of exposure to waterborne diseases; determine the most popular areas of the watershed for recreational use; and ultimately achieve environmentally equitable outcomes for all who live, work, and play in the Bay. Indeed, better data can help regulators develop better benchmarks for future regulation. For example, in general, the EPA assumes that most people consume 17.5 grams of fish per day. For populations that include recreational and subsistence fishing, however, the EPA increases this assumption

to 142.5 grams of fish per day, resulting in regulations that reflect this increased consumption. This site-specific approach to address the needs of vulnerable communities is an example of how trading should be implemented across the Bay region.

- Finally, nutrient trading programs require access to information and accountability. For too long, Bay restoration has failed because of a series of overly optimistic promises that have not materialized, and for which no one has been held accountable. Accountability in trading depends on having information about the potential impacts of trading, both the environmental and human risks and the potential benefits. Without such information, community leaders cannot fully participate in decisions that affect their families and neighbors. Information should be made available through socially

appropriate channels, including community centers and churches, and in languages spoken in the community.

Bay states should be applauded for taking the Bay TMDL seriously and pursuing strategies for achieving long-overdue improvements in water quality. The Bay and its tributaries are woven into the social fabric, cultural identity, and collective memory of the mid-Atlantic region, and perhaps no state benefits from its shorelines, sunsets, biodiversity, and cooling waters more than Maryland. All Marylanders, regardless of race, ethnicity, or income, should enjoy these benefits. Thoughtful consideration of environmental justice is an essential component of any environmental regulation; otherwise, the latest attempt to restore the Bay through water-quality trading could come at the expense of low-income and minority communities in Maryland and throughout the region.

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