SR Toxics/Plastics

“The lifecycle of Plastics and Human Rights”

Special Rapporteur on Toxic and Human Rights

Nelson Mandela said, “Education is the most powerful weapon which you can use to change the world.” I believe education is key if we are to solve the plastic crisis affecting our entire planet. Sadly, the fossil fuel industry has taken control of the narratives on the importance and necessity of plastics, the toxicity of plastics and how plastic production contributes to climate change.

Our family moved to rural Ohio over twenty years ago, before the word “fracking” became a common term used in the Ohio River Valley region. The Ohio River Valley has become the target of the petrochemical industry. Communities in the tri-state region have watched as the infrastructure of high-pressure hydraulic fracturing (fracking) has spread along the landscape like a cancer.

Our county, Harrison County, Ohio is now crossed by a plethora of pipelines, including the Falcon Pipeline. This pipeline has had at least 70 spills since construction began in 2019 and has released over a quarter million gallons of drilling fluid into the environment, which includes the watershed of Tappan Lake, Ohio. (1) It will supply fracked ethane to the Shell Ethane Cracker in Monaca, PA. This plant when completed and operational will emit 500 tons a year of volatile organic compounds, 2.2 million tons of carbon dioxide and 160 tons of small sized particulate matter. (2) It will produce 1.6 million metric tons of polyethylene pellets, a plastic used to create short-lived packaging. (3) The Rover Pipeline, which bisects the state of Ohio and also passes through Harrison County has been plagued with spills during construction as well. (4)

We have injection wells to the west of the county, a huge water withdrawal well to the west and Encino Energy has recently built a frack pad behind Tappan Lake close to the small village of Deersville, Ohio (5). Compressor stations sit within a few miles of our home and Mark West has a fractionator plant in Cadiz, Ohio less than fifteen miles from our home. (6)

Rural communities must also deal with dangerous truck traffic on roads scarcely large enough to accommodate two cars let alone huge fracking trucks. According to a report in Cornell University’s *Green Choices* “Each well drilled requires approximately 592 one-way trips, with a truck that carries between 80-100,000 lbs. when fully-loaded. Multiple wells are drilled on each pad; each bore is fracked multiple times. The traffic from the development of one well is equivalent to 3.4 million car trips.”

Certainly a few families have received money for leasing their land and a few have received royalties, but we know that for the most part, fracking has not brought the economic wealth promised by the fossil fuel industry. A recent report published by the Ohio River Valley Institute paints a different picture of the so-called economic boom promised by the fossil fuel industry. According to the report, “Belmont, Carroll, Guernsey, Harrison, Jefferson, Monroe, and Noble were the hardest hit, seeing a net job loss of over 8% and a population loss of over 5%.” (7) As a chemist and environmentalist, I find the externalities associated with all the stages of plastic production and plastics themselves to be totally incompatible with maintaining a livable planet.

One of the major concerns is contamination of water from not only fracking chemicals, but also the plastics that are made from the fracked gas. An average of seven million gallons of fluid are used for each fracked well. If one percent of this fluid is composed of chemical additives, then over 40,000 gallons of chemicals including biocides, surfactants, and anti-corrosive agents are required for each well. (8) Additionally, a study by Yale Public Health found that of these hundreds of chemicals, over 80 percent have never been reviewed by the International Agency for Research on Cancer (IARC). Of the 119 that have been reviewed by IARC, 55 were found to be carcinogenic. (9) Among the chemicals most frequently used in fracking, 24 are known to block the hormone receptors in humans, according to a 2014 study published in Science Daily. (10)

Fracking has contaminated citizens’ water wells; according to a 2020 article in the Journal of Petroleum Technology, “wellbore integrity cannot be taken for granted.” The XTO Energy well blowout in Belmont County in February 2018 was from a “failure of the gas well’s casing or internal lining.” This one blowout released the equivalent of an entire year’s worth of methane by oil and gas industries in countries like France. (11)

Methane gas is much more potent than carbon dioxide as a heat-trapping gas and according to a study in Biogeosciences, a significant portion of the anthropocentric methane emission increases are due to the fracking boom in North America. (12)

The waste water left over after a well is fracked is known as “produced water”. In addition to brine, which is a result of the prehistoric conditions which formed the oil and gas reserves, the waste also contains radioactive materials (Radium -226 and Radium-228) and any chemicals initially injected with the fluid. Fracking wastes have been found to contain water soluble radionuclides that are brought to the surface via produced water. “Elevated levels of chloride and bromide, combined with strontium, radium, oxygen, and hydrogen isotopic compositions, are present in the Marcellus shale wastewaters” (13)

In 1978, the EPA exempted oil and gas wastes from exploration and production activities from the hazardous waste management program Subtitle C of the Resource Conservation and Recovery Act. This includes produced water, drilling fluids and drill cuttings. Yet, in 2002 the EPA admitted that just because the wastes were exempt this did not mean that wastes could not present a hazard to human health and the environment. (14)

Peer reviewed studies show that watersheds surrounding frack well pads test positive for these radioactive substances. “Drilling companies deliberately spread wastewater on roads and fields. Pollutants from the water can then contaminate local waterways. Drilling operators sometimes spray wastewater on dirt and gravel roads to control dust, or on paved roads to melt ice. In some Western states, fracking waste is spread on farmland or used to water cattle.”  (15)

The oil and gas industries are also exempt or excluded from certain sections of these federal environmental laws: Clean Air Act, Clean Water Act, Safe Drinking Water Act, National Environmental Policy Act and Emergency Planning and Community Right-to Knows. (16)

“More than 18 billion gallons of waste fluid from oil and gas is generated annually in the USA” according to the American Petroleum Institute. The waste is often referred to as Technically Enhanced Naturally Occurring Radioactive Materials or TENORM. (17)

According to a study done by FrackTracker Alliance, Ohio has 226 active Class II injection wells. These wells dot Ohio’s landscape in and along the area of Utica and Marcellus drilling, as well as expanding into Ashtabula, Trumball, and Portage counties to the north and Washington, Athens, and Muskingum counties to the south. (18)

FracTracker data shows that the top twenty wells within these 226 are accepting more waste each year, at least 24,822 barrels more annually. This is due in part to an increase in the horizontal distances drilled to frack a well. In the beginning of the fracking boom, most lateral lengths were approximately two miles, now they have increased to three to three and a half miles. These “super laterals” require more water to frack and therefore create more wastes or “produced water”.

Another troubling issue is the use of waste brine as a deicer on Ohio’s roadways. This not only increases the release of bromide and chloride ions into our watersheds but also adds radioactive nuclides such as the water-soluble Radium-226. Pennsylvania stopped the use of brine on road surfaces in 2016 to protect human health and the environment.

Instead, Ohio’s oil and gas industry is taking advantage of the lack of adequate regulations for waste water. The industry has found a way to make money from the salty wastes. Aqua Salina is a product made from waste and marketed as “ancient sea water”. It can be bought by the gallon at many local hardware stores. (19)

Samples purchased directly from shelves of local hardware stores were tested and results showed some samples were as high as 500 times greater than the background radiation from Radium -226 and Radium -228. If someone drinks water with radium in it, the body mistakes it as calcium and will use it to build bone cells. Radium is an alpha emitter and can cause bone cancer. (20)

Fracking produces ethane gas as by-product and this gas will be used to feed the proposed plastics-making cracker plants along the valley corridor. The health impacts and environmental damage that would result from the operation of plastic-making ethane cracker plants along the Ohio River Valley transcend the local region. These cracker plants would be components of the Appalachian Storage Hub. (21)

Obviously, the people in the frontline communities of the Ohio Valley would be exposed to the majority of air and water contamination, as well as the externalities of increased fracking needed to supply these crackers. But the contamination from plastics and the compounds used to make plastic is not just a local issue; it is a global catastrophe. The pollutants, volatile organic compounds, carbon dioxide, and particulate matter as well as the plastics from the cracker plants will eventually be spread across the entire planet.

Plastic has become so pervasive that a new term is being used to describe microbial life that develops on plastic pieces in aquatic environments: plastisphere.  Our planet has been polluted by enormous amounts of plastic. According to scientists who tried to come up with a realistic number of the amount of plastics that has been made, we have produced 9.2 billion tons since the 1950s. Of that, more than 6.9 billion tons have become waste and of that waste, 6.3 billion tons is never recycled. (22) (23)

Much of the plastic that covers our planet is found in our oceans. The June 2018 issue of National Geographic was dedicated to the problem of plastics pollution. The issue has some alarming photos of species entangled in plastics dumped into the ocean. It also has a graph that shows how plastic production started trending upward around 1955, the same year I was born. I do remember some of the first types of plastics, like Bakelite, but I also remember what life was like before almost everything was packaged in plastic. (24)

Of the 300 million tons of plastic we use every year, half is used for packaging or single-use items, (25) such as coffee cups or utensils that are used for a matter of minutes and then thrown away. In addition to polluting our oceans, plastic is also entering our fresh water as well. We have plastic in our atmosphere. (26) We have plastic in salt, in beer, and in bottled water. (27)

There is even plastic in human feces, which means it’s in our food. “Up to nine different types of plastics were identified in the feces samples, including common household and food-industry staples like polypropylene, polyethylene, and terephthalate.” (28)

The average citizen has very little knowledge of the extent that plastic has invaded our lives and the life-cycle of practically every organism on the planet.  Sadly, many of the tri-state’s citizens fall into that category and are unaware of the plans to make the Ohio River Valley the next petrochemical hub, and the plastics capital of the USA. (29)

The Great Lakes, the source of 95 percent of our surface freshwater and the drinking water source for over 40 million people in Canada and the USA are being heavily impacted by plastics pollution. (30)

A 2017 article published in the Marine Pollution Bulletin states that the Great Lakes receive about 11,000 tons of plastics a year. Plastic waste is washed into sewer pipes from our homes and businesses. Trash from streets is carried into storm drains. Washing machines discharge fleece fibers from our clothes. Run-off from landfills carries wastes into sewers. City wastewater treatment plants send microplastics into the lakes. Beachgoers and local neighborhoods are responsible for windblown trash like plastic bags and single use food containers making their way into the lake. (31)

A major concern of the plastic pollution problem in the Great Lakes is the widespread contamination from substances termed microplastics. These are particles that are smaller than 5 millimeters in size, about the size of the top of a pushpin. These particles can be in the form of beads such as those found in exfoliant creams, soaps, toothpastes, lip gloss, and deodorants.

Fibers and fragments are also classified as microplastics. These microplastics can come from fleece fabrics. In a study of marine organisms performed by researchers at the University of Toronto, microplastics were found in all fish tested. These fragments make their way into our food sources. (32)

Most of the plastic fragments found are from degradation of larger plastic items. These are referred to as secondary plastic debris. Primary plastics, those in their original form, can be broken down via exposure to UV light and mechanical weathering. However, complete “mineralization”, where a product is broken down into carbon dioxide, water and other inorganic molecules, happens only after hundreds or thousands of years of exposure to sun and weathering. Therefore, plastics never truly “go away”. (33)

This is especially disturbing because these plastics are carbon based and can carry toxic substances such as polycyclic aromatic hydrocarbons and polychlorinated biphenyls into the food chain. Both compounds are capable of causing cancer and birth defects. Studies are now underway to determine the potential for these compounds to be transferred to humans via consumption of fish and other organisms. (34)

The question remains: Can we even begin to tackle the major problem of plastics pollution? Efforts to curb larger plastic debris, such as bans on plastic bags and other single-use items have been met with resistance from industry and politicians. (35)  Recycling can be unpredictable, as markets like China have disappeared. (36) Sadly, buying virgin plastic is often cheaper than using recycled plastic. (37)

Additionally, the petroleum industry sees cheap plastics as a new use for its fracked gas. (38) It will take a massive push by consumers to demand that single use plastics be phased out and that companies become responsible for plastic wastes, including nurdles, from cradle to grave.

As it is now, citizens have little knowledge and no vote; the decisions about new sources of plastic are made by distant CEOs. Workers and people living near the sites of production get all the harm and little benefit; and future generations—for hundreds of years—will be harmed.

Sources and references;

* 1. <https://www.fractracker.org/2020/06/falcon-pipeline-construction-releases-over-250000-gallons-of-drilling-fluid/#:~:text=A%203%20million%20gallon%20loss,ft%20of%20an%20HDD%20site>.
  2. <https://breatheproject.org/patrolling-our-air/>
  3. <https://insideclimatenews.org/news/04062020/shell-plastics-plant-pittsburgh-coronavirus/>
  4. <https://www.nrdc.org/stories/following-spills-ohio-wants-reroute-rover-pipeline-lacks-muscle>
  5. <https://ohiodnr.gov/wps/wcm/connect/gov/09a66062-df5c-44d1-8997-412db21fa418/Supplement+to+Application+of+EAP+Ohio%2C+LLC+for+Unit+Operation+-+Deersville+HN+FRA+Unit+%286-26-2020%29.PDF?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE.Z18_M1HGGIK0N0JO00QO9DDDDM3000-09a66062-df5c-44d1-8997-412db21fa418-nhaeb3E>
  6. <https://www.emht.com/expertise/transportation/rail-engineering/markwest-fractionation-facility-markwest-energy-partners-lp-cadiz-oh/>
  7. <https://ohiorivervalleyinstitute.org/new-report-natural-gas-county-economies-suffered-as-production-boomed/>
  8. <https://www.epa.gov/sites/production/files/2015-07/documents/hf_es_erd_jun2015.pdf>
  9. <https://publichealth.yale.edu/news-article/13714/>
  10. <https://www.sciencedaily.com/releases/2014/06/140623103939.htm>
  11. <https://www.dispatch.com/news/20191223/ohio-gas-well-blowout-released-more-methane-than-some-countries-do-in-year-researchers-find>
  12. <https://www.biogeosciences.net/16/3033/2019/bg-16-3033-2019.pdf>
  13. <https://pubs.acs.org/doi/10.1021/es402165b>
  14. <https://yosemite.epa.gov/oa/eab_web_docket.nsf/Attachments%20By%20ParentFilingId/945EF425FA4A9B4F85257E2800480C65/$FILE/28%20-%20RCRA%20E%26P%20Exemption.pdf>
  15. <https://www.peer.org/dont-drink-the-fracking-fluids/>
  16. <https://insideclimatenews.org/news/06102014/how-oil-gas-waste-became-exempt-federal-regulation-timeline/>
  17. [TENORM: Oil and Gas Production Wastes | Radiation Protection | US EPA](https://www.epa.gov/radiation/tenorm-oil-and-gas-production-wastes)
  18. <https://www.fractracker.org/2016/07/oh-class-ii-injection-trends-images/>
  19. <http://www.acfan.org/2020/radioactive-oil-and-gas-waste-on-ohio-roads/>
  20. <https://www.ncbi.nlm.nih.gov/books/NBK218126/>
  21. [Appalachian Storage Hub/Petrochemical Complex (ohvec.org)](https://ohvec.org/appalachian-storage-hub-petrochemical-complex/)
  22. <https://www.nationalgeographic.co.uk/2018/05/we-made-plastic-we-depend-it-now-were-drowning-it>
  23. <https://www.nationalgeographic.com/science/article/plastic-produced-recycling-waste-ocean-trash-debris-environment>
  24. [Bakelite First Synthetic Plastic - National Historic Chemical Landmark - American Chemical Society (acs.org)](https://www.acs.org/content/acs/en/education/whatischemistry/landmarks/bakelite.html)
  25. [Plastic Pollution Facts | PlasticOceans.org/the-facts](https://plasticoceans.org/the-facts/)
  26. [Microplastic contamination in an urban area: a case study in Greater Paris (archives-ouvertes.fr)](https://hal-enpc.archives-ouvertes.fr/hal-01134553/document)
  27. [Anthropogenic contamination of tap water, beer, and sea salt (plos.org)](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0194970)
  28. [Microplastics Found in Human Feces, Says New Study | Health.com](https://www.health.com/home/microplastics-human-poop)
  29. [Plastics: The New Coal in Appalachia? - Inside Climate News](https://insideclimatenews.org/news/25022019/plastics-hub-appalachian-fracking-ethane-cracker-climate-change-health-ohio-river/)
  30. [Researchers-focus-on-Great-Lakes-pollution (plasticsnews.com)](https://www.plasticsnews.com/article/20150319/NEWS/150319902/researchers-focus-on-great-lakes-pollution)
  31. [Researchers study plastic pollution in Great Lakes | RIT](https://www.rit.edu/news/researchers-study-plastic-pollution-great-lakes)
  32. [Microplastics in Seafood and the Implications for Human Health - PubMed (nih.gov)](https://pubmed.ncbi.nlm.nih.gov/30116998/)
  33. <https://pubs.acs.org/doi/10.1021/acssuschemeng.9b06635>
  34. <https://www.chesapeakebay.net/channel_files/22127/ii.c._-_toxic_contaminants_summary_report_2012.pdf>
  35. [State Lawmakers Seek to Ban the Plastic Bag Bans in Ohio / Public News Service](https://www.publicnewsservice.org/2019-06-14/environment/state-lawmakers-seek-to-ban-the-plastic-bag-bans-in-ohio/a66802-1)
  36. <https://www.npr.org/sections/goatsandsoda/2019/03/13/702501726/where-will-your-plastic-trash-go-now-that-china-doesnt-want-it>
  37. [Making New Plastic Is Now Cheaper Than Recycling (businessinsider.com)](https://www.businessinsider.com/low-oil-prices-hurt-plastics-recycling-2016-4)
  38. [Fueling-Plastics-How-Fracked-Gas-Cheap-Oil-and-Unburnable-Coal-are-Driving-the-Plastics-Boom.pdf (breakfreefromplastic.org)](https://www.breakfreefromplastic.org/wp-content/uploads/2019/03/Fueling-Plastics-How-Fracked-Gas-Cheap-Oil-and-Unburnable-Coal-are-Driving-the-Plastics-Boom.pdf)