

**Abigail Hadden**  
**Class of 2023**  
**Forensic Science with an Emphasis in Chemistry**  
**The Cost Benefit of Portable Ozone Devices**  
**Dr. Chong Qiu**  
**Chemistry Department**

The ozone layer is essential for absorbing most of the ultraviolet radiation that extends from the sun to the earth. UV radiation is known for causing many forms of cancer. The ozone layer started to get damaged by chlorofluorocarbons in the 1970s-1980s. Stricter monitoring began to be conducted to determine the extent of the damage. Although ozone is important in the upper atmosphere, high levels of ground ozone are damaging to human health (current standard of acceptable ozone level is 0.08 parts per million in the US).<sup>1</sup>

The aim of this project was to develop a more accurate network of ground ozone monitors and to set up an open-access program for local and state governments to evaluate their needs on an individual basis. By doing so this would allow for better determination of whether an federal reference model or a portable ozone monitor is better suited for a specific location using the parameters made in the toolbox.<sup>2</sup> This will allow for better environmental monitoring of the ozone layer and the more ozone monitors across the nation will allow for more accurate measurements. This program would be available for the public and could also be used for education purposes.

The methods that are currently used to monitor the ground level are federal reference methods or FRMs. Technology is continuing to advance and there are now more affordable and portable ozone devices available today. These new devices could lead to a much more cost-effective way to monitor certain pollutants.

Once all the research and cost benefits were defined, the modeling was conducted using an Excel sheet. Using an Excel sheet allowed for better organization and allowed for the user to input data and automatically analyze the results. All the different outcomes that were hypothesized were analyzed in Excel to determine the device that is best for each of them.

After adding all possible outcomes, comparisons were able to be made quantitatively to determine the best cost-benefit parameter. This led to the identification of critical factors for local/state governments to consider to switch from FRM to low-cost sensors. The final Excel sheet created a final analysis program available to everyone to determine which device is more cost effective based on their demographic information.

The future plan for this project is to release the calculator for public use and possibly use it as an educational tool in schools.

### **Works Cited**

1. Environmental Protection Agency. Review of the Ozone National Ambient Air Quality Standards, 251st ed., vol. 85, 2020, pp. 87256–87351.
2. William, Reshmina, et al. “An Environmental Cost-Benefit Analysis of Alternative Green Roofing Strategies.” *Ecological Engineering*, vol. 95, Oct. 2016, pp. 1–9., doi:10.3390/su1112331