Delaware County's Life Cycle Assessment study of Incineration vs. Landfilling vs. Zero Waste

In 2021, Delaware County's Office of Sustainability issued a request for proposals (RFP) to draft the county's new Solid Waste Management Plan, with the intent of making it a Zero Waste Plan. Given the controversy over the incinerator in Chester, the county found it important to commission a study that could compare incineration (and landfilling of the ash in our county landfill) vs. skipping the incinerator and landfilling the unburned trash in the same landfill. The study also compared to implementing the Zero Waste Plan.

The RFP spelled out that the life cycle assessment (LCA) must look beyond climate impacts and include various health and environmental impacts associated with chemicals released from the incinerator. Delco ended up hiring Sound Resource Management Group, the only outfit that has a comprehensive life cycle assessment tool which can look at nine different health and environmental criteria, including climate impacts, but also cancer and non-cancer effects of toxic chemicals, impacts on respiratory health from pollutants like nitrogen oxides, and impacts of particulate matter, such as heart attacks and strokes. The model also converts these impacts into dollars using accepted standard economic values for the social cost of carbon and other pollutant impacts. This enables the model to present a single chart that can sum up the diverse impacts into a dollar value representing externalized health and environmental costs. These are costs that people pay in medical bills and that society pays in impacts from climate change, premature deaths and many other sorts of harms.[1]

The report, completed in 2023, found that **burning trash at the incinerator in Chester and then landfilling the ash is 23% worse for the climate and 23 *times* as harmful for other (more local) public health and environment impacts than going directly to the landfill without burning first**.

Climate impacts are the largest, and are worse from incineration than from landfilling, so long as at least 30% of the landfill's gas is captured. It is typically assumed that landfill gas capture is around 70-75%. While this assumption is likely optimistic, it is safe to say that landfills with gas capture systems are collecting at least 30% of their gas, meaning that incineration will consistently be more harmful for the climate than landfilling.

When factoring in other health and environmental impacts, the difference becomes starker, as there are far greater emissions from incineration than from landfilling, contributing to **asthma, cancers, birth defects, heart attacks, strokes**, and more. Most of the landfill's impacts were climate impacts, meaning that landfill impacts can mostly be eliminated once we remove compost our food scraps and yard waste.

One of the more eye-opening results was on the role of transportation. It was commonly believed that diesel truck emissions were significant and that trucking more trash a further distance to the landfill would be such a problem that incineration in Chester is preferable. As it turned out, as other studies have also shown, transportation impacts are tiny relative to landfilling or incineration. Transporting our trash to the landfill in Berks County was just 1.1% of the impact of using the landfill without burning the trash first. The greater impacts of incineration far outweighed any impacts of using landfills at a greater hauling distance.

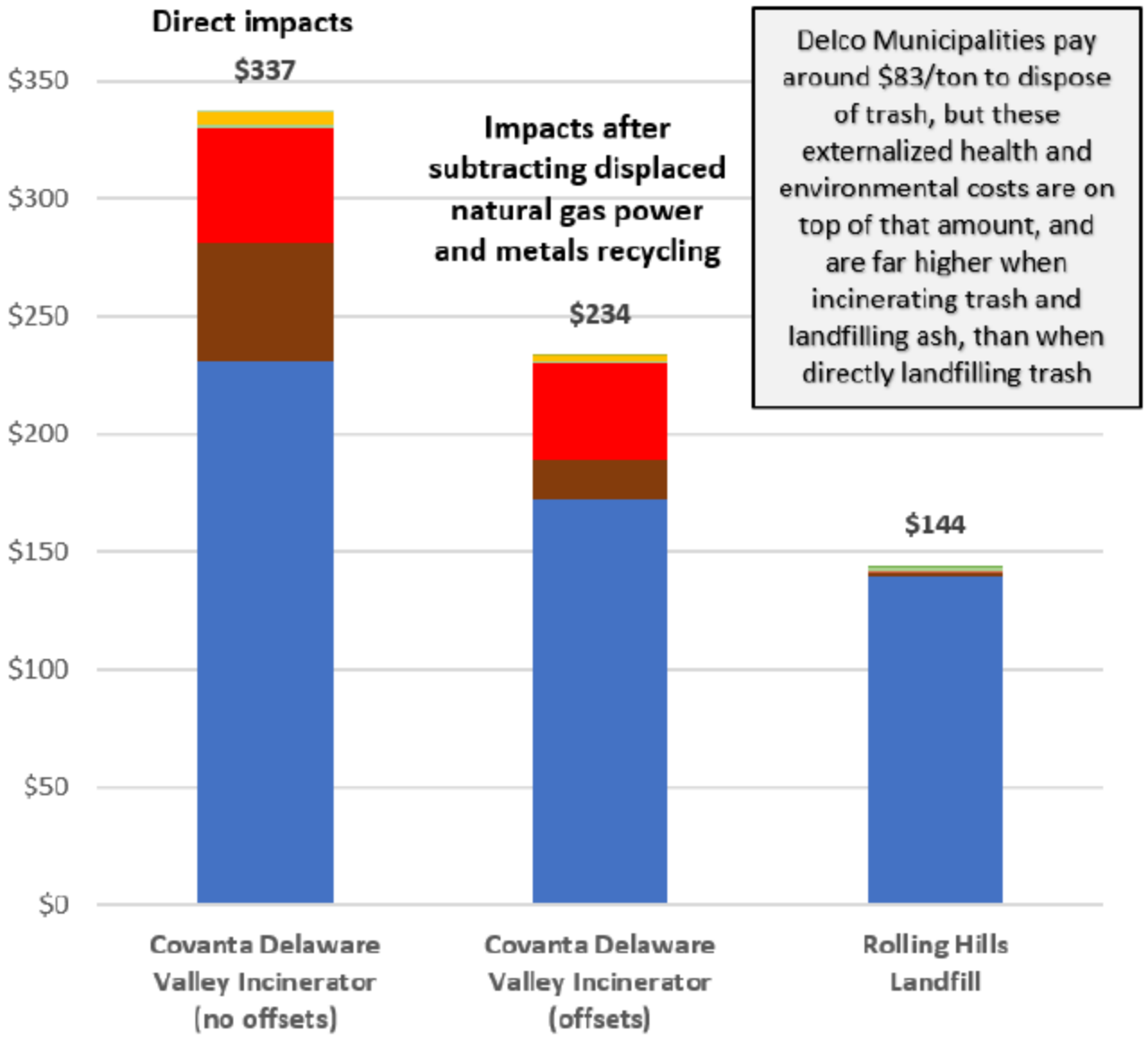
If Philadelphia is looking to understand its options, the Delco LCA is very instructive. It not only looks at the same trash incinerator that Philadelphia mainly uses, but the waste composition data is primarily of Philadelphia's trash, since the state's study did not have Delaware County data available, and the consultants had to use the southeast regional data, 2/3^{rds} of which is Philadelphia's trash.

The full study can be found at https://delcopa.gov/sites/default/files/2025-10/LifeCycleAnalysis.pdf and the summary charts from it are on the following pages. Mike Ewall, of Energy Justice Network, is available to answer technical questions on the study. He can be reached at 215-436-9511 or mike@energyjustice.net

[1] Measuring Environmental Benefits Calculator (MEBCalc™), Sound Resource Management Group. https://srmginc.com/mebcalc/ In the summary boldfaced above, we count offsets for the global climate impacts, but not for the more localized health impacts.

Incineration vs. Landfilling

Health & Environmental Impacts per Ton of Waste Disposed at Covanta Delaware Valley Incinerator vs. Rolling Hills Landfill



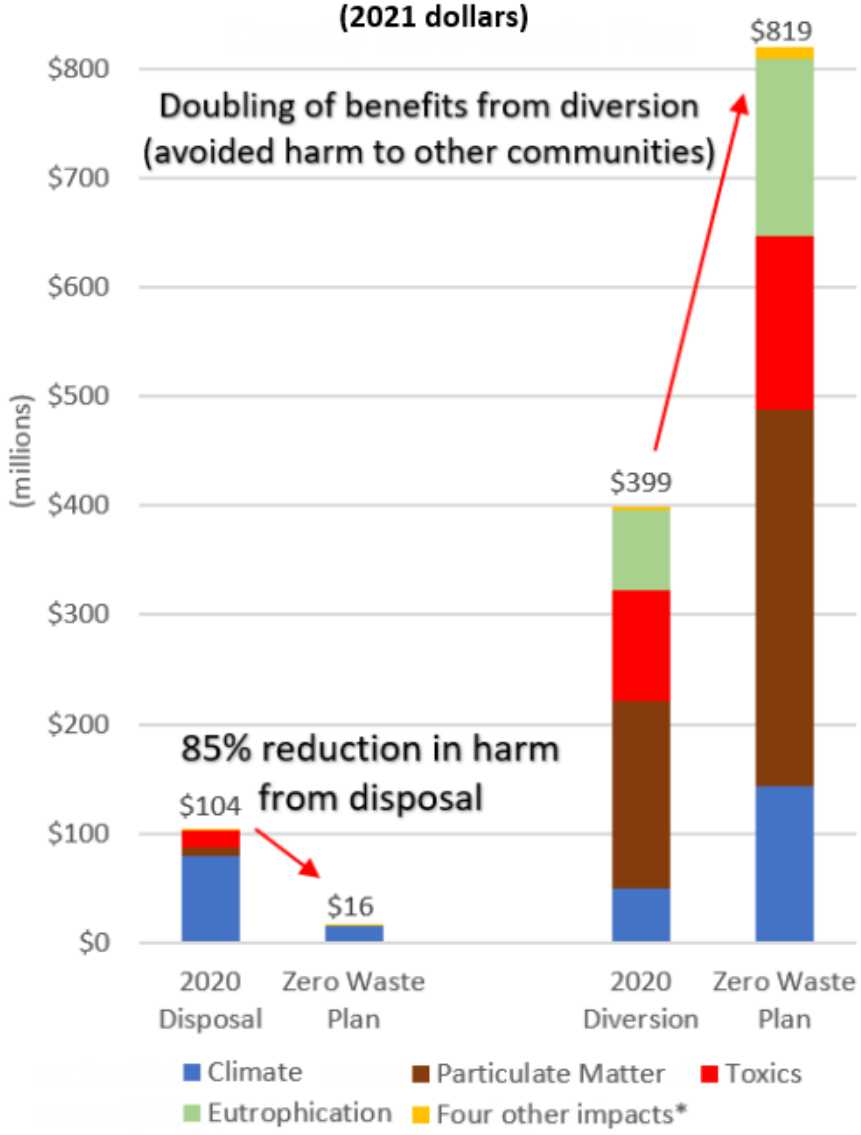
Delco Municipalities pay around $83/ton to dispose of trash, but these externalized health and environmental costs are on top of that amount, and are far higher when incinerating trash and landfilling ash, than when directly landfilling trash

Incinerating trash at the nation's largest trash incinerator and landfilling its ash is <u>2.3 times as harmful</u> as directly landfilling trash at the same landfill.

- Four other impacts (eutrophication, acidification, ecosystems toxicity, ozone depletion)
- Toxics (cancer, birth defects, learning disabilities...)
- Smog formation (asthma attacks & respiratory distress)
- Particulate Matter (heart attacks, stroke, COPD...)
- Greenhouse Gases (climate change)

Impacts of Adopting Zero Waste Plan

Annual Health and Environmental Impacts of Implementing Delaware County Zero Waste Plan
(2021 dollars)



* Acidification, ecosystems toxicity, ozone depletion, and smog formation

85% reduction of disposal impacts from a combination of diverting materials from disposal, and switching from incineration (and landfilling ash) to direct use of landfilling.

Note: This chart combines Figure S1 / Figure 1 and Figure S4 / Figure 5, but all expressed in positive dollars. Table A1, A2, B1, and B2 provide the raw numbers behind this chart.

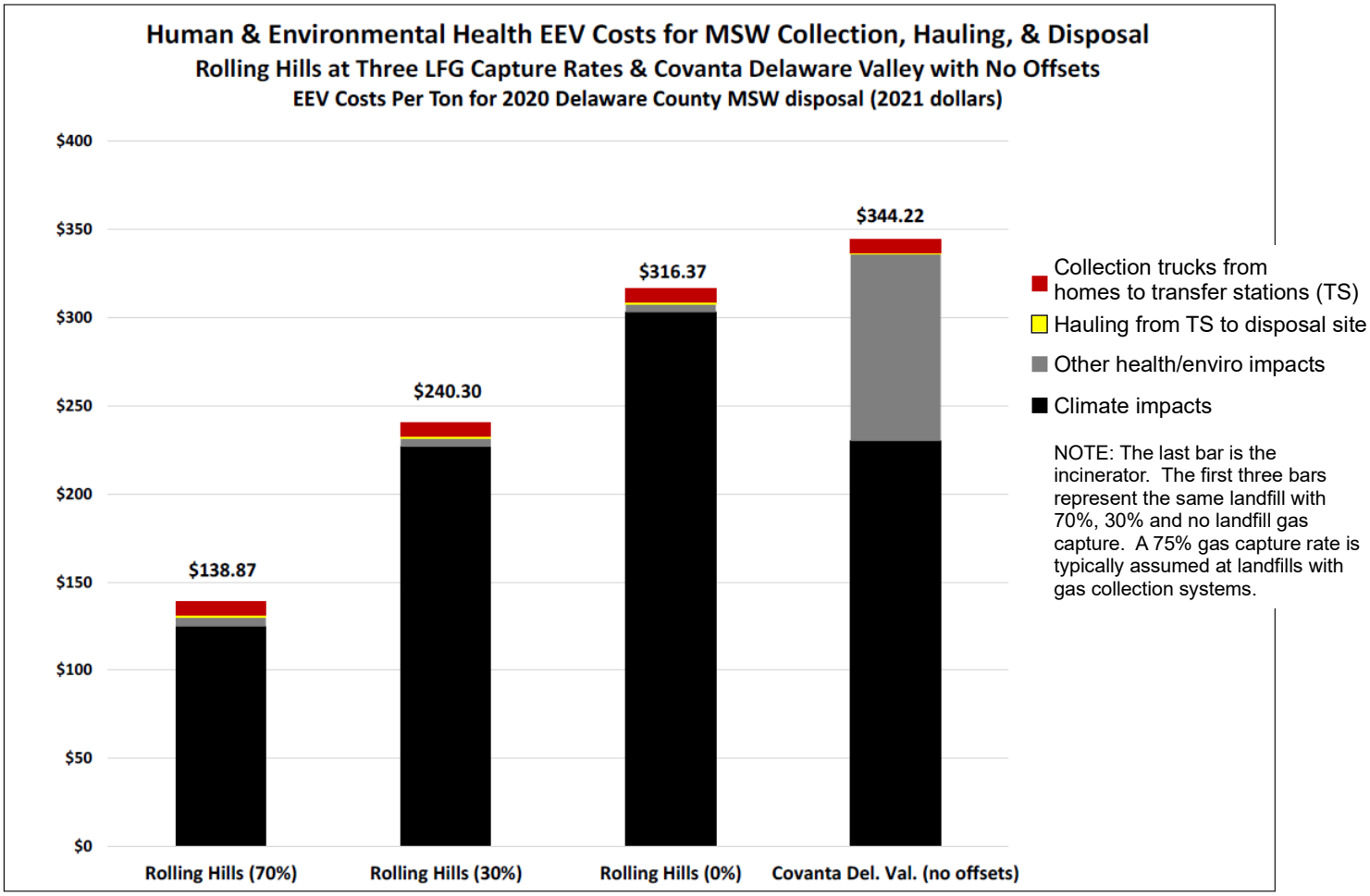
While the previous chart looked at externalized health and environmental costs per ton, this looks at the entire impact of Delaware County, Pennsylvania's waste system (all tons in a year), showing $104 million dollars of health and environmental costs per year.

Adopting the Zero Waste Plan (ending incineration and reducing waste) cuts those harms by 85%, while the benefits (avoided harms) that already happen from current recycling efforts (about $400 million a year) would be doubled.

Examples of these avoided harms are not needing to log or mine new raw materials because we're now consuming less, reusing/repairing, recycling and composting.

Incineration worse than the worst landfills; Transportation impacts insignificant

Yellow lines show difference between hauling from two transfer stations 3 and 13 miles from the incinerator (last bar) vs. trucking all trash to landfill 60 miles away (first 3 bars)



Two notable lessons from this chart. First, it includes a sensitivity analysis to see how much the landfill gas capture rate matters. Even with zero gas capture (all leaking out), the overall impacts of incineration are worse than landfilling because the other impacts of incineration – asthma, cancer, heart attacks, etc. (grey) – add up to significant harm on top of the climate impacts (black). If only looking at climate impacts, landfill gas capture rate would have to be as low as 30% to be comparable to incineration.

The collection trucks (red) are the same in all scenarios. The greater hauling distance to landfill (yellow) in the three landfill scenarios is more than the nearby incinerator, but so insignificant that trucking emissions cannot justify a preference for incinerating in-county vs. trucking to landfills.