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

NEWSLETTER **Spring 2017**

PRESIDENT'S MESSAGE

By Al Tucker

HAVE WE REACHED THE CARRYING CAPACITY OF OUR ENVIRONMENT?

In the last half-century, land use in Anne Arundel County has been undergoing rapid transformation from agriculture to suburban and exurban sprawl. This sprawl has rapidly reduced the forest cover, increased the impervious surface, and increased pollution from stormwater runoff. It has generally degraded the ability of the environment to absorb and mitigate these adverse effects. Currently, TMDLs (Total Maximum Daily Loads) focus on reducing the nutrient and sediment loading in the Bay so that the Bay's natural ecosystems can return to a sustainable balance. Nutrients and sediments are not pariahs; they are critical to sustain life. But we humans have caused an oversupply of these nutrients to be injected into the Bay. In an attempt to restore balance, algae and other phytoplankton overproduce leading to the Bay's oxygen depletion problem. Similarly, dams and loss of forests have caused the wrong types of sediments to be transported into the bay. The fine sediments, easily transported in suspension, occlude natural sunlight that produces the bay grasses that provide the habitat for the higher order animals in the food web. The coarse sediments which are critical to sustain and develop wetlands and shallow bay grass habitat become trapped behind the dams. Again the natural corrective feedback mechanisms of the Bay have been thwarted by human development. The recognition that TMDLs are necessary is a tacit admission that the carrying capacity of the Bay has been exceeded. If the capacity of the Bay has been exceeded, it's natural to ask if the carrying capacity of the surrounding land, the watershed, also been exceeded?

This question is being asked more frequently by land and urban planners as they realize that the classical approach to land-use planning, controlled by zoning classifications, has become inadequate and does not promote sustainable environmental and financial development. In a "build-out" or "development capacity" approach, all buildable land remaining in a given zoning classification is assumed to be developed and public facilities will be built to support the additional development. In Anne Arundel, adequacy of public facilities is addressed separately by the Adequate Public Facilities Ordinance (APFO), which restricts development if certain specific public facilities are not available at the time of request to build. However, after a six-year waiting period, development can proceed. So the AFPO delays development, but it does not prevent development. A build-out analysis does show shortcomings in the zoning and inadequate infrastructure to support it. However, it does not analyze the "carrying capacity" of the natural systems and built-systems needed to support the development. And, in particular, it does not address the financial carrying costs or the decline in quality of life incurred by added development.

Generally the concept of carrying capacity analyzes four types of limits to carrying capacity:

1. PHYSICAL CARRYING CAPACITY – Maximum number of people, vehicles and structures that can be physically accommodated in a given area.
2. ECONOMIC CARRYING CAPACITY – Maximum use that enables economic feasibility of resources' potential uses.
3. ECOLOGICAL CARRYING CAPACITY – Maximum population that can be indefinitely supported in an habitat without affecting the productivity of that ecosystem.
4. SOCIAL CARRYING CAPACITY – Maximum level of use above which there is a decline in the quality of experience sensed by the user.

A build-out analysis will address several of the issues covered in limits 1 and 2, but offers no insight into the impacts 3 and 4. As you can imagine, research into understanding the limits of 3 and 4 is being carried out most actively in China, where population and natural resources are being strained to their limits. However, closer to home, Maryland Department of Natural Resources (DNR) has been a leader in the types of ecological economic analyses that shed light, supported by data, on the issues of limits 3 and 4. DNR maintains the State's Genuine Progress Indicator (GPI), which contains many of the data types that could be used to perform the analyses for limits 3 and 4. The chart below gives an overview of the data maintained for the state.[i]

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Economic Categories	Environmental Categories	Social Categories
Household Budget Expenditures	Services from natural capital	Services from human capital
Defensive Expenditures	Depletion of natural capital	Services from social capital
Household Investments	Costs of pollution	Social costs of economic activity
Income Inequality		
Public Provisioning		
Services from built capital		

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This analysis was applied locally to the city of Baltimore[ii] and focused primarily on the social categories. At the 2016 CEPA Forum on the "Unsustainable Spiral of Growth," Dr. Elliott Campbell presented a detailed analysis of the ecosystems services in Anne Arundel County. (available online at: http://cepaonline.org/presentations/CEPA%202016%20ECampbell.pdf). This type of analysis could be used to pinpoint the most valuable areas of the county that maximize ecosystems services. In this presentation, the ecosystems returned over $287M per year to the county.

In Anne Arundel we are beginning to sense the limits of ecological and social carrying capacity. For example, on the Mayo peninsula residents are feeling the social pressure of increased traffic, which not only induces physical stress, but also decreases their access to leisure time. Similarly, additional development impacts groundwater availability. The peninsula has experienced localized arsenic contamination and saltwater intrusion. Fixing these issues requires individuals to spend thousands of dollars, which further exacerbates their physical stress – a social cost. At the same time new development reduces the ecosystems services, thus requiring all residents to pay more for stormwater remediation, loss of nutrient absorption and increased infrastructure. These costs are rarely articulated, yet they are real costs for a degraded quality of life. The Mayo peninsula is not an isolated case; similar instances occur across the state.

So the time has come for a new method to assess land-use at the local, almost at the neighborhood scale. If the infrastructure costs exceed the value of remaining lots, then government must retire these lots. This could be done by outright purchase or through innovative programs that transfer development rights to less impacted parts of the county. The unique topography of Anne Arundel County begs for a solution. The undeveloped land on peninsulas is key to providing the "last mile" of protection for the bay. The undeveloped areas of West County – the growing economic center of the County – are much better suited toward implementing advanced technology across to improve our economic, social and environmental quality of life.

[i] See Maryland GPI website:
http://dnr.maryland.gov/mdgpi/Pages/default.aspx
[ii] http://sustainable-economy.org/wp-content/uploads/2014/09/Baltimore-GPI-2012-2013.pdf

THE ALLIANCE FOR LIVABLE COMMUNITIES - UPDATE

By Mike Lofton

The Alliance for Livable Communities, born out of last fall's CEPA Forum on Unsustainable Growth, http://www.cepaonline.org/forums.htm is beginning to have an impact and is refining a plan for its next steps.

A resolution calling on the County Executive to begin planning now for the General Development Plan (GDP), http://www.aacounty.org/departments/county-council/legislation/bills-and-resolutions/Resolution%20No.%2018-17%20FINAL2.pdf , was supported by Growth Action Network (GAN) and the Alliance for Livable Communities(ALC) with emails, phone calls and testimony and the resolution passed 7 to 0!! The first introduction of the Alliance for Livable Communities (ALC) to the County Council was its submission of a letter to the County Council in support of starting the GDP now.

A very good discussion of the reasons to begin the plan immediately resulted from the resolution. The biggest reason given for starting now was because lots of piece meal pieces of legislation (Example: the Rural Conservation Line) were being put forward and a comprehensive view was needed. The other major reason the Council was in full support was that their constituents are eager to plan for the best future for the County before all the land is used up! There are several major rezonings that have been granted or are pending that will make huge changes without the benefit of a GDP process.

Looking ahead the ALC will produce "white papers" to guide policy discussions and decision-making. Topics identified include: Economics of Growth, Adequate Public Facilities Ordinances (shortcomings of), Ecosystems Services, and Sewers vs. Septic.

In addition, a series of County Charter amendments intended to eliminate serious flaws in the comprehensive zoning process, institutionalize public notice requirements, create a planning commission and an office of legislative services to analyze/draft legislation will be drafted.

Take a look at Calvert County's public engagement website: . http://www.co.cal.md.us/futureCalvert. It could be a good source of ideas. Are you willing to help? Contact Ann Fligsten, Executive Director, Growth Action Network, annfligsten@gmail.com.

GROUND WATER FOR SOUTHERN MARYLAND AND THE EASTERN SHORE

By Bill Klepczynski & Al Tucker

The Maryland Geological Survey (MGS) team of Andrew Staley and David Andreasen along with Stephen Curtin of the US Geological Survey (USGS) [Ref. 1] has recently added another sequel to their papers presenting potentiometric-surface maps and water-level difference maps that they wrote in 2014 and 2013. Their current paper analyzes water levels measured from 1975-2015. *These papers are a critical tool in helping communities to evaluate and meet their future needs for potable water*. In fact, the MGS, since the 1940's, has maintained a groundwater-level monitoring network to observe changes in groundwater levels and its staff have written many papers on this critical topic.

A main purpose of these papers is to assess the **regional effects of groundwater withdrawals** on the water levels in Southern Maryland and Maryland's Eastern Shore.

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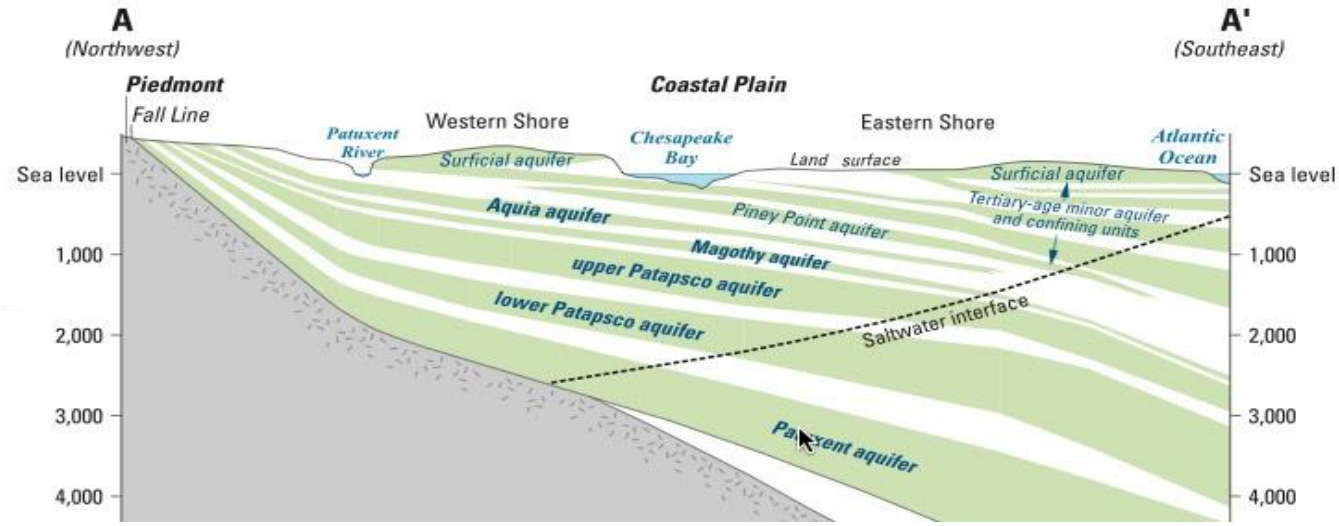

Figure 1. Schematic of the Aquifers which supply water for Southern Maryland and the Eastern Shore along with their distances below sea level.

The withdrawals are for, among other things, the operation of power plants, wells used for private residences and public suppliers of water, and the extensive use for irrigation in Kent and Queen Anne's Counties.

The current report presents ***potentiometric surface maps*** for the five aquifers supplying water for this region: the Aquia, the Magothy, the Upper Patapsco, the Lower Patapsco and the Patuxent (Fig. 1).

A "***potentiometric surface***" is an imaginary surface that defines the level to which water in a tube placed in a confined aquifer would rise. A **potentiometric surface map** is an important tool for visualizing the directions of groundwater flow and changes in hydraulic gradients in an aquifer. Wells or sampling tubes at different depths at the same location enable vertical gradients to be computed. These quantities are important because they form the basis for permitted withdrawals from Maryland's confined aquifers. If future permitted withdrawals will cause the water level to decline to a point which exceeds a water management level referred to as the 80-percent management level then the confined aquifer may start to **dewater**.

So, these potentiometric surface maps define, at a point in time, the levels of the aquifers. And, when we make estimates for future use due to growth, we can see if the water usage will drop below the critical 80-percent management level as shown in Fig. 2.

In 2007, David Drummond (Ref. 4) published a paper which computed and showed the 80-percent management surfaces for the Aquia, Magothy, Upper Patapsco and Lower Patapsco aquifers. Water-supply providers are restricted from letting the water level decline below this level.

The 80-percent management levels are shown in Figures 3 and 4 for the Aquia and Magothy Aquifers. Compare each with Figure 1 to visualize how the aquifers physically lie below the contours.

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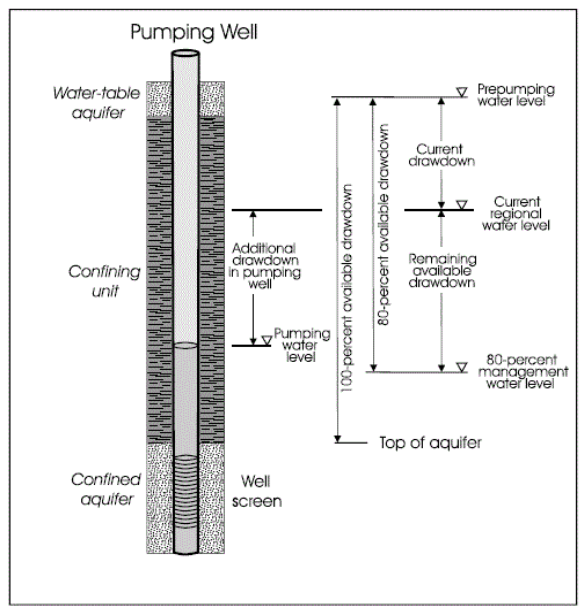

Figure 2. Schematic visualizing the 80% management level. From Ref. 4, page 91.

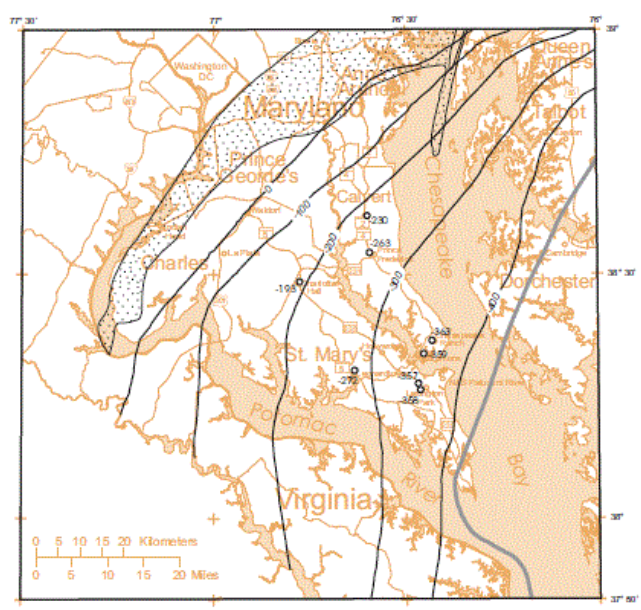

Figure 3 – Aquia Aquifer 80% contour levels.

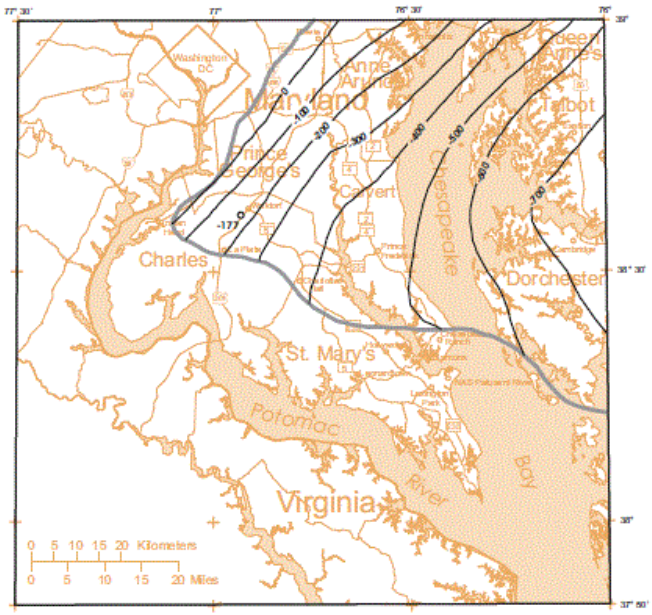

Figure 4 – Magothy Aquifer 80% contour levels.

In their current paper, the authors summarize the current water level differences in the 5 main aquifers for southern Maryland and its eastern shore as shown in Table 1.:

Table 1.

	Aquifer	Deepest water level	Difference in level	Since
1)	Aquia	-164 ft	-116 ft	1982
2)	Magothy	-106 ft	-99 ft	1975
3)	Upper Patapsco	-115 ft	-66 ft	1990
4)	Lower Patapsco	-194 ft	-83 ft	1990
5)	Patuxent	-171 ft	-80 ft	2007

As an example of how these data are used, consider the Aquia. We see from the table that the deepest water level is 164 ft. below sea level. That was in Lexington Park. We see from Figure 3, that the 80% management level at Lexington Park is -357 feet. So a drawdown of 193 more feet would put us at the 80% management level. The pre-pumping water level was 13 feet above sea level, so the total drawdown is now 177 feet total (38% level), and, from the table, 116 feet since 1982. This level will change depending on how much water is pumped from the area. A cone of depression is formed around wells as water is pumped, and it may be several miles across. When the cone of depression is too large and the water level approaches the 80% management level, water must be pumped from a well at a different location or from a different aquifer. Even though the drawdown at Lexington Park is not yet excessive, the 80% level of the Aquia was reached in the area of Wayson's Corner, so the amount of water pumped from the Aquia has been reduced, and future growth will most likely be supplied from other aquifers.

Data for Lexington Park is more complete than most places since it has had growth spurts in the past, and as a result the water supply was a concern. South county will experience more rapid growth, so we need to increase our ability to make the necessary adjustments to how we use our water supply. Years ago, it was recognized that we need more monitoring wells. That hasn't happened primarily due to restricted funding and the fact that right now there is not a crisis.

An additional complication is that as the water level falls in the aquifers, there is an increasing chance that salt water will intrude into the aquifer (see Figure 1).

REFERENCES:

1) Potentiometric Surface and Water-Level Difference Maps of Selected Confined Aquifers in Southern Maryland and Maryland's Eastern Shore, 1975-2015; *A. W. Staley, D. C. Andreason and S. E. Curtin*; Maryland Gelologic Survey; **2016**
2) Potentiometric surface and water-level difference maps of selected confined aquifers in Southern Maryland and Maryland's Eastern Shore, 1975–2013; *A. W. Staley,D. C. Andreasen, and S. E.Curtin*; Maryland Geological Survey; **2014**,
3) Potentiometric surface and water-level difference maps of selected confined aquifers in Southern Maryland and Maryland's Eastern Shore, 1975-2011; *A. W. Staley, D. C. Andreason and S. E. Curtin*; Maryland Gelologic Survey; **2013**
4) Optimization Of Ground-Water Withdrawals In Anne Arundel County, Maryland, From The Upper Patapsco, Lower Patapsco, And Patuxent Aquifers Projected Through 2044;*D. D. Drummond;* Maryland Gelologic Survey; **2007**

THE FUTURE OF COAL

By Gary Antonides

In the last newsletter, the Clean Power Plan (CPP) was mentioned as one of the environmental regulations that was likely to be cancelled by the Trump Administration. Trump did issue an executive order to "review" the CPP as well as other environmental regulations. Although the policies for the use of coal are uncertain right now, this article looks at the use of coal in this country and how technology could be used to clean up the use of coal.

In http://ngm.nationalgeographic.com/2014/04/coal/nijhuis-text, Michelle Nijhuis asks "Can coal ever be clean?" and reports that coal provides 40 percent of the world's electricity and produces 39 percent of global CO_2 emissions. It kills thousands a year in mines and many more with polluted air. According to the U.S. Energy Information Administration, in 2011 the average daily consumption of coal was 18 pounds per person in the U.S.

In West Virginia, whole Appalachian peaks have been knocked into valleys to get at the coal and streams run orange with acidic water. Air pollution in China, much of it from coal, is blamed for more than a million premature deaths a year. Coal is the dirtiest, most lethal energy source we have, but by most measures it's also the cheapest. So the real question is whether it can ever be clean *enough* to prevent local disasters and a radical change in global climate.

In August 2015, the Environmental Protection Agency (EPA) issued the final draft of the Clean Power Plan. The plan would be issued under the Clean Air Act, which has already been used to dramatically reduce the emission of sulfur dioxide, nitrogen oxides, and soot particles from American power plants. But carbon dioxide, the main cause of global warming, is a problem on a much larger scale.

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Photograph by Robb Kendrick

Cheap natural gas has lately reduced the demand for coal in the U.S., but everywhere else, especially in China, demand is surging. During the next two decades several hundred million people worldwide will get electricity for the first time, and most will probably use power produced by coal. Even the most aggressive push for alternative energy sources and conservation could not replace coal right away. But we could start to capture carbon, as we do sulfur and nitrogen, and store or sequester it underground -- carbon capture and storage (CCS).

Some techniques for CCS involve treating the stack gases of conventional power plants. This is called "post-combustion" treatment. This was used at American Electric Power's (AEP) Mountaineer Plant, on the Ohio River in New Haven, West Virginia. It uses a million pounds of Appalachian coal every hour and supplies electricity to 1.3 million customers in seven states. Those customers pay about a dime per kw-hour, but nobody pays for the privilege of spewing six to seven million metric tons of carbon dioxide into the atmosphere every year. Carbon is dumped without limit because in most places it costs nothing to do so and because there is no law against it in the U.S.

In 2009, AEP attached a chemical plant to the back of its power plan that captured about 1.5 percent of Mountaineer's stack gases and compressed and injected the CO_2 into a porous sandstone formation more than a mile below the banks of the Ohio. This system was the size of a ten-story apartment building—and that was just to capture a tiny fraction of the plant's carbon emissions. This energy-intensive technique could eat up as much as 30 percent of the total energy output of a coal plant if it were capturing all its carbon.

AEP planned to scale up the project to capture a quarter of the plant's emissions, and the company had agreed to invest $334 million. The U.S. Department of Energy (DOE) had agreed to match that. The deal was scrubbed when state utility regulators told the company that it could not charge its customers for a technology not yet required by law. The process worked, but it would take a regulatory or technical breakthrough to make it worthwhile.

Elsewhere, for more than four decades, the oil industry has been injecting compressed carbon dioxide into depleted oil fields to coax trapped oil to the surface. The Saskatchewan Government's Boundary Dam Integrated Carbon Capture and Sequestration Demonstration Project uses a post-combustion, scrubber technology to capture 90% of the CO_2 emitted by one of the units of the plant. The CO_2 is piped to and utilized for enhanced oil recovery in nearby oil fields.

In North Dakota, a "pre-combustion" technique is used in one of the world's largest underground carbon-storage operations. This plant gasifies the coal before burning it. Gasification is a process that converts organic or fossil fuel into carbon monoxide, hydrogen and CO_2. This is achieved by reacting the material at high temperatures (greater than 700 °C), without combustion, but with a controlled amount of oxygen and/or steam. Gasification can make power generation more efficient and allows the CO_2 to be separated more easily and cheaply. Gasification also removes the sulfur dioxide and mercury

Since 2000, more than 20 million tons of carbon dioxide from this North Dakota plant has been piped 200 miles north into Saskatchewan where a Canadian company pushes the CO_2 deep into sprawling oil fields that had their heyday in the 1960s. Two to three barrels of oil are dissolved out of the reservoir rock by each ton of CO_2. This Plant, the Great Plains Synfuels Plant, began operating in 1984, according to https://www.dakotagas.com/.

The gas in the pipeline is over 2000 psi, which makes it a supercritical fluid, which is as dense as the liquid phase, but it flows easily, making it ideal for transporting through pipelines. It is predicted that the CO_2 enhanced oil recovery operation will extend the field's commercial life by around 25 years.

Sites for storing CO_2 have to be chosen carefully, but European researchers estimate that a century's worth of European power plant emissions could be stored under the North Sea. According to the DOE, similar "deep saline aquifers" under the U.S. could hold more than a thousand years' worth of emissions from American power plants.

A new power plant being built in Kemper County, Mississippi was designed with carbon capture in mind and will also gasify its coal. This is the first American power plant designed from scratch to capture carbon. It has been delayed multiple times, but is supposed to be operational any day now. It will capture more than half its CO_2 emissions and pipe them to nearby oil fields. The project is supported in part by DOE.

A third technology uses pure oxygen for combustion (oxy-fuel). This process results in simpler flue gasses, from which the CO_2 can be more easily separated. Examples of oxy-fuel CCS plants are in Germany, Australia and Spain. The DOE's National Energy Technology Laboratory in Morgantown, West Virginia is working on an advanced version of this scheme.

https://www.washingtonpost.com/news/energy-environment/wp/2017/04/10/the-quest-to-capture-and-store-carbon-and-slow-climate-change-just-reached-a-new-milestone/?utm_term=.bc024edc7316&wpisrc=nl_green&wpmm=1 reports on a new large-scale technology in Decatur, Illinois that combines corn-based fuels with the burial of carbon dioxide deep underground. It could potentially result in actual removal of greenhouse gases from the atmosphere. DOE invested $ 141 million into this project. The facility is operated by ethanol giant Archer Daniels Midland (ADM). They are struggling to move beyond feedstocks like corn, which can create conflicts with food supplies. Eventually, this technology could be quite significant from a global climate perspective.

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At the Decatur plant, CO_2 is stripped out of the fermentation process in which corn is converted to ethanol and which yields an almost perfectly pure stream of CO_2 gas. The gas is then converted to "supercritical," fluid form and piped underground. The CO_2 will not be used for the purposes of enhanced oil recovery, which would add to the economic viability of CCS. However, oil recovery has drawn criticism because it promotes further use of fossil fuels.

Despite campaigning about the importance of "clean coal", the Trump administration is aiming to slash research funding for these kinds of technologies.

In West Virginia, century-old coal mines are now closing as power plants convert to natural gas. With gas prices in the U.S. near record lows, investing in advanced coal technology here may actually be a mistake. However, in China, coal provides about 80 percent of China's electric power, and it isn't used just for making electricity. Since coal is so plentiful, it's also used for making industrial chemicals, liquid fuels, and other products, a role played by petroleum in most countries.

Coal has also made China first among nations in total CO_2 emissions, though the U.S. remains far ahead in emissions per capita. Because of public complaints about air quality and awareness of the risks of climate change, China has invested hundreds of billions of dollars in renewable energy and is now a top manufacturer of wind turbines and solar panels. But they are also pushing ultra-efficient coal power and simpler, cheaper carbon capture. China's first power plant designed from scratch to capture carbon will reportedly be complete in 2020, and is supposed to capture 80 percent of its emissions.

Last fall, the Intergovernmental Panel on Climate Change (IPCC) advocated an emissions budget for the planet—the total amount of carbon we can release if we don't want the temperature rise to exceed 2 degrees Celsius (3.6 degrees Fahrenheit) above the 19th century level. Many scientists believe more than this would result in serious harm. They concluded that we've already emitted more than half of our carbon budget, and, on our current path, we'll emit the rest in less than 30 years. To meet the 2 degree goal, we need to reduce global emissions by roughly 80 percent in the next 30 or 40 years. Carbon capture has the potential to deliver big emissions cuts quickly. But carbon capture technology won't spread until governments require it, either by imposing a price on carbon or by regulating emissions directly.

In the 1990s, when the EPA used the Clean Air Act to impose a cap on total emissions of sulfur dioxide from power plants, the power industry predicted disastrous economic consequences. Instead the cap produced innovative, progressively cheaper technologies and significantly cleaner air. Carbon-capture systems are at much the same stage that sulfur dioxide systems were in the 1980s.

The state of the technologies discussed above are largely a result of the U.S. Department of Energy (DOE) conducting a joint program with the industry and State agencies in the late 1980s and early 1990s to demonstrate clean coal technologies large enough for commercial use. It sponsored 18 programs, and now https://en.wikipedia.org/wiki/Clean_coal_technology reports that there are now more than 80 carbon capture and sequestration projects in the United States.

The Clean Power Plan (CPP) initiated during President Obama's administration set carbon reduction goals for the states, and left it up to the states to develop plans to meet the goals. If a state did not have a plan after a reasonable time, the EPA could impose a plan on that state. Unfortunately, the CCP was challenged by several states and the Supreme Court issued a stay until the case could be heard. And that was even before Trump issued an Executive Order telling the EPA to "review" the CPP.

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 a simpler plan that has received attention lately. Representatives from a coalition of veteran Republican officials met in February with White House officials to discuss the idea of imposing a national carbon tax, rather than the CPP to address climate change.

This newly formed Climate Leadership Council, led by James A. 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 from the fee if it starts at $40 per ton, and as the tax rises, so would their dividends. This naturally creates a constituency for ever-tougher climate change action.

Right now there is wide disagreement on the "price" of carbon. Such a number could be used in carbon taxes or cap-and-trade systems. It can be market based or imposed by governments.

http://www.zdnet.com/article/why-carbon-capture-and-storage-will-never-pay-off/ reports that The Global CCS (Carbon Capture & Storage) Institute, based in Australia estimates that CO_2 would have to be priced at $23 to $92 per ton to make CCS viable. Other estimates vary considerably.

http://hub.globalccsinstitute.com/sites/default/files/publications/195008/costs-ccs-other-low-carbon-technologies-united-states-2015-update.pdf says that coal-fired generators in the US with CCS capability should be on par with traditional coal and gas generation if carbon were priced between $48 and $109 per ton and that a price above $48 would start to incentivize investment in coal plants with CCS.

Unfortunately, global carbon markets aren't pricing CO_2 emissions anywhere near these levels. The EU has a carbon trading scheme, and the current price for carbon in this system is about $6.00 per ton. With the future of carbon policy so uncertain in the U.S. and abroad, it's not likely that carbon prices will rise to the point where investing in CCS makes sense.

In addition, the recent cancellation of several large CCS projects doesn't bode well for carbon prices. Two projects in Canada have been scrapped due to cost and cheap natural gas. As mentioned earlier, AEP's Mountaineer Station in West Va., was cancelled. An oxy-fuel plant planned for Illinois was cancelled in 2015. Still, the coal companies are fighting for their lives, and hope that CCS will justify their existence, even though the declining costs of renewable power may soon make CCS economically unviable.

Trump promised to bring back coal jobs, but rolling back the CPP is not likely to have much effect since the coal industry

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was already suffering from three main factors: (1) increased natural gas production, (2) the growing renewable energy industry, and (3) the automation of coal mining. Also, consider that the CPP never even took effect since a stay was put on it by the courts until the case can be heard. Fortunately, several states have imposed their own taxes or cap-and-trade schemes, and more are likely if the EPA's authority is reduced.

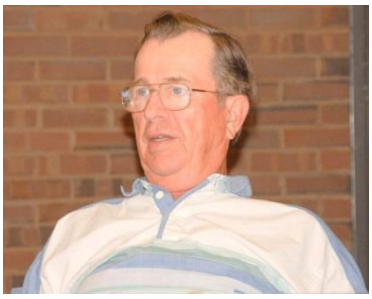
One way states are helping is described in https://www.brookings.edu/wp-content/uploads/2016/07/State-level-carbon-taxes-Options-and-opportunities-for-policymakers.pdf. They report that a number of states have committed to deep, long-term emissions reduction targets. For example, Massachusetts, New York, 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.

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 CO_2 on fossil fuels sold or consumed in the state. The measure would use the revenue, among other things, to reduce the state sales tax by one percentage point. The measure failed, primarily because people disagreed on how to spend the revenue.

Cap-and-trade systems seem to be more popular. Nine Eastern/Midwestern states (including Maryland)) have formed the Regional Greenhouse Gas Initiative (RGGI) for that purpose and California also has a cap-and-trade scheme.

More common still is the Renewable Portfolio Standard (RPS). This requires a certain percentage of power to come from renewable sources. Twenty-nine states have them. Maryland recently increased its RPS to 25% by 2020, and several other states are considering increases. Hopefully, the states will continue to lead in GHG reduction.

PROFILE OF A TRUSTEE
Lloyd Lewis Ph.D.



Lloyd has been heavily involved in environmental issues and has worked with numerous volunteer organizations for many years. His knowledge and experience has benefited CEPA since he became a Trustee in 1999.

His formal education was in Engineering Physics at U.C. Berkeley (B.S.), Physical Oceanography at MIT (M.S.), and Ocean Engineering at U. of Rhode Is. (Ph.D.). He worked for the federal Government, including the Navy Department and the Department of Energy for a total of 25 years, and also spent 10 years with industry as Oceanographer/Ocean Engineer, before retiring in 1995.

He has received many awards for his volunteer activities, including:

- Anne Arundel County Volunteer of the Year, 1996
- Maryland's "Most Beautiful People" Governor's Citation, 1996
- Anne Arundel County Utilities Citizen Volunteer of the Year, 1987
- Chesapeake Bay Foundation Oyster Restoration Volunteer of the Year, 2004
- Chesapeake Bay Foundation Maryland Bay Saver of the Year, 2006
- Maryland Senior Center Hall of Fame "Geri" award, 2015

The Bay Saver of the Year award was reported in the Annapolis Capital, and recognized his contributions to the CBF oyster restoration program. Lloyd especially enjoyed this work since it is outside, and many of his other interests, such as gardening are also outside activities.

He has served on the following Anne Arundel County Advisory Committees:

- Edgewater/Mayo Water and Wastewater (Chair)
- Mayo Wastewater Reclamation Subsystem (Chair)
- Beverly-Triton Beach Park Management Plan
- Patuxent Greenways Committee
- Anne Arundel County Septic Task Force
- Mayo Parks Advisory Committee

In addition to serving as a Trustee (currently as Secretary) of CEPA, he also works with the South River Federation and the West-Rhode Riverkeeper.

He is a member of the Southern Maryland Chapter, National Audubon Society; Maryland Ornithological Society; Anne Arundel Bird Club; Marine Technology Society; Nature Conservancy; National Resources Defense Fund; and the National Wildlife Federation.

In addition to his environmental interests, he has served in many other community service positions:

- Friends of Arundel Seniors (currently President)
- Commodore Mayo Kiwanis (Chairman of Community Services)
- Marine Technology Society - Anne Arundel County Science Fair Judge
- Mayo Peninsula Action Council
- South County Community Garden (Manager)

He resides in Cloverlea on the Rhode River and somehow has time to get involved in sailboat racing.

RICH ROMER APPOINTED CHAIRMAN OF CALVERT COUNTY ENVIRONMENTAL COMMISSION

At its January, 2017 meeting, the Calvert County Environmental Commission elected CEPA Vice President Rich Romer as its Chairman. The Environmental Commission was established in 1975 by the Board of County Commissioners and is tasked to provide recommendations to the Department of Community Planning and Building, the Planning Commission, and the Board of County Commissioners on matters that affect the environment (air, land, and water) in Calvert County.

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