



CHESAPEAKE ENVIRONMENTAL PROTECTION ASSOCIATION, INC.
P.O. Box 117, Galesville, Maryland 20765

NEWSLETTER

Spring 2018

PRESIDENT'S MESSAGE

By Al Tucker



Phosphorus – Why are we wasting a critical life-giving resource?

This question arises because it is estimated that the world's supply of easily mined phosphate rock will last only about 100 years at the current rate of usage. Phosphate rock is a nonrenewable resource that constitutes one of the three primary components of modern inorganic fertilizers.

The easy availability of phosphate rock supports the green revolution and makes it possible to feed the world today. Along with nitrogen and potassium, it is a key fertilizer component that enhances crop yields. Almost all life on the planet relies on it. Phosphate and sugars form the backbone of DNA, and adenosine triphosphate (ATP) transports chemical energy within the cells. This molecule consists of only three elements: oxygen, nitrogen and phosphorus. Plants manufacture this molecule by photosynthesis, through which they extract phosphate from soil. Animals, on the other hand, obtain it by consuming plants or other animals.

Why is phosphorus important? It is this life-giving property of phosphorus that gives rise to problems in the Bay. One of the key nutrients leading to the degradation of the Bay is phosphorus (often just referred to as "P"). It contributes to the algal blooms and oxygen depletion. Hence, we tend to think of it as more of a pollutant and not as a key element that sustains life. We treat it as a waste product that must be curtailed. In the Bay watershed states, we have banned household products and home lawn and garden fertilizers containing phosphorus. Farmers are required to develop nutrient management plans that limit nitrogen and phosphorus applications to their fields. But! We should think more about the sustainability of this important element. In the Bay watershed, farmers limit their phosphate use to meet regulations for a clean Bay, not to conserve phosphate.

What is the problem? Phosphorus is one of the most common elements found on earth, but it is widely dispersed in many

different chemical forms that are not easily refined. Only in phosphate rock are deposits found in a readily available and easily processed form. The world's reserves of phosphate rock are concentrated in fundamentally one country, Morocco, with 75% of the total global supply. The next largest reserve resides in China with 6%, and the remaining 19% are in scattered deposits of 3% or less. The U.S. has about 2% of this supply. In 2017 there were 11 active phosphate mines, with 5 located in Florida, 5 in Idaho, and 1 in North Carolina. Surprisingly, the single mine in North Carolina makes the state the second largest producer of phosphate rock in the U.S. Prior to 1996 the U.S. was a net exporter of phosphate rock. Since then the U.S. has become a net importer of the raw material, but it has become a net exporter of processed phosphate. At the current rate of use, U.S. reserves will last about three decades, and then the U.S. food system will have to rely on the global supply.

How do we waste phosphorus? Our understanding of the global cycle for phosphorus is quite limited. Prior to modern farming, the primary source of phosphorus in soils derived from plant decomposition and animal waste. Hence, phosphorus uptake from soil and its re-deposition there recycled phosphorus. With the advent of modern agriculture, phosphorus is now transported globally to farms with phosphate deficits. In turn, these farms produce feed for animals and processed foods for people in urban areas.

In the first step of the process, only 10% to 15% of the phosphorus used in agriculture becomes available to the plants. The remainder undergoes chemical reaction that converts it into forms that bind to the soil or, in sandy soils, are rapidly transported away from root zones. Modern techniques can increase this efficiency to about 45%; however, these procedures are expensive to implement and are beyond the reach of most farmers.

In the next step, humans and animals excrete almost all the phosphorus they consume. Finally, the phosphorus then finds its way into the effluent of wastewater facilities or into the huge manure flows from confined animal feeding operations or poultry production. Poultry manure, by the way, contains one of the highest concentrations of phosphorus. It is estimated that animal waste contains 40 - 50% of the phosphorus that was applied by inorganic fertilizer to feed crop. If, by some technological miracle, we could capture all of this waste, we would still require the mining phosphate to supply the remaining 60-40% to maintain the current food supply. However, this would only delay the inevitable by extending the time to exhaust the global supply of phosphate rock.

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Unfortunately, the current conditions are not static. Developing countries like China and India, where the efficiency of use is much lower than the U.S., have become the primary consumers of phosphate.

What can you do to preserve the phosphorus resources?

1. Change your diet. Eat more vegetables and less meat. When we consume meat, domestic animals waste phosphorus just like humans. When you consume vegetables, you eliminate a major inefficient use of phosphorus in the food supply chain.
2. Advocate for farmers to increase the efficiency of fertilizer use. Programs are needed to inform farmers about the tools and techniques that improve the efficiency of phosphorus uptake. The current Bay programs restrict the use of phosphorus, but do not address how farmers can improve the bioavailability of it in their soils.
3. Extend global supplies by recycling. Many wastewater plants in the Bay watershed remove phosphorus by sludge sedimentation. This removes only 10-15% of the phosphorus. New ENR (Enhanced Nutrient Removal) facilities will reduce this amount by a factor of ten. But the technology to recover phosphorus from wastewater plants remains even more expensive and would require extensive and expensive renovation of existing wastewater facilities.
4. Support and advocate for science and technology to improve recovery rates of phosphorus. It is clear that scientific and technological breakthroughs will be required in the near future to conserve and recycle phosphorus. Every step in the chain of its use must be examined and the losses curtailed. Techniques to improve its bioavailability to plants must be developed. (This has the added benefit of reducing P runoff into waterways.) New technology to recover almost all the phosphorus still remains elusive.

And perhaps, the best contribution we can make at the moment remains to eat less meat.

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CARBON TAX

By Gary Antonides



In the Spring 2017 issue of the CEPA Newsletter, we discussed "The Future of Coal." At that time, there were many changes in the works, and this article is to bring readers up to date with regard to "carbon taxes." Since the previous article, the Trump administration has killed the Clean Power Plan initiated by the Obama

administration. This would have left it up to the states to implement plans to meet carbon reduction goals set by the EPA. In the absence of federal leadership, many states have implemented or are now considering various means of carbon reduction.

<https://www.brookings.edu/wp-content/uploads/2016/07/State-level-carbon-taxes-Options-and-opportunities-for-policymakers.pdf> reports that a number of states have committed to deep, long-term emissions reduction targets. For example, Massachusetts, New York, and Rhode Island all have targets to reduce their greenhouse gas (GHG) emissions by 80 percent of 1990 levels by 2050, and Oregon and Vermont have goals of 75 percent reductions.

The three most common carbon reduction methods are: (1) Renewable Portfolio Standards (RPS), (2) Cap-and-Trade systems, and (3) Carbon Taxes.

(1) Renewable Portfolio Standards are requirements that a certain amount of power generation come from renewable sources. Twenty-nine states have them. Maryland's RPS is 25% by 2020. Environmentalists are advocating a higher percentage in the future.

(2) Cap-and-Trade Systems. In the US, the trading of greenhouse gas (GHG) emission-reduction credits is underway in a large group of states on the East Coast and in California. In the northeast US, the six New England states, New York, Maryland, and Delaware joined together to set up a carbon dioxide (CO2) cap-and-trade regime that covers CO2 emissions from power plants in those states. This is the Regional Greenhouse Gas Initiative (RGGI) and it was the first US mandatory cap-and-trade program for GHG emissions. The RGGI trading scheme, which became effective in 2009, applies only to power plants with capacities to generate 25 MWs or more. The RGGI system is narrower than some other regional GHG emissions trading systems that cover GHGs other than CO2 and that apply to emitters other than power plants. The RGGI states set a cap for total emissions of CO2 from covered power plants in the region. Each state implements the program through its own emissions caps which decline over time. Covered power plants must obtain an allowance for each ton of CO2 emitted annually. RGGI auctions allowances, rather than allocating them for free. Power plants may

purchase allowances at quarterly auctions or purchase allowances from other generators within the region that have an excess. According to <https://www.rggi.org/>, the price for an allowance of a ton of CO2 at the last auction was \$3.79, and the Chair of the RGGI, Ben Grumbles, who is Secretary of the Maryland Department of the Environment says other states have become interested in the program.

<https://www.lexology.com/library/detail.aspx?g=0f6bf054-27dd-4cc0-b856-107b1ad0854e> reports that although Virginia is not an RGGI member, its governor recently directed environmental regulators in that state to cap power plant GHG emissions in Virginia and establish a GHG emissions trading system where credits can be traded with similar systems in other states. Additionally, New Jersey, who pulled out of RGGI in 2011, may get back in.

California operates one of the most active GHG trading markets in the world, second in size to the European Union's Emissions Trading System. The California cap-and-trade rules came into effect in 2013, and apply to large power plants, industrial facilities, and fuel distributors. It is broader than the East Coast's RGGI system because it covers emitters other than power plants and GHGs other than CO2. Some allowances are auctioned, while others are allocated or given away for free. The free allowances allocated to emitters has been reduced over time. Also, the California Global Warming Solutions Act of 2006 aims to reduce the state's GHG emissions to 1990 levels by 2020 and to 40 percent below 1990 levels by 2030. California's cap-and-trade system is connected to a similar scheme in Québec. Ontario plans to join the program next year.

- (3) **Carbon Tax.** At this time, there is increasing interest in a carbon tax based on the amount of CO2 generated by fossil fuels, and this now seems to be most likely means of carbon reduction to be implemented nationwide. This could be implemented at the refinery or the first point where they enter the economy, such as the mine, well or port. Different carbon tax plans use the money collected in different ways (schools, infrastructure, dividend to the people, etc). At the present time, it is estimated that a tax of \$40/ton of CO2 would be sufficient incentive to motivate companies to reduce carbon emissions. An initiative on the November 2016 ballot in Washington State would have instituted the first state carbon tax starting at \$15 per metric ton of CO2 on fossil fuels sold or consumed in the state. The measure would have used the revenue to, among other things, reduce the state sales tax by one percentage point. The measure failed, primarily because people disagreed on how to spend the revenue. There are several variations of carbon taxes being proposed, which are discussed later in this article.



Public Opinion. There seems to be a willingness on the part of our population to pay more to combat climate change. According to a new study published by Yale scientists in *Environmental Research Letters*, Americans are willing to pay a carbon tax that would increase their household energy bills by \$15 per month, or about 15%, on average. This result is consistent with a survey from last year that also found Americans are willing to pay an average of \$15 to \$20 per month to combat climate change. Another recent Yale survey found that overall, 78% of American voters support taxing and/or regulating carbon pollution, including 67% of Republicans and 60% of conservative Republicans.

With such broad support, why doesn't America have a carbon tax in place by now? Study co-author Anthony Leiserowitz noted the similarity to public support for many gun control policies. Public support often doesn't translate into policy. On the issue of gun control, Republican lawmakers are afraid that if they vote for even the most benign policies like requiring background checks for all gun purchases, the NRA will mobilize its supporters against them in elections. On the issue of climate change and carbon taxes, they have the same fear of the gas, oil, and coal interests. Unfortunately, the wealthy and powerful have more influence over our legislators than voters.

The new Yale study also asked survey participants how they would like to use the revenue generated by a carbon tax. Supporting the development of solar and wind energy and funding infrastructure improvements were the two most popular choices (around 80%), followed by assisting displaced coal workers (73%) and paying down the national debt (67%). Interestingly, the option of returning the revenue back to taxpayers was supported by fewer than half of Americans – both Republicans and Democrats.

The Case for Revenue Neutral Carbon Taxes. There are some important reasons why returning all of the carbon tax revenue to households ('revenue neutrality') has widespread support, including among many prominent Republicans, and this type of tax is being advocated on a federal level as well as in individual states.

Poorer households spend a larger proportion of their income on energy bills, so a carbon tax by itself would be a regressive policy. However, because wealthier households will have larger

net energy bills, returning all the revenue equally to all households would be a progressive policy. Studies have found that most households would actually come out ahead -- rebate checks would exceed their increased energy costs, particularly in lower income households. Studies have also shown a revenue-neutral carbon tax would grow the economy because the rebate checks would give people more disposable income. Lastly, returning the revenue to households would allow for a higher carbon pollution tax. If Americans are willing to pay an extra \$15 per month to tackle climate change, that would translate to a very modest carbon tax. But if some or all of the revenue is returned to households, higher energy costs will be offset by rebate checks, allowing for a higher carbon tax at the same cost to households. And the higher the tax, the more effective it will be at reducing American carbon pollution.

Citizen's Climate Lobby (CCL). This is one of the organizations advocating a revenue-neutral carbon tax policy in the USA. Their volunteers have been at work for ten years, and the group has grown exponentially. In its annual lobbying effort this year, the group sent 1,300 volunteers to lobby every member of congress to support a revenue-neutral carbon tax. CCL is a non-profit, nonpartisan, grassroots advocacy organization. They train and support volunteers to build relationships with elected officials, the media and their local communities. They have 476 chapters worldwide, including 9 in Maryland, one of which is in Annapolis. CCL proposes a \$15/ton tax in the first year, increasing \$10/ton in each succeeding year. This would not be much of a burden at first, but knowing the tax would increase significantly in the coming years would motivate reductions in carbon use.

Last month CEPA invited Jim O'Reilly from the Annapolis Chapter of CCL to speak at our Board of Trustees meeting. You can get their monthly newsletter by contacting www.citizensclimatelobby.org, click on "Join CCL" and provide your email address.

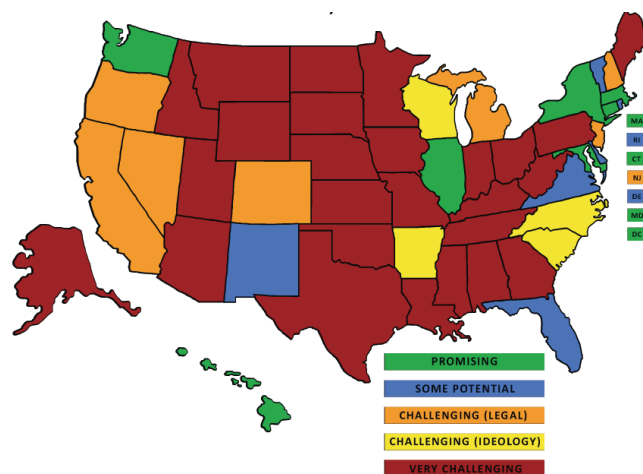
Climate Leadership Council. As explained in https://www.washingtonpost.com/news/energy-environment/wp/2017/02/07/senior-republican-leaders-propose-replacing-obamas-climate-plans-with-a-carbon-tax/?utm_term=.ef9f9d2f4310, there is another plan that has received attention lately. Representatives from a coalition of veteran Republican officials, including five who have either served as treasury secretary or as chairman of the Council of Economic Advisers, met with White House officials to discuss the idea of imposing a national carbon tax to address climate change. The Climate Leadership Council, led by James Baker, is proposing elimination of nearly all of the Obama administration's climate policies in exchange for a rising carbon tax that starts at \$40 per ton, and is returned in the form of a quarterly check from the Social Security Administration to every American.

This revenue-neutral plan has been popular among economists and some climate scientists for years. The Council estimates that the average family of four would receive \$2,000 annually in dividends if the tax starts at \$40 per ton, and as the tax rises, so would their dividends. This would naturally create a constituency for ever-tougher climate change action.

CLC's plan would have border carbon adjustments for the carbon content of both imports and exports. Exports to countries without comparable carbon pricing systems would receive rebates for carbon taxes paid, while imports from such countries would face fees on the carbon content of their products.

Regulations that are no longer necessary upon the enactment of a rising carbon tax could be eliminated. Many of the Obama-era carbon dioxide regulations could be safely phased out, including the repeal of the Clean Power Plan (which, of course, has already happened).

Carbon Tax Center (CTC). This organization developed a website (<https://www.carbontax.org/states/>) that advocates a carbon tax. They report that no U.S. state has a carbon tax. It also reports that, although a tax on carbon emissions in the state of Washington was defeated in 2016, Washington's governor has proposed another plan with the majority of the funds being used for education. Six other states and Washington DC are considered "promising" arenas for enacting state carbon taxes. In a comprehensive 2017 report by the Carbon Tax Center, they classify the 51 states (including DC) into five categories of carbon tax readiness ranging from "promising" to "very challenging."



Summary: 25 states that are promising or may have potential for carbon taxes

	Promising	Potential
No legal or ideological constraints	CT, DC, HI, IL, MD, MA, NY, WA	DE, FL, NM, RI, VT, VA
Promising/potential but with legal constraints	CA, NV, NJ, OR	CO, MI, NH
Promising/potential but with ideological constraints	NC, SC	AR, WI

The eight most promising states are Connecticut, Hawaii, Illinois, Maryland, Massachusetts, New York, Washington and the District of Columbia. The other 26 states are a lot less promising. Legal constraints mentioned might include state constitution requirements that restrict how taxes are used.

Other Countries. Finland was the first country to impose a carbon tax in 1990 and Sweden followed in 1991. Finland's tax is now \$24./ton, and Sweden's is \$150. although Sweden has big discounts and exemptions, including an exemption for electrical generation. The EU has an ETS (Emissions Trading System) which includes 31 countries and the price of carbon is now about \$18./ton. The number of GHG plans worldwide now

number 42, with about 13% of the world's greenhouse gasses being covered. And if China's lives up to its claims, about 25% of GHGs will be covered.

In Canada, some sort of carbon pricing is in place in four provinces (Alberta, British Columbia, Ontario and Quebec), covering more than 80 percent of the population. A national system, as described in <http://www.cbc.ca/news/politics/carbon-pricing-draft-legislation-1.4487421>, is being devised for all provinces that haven't created their own system and put it in place by September 2018. The combination of provincial/territorial carbon pricing systems and the federal system would ensure a price on carbon across Canada. Under the federal plan, the price on carbon pollution would start at \$10 a ton this year and increase to \$50 a ton by 2022.

At the same time, many of the provinces and territories are taking action. Manitoba is proposing a flat \$25/ton carbon price, which will be in compliance with the federal system until mid-2020; Nova Scotia is proposing a provincial cap-and-trade system that may meet federal standards; New Brunswick, P.E.I., Newfoundland, Nunavut and Northwest Territories have not yet set up their carbon pricing systems; Yukon has decided to adopt the new federal system; and Saskatchewan has threatened to go to court to fight the federal government's plan. British Columbia has its own carbon tax which is now \$23./ton.

QUESTIONS FOR CANDIDATES



On June 26th we will have our primary elections for Anne Arundel County Council and County Executive as well as for state candidates. CEPA would like to find out the County candidates' thoughts on issues we have been working with.

The League of Conservation Voters and Sierra Club have already given them a list of questions having to do with the environment, but we noticed that there were some issues that CEPA has been working on that were not covered. Consequently, we will ask both the Democratic and Republican candidates for County Council and County Executive the following questions and publish their answers in our Fall 2018 Newsletter.

1. Much of the stress on our environmental resources comes from rapid development in AA County. Currently, our tax/fee policies act as an incentive to rapid growth by failing to recover the full cost of infrastructure to mitigate adverse impacts on the environment and quality of life. If you agree, how would you correct this mistake?
2. Presently, things like the value of forests in absorbing CO2 and reducing stormwater runoff are not considered in evaluating development projects. There have been studies on the monetary value of such "ecoservices" which could be used for that purpose. Should the value of ecoservices be considered in impact studies and impact fees for development?

3. The Wolman report recommended various measures to manage our water resources more effectively. One of the recommendations, arguably the most important one, was to install more monitoring wells. Should more monitoring wells be installed for monitoring our aquifers?
4. Groundwater is the source of drinking water for Anne Arundel County residents, and supplies are shrinking. How would you protect critical ground water recharge areas in West County?
5. In the last Maryland legislative session, a bill was passed by both houses which authorized the Maryland Department of the Environment to develop proposed requirements for residential graywater use. This would be subject to local (county) plumbing codes. Should requirements for residential graywater systems be developed for AA County?
6. CEPA has been overseeing the monitoring of the closed unlined PST Landfill in Harwood for several years, and the landfill has been directed by means of a consent decree to develop a plan to mitigate the several toxic substances found. The other unlined landfills are not subjected to the same scrutiny. Should the monitoring of all the unlined landfills in AA County be reviewed by a third party?
7. A bill requiring that, for changes in zoning, the Director of Planning and Zoning must certify that the change complies with the GDP was not passed during the last session, This measure would prevent one person, through "councilmanic privilege," from deciding on such changes. After the new GDP is effective, should changes in zoning have to be so certified?

GREEN EXPO

On March 24th, the Davidsonville Area Civic Association hosted its annual Green Expo at the Davidsonville Elementary School. It gives environmentally oriented organizations, both non-profit organizations and businesses, an opportunity to meet the public and let them know how we can all preserve our environment.



CEPA has participated for several years, and, for 2018, we had a new display about three issues that we have focused on in recent years (Growth, Water Resources, and Landfills). The photo shows CEPA President Al Tucker educating an interested observer while CEPA Trustee Gary Antonides looks on. If you haven't gone to a Green Expo before, plan to go next March.

PROFILE OF A TRUSTEE

Albert Tucker



Al Tucker is a physicist and engineer by training and an environmentalist at heart. He is a Maryland Certified Farmer, operating a 147-acre farm in Pindell, MD. Currently, he serves as president of the the Chesapeake Environmental Protection Association (CEPA). He is also a Patuxent River Commissioner, representing agricultural and environmental interests along the Patuxent River. He originally heard the call to environmental

action four decades ago with the proposed commercial development at Jug Bay. Through concerted community outreach, political advocacy and legal efforts, Jug Bay Wetlands Sanctuary was established in 1985.

Al holds a Ph.D in physics and is retired from the Senior Executive Service at the Office of Naval Research, where he was Division Director for Ship Science and Technology. He has served assignments to the Office of the Secretary of Defense, leading international scientific collaborations, and to the Defense Research Projects Agency (DARPA), leading major technology development programs.

Al continues his professional interests serving on university scientific advisory boards. As a member of the Institute for Electrical & Electronic Engineers, he participates in the development of engineering standards for electric power systems. He is also a member of the American Society of Naval Engineers, the Sigma Xi Research Society and the American Association for the Advancement of Science.

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