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Comments on Pennsylvania 2015 Climate Change Impacts Assessment Update

The Center for Coalfield Justice was founded in 1994 by individuals organizing against the destruction caused by longwall coal mining. Over the last 21 years, we have expanded our mission to work on issues related to extractive industries generally in Washington and Greene counties in Pennsylvania. CCJ's mission is "to improve policy and regulations for the oversight of fossil fuel extraction and use; to educate, empower and organize coalfield citizens; and to protect public and environmental health." We have nearly two thousand members and supporters, most of whom live in Washington and Greene counties and live with the daily impacts of coal mining, natural gas drilling and fracking. Our comments below address the 2015 Climate Change Impacts Assessment Update prepared pursuant to Section 3 of the Pennsylvania Climate Change Act (71 P. S. § 1361.3) which requires the Department to update and publish a report on the potential impact of climate change in this Commonwealth every three years.

I. Anthropogenic Climate Change in Pennsylvania

As an initial matter, it is important to highlight the update's conclusion that "*Observed long-term changes in Pennsylvania's temperature are human-induced.* Pennsylvania has undergone a long-term warming of more than 1 °C (1.8°F) over the past 110 years, interrupted by a brief cooling period in the mid-20th century, which is simulated by climate models only when anthropogenic forcing, mainly increases in greenhouse gases, are included." (56) (emphasis in original). The fact that the modeling and analysis performed for this report found that warming was due to anthropogenic activity is a fact still not accepted by many residents of the Commonwealth. (18).

There are still a lot of people who do not believe that climate change is occurring or that it is caused by human activities. A recent study found that only 62% of adults in Pennsylvania believe that climate change is happening, which leaves 38% who do not believe it is happening.¹ As of 2014, only 48% of Pennsylvania adults think climate change is mostly caused by human activities. However, 77% of adults support funding research into renewable energy sources and 76% support regulating CO2 as a pollutant.

These statistics reveal the complex, seemingly conflicting nature of people's thoughts on climate change. Denial that climate change is occurring is unsettling because refusal to accept this scientifically proven fact prevents people from accepting responsibility for contributing to climate change. In turn, that denial has the potential to stymie progress on mitigation activities and reduction of greenhouse gas emissions that further drive climate change. Yet, it is encouraging to see that there is broad support for renewable energy development and regulation of CO2. These complexities are understandable in light of the fact that Pennsylvania is home to a wide range of energy activities, from extraction to processing to generation, making the state a major exporter of energy. (95, 100).

The dark side of that role as an energy exporter is that Pennsylvania is responsible for 1% of the emissions of greenhouse gases *worldwide*.² That number does not include methane emissions from natural gas drilling activities which is estimated to leak significant quantities of methane. The update recognizes that the natural gas production in the state has "likely also led to an increase in the greenhouse-gas footprint of Pennsylvania's natural gas production sector, due to methane leakage across various portions of the production and delivery chain. While these leakages are difficult to quantify with precision, the Pennsylvania DEP has estimated 10 tons per year for the average drilling site in the Commonwealth in 2013 (PA DEP, 2015)." (98). Other studies have estimated that each natural gas well leaks on average, 34 grams of methane per second.³ This data is crucial because methane is approximately 30 times more potent than CO2 in terms of heat trapping power.

¹ Yale Project on Climate Communication, Climate Opinion Maps, based on national survey data gathered between 2008 and 2014 by the Yale Project on Climate Change Communication and the George Mason Center for Climate Change Communication, <http://environment.yale.edu/poe/v2014/>.

²<http://www.portal.state.pa.us/portal/server.pt/community/newsroom/14287?id=7922&typeid=2>

³ Caulton, et. al. "Toward a better understanding and quantification of methane emissions from shale gas development" Proceedings of the National Academy of the Sciences, 2013, <http://www.pnas.org/content/111/17/6237.abstract>

II. Prime Farmland and Impacts on Agriculture

The update notes that agriculture is the second-largest land use in the state, constituting 27% of all land. Most farms in Pennsylvania are under 200 acres, 39% of farms have 49 acres or less, and 42% have 50 to 179 acres. (64). The update discusses farms in terms of agricultural product sales statistics, acreage devoted to various crops, and geographic production patterns. However, the update does not discuss the amount and location of prime farmland in the Commonwealth as designated by the United States Department of Agriculture. Prime farmland is defined as:

[L]and that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding.⁴

Prime farmland should be discussed in the update because it is an agricultural resource of exceptional value, since it produces the highest yields and requires minimal amounts of energy and economic resources, and farming it results in the least damage to the environment. It represents a special segment of the potential for growth and development in the state. Although the update describes issues that will affect crop and livestock producers across the board, like changing pest, weed, and disease management challenges, (89), there could be a focus on changes to prime farmland due to climate change and unique challenges that may arise. Washington and Greene counties have a combined total of 36,134 acres of prime farmland.

The farm acreage information in the update was based on the *2012 Census of Agriculture*, and it would have been interesting if the update had covered changes in the amount of farmland over the last 10-20 years. Washington and Greene counties

⁴ National Soil Survey Handbook, Part 622.03
http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/soils/ref/?cid=nrcs142p2_054242

are both losing farmland acreage at astounding rates. Washington County lost the most farmland, 50,086 acres, of all 67 PA counties from 2002-2007, a decrease of -9.1%. Between 2007 and 2012, Washington County lost an additional 2% of its remaining farmland 5,232 acres. During the same time, 2007-2012, Greene County lost 25% of its farmland 37,845 acres.⁵ In Washington and Greene counties, we hypothesize that some of these farmland losses were due to the coal mining and natural gas drilling industries operating in the area. It would be beneficial to understand how the amount of farmland has changed over the last few decades, the types of farmland that have been affected, and what those changes could mean for agriculture as an industry in light of the challenges that climate change will bring in the coming years.

III. Impacts on Energy Generation

The update identifies the challenge of distinguishing between mitigation measures and adaptation measures in energy generation that will occur due to climate change. Additionally, the update notes “impacts of climate change on the energy sector, or impacts of energy-sector shifts on mitigation efforts, are highly uncertain in some areas.” (111). Considering those difficulties, we were still looking for a robust discussion of energy generation in the future subject to the influence of resource scarcity, feasibility of energy extraction, and processing issues with fossil fuels which Pennsylvania has relied on for decades.

The update predicts that warmer temperatures are “likely to increase demand for energy, particularly electric power, during the summer months. This increase is likely to be larger than any decline in wintertime energy consumption.” (94). Accordingly, as climate change progresses, overall energy use will increase, particularly the demand for electric power, as the demand for air conditioning rises along with summer temperatures. Yet, the update fails to substantively discuss the relationship between this forecasted rise in demand and the future of the coal industry. The update merely mentions that “[c]oal and nuclear power remain the predominant fuels used for generating electricity in Pennsylvania” and that the state “continues to decrease its utilization of coal-fired electricity for power generation, with increases in the amount of natural gas utilized.” (95). The most recent report on Act 54, *The Effects of Subsidence Resulting from Underground Bituminous Coal Mining, 2008-2013*, found that if underground coal mining continues at current

⁵ Hoch & Ctr. for Coalfield Justice, *Community Indicators of Environmental Justice: A Baseline Report Focusing on Greene and Washington Counties, Pennsylvania* (2013), coalfieldjustice.org/files/Community-Indicators-Environmental-Justice-2014.pdf.

rates, “it will take approximately 37 years to mine the remaining Pittsburgh Coalbed.” Tonsor ET AL., Univ. of Pitt., Act 54 Report on the Impacts of Underground Coal Mining (2008-2013), § III, at 27 (2015). That predicted timeline does not account for the economic and technical feasibility of extracting those resources, nor does it reflect regulatory changes or other factors that affect the market demand for coal. Ultimately, coal is a finite resource that southwestern Pennsylvania is poised to deplete in the near future. The possibility remains that we would import coal from another state or county to keep it as part of our energy mix, yet that seems unlikely based on our current trajectory. So, more information is necessary to understand how increased energy demands due to climate change will be met. The report hints that natural gas has been replacing coal in electricity generation. Yet, the natural gas industry has experienced low commodity prices due to the “current and anticipated pace of Marcellus gas production” and the imbalance between supply and demand all of which have had the effect of driving down the amount of drilling and production dramatically over the last year. (96).

It would be interesting to see a discussion of how natural gas drilling activities, including fracking, may need to adapt to a future with the impacts of climate change. For example, whether the water-intensive production techniques currently employed can be balanced with the need to conserve water resources as well as climate change mitigation measures that seek to reduce methane emissions. Recognizing that such discussions could run into a significant amount of uncertainty, there are some issues, like water conservation, that we will clearly have to face in the future. If natural gas is predicted to play a significant role in the state’s electricity generation in the future, then such a discussion of the issues with shale gas extrication activities is necessary.

IV. Vulnerability of Wetlands, Streams, Lakes, and Rivers

The recommendations made in this section for increasing adaptive capacity according to the predicted impacts to aquatic resources must be incorporated into current permitting decisions and other decisions made by the state government that will affect these resources. (191). The recommendations that stream and wetland habitat need to be protected, riparian forests should be maintained, restoration of aquatic ecosystems should be performed wherever possible, and that pumping of groundwater should be minimized to equalize levels across wetland systems, all stand in stark contrast to many of the adverse impacts of the coal mining industry in southwestern Pennsylvania. (191).

The most recent report on Act 54, *The Effects of Subsidence Resulting from Underground Bituminous Coal Mining, 2008-2013*, detailed the devastating impacts of underground coal mining on wetlands, streams, rivers, and groundwater.

Between 2008-2013, the 46 bituminous coal mines operating in the state undermined a total of 31,343 surface acres.⁶ Approximately 40% of that undermined acreage is within Greene County, and 19% in Washington County. *Id.* § III, at 29.⁷ During that same time, nearly 100 miles of streams were undermined. Of these, 50.59 miles of streams were undermined by longwall mining methods, while 45.04 miles were undermined by room-and-pillar methods. *Id.* § VII, at 15. About 77% of the total miles of streams undermined by longwall techniques, 39.2 of the 50.59 miles, experienced flow loss, pooling, or both. Thus, only 23% of the total miles of streams undermined by longwall techniques did not experience mining-induced flow loss or pooling. *Id.* § VII, at 20. Maximum post-mining flow loss lengths in the dry season ranged from 936-ft to 10,883-ft and 96-ft to 8,106-ft in the wet season. Maximum flow losses across all streams totaled 52.2 miles of undermined streams in the dry season and 23.7 miles in the wet season. *Id.* § VII, at 22.

The report detailed the variety of adverse effects on the entire stream ecosystem that can result from disturbances in stream flow and chemistry, including excessive stream vegetation growth, increases in undesirable insect species, reduced aquatic insect diversity, reductions in fish populations, habitat space reduction, higher water temperatures, and lower oxygen levels. *Id.* § I, at 16. Mining-induced flow loss and pooling in streams were also found to have adverse effects on stream biological communities and health. *See id.* § VII, at 31.

The report also studied stream restoration activities in Pennsylvania after streams were damaged by coal mining and questioned whether stream restoration could be

⁶ Tonsor ET AL., Univ. of Pitt., Act 54 Report on the Impacts of Underground Coal Mining (2008-2013), § IX, at 3 (2015)

<http://www.portal.state.pa.us/portal/server.pt?open=514&objID=1149978&mode=2>

⁷ Greene County has a total area of 368,640 acres and 12,637.1 acres were undermined between 2008-2013. Washington County has a total area of 548,480 acres and 5,942.7 acres were undermined 2008-2013. Tonsor ET AL., Univ. of Pitt., Act 54 Report on the Impacts of Underground Coal Mining (2008-2013), § III, at 29 (2015). As of 2014 in Greene County, 242,282 acres have already been mined, are actively being mined or permitted to be mined, representing 65.50% of the acreage of the county. In Washington County, 313,712 acres have already been mined, are actively being mined or permitted to be mined, representing 56.89% of the acreage of the county.

Hoch & Ctr. for Coalfield Justice, *Community Indicators of Environmental Justice: A Baseline Report Focusing on Greene and Washington Counties, Pennsylvania*, at 47 (2013), coalfieldjustice.org/files/Community-Indicators-Environmental-Justice-2014.pdf.

effective at all. DEP requires mine operators to restore aquatic ecosystems, like streams and wetlands, after they are damaged by mining activities. The report found that “water quality does not recover over time and pH and conductivity at flow loss sites remain elevated following mitigation.” *Id.*, § VII, at 76. The report concluded that “while mining companies are generally either able to repair, replace, or financially compensate for damages to structures, the ability to repair damage to streams remains largely unknown.” *Id.*, § I, at 7. The report also found that seven stream investigations had a final resolution status of “Not recoverable: compensatory mitigation required.” This means that all other mitigation efforts failed and the company will have to compensate Pennsylvania monetarily for the loss of these natural resources. In total, eight cases represent stream impacts that have not recovered from mining-induced flow loss. *Id.*, § VIII, at 5 (2015).

Accordingly, we remain concerned about the success of stream restoration activities on a long-term basis after a stream has experienced severe adverse impacts from subsidence due to mining operations. The recovery of these aquatic resources is crucial to local ecosystems, downstream waters, and the environmental vitality of the state as a whole as the impacts of climate change take effect in an increasingly dramatic manner. Even more crucial is ensuring that we protect these precious resources affected by coal mining activities and other projects that degrade or destroy water resources. For example, the Department is currently considering a permit application for two new Coal Refuse Disposal Areas (CRDAs) in Greene County which will allow Consol Pennsylvania Coal Company to fill in 83,822 linear feet of stream, which amounts to about 16 miles of headwater streams, 1.628 acres of open water, and 23.242 acres of wetland. If granted, these will be the seventh and eighth CRDAs for Consol’s operations alone adding to the approximately 25 CRDAs in Washington and Greene counties. These large scale projects which fill in miles of streams are exactly the types of projects the Department needs to consider more carefully in light of the impending impacts of climate change and deny if it finds that granting such permits would be incompatible with its duties to the citizens of the Commonwealth.

V. Recommendations

We would like to see the information in this update and previous reports incorporated into DEP’s regulatory process. This could take the form of a directive from DEP Secretary Quigley or an Executive Order by the Governor that requires certain recommendations made in this report be considered in permitting decisions for various programs. Many of the current permit applications and related processes

do not account for this new information and decisions are made which go against the data and recommendations in this update.

Alternatively, some recommendations could be incorporated into permitting processes on an ad hoc basis where relevant. For example, Coal Mining Activity Permit applications could be modified to include a new section in the Operation Plan in Module 10 that could complement section 10.11 which prompts applicants to

Describe the measures which will be taken during the development and active phases of operation to minimize disturbances and adverse impacts to fish, wildlife and related environmental values, and achieve enhancement of the resources where practical. If enhancements measures are not proposed, explain why enhancement is not practical. (89.82(a) & 89.74 (b))

A section could be added which requires applicants to describe the measures which will be taken during the life of the project to minimize adverse impacts to resources vulnerable to climate change impacts and mitigate impacts to such resources. And if such impacts cannot be mitigated, the applicant should explain how other aspects of its operations will enhance related environmental values crucial to adaptation to climate change.

Many of the human health risks that will be increased by climate change were deemed more sensitive to other environmental factors. For example, “[r]espiratory and cardiovascular disease associated with ozone and airborne particulates are sensitive to climate change, but are more sensitive to air pollutant emissions than climate and “[t]he weather patterns that favor harmful algal blooms are more likely to happen with climate change, but the risk of [such blooms] is more sensitive to nutrient runoff than climate.” (137). These two areas are also perfect examples of the need to incorporate the findings of this report into the current regulatory scheme in order to mitigate the impacts of climate change through effective environmental protection measures now, particularly in these areas where other factors can make a significant difference.

The update identified a gap in research on renewable energy development in the Commonwealth as climate change progresses, stating that “[r]elatively little research has been done on how climate change might impact the renewable energy industry, aside from the large body of work discussing renewable power generation resources as climate mitigation pathways. None of this research has focused on Pennsylvania specifically.” (102). Such research would be incredibly valuable both for policymakers and state residents, and one that the state should invest in over the

coming years. Understanding the potential upsides or challenges the renewable energy industry might face due to climate change could advance support for the industry in specific ways necessary to defeat such challenges or take advantage of potentially beneficial aspects of climate change impacts.

Thank you for the opportunity to provide these comments.