Analyzing Policy Options to Mitigate Tire Pollution in the Anacostia River

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Acknowledgments

The Environmental Resource Policy (ENRP) Capstone Group would like to thank those that made this important project possible. We want to thank the Anacostia Riverkeeper team, Trey Sherard, Quinn Molner, and Petra Baldwin, for guiding us through the process of assessing problems in D.C., as well as providing crucial data and information that was necessary for the execution of this project. We also want to thank our academic advisor, Dr. Peter Linquiti, for his guidance in helping us with issues we came across in the course of this project and keeping us on track to make sure we were as efficient as possible. Furthermore, we would like to express our gratitude to all of the interviewees who provided us with the most critical information for this research. Without your dedication to helping us, this project never would have turned out the way it has. To everyone we encountered along the way, we thank you tremendously.
**Executive Summary**

This report summarizes the Environmental Resource Policy (ENRP) Capstone Project completed for the client Anacostia Riverkeeper. For this project the team investigated illegal tire dumping into the Anacostia River, what the causes are, and what policy alternatives can be implemented to help reduce or eliminate tire pollution in the Anacostia River completely. This included interviewing local stakeholders as well as going into the field to search for tires. Ultimately the team identified four potential policy alternatives besides the status quo. After deliberation, a tire management fund overseen by the District of Columbia was chosen as the best option, which will ultimately create a fund that will allow for better enforcement of penalties for illegal tire dumping, as well as funding for cleanups and tire drop-off locations so they can run more efficiently. However, this alternative has a relatively high cost to get the fund started. To combat this, this policy can be used in conjunction with an alternative focused on extended producer responsibility, or other related policies.

**Introduction and Background**

The District of Columbia’s waterways are affected by serious environmental issues. Due to a complicated sewer system, litter and contaminants enter the rivers that run through D.C., including the Anacostia River, which flows from Prince George’s County, Maryland into D.C. where it empties into the Potomac River at Buzzard Point (Anacostia River, 2023). This nearly 9 mile long waterbody is home to all sorts of wildlife, as well as providing a host of recreational activities to nearby residents.

Unfortunately, heavy pollution and development along the riverbanks has made the Anacostia one of the most heavily polluted rivers in the United States. One of the biggest sources of pollution is raw sewage that gets discharged as runoff after rainstorms. The sewage adds harmful bacteria and other pathogens into the water and impairs water quality as well as leading to the deaths of large amounts of fish (Anacostia River, 2023). Another major cause of pollution is litter. This can include plastic bags, bottles, and even waste tires. While small household litter is often the target of mitigation efforts, automobile tires are a large source of pollution in and along the river.

Illicit tire dumping into the river has been on the rise as noted in Anacostia Riverkeeper’s cleanup data through the years. This is a disregarded environmental issue that has detrimental effects on both the residents that live along the river as well as the wildlife that calls the river home. This issue is what this capstone group set out to look into to provide an answer on behalf of Anacostia Riverkeeper, an organization working relentlessly to clean up the river, host educational tours, and make the river as enjoyable as it can be.

In this report, the team shares research on the effects that waste tires have on the ecosystem when they are left to break down into waterways and factors that contribute to waste tires being dumped illegally into the river. Additionally, a look into policies that exist in other regions and states help guide the analysis. Finally, this report provides policy alternatives and a final recommendation for D.C. and Anacostia Riverkeeper on how to reduce and prevent tire pollution in the Anacostia River.
Problem Statement

Research Puzzle

In order to understand the extent of hazardous pollution from tires in the Anacostia River, the team addressed a core question: what is the optimal policy alternative to minimize the prevalence of tire pollution in the Anacostia River?

Client Profile

The mission of Anacostia Riverkeeper is to protect and restore the Anacostia River for all who live, work, and play in its watershed, and to advocate for a clean river for all its communities (Anacostia Riverkeeper, 2023). They do this through water quality monitoring, trash cleanups, green infrastructure, and stormwater education to ensure everyone has safe and equal access to the Anacostia River.

Statement of Problem

The Anacostia River faces high levels of pollution that can prevent community members from recreating in the water and around the watershed. There is a great variety of pollution from plastic bags to plastic bottles, but when the team analyzed data of collected contaminants, it noticed that tires were the largest source of bulk waste. Further, there was little regulation or enforcement to prevent tires from being illegally dumped into the river. After further research the team determined this was caused by multiple reasons including high disposal fees, a lack of methods for disposal, and minimal enforcement from local authorities.

Objectives

The goal of this project was to determine the key causes for illegal tire dumping into the Anacostia River and how to prevent it in the future. Ultimately the team wanted to conduct thorough research, gather relevant data, and provide the Anacostia Riverkeeper with different policy alternatives that they could advocate for the D.C. government to implement, or that they could work with community stakeholders to help to implement.
Literature Review

Why Illegal Tire Dumping is a Problem

While tires are a part of everyday life for most people in the United States, they can also pose many dangers to the environment, and even to humans. A tire on any passenger car can travel thousands of miles and seem unaffected by harsh road conditions. However, throughout its lifetime, tires will lose about 30% of their tread, and what is lost are the additives, synthetic rubbers, and oil that go into producing it. These will then enter the environment and pollute waterways and ecosystems (Rosane, 2022).

Tires contain additives and chemicals to make them durable and light-weight on the road. They are usually made up of a blend of styrene butadiene rubber (SBR), polybutadiene (PBD), natural rubber compounded with carbon black or silica (as a reinforcing agent/filler), oils (as softeners and extenders), and vulcanising chemicals (Wik et al., 2008). Although necessary, these materials, fillers, and softeners are lost when the tire loses its tread.

In a study conducted in Switzerland in 2022, researchers found that tire particles are a large source of microplastics released into the environment. These microplastics contain chemical compounds that can be harmful to fish when released into water bodies. One compound the study focused on was 6PPD-quinone (6 p-phenylenediamine), which is an antioxidant commonly used in tire industries and has been linked to fish deaths in Seattle (Perroud, 2022). 6PPD is added to tires to prevent them from deteriorating (Raphael, 2022). A study in Washington State found that salmon in the Pacific Northwest would act strangely when swimming through streams in order to spawn (Raphael, 2022). The salmon were disoriented; they were swimming sideways and into creek beds, before dying hours later. The study found that the cause of the strange behavior and deaths was due to 6PPD. While this study focused on salmon in the Pacific Northwest, NOAA research has shown that 6PPD can harm other species of fish including trout (Raphael, 2022).

In a study done by Oregon State University in 2017, researchers exposed estuary and freshwater ecosystems to tire microparticles and nanoparticles and their chemicals that leach from the worn down tires. For estuary organisms, they used Inland Silverside and mysid shrimp and found that the tire particles altered the animals’ swimming behavior as well as limited their growth. They also concluded that the leached chemicals impacted the species’ behavior. For freshwater organisms, the researchers studied a type of Zebrafish as well as a crustacean and found that the tire particles and the leached chemicals could have a deadly effect on these species and cause developmental problems. Furthermore, they found that the leached chemicals were even more toxic when the organisms were exposed to both the leached chemicals and nanoparticles at the same time (Rosane, 2022). While this is a specific study done in another region, it emphasizes the dangers that worn tires can cause on ecosystems and highlights how every species can be impacted. While much of the toxins from tires enter the river from roadways, tires in rivers expelling pollutants is just as harmful.

Tires can take between 50-80 years to decompose (Metro Recycling, 2019). Sometimes, although unfavorable, tires can end up in landfills. Unwanted tires are unsuitable for landfills and will rise to the surface of them due to being less dense than other trash (Former EPA employee,
2023). This causes the surface cover of a landfill to be damaged, which can cause trash to escape the landfill and cause litter in places surrounding the landfill. Currently, 38 states ban whole tires from landfills due to this (Environmental Protection Agency, 2016). Because tires cannot be easily disposed of in landfills, dumping often occurs. Dumped tires can also create breeding grounds for rodents and mosquitoes due to rain water becoming trapped in the tires and causing standing water (Environmental Protection Agency, 2016). Additionally, once the tires continue to break down in the water, they can continue to leach toxins, posing more of a danger to habitats.

Why Illegal Dumping Exists

There are several reasons why illegal dumping occurs, but studies on the causes are limited. Experts generally agree that the fundamental cause of illegal dumping is our political, economic, and social principles that place little or no “intrinsic value” on efficient waste management systems (Fujikura, 2011). Urbanization, rising population, technological innovation, and high consumer expectations all lead to an increase in waste generation that exceeds waste management capacity. Tire production and disposal are no exception. Since 2013, the total percentage of managed scrap tires in the United States has been progressively falling. In 2013, 3.8 million tons of scrap tires were generated, and almost all of them handled through market, landfill, and other methods. However, by 2021, scrap tire generation had climbed to 5 million tons, with just 86% managed, with passenger tire replacement accounting for around 70–74% of that generation (U.S. Tire Manufacturers Association, 2013, 2017, 2019, 2021). This suggests that rapidly increasing tire manufacturing generates more waste tires, yet dealing with this growing volume of redundant waste tires is becoming much challenging. When dealing with illegal dumping, most literature reviews associate it with waste management inefficiency. This mostly focuses on economic and social aspects, namely the relationship between waste disposal fees and environmental justice issues with illegal dumping.

Disposal Fee Increase

For many years, the District of Columbia has been criticized for not having an efficient system to handle its waste. A major contributing factor is that the Department of Public Works (DPW) has never adequately invested in its solid waste processings, operations, related expenses, and data disclosures prior to 2017 and 2018. The city has two large solid waste transfer stations, which are run by DPW: Fort Totten and Benning Road. Private and public haulers pick up and dump solid trash at transfer stations, mostly at those two sites since their tipping fee (disposal fee) was previously lower. Because the city lacks landfills and recycling facilities, solid waste is transported to various facility locations (Dil, 2020).

The District of Columbia's solid waste is distributed to a total of 68 destination facilities, of which 37 are in the state of Maryland, 16 are in the state of Virginia, 10 are in multiple or other states, and only 5 are in D.C. MD and VA locations cover 78% of those disposal destinations (D.C. Department of Public Works, 2018). The District nearly entirely covers the costs of solid waste disposal, including truck weighing, waste management, storage facility maintenance, labor, putting solid waste into tractors to transport them to various facilities, and paying the expense to burn those wastes in Lorton, Virginia. Between 2010 and 2019, the DPW's
tipping fee for private haulers was around $50 per ton solid waste; however, they raised the rate to $60.62 per ton in 2019 (Dil, 2020). When it comes to solid waste, particularly scrap tires, three primary factors have a significant impact on the tire disposal fee: Market/recycling, landfill/incineration and transportation.

**Market/Recycling**

DPW takes recyclable waste in D.C. and delivers it to the Fort Totten or Benning Road transfer stations, where it is processed for transmission to the material recovery facility (MRF) in Elkridge, MD. In the MRF, recyclables are categorized and bundled into piles before being sold into the market for future production. The MRF in Manassas, VA is a second location for recycling from the District of Columbia. Recycling scrap tires and creating additional end-use markets in the United States contributed to the reduction of waste tires. According to the EPA, illegal or discarded stockpiled tires in the United States have decreased from 1 billion in 1990 to around 50 million in 2021. In the same year (2021), less than one million stockpiled tires remained in the District of Columbia. This favorable outcome is due to the country's successful growth of the scrap tire recycling sector and cleaning of stockpile areas (Kleine, 2022; U.S. Tire Manufacturers Association, 2021).

From 2017 to 2021, tire recycling accounted for more than 70% of total scrap tire generation. Tire-Derived Fuel (TDF) makes up for 32-39% of the scrap tire market, whereas Ground Rubber holds for 24-32%. However, due to a lack of new markets or advancement in existing markets for waste tires, overall market use of scrap tires has steadily declined from 96% in 2013 to 71% in 2021 (U.S. Tire Manufacturers Association, 2019, 2021). Before 2018, the United States exported a substantial proportion of recyclables to other nations, particularly China. Nevertheless, China, the world's largest waste importer, banned a variety of recyclables, including scrap tires, at the end of 2017. This reduction in international demand for recyclables led the domestic supply of recyclables to surge. Contamination has become a concern as a result of the substantial growth in domestic recyclables. To address these concerns, MRFs were required to restructure and tighten their inspection for waste loads, which slowed down processing and eventually lowered capacity and elevated the region's recycling operating costs (Zero Waste DC, 2019).

Tire recycling is a demanding and expensive process. Tires are constructed of fiber and steel elements hardened within a range of different types of rubber admixture and other proprietary materials. High-capacity shredders, granulators and crackers mills, plus cryogenic and separation machinery with significant capital investments are used to break down tires (Marshalaba, 2002).

**Landfill/Incineration**

When there are no viable markets within a reasonable location, or when scrap tires do not pass recycling inspection, they are either incinerated, landfilled, or mono-filled. The majority of D.C.'s trash is carried to Covanta, one of the nation's largest incinerators, in Lorton, VA. The remainder is distributed into several southeastern Virginia landfills. All of the toxic incinerated ashes from the solid waste are dumped in the I-95 Landfill, which is located directly behind Covanta (Ewall, 2014). The Northeastern landfill tipping fee for Municipal Solid Waste (MSW)
increased from $58.20 to $69.94 between 2016 and 2021. This is one of the most constantly increasing top landfill tipping fees in the nation. States with active MSW waste-to-energy (WTE) facilities have the highest landfill tipping fees (Environmental Research and Education Foundation, 2017-2020; Tiseo, 2023). Typically, this sort of system is utilized for waste management in Europe, Japan, and South Korea, where space is limited, or as part of the waste management in big cities (Wu, 2018). The state of Virginia is the only one in the Washington Metropolitan Area that takes whole tires to landfill. Tires that are not shredded take a great deal of space in the landfill. Between 1990 and 2018, the number of landfills decreased from 6000 to 1269 (Tiseo, 2023) Yet, the amount of scrap tires landfilled in the United States has climbed from 328 thousand tons in 2013 to 733 thousand tons in 2021.

Tires pose unique problems in landfills that differentiate them from other forms of bulk waste. The most serious of these issues is the tendency of tires to “float” up through other waste and the soil caps of landfills and eventually come out of the surface (Brown et al., 2001). This “floating” is caused by the relative weight and buoyancy of tires compared to soil (Former EPA employee, 2023). Floating tires can do serious damage within landfills by breaking cell walls. Further, the floating issue can create a bog like condition on the top of a landfill. Tires can be shredded and used as cell barriers to avoid this issue (Former EPA employee, 2023). Tires can also leach potentially toxic materials once they are in a landfill, meaning that they can contribute to environmental damage around landfills if the landfill is not properly sealed (Brown et al., 2001).

Transportation

Transporting scrap tires from one site to another is an expensive process and the waste industry is heavily labor-intensive. Although waste tires can be transported by rail, rail owners do not consider it a profitable business, hence the industry greatly depends on truck transportation. As a result, experts noted that rising transportation costs from transfer stations to landfills, as well as a continual shortage of labor, particularly commercially licensed drivers, are pushing the tire disposal fee even higher (Karidis, 2019). Finding commercially licensed drivers is an ongoing struggle in the industry. In 2021, 80,000 truck drivers were needed, and this number is expected to rise to 160,000 by 2030. The annual median salary of truckload drivers in the United States was $69,687 in 2021, up 18% from the 2019 study (American Trucking Association, 2021–2022). Besides, trucks fueled by diesel, which is impacted by the price of diesel fuel, which in turn affects transportation costs. Diesel fuel price per gallon was $3.17 in 2018 and $4.98 in 2022, representing a 57% increase over the last five years (U.S. Energy Information Administration, 2023).

The Impact of Increased Tire Disposal Fees on Illegal Tire Dumping in the District of Columbia

The majority of consumers in the United States buy and replace their tires through dealers. As a result, the obligation for scrap tires mostly falls on the dealers and auto shops. According to the U.S. Department of Transportation (2016), about 80% of scrap tires are handled by retail tire vendors, with the other 20% handled by auto dismantlers.

Despite the fact that some of the Washington Metropolitan area's disposal facilities have stopped accepting waste tires from commercial businesses, the majority of the cases of illegal
waste tire dumping are done by small tire retailers, auto body shops, and unlicensed haulers. To combat illicit dumping, D.C. launched the "Dump Busters" environmental enforcement program in 2016. According to Master Patrol Officer Underwood (Metropolitan Police Department Environmental Crimes Unit), small tire retailers typically use unlicensed haulers known as "fly-by-night tire disposal teams" to dispose of their tires. This is because such retailers pay them a far lower cost than the legal disposal fee (Schick, 2019; Tuss, 2022). As a result, those unauthorized carriers take no responsibility for properly disposing of the tires and instead illegally dump them in the most remote areas. The Anacostia River region is a common target for unlicensed haulers to dump their collected waste tires, especially in its parks and recreation areas, which feature large open spaces near highway shoulders that are not connected to any neighborhood but have multiple entry points for trucks to drive and park in so they can dump multiple tires at once without being detected. It is uncertain if cameras were installed in such locations. Since its establishment, the Dump Busters have arrested 197 individuals responsible for illicit dumping by the end of 2019, and they monitor 20 different areas across the city, mainly in Ward 7 and 8, which are the most marginalized communities in the capital city (Schick, 2019).

Environmental Justice

According to Anacostia Riverkeeper clean-up data from 2018 to 2022, the preponderance of illegally disposed tires were collected in Ward 7 and 8 of the District of Columbia alongside the Anacostia River. Pope Branch Park (located in Ward 7) in particular has been the site of the bulk of illegal tire dumping found throughout the previous five years' clean-ups (Anacostia Riverkeeper, 2023). Wards 7 and 8 are the most economically disadvantaged neighborhoods, with low incomes in comparison to the other six wards, which are indisputably economically affluent. Wards 7 and 8 have per capita incomes ranging from $26,634 to $30,298; this is 2-4 times lower than the income of the other six wards' communities. African Americans or people of black ethnicity are the majority (87-89%), and non-degree holders are the highest in those wards (13%), as are poverty levels (below) in those wards (26%-30%) (U.S. Census Bureau, 2021).

Why are Illegal Tire Dumpers Specifically Targeting Wards 7 and 8

Because they are the most overlooked communities in the District, there are many environmental justice elements such as political underrepresentation, a larger proportion of minorities, people of color, and a lower level of income and education, all of which draws illegal dumping. Disadvantaged localities often have higher incidences of criminal activities, which often leads to law enforcement personnel giving illegal waste dumping a low priority (Environmental Protection Agency, 1998). During 2019 and 2021, the Metropolitan Police Department (MPD) of the District of Columbia's district 6 (ward 7) had 874–900 violent crime cases, and district 7 (ward 8) had 668–800, which was 2–3 times greater than other wards of the city (D.C. Metropolitan Police Department, 2020–2021). The majority of Ward 7 and 8 territory is on the capital city's southeast boundary, and those border areas have greater rates of illegal dumping due to a lack of police intervention. Moreover, illegal dumping becomes abundant in neighborhoods with a large population of renters because renters usually have less power and influence over the community’s waste-related issues. The southeast section of the city has the
greatest renter occupancy rate. Ward 8 had the highest percentage of renter occupied (76%) by 2021 (Environmental Protection Agency, 1998; U.S. Census Bureau, 2021).

Dumpers frequently illegally dump their waste in the areas near solid waste transfer stations. This is because waste transfer stations improve the efficiency of the solid waste collection process, lowering total transportation and fuel costs, travel time, and disposal expenses (Environmental Protection Agency, 2001). Dumpers who are unconcerned about others take advantage of this opportunity exclusively for their personal benefit, dumping their waste illegally near the solid waste transfer stations to simply avoid disposal fees, or when they discover that the site is closed, or simply when their wastes are not accepted by the facilities (Environmental Protection Agency, 1998). Fort Totten and Benning Road are the District of Columbia's two solid waste transfer stations. The Fort Totten station is now being renovated, and the majority of the operation has been transferred to the Benning Road station. Their operating hours are extremely restricted, and only commercially licensed haulers are able to dump off trash. Ward 7 is home to the Benning Road station, whereas Ward 5 is home to Fort Totten. The presence of waste transfer sites can cause a variety of discomfiting problems in the surrounding areas, such as increased noise, traffic, odor, rodents, and litter. Trash and rubbish may quickly create litter in and around the stations. Litter and previously existing illegally dumped items invite more illegal dumping, including scrap tires (Environmental Protection Agency 1998, 2001).

Laws and Regulation of the D.C. to Address Illegal Tire Dumping

The laws and regulations of the District of Columbia regarding tire pollution are not sophisticated, in-depth, or well-crafted. First, there are many key points that D.C tire dealer regulations have not clearly defined the waste tire disposal parties. To begin, there are three major players in the waste tire disposal process: the waste tire dealer (generator), the waste tire hauler, and the waste facility. If there is no economic value to the tires, they (tires) must be transported to a waste facility when they are disposed of at a tire dealer's location. Title 17, Section 899 of the D.C. Municipal Regulation (Definition), does not make a distinction between any of these disposal parties. Additionally, it only identifies the generator (tire dealer) and states nothing about the other two parties, especially the waste hauler.

Title 17 section 804 of the D.C. Municipal Regulation (Tire Dealer's Recordkeeping) requires tire dealers to keep a daily record of the source, type, and average number of waste tires collected and accumulated on the premises. And Title 17 section 803 (Tire Dealer’s Disposal of Waste Tires) requires licensed tire dealers to enter into a "contractual arrangement" with waste tire haulers. Nevertheless, the law fails to define the function and responsibilities of the waste tire hauler, as well as how the recording and contractual method should work amongst the three primary waste tire disposal parties. Dumping solid waste without authorization is prohibited by D.C. Code 8-902, and is punishable by a criminal record and a fine of up to $10,000 ($5,000 for a first offense). If someone deliberately illegally dispose for commercial purposes, they may be subject to a fine of up to $40,000 per incident, a 5-year imprisonment punishment, or both. See Appendix A for more relevant statutes.
Methodology

This section bridges the gap between the literature review (existing evidence) and the evidence needed to answer research core questions.

Data Collection

The research was conducted using three main data collection methods: observation, semi-structured interviews, and secondary research.

Observation

The research team participated in two clean-up events hosted by the Anacostia Riverkeeper: Burnt Mills East Special Park and Anacostia Park. The clean-up events are entirely volunteer-driven. The number of volunteer participants and illegally disposed waste tires collected at each event fluctuates. The park to be cleaned is selected depending on factors such as metro accessibility, volunteer accommodation requirements, the urgency of the park's need, and sponsor or grant availability. There are several non-profit organizations that organize clean-ups along the Anacostia River, and each keeps their own trash collection statistics, but not all of them capture data on illegally dumped waste tires.

Despite the fact that Anacostia Riverkeepers began sorting and documenting their collected trash from clean-ups in 2015, it is not until 2018 that they begin actively and consistently tracking tire counts. Anacostia Riverkeeper has worked diligently over the previous 5 years to improve their collected waste data tracking, which includes tires. The research team learned through the Burnt Mills East Special Park and Anacostia Park clean-ups that the U.S. Department of Transportation (DOT)\(^1\) Tire Identification Number (TIN)\(^2\) is visible and legible on discarded tires unless they are substantially damaged.

Semi-Structured Interviews

The research team sought 29 professionals from various sectors with the potential to supply valuable information on illicit waste tire disposal. These experts are employed in the environmental, enforcement, inspection, non-profit, private sector, government, research, and engineering fields. 13 of the 29 contacts provided no response, 3 declined the interview invitation, 1 contact information was incorrect, and 12 interviews were successfully conducted. The list of interviewees is shown in Appendix C Table 1.

Depending on the expert's discipline, the questions shifted and fluctuated. However, the following 5 types of questions were asked of most interviewees:

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\(^1\) The DOT marks signify that the tire manufacturer satisfied the U.S. Department of Transportation tire safety requirement (Cooper Tires, n.d).

\(^2\) The TIN code contains information about the tire such as the plant code, tire size, brand code, manufacture week, and year (Cooper Tires, n.d).
• What is the extent of tire pollution in the Anacostia region? What is the impact of tire pollution on water quality?
• Who is mostly committing these illegal acts? When waste tires are dumped illegally along the Anacostia River, what is the primary method to detect them?
• What are the most significant barriers to resolving or combating illegal waste tire disposal along the Anacostia River?
• What is the community's engagement and attitude toward reducing tire pollution from the Anacostia River? How much have prior studies done on impoverished communities willing to assist the river's well-being?
• What policy should be advised to reduce tire pollution in D.C. in order to enhance the water quality in the Anacostia?

Secondary Research

The data collection processes utilized a considerable amount of secondary research materials obtained through a variety of avenues. Local news reports, for example, were extremely beneficial for learning about illegal tire disposal incidents in Washington, D.C. and neighboring states. Furthermore, the research required delving into statutes, rules, and regulations in order to comprehend the legality. Government reports and statistics were also essential sources of information.

Figure 1: The map displays the locations where the research team (Capstone), Anacostia Riverkeeper (volunteers) and residents have reported tires being found along the watershed.
**Mapping Tire Pollution**

The map in Figure 1 shows the data that was collected from different stakeholders, as well as the team’s own findings, of where the tires are located along the Anacostia River. The development of the map gave key insight into where the main dumping sights are, and where this issue is most concentrated to help develop proper policy alternatives. It also gave insight into any possible trends in tire dumping, but none could be drawn for certain. Anacostia Riverkeeper provided cleanup data dating back to 2012, although the tracking of tires only began in 2015. All bulk litter was measured in weight, not count, so in order to create the map divided each weight by the average weight of a tire, which is 18 pounds. This provided the majority of what was known to the team about how vast the tire pollution problem is in the Anacostia River. Cleanup data was also received from two concerned citizens, Kent and Kelly Fothergill who since moving to Bladensburg three years ago, have gone out and collected trash, and more specifically tires, on their personal kayaks, once per week, regardless of weather and circumstances. Kent and Kelly’s data was also predominantly collected in the Northwest Branch section of the watershed, while the Anacostia Riverkeeper data spans the entirety of the watershed (See Appendix B).

**Limitations**

In the District of Columbia, waste tire data is extremely opaque. Each government department and non-profit organization (if they conduct waste tire recording) retains their own separate and confidential records. The quantity of tires collected varies depending on volunteer numbers, geographical coverage of clean-ups, and the number of clean-up activities held each year. Overall it was difficult to determine exactly how many tires remain in the Anacostia River, and how severe the problem really is. Volunteers for clean ups have remained about the same while the amount of tires has risen, which suggests that there is a rise in tire pollution. This data also did not include the one instance of over 1000 tires being dumped at once in the Southeast portion of Anacostia park in 2019 (Fenston, 2018). This suggests further limitations to quantifying exactly how many tires there are as those not cleaned up by volunteers.

**Data Analysis**

A five-step approach was developed to analyze the received data collection for potential alternative policy options, as indicated in Figure 2.

<table>
<thead>
<tr>
<th>Step 1: The literary review found challenges and discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary research and observation were used to collect data on the broad frame of the issue</td>
</tr>
<tr>
<td>Step 2: Narrowed down by applicability to D.C. and the Anacostia River area</td>
</tr>
<tr>
<td>Data gathering was confined down to be particular to D.C. and the Anacostia River from the overall themes of illegal waste tire dumping</td>
</tr>
<tr>
<td>Step 3: Merge the applicability with the themes from the interviews to create sub-categories</td>
</tr>
<tr>
<td>Subcategories were formed based on recurring topics in the interviews regarding D.C. and Anacostia theme</td>
</tr>
</tbody>
</table>
Step 4: Integrate responses to form a master category

Outliers were also carefully studied in order to better comprehend the unique responses of each interview participant and potentially reveal any critical concerns that were overlooked in the previous stages. Based on these responses, subcategories are consolidated to create a master list of barriers to investigate for the alternative policy options.

Step 5: Choose the top four from the category for further exploration

The number of responses to each category list is tallied. Based on these results, the top four most often appearing concepts were chosen for further exploration as policy options. Furthermore, in order to thoroughly investigate the multifaceted policy alternatives, the Status Quo policy option is automatically added.

Findings

This part will go through the findings of the analysis according to the methodology. Following the categorization of interview replies, the four most important policy choices were chosen and are discussed in detail below. The results are depicted in Figure 3.

![Figure 3: Policy Options needed to Mitigate Tire Pollution in the D.C.](image)

Criteria to Evaluate Each Policy Alternative

From the information collected in the methodology section, the team proposed five policy alternatives for mitigation of tire pollution in Washington D.C.: Status Quo, D.C. Government Action Plan, Tire Education Program, Extended Producer Responsibility, and Tracking System. This section outlines the policy analysis criteria used to evaluate policy options applying the Weighted Scoring Model (WSM), as illustrated in Figure 3. The criteria were determined exclusively on the basis of the data analysis and findings. This analysis is conducted by analyzing the policy alternatives and assigning a ranking to them by assessing each criteria and its factors. Once all the policy alternatives have been ranked, they are put in the matrix, where the weighting...
specific to each criteria is scored. Then, the completed table will provide a picture of which policy alternative scores highest based on the weighting and criteria. This matrix is a tool to help guide a policy recommendation.

**Weighting Criteria**

The research team chose sustainability, cost minimization, effectiveness, and political feasibility and legality criteria for evaluating policy options.

**Sustainability (15%)**

This criterion measures the policy alternative's capacity to be sustained for 5 years or more. The criteria include (1) the policy necessity for continued consistent staff and (2) reliance on funding that is not assured renewal each year. It takes a long period of time for these types of policies to be adopted and implemented, which means D.C. needs long-term policy options to reduce tire pollution. The durability of a policy is directly determined by politics and its attitude toward the policy. As a result, the proportion is split evenly between sustainability and political feasibility.

**Cost Minimization (40%)**

This criterion assesses a policy option's ability to reduce D.C.'s tire pollution at a lower cost while not exceeding the city's current budget constraint. It is measured by asking what additional costs will be needed to implement and maintain the alternative. The cost reduction criteria is weighted 40% since, according to the data (Figure 3), 4 replies of the 12 interviews were connected to financial requirement (funding necessity), accounting for 33%. As a result, cost control or minimization is crucial for D.C.'s budget efficiency. For the 100% reason, 33% was rounded up to 40% since it was the most relevant theme throughout the interviews.

**Effectiveness (30%)**

This criteria measures the likelihood of a policy option reducing illegal waste tire disposal in the District of Columbia, specifically in the Anacostia River. Measured by asking (1) how close to the root of the issue does this policy address and (2) does it address the Environmental Justice (EJ) concerns in the Anacostia watershed? Environmental Justice is included in this criterion because if the policy has a high potential to prevent illegal waste tire disposal around the city, the positive results will benefit all diverse communities as well as Anacostia's well-being.

The criteria is weighted 30%. According to the statistics (Figure 3), tracking/recording and enforcement/surveillance received altogether 4 responses (33%). This means that the district requires an effective mechanism to decrease such criminal activities. Because neither tracking/recording nor enforcement/surveillance received more responses than funding necessity, the effectiveness criterion was reduced to 30%.
Political Feasibility and Legality (15%)  

The District of Columbia is the capital city, which is strongly influenced by politics. The legality is critical to any policy’s implementation. This criteria is measured by (1) how likely the alternative will be accepted and adopted into law and (2) are there any legal barriers to implementing the alternative. The criterion also assesses the possibility of a policy alternative being approved and accepted by the D.C. administration and decision makers.

Scoring Criteria

Each policy alternative scores each criterion on a scale of 1–5, with 1 as low, 2 as medium-low, 3 as medium, 4 as medium-high, and 5 as high. Because the research analysis is more qualitative, the rating (1–5) scale is adopted. To avoid bias or decision-making impacts from externalities, the research team discussed and voted on each policy alternative.

Policy Alternative Options and Criteria Analysis

Policy Alternatives

Alternative 1: Status Quo

No policy action will be taken. Efforts against illegal tire pollution will rely on policies currently in place in the District of Columbia. The issue will remain as is.

Alternative 2: D.C. Government Action Plan

A tire fund will be established from new and used tire sales to provide better efficiency towards cleanups and allow for stricter enforcement to increase deterrence for repeat tire dumpers. It will additionally allow for a task force to be composed to help monitor areas of high dumping as well as provide drop-off areas where residents can dispose of tires free of charge in a more effective manner.

Alternative 3: Extended Producer Responsibility

Tire producers who sell tires in the District of Columbia will be tasked with the burden of disposing of tires through a producer responsibility organization (PRO). The PRO will be charged with collecting tires at the end of use and disposing of them, with activities funded by a $3 fee levied on purchases of new tires.
Alternative 4: Tire Education Campaign

A tire education campaign will be implemented that will function as an accreditation system where retailers attend training and are given resources to learn about how to sell tires without endangering human or ecological help. There will also be outreach to consumers to ensure they are aware of the certification system, and shop from certified retailers.

Alternative 5: Tracking System

The District of Columbia's waste tire tracking and monitoring process is simple and poorly implemented. The city's municipal regulations are vague about the roles and responsibilities of tire dealers, waste haulers, and solid waste facilities. The tire management program is critically lacking. When tires are discarded along the Anacostia River, the neighborhood is entirely responsible for informing the authorities. The Tracking System is designed to track the flow and movement of used/waste tires between generators, haulers, and facilities.

Alternative 1: Status Quo

This policy option allows current actions against tire pollution in D.C. and Maryland to remain as is. No new policy action will be taken to help reduce illegal tire dumping and there will be no changes to how tire pollution is currently handled by different enforcement entities such as local, state, and federal governments.

This policy option relies on policies currently in place to prevent tire pollution. Currently in D.C. and Maryland, where the Anacostia River runs through, tire dumping is illegal. However, this does little to prevent current tire dumping to the river. Current D.C. laws state that anyone guilty of solid waste dumping, which includes tires, can receive a misdemeanor, felony, or a fine between $5000 – $40,000 (see Appendix A). Companies within D.C. that sell tires must maintain a license with the D.C. government to sell tires, as well as maintain a contract with a tire hauler that will bring their unwanted tires to a tire disposal facility. The D.C. Department of Energy and Environment (DOEE) has a system where they monitor D.C. tire shops’ logs of how many tires they have at one time and how many tires they send to a hauler. This system does not account for tires that are not on D.C. tire shop records.

Current Maryland laws state that anyone guilty of illegal dumping can face 30 days to 5 years in prison and pay fines of up to $30,000 (MD Department of Environment). Maryland has an 80 cent recycling fee charged whenever a tire is purchased in the state. This fee goes toward the Maryland Department of the Environment’s Scrap Tire Program. This program works to clean up dumped tires and properly dispose of them (MD Department of Environment). Additionally in Maryland, if a motor vehicle is used to break illegal dumping laws that are in place, there can be two to three points added onto a Maryland license. This not only increases insurance rates based on the number of points you have, but also requires traffic school attendance with five points on a license, and a suspended license with more than eight points (Maryland General Assembly, 2023).

Federally, tires are currently unregulated. The Environmental Protection Agency (EPA) disinvested in their tire program in 2014 and has not been involved with efforts to reduce illegal
tire dumping since. In an interview with a former Environmental Protection Agency (EPA) employee and member of the Scrap Tire Workgroup, he shared his experiences with tire pollution regulations at the EPA. The former employee helped lead a workgroup that explored options to increase scrap tire recycling. This workgroup had anywhere between 125–180 members between 2000 and 2014. This workgroup ended in 2014 when the EPA made the decision to disinvest in their tire programs and give greater responsibility to state and local governments for reducing tire pollution (Former EPA Employee, personal communication, March 29, 2023).

Enforcement of illegal tire dumping is difficult. It is near impossible to pinpoint individuals who are illegally dumping tires. In an interview with a member of the Ward 8 Woods Conservancy, they shared with the team that D.C. Police Department (PD) has cameras in common dumping locations around the Anacostia Watershed (Ward 8 Woods Employee, personal communication, March 8, 2023). The D.C. PD visits these common dumping locations and when there is new trash found, they watch the cameras and attempt to identify the dumper. However, the camera batteries frequently die, are easy to vandalize, and it can be difficult to identify someone based solely on camera footage. Additionally, officers within the Environmental Crimes Unit of D.C. PD will respond to crimes that take precedence over environmental crimes, which leaves the dumping areas left without supervision. According to an interview provided by two officers from D.C. PD, the primary way they are informed of illegal tire dumping is through community calls or notifications. Around 50% of their information regarding recent tire dumping originates from members of the community notifying them (DCPD, personal communication, March 31, 2023).

Currently, there are limited options for people looking to dispose of tires in D.C. There is one open tire facility in Washington D.C., which is located on Benning Road. This facility is available for individuals and companies to bring tires they wish to dispose of. This facility has limited hours and a limited number of tires one can bring. Another option for an individual to dispose of an unwanted tire is to bring the tire to a tire dealership. Tire dealerships around D.C. will take unwanted tires for $3 – $5 per tire.

**Projected Outcomes**

*Sustainability: Low*

Sustainability of maintaining the status quo will score low. There is currently a tire pollution and illegal tire dumping issue in the Anacostia Watershed. Maintaining the status quo would not implement a program that works to reduce tire dumping; it would rely on current policies already in place. It would be unsustainable to not implement a policy action, as tire pollution is an issue and should be addressed. The sustainability of this option is low because the issue will remain exactly the same.

*Cost Minimization: Medium*

The status quo policy option scores a medium for the cost minimization criteria. There will be no cost to maintain policies currently in place and no further costs will be needed to advocate for new policies to be written. However, the status quo option scores a medium because
the cost of cleanups throughout the Anacostia Watershed must be accounted for. Time given by local residents, cleanup volunteers, environmental groups, and Anacostia Riverkeeper employees is highly important to reducing tire pollution. Additionally, it is costly to pay hauler fees every time dumped tires are found. Hauler fees create a cost burden to the community.

**Effectiveness:** Low

The status quo policy option scores a low because it will not create any new efforts aimed to reduce tire dumping. Current enforcement efforts will remain as is. The effectiveness of this policy option is based on the fact that tire dumping to the Anacostia River has grown within recent years based on data provided by Anacostia Riverkeeper. As tire dumping increases, the status quo option will have less of an impact.

**Political Feasibility and Legality:** Medium-High

This policy option ranks medium-high for political feasibility and legality. Policies and enforcement efforts remaining the same will not cause any political or legal restraints because efforts can continue as normal. This option scores a medium-high rather than a high because of potential advocacy efforts to reduce tire pollution. If advocacy efforts to lower tire dumping began, political feasibility could be altered. If public concern for tire pollution rose, it would be more difficult for government agencies and elected officials to maintain the status quo for the issue. They would face pressure to implement new efforts to reduce tire dumping.

**Alternative 2: D.C. Government Action Plan**

Scrap tire management is conducted on the state level; around 48 states currently have laws or regulations that focus on scrap tires (Environmental Protection Agency, 2016). Each state’s program is unique, yet many common themes include funding via taxes or fees on automobiles or tires and tire pile cleanup (Environmental Protection Agency, 2016). Many programs have tire fees, which range from $0.50–$2, and about 35 states collect tire fees (Former EPA Employee, personal communication, March 29, 2023). These fees help fund programs that “local communities establish market programs, create licensing/enforcement systems, and host tire collection programs/amnesty events. States and municipalities may also use money generated by scrap tire fees to offer grants or loans to scrap tire processors and end users of tire-derived materials” (Former EPA Employee, personal communication, March 29, 2023). Many states have had a tire management program since the 90s. Washington D.C. does not have a levy fee on used tires. Tire management programs are able to be amended to address the unique concerns of scrap tire dumping/waste in each state (Former EPA Employee, personal communication, March 29, 2023). These programs are well-established and have been successful in removing waste tires from the environment.
Case Studies

Since 48 states have some version of a tire management fund, there were a lot of potential case studies to choose from. This team focused on Maryland and Illinois. Maryland was chosen because of its proximity to D.C. and the Anacostia River. Illinois was chosen because of the similarities between Chicago and Washington D.C., and the program has funding allocated similarly to the goals of the policy, based on the research.

**Illinois: Used Tire Management Fund**

Illinois has a robust tire management program enacted in 1992 (Used Tire Management Fund, 1992). The funding of the program comes from a $2.50 fee at the point of retail sale, which applied to new and used tires (Used Tire Management Fund, 1992). The fund is allocated in various different state agencies, 38% goes to the IL EPA for the “prevention and removal of scrap tires” (Used Tire Management Fund, 1992). Which includes “performance of inspection and enforcement activities for used and waste tire sites, To provide financial assistance…for the performance of inspecting, investigating and enforcement activities, To provide financial assistance for used and waste tire collection projects sponsored by local government or not-for-profit corporations”(Used Tire Management Fund, 1992). Then, “23% goes to Dept. of Commerce & Community Affairs for grants and loans to local gov. or private agencies to collect and process used & waste tires” (Used Tire Management Fund, 1992). The remaining is split up by “25% goes to Ill. Dept. of Public Health to prevent scrap tire waste disease. 2% goes to Dept. of Agriculture, 2% goes to Pollution control Board, 10% goes to Dept. of Natural Resources” (Used Tire Management Fund, 1992).

Each fiscal year a Tire Management Program is evaluated for its effectiveness. In the 2021 report it highlighted 3,500 used/waste tire inspection activities, 78 used tire collection events were conducted by local governments, which resulted in the removal and proper disposal, reuse, or recycling of more than 3,849 tons of used and waste tires (Kim, 2021).

As of 2014 Illinois is creating new rules for used tire management. They are working to implement new permitting requirements for large used tire storage and processing facilities as well as establishing a market development program to strengthen and diversify used tire markets (Used Tire Facts (Illinois), 2022).

**Maryland: Used Tire Cleanup and Recycling Fund**

Maryland also has a comprehensive tire management fund. It was also created in 1992, the fee applies to new sale tires and has fluctuated; it was $1.00 in 1992, it was brought down to $0.50 and brought back up to $0.80 effective April 1, 2005 (Recycling Programs List - St. Mary’s County, MD, n.d.) The fee funds the administration of the scrap tire program, license business and haulers, clean up scrap tire stockpiles, enforce and ensure compliances of scrap tire laws and regulations, implement projects that will reduce, recover and recycle scrap tires (U.S. Tire Manufacturers Association, 2020). It also includes funding for grants for tire removal/cleaning projects (U.S. Tire Manufacturers Association, 2020). It also has had success in removing tires from the environment, for the 1998 annual Scrap Tire Amnesty day the 15 Maryland counties participating in the event collected a total of 1,642.29 tons of scrap tires which was
re-transported and disposed of by the State at a cost of $241,408.25 (Recycling Programs List - St. Mary’s County, MD, n.d).

Mississippi: Enforcement

One successful instance of increased enforcement can be seen through illegal dumping laws in Mississippi. Their illegal dumping laws, dating back to 1994, are some of the more stringent and have been reflective in their dumping complaints and cases. The state raised the penalty on unauthorized dumping and stated that if the pollutant weighs more than 500 pounds, it is a punishable felony with a $500–$50,000 fine, five years in prison, or both. In contrast, dumping material that does not exceed 15 pounds in weight is classified as littering and characterized as a misdemeanor carrying a penalty of $50–$250. Anything weighing 15–500 pounds is also a misdemeanor carrying a fine of $100–$1,000, imprisonment for up to two years, or both. Due to these harsh penalties, the state’s average complaints of reports of illegal dumpings decreased from 1,000–1,500 each year to only 450 complaints after three years. Given this, the same success rate can be applied to this alternative where an increase in enforcement and penalties can subsequently decrease complaints and occurrences of illegal tire dumping (Martin, 1999).

Alternative

The Illinois Used Tire Management fund and the Maryland Used Tire Cleaning and Recycling fund provide solid foundations which were used as examples for this alternative. It would involve the D.C. Council passing a law or promulgating a regulation under D.C.’s current waste management program setting up a fund from a $1.00 fee on each new and used tire sold in the District of Columbia. Both Maryland and Virginia have the fee only on new tires, but there is a significant used tire market in D.C. where additional funding could come from. The $1 fee was chosen because Maryland’s fee is 0.80¢ and VA’s fee was $1, but recently was back down to 0.50¢. Depending on the future of the program, the fee amount could be altered. Maryland’s fee was $1 at its inception, moved down to 0.50¢ and then moved up to 0.80¢ (Recycling Programs List - St. Mary’s County, MD, n.d).

The fee will be collected by new and used tire dealers and sent directly to the fund. 0.10¢ per tire will go back to the dealer. The remaining 0.90¢ will be put into the Tire management fund. The fund breakdown will include 15% to administration, 42.5% to cleanups, and 42.5% to increased enforcement (see Figure 4).

To increase enforcement and consequences of illegal tire dumping, 42.5% of the management fund will be invested in this part of the policy. There will be two aspects of the enforcement: 75% of the funding will be put towards improving the environmental crimes unit of
the District of Columbia Police Department (DCPD) and 25% will be put into staffing previously incarcerated residents to gain the training and ability to carry out a task force capable of monitoring areas, reporting illegal dumpers, and assisting with cleanups and at dump sites so they can become the trained professional able to head the enforcement when DCPD is unable.

The money put towards the environmental crimes unit can prove to be vital in giving them more authority in citing and penalizing individuals who illegally dump tires. According to the DCPD, due to minimal funding, the unit cannot impose large fines because their budget is tight and only allows for a certain amount of money to be given towards penalties, even for substantial crimes such as dumping hundreds of tires. With the increase in funding dedicated to this unit, officers can enforce harsher penalties on those breaking the law and in doing so, will increase deterrence so those individuals will be less likely to be repeat offenders (DCPD, personal interview, March 31, 2023). In order to accomplish this, the funding will adopt the same penalties as D.C. illegal dumping laws. Within this, individuals who are charged with a crime for illegal dumping of tires will be mandated with 200 hours of community service or $5,000 for the first offense, $10,000 for additional offenses, or 90 days in prison (Fenston, 2018). Another enforcement mechanism is directed towards motor vehicles, where if a driver is caught breaking illegal dumping laws (including tires) that are in place, there can be two to three points added onto a D.C. license.

Another aspect of the funding in this alternative will be put towards creating a task force that is primarily staffed through the Mayor's Office for Returning Citizens, Jobs Have Priority, and National Reentry Network. These individuals can oversee dumpsites and monitoring in heavily dumped areas, as well as providing skills for reentering the network, and being in control of their greenspace. This is successfully being executed through organizations such as Friends of Anacostia Park, who have set up a program with residents of Wards 7 and 8 and those previously incarcerated to lead in-park programming, maintain facilities, and welcome people to Anacostia Park (Friends Corps, n.d.). This successful program can be replicated so similar individuals can monitor the area for illegal dumping and alert DCPD of crimes. In doing so, they will be learning valuable skills, contributing to solving the problem of illegal tire dumping, and relieving DCPD of monitoring the area constantly while they may be pulled to other crimes in the area.

The other 42.5% of the policy will be allocated to clean up. Both Maryland and Illinois have a component focused on clean-up. 42.5% of the management fund will be invested in this part of the policy. This allocation will have two main sub-categories, (1) cleanup projects with 75% of the funding and (2) Designated Scrap Tire Drop-Off Days with 25%.

Cleanup projects will be either conducted by the D.C. government or in cooperation with non-profits. Cleanups must be conducted in Wards 7 and 8. This is where a lot of the tire dumping in the Anacostia River Watershed occurs. This mandatory percentage of cleanups in these Wards ensures that the cleanups are happening where they are most needed. Like the IL tire management program, this will help provide financial assistance for used and waste tire collection projects that are sponsored by the D.C. government and not-for-profit corporations, like Ward 8 Woods, Anacostia Riverkeepers, Friends of Anacostia Park, and others (Used Tire Management Fund, 1992). 15% of this funding will go to specific grants for not-for-profit organizations, giving the organizations who are already combating this issue at a grassroots level they can continue to do their work. Cleanups constitute both specific tire dumping sites, like the 1000+ tires found under 295, or planned clean-up days (Domen, 2022).
Both Maryland and Illinois include scrap tire drop off days in their programs. A Scrap-Tire drop-off day will vary by year on how many days can be afforded on earnings from the tire fee. At least half of the drop-off days occur in Wards 7 and 8. This ensures a level of equity for those that face a higher barrier to disposing of tires. A tire drop-off day allows residents to dispose of their tires (5 per resident per drop-off) at no cost to them, funded by the new/used tire fee. This will provide an option to dispose of tires that do not pose harm to the environment and reduce the cost to residents, which will lower the incentive for resident illegal dumping. Instead of residents leaving tires at dealers and paying them a fee, for free they can bring them to a scrap-tire drop-off day.

The final 15% will be allocated to administration. This allocation will be to fund salaries for those individuals in charge of running the program. This includes permanent and temporary clean up staff, supplies needed for projects, and those involved in the bookkeeping of the fund.

Projected Outcomes

Sustainability: High

Sustainability will be high. The policy will have to require staffing to get the program off the ground, and will continue to require staffing to run drop-off days, the Environmental Crimes task force, as well as those to administer projects and grants. However, as long as fees are collected from new/used tire sales, the program will be self-sufficient after one year.

Cost Minimization: Medium-High

Cost minimization will be medium-high. There is an estimated initial start-up cost of $1,000,000. This will help get the program off the ground, hire administrative personnel, and implement drop-off days, clean-ups, and grants. Maryland’s tire program costs ~3.5 million a year, and gained ~3.6 million in 2009 (Maryland Scrap Tire Annual Report, 2010). While there is a lack of data on how many tires are sold each year in D.C. there is data on how many motor vehicles are registered each year, which allows for an estimation on how much the fund will make each year. In 2020 there were 356,537 motor vehicles registered in D.C., and about every 4 years those tires need replacing which with a fee of $1 will bring ~$360,000, into the fund each year (Maryland Scrap Tire Annual Report, 2010). This does not account for tires from vehicles that may not be registered in D.C. but still purchase tires, so this is a low bracket estimate. The fund is set up so that projects can only be done that are covered by the fund. This cost to get the program running will be the only outlying cost, since the fund is estimated to have enough money going in each year to cover the costs.

Effectiveness: Medium-High

Effectiveness in reducing dumped tires in the Anacostia Watershed will be medium-high. Similar tire management funds have been implemented in states such as Illinois, Ohio, and Florida, so this policy, being very similar, can also be equally as effective. With specific considerations for focus on Wards 7 & 8, this alternative takes into account specific environmental justice concerns that may surround the issue of illegal tire dumping. Additionally,
the alternative focuses on enforcement and deterrence, which will be the most important aspects of catching those illegally dumping tires as well as making sure repeat offenses of dumping are minimized.

Political Feasibility and Legality: High

Political and Legal feasibility will be high. Since other programs were implemented in other states, the feasibility of this program to be implemented in D.C. as well as admirable to lawmakers and city officials is likely. Additionally, the enforcement penalties will follow the laws already in place in D.C. for illegal dumping of solid waste, so that aspect will already be attractive to lawmakers seeing as though no new laws need to be created.

Alternative 3: Extended Producer Responsibility

Introduction

The basic concept of Extended Producer Responsibility (EPR) is that the original producer of a product that is in waste should be disposed of by the producer rather than the municipality that the waste was generated in. (OECD, 2016). The impetus behind this theory of waste management is to shift the burden of disposal, which has historically rested with states and municipalities in the United States, back to the producer of that good. This is more commonly implemented in some manufacturing areas as the “polluter-pays” principle but ultimately some costs are transferred to the consumer via higher prices imposed by the producer (OECD, 2016). EPR as a waste disposal approach has good potential and is especially recommended when dealing with materials that impose a health risk to communities, such as batteries, paint, mercury switches, old medicines, and medical sharps such as used needles (Seldman, 2017). However, there has been questioning of the efficacy of EPR models for disposal of waste that, while not outright dangerous to nearby communities, is hard to manage at a local level (Seldman, 2017).

According to the Organisation for Economic Cooperation (OECD), there are four possible policy instruments to achieve EPR, often used together (OECD, 2016). For purposes of this report, these are the possible implementation instruments drawn directly from the OECD’s report that will be considered for this policy alternative:

1. **Product take-back requirements:** Essentially, responsibility is assigned to the producer or retailer to collect and dispose of the waste generated by the product. Of the policy instruments that can be used to implement EPR, take-back requirements are the most direct. Often, a specified pick up location like the point of sale is used as a drop off point for the consumer to return the waste to the producer.

2. **Economic and Market-based instruments:**
   a. Deposit-refund: Similar to a waste management fund, an initial payment is made by the consumer at purchase then partially returned when the waste product is returned.
   b. Advanced Disposal Fee (“ADF”): Also similar to waste management fund, this is a fee levied on the consumer at purchase to be used to finance post-consumer disposal.
c. **Material Taxes**: Tax imposed on the materials needed to create products or on materials that are difficult to recycle to incentivize use of less toxic or recycled materials. According to the OECD, this tax should be set “at a level where the marginal costs of the tax equal the marginal treatment costs.”

d. **Upstream Combination tax/subsidy**: A tax paid by producers that is used to subsidize waste treatment.

3. **Regulations and Performance Standards**: Standards that are imposed by the relevant government requiring new products have a certain minimum of recycled content.

4. **Information-based instruments**: These may support EPR by raising public awareness. Measures may include reporting requirements, labeling of product components, and communicating to consumers product responsibility requirements.

EPR as a policy approach has garnered recent interest but is not yet widespread in the United States as a waste disposal regime (Austin, 2013). Most of the EPR regimes adopted have used the “take-back” requirement model sometimes combined with ADF rather than deposits/refunds (OECD, 2016). While uptake of EPR policies in the European Union has been quick, EPR-based regulations in the United States face potent obstacles such as numerous entry points for industry to block such efforts via lobbying, legal challenges, and legislative gridlock at the federal level (Sachs, 2006). Further, some implementation efforts in the United States have been controlled by industry without public oversight. This has led to cases with poorly aligned incentives because the control of such programs was centered in for-profit entities that may prioritize profits over environmental best practices (Seldman, 2017). Within the EU, member states have established EPR systems for packaging, batteries, end-of-life vehicles, and in some cases tires. However, given that the federal government has seemingly abdicated from regulating in this area, a state level law establishing EPR may be a path forward.

Many EPR strategies involve setting up a producer responsibility organization (“PRO”) that executes EPR obligations on behalf of consumers (OECD, 2016). Usually, PROs are set up as non-profit organizations jointly by the producers to effectively control their implementation. As expanded on below, the District of Columbia relies on a PRO for paint-producers to comply with its laws. According to the OECD, a key point of contention over EPR is cost control (OECD, 2016).

**Recent Cases and Examples**

Aside from Federal efforts at cradle to grave style regulation of toxic materials via RCRA, states have been the most active in implementing EPR policies. For example, California, Maine, and Maryland have all passed laws or considered bills in the last few years. In 2022, California passed a sweeping bill targeting plastic waste from single use containers (National Law Review, 2022). Maine is also in the process of implementing its own EPR legislation for packaging, which will take full effect by the summer of 2025 (Maine Department of Environmental Protection, 2023)

Maryland can offer another model as a nearby state implementing a plastic packaging EPR program. Under legislation passed this year but not yet implemented, each producer must submit a stewardship plan to the Maryland Department of the Environment (MDE) for review and approval. Beginning October 1, 2024, a producer may not sell, offer for sale, distribute, or
import for sale or distribution covered materials or products for use in the State unless the producer has an approved stewardship plan on file with MDE, either individually or as part of a PRO (Quinn, 2023).

The stewardship plans must (1) list the producers and brands covered by the plan, as specified; (2) include performance goals for a minimum post consumer recycled material content rate and a minimum recycling rate for covered materials or products that includes specific minimum goals for post consumer content, recyclability, and reductions in single use plastic, as specified; (3) describe several specific items related to the development of the plan, the implementation of the plan, the attainment of the performance goals, and outreach and education, as specified; and (4) include any other information required by MDE.

Further, the District has already implemented an EPR program for architectural paint. The District’s paint stewardship law requires a stewardship organization representing manufacturers (or individual manufacturers) to submit a plan for the implementation of a paint stewardship program to DOEE for approval. The law lists the required elements of the plan, requiring the PRO to minimize District involvement in the management of postconsumer paint by reducing its generation, promoting its reuse and recycling, and implementing agreements to collect, transport, reuse, recycle, and dispose of postconsumer paint using environmentally sound management practices (D.C. Code Ann. § 8-233.02). Further, the PRO must provide for collection of paint and create a sufficient funding base to continue the PRO’s operations (D.C. Code Ann. § 8-233.02).

No state has passed or implemented an EPR model for tires, but there are several successful European models that can provide guidance. In the Belgian Take-back requirements for tires, consumers pay an environmental fee as they buy a tire, which will be used for the collection and treatment of used tires. The Acceptance Duty imposed by receiving this fee implies that the vendor is obliged to take back for free the product returned by the consumer. The intermediaries are obliged to take back for free the returned product from the vendor in proportion to the amount of products they had delivered to vendors. The responsibilities of intermediaries and vendors of tires also include charging the environment fee to consumers and contacting transport operators acknowledged by the Belgian tire PRO, Recytyre (OECD, 2016).

When buying tires in Belgium, consumers pay a fee that is transferred by producers to Recytyre and that fully covers collection and treatment operations for used tires. The fee depends on the type of tire and ranges from EUR 1.32 including 21% VAT (e.g. motorcycle tires) to EUR 794 37 including VAT (e.g. tires from some vehicles for public works and construction services). The fee is mentioned separately on the consumer’s receipt (OECD, 2016). Therefore, between the PaintCare PRO and Belgium’s model, there is a model for a successful tire EPR in the District.

Alternative: Law setting up an EPR PRO for the District of Columbia

Using D.C.’s paint EPR law as a model, this alternative would involve the D.C. council passing a law (or promulgating a regulation under D.C.’s existing waste management regime) setting up a PRO for tire producers who sell any tires within the district. To improve the effectiveness of this alternative for tire dumping prevention, the District should work with Maryland and ask Maryland to amend its recently passed EPR law to include tires as a covered
entity requiring submission of a management plan to the Maryland Department.

In the District of Columbia, the PRO set up would create drop off points for used tires. The best locations for these would be at places where automobiles are serviced or tire retailers to incentivize drop offs (OECD, 2016). Similar to the Paint system, the PRO would be funded by a flat advanced disposal fee (ADF) levied on the consumer with scaling prices for the size of tire bought. The PaintCare program imposes no fee on a half-pint or smaller, 30 cents up to one gallon, 70 cents between 1 to 2 gallons, and $1.60 between 2 and 5 gallons. Oil based paint can cost between $20–60 (Glover and Tynan, 2023). Working off a $40 median, the PaintCare program imposes a 70 cent fee, equaling around 1.75% of the total purchase price. Applied to tires, the average consumer price of a single tire in 2022 was around $177 (Placek, 2023). Therefore, under similar pricing as the Paintcare program, the ADF fee would equal around $3.

In terms of cleaning up tires currently within the ecosystem, the D.C. Council could pass a local version of the indemnification currently required under The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), but only for tires. For the illegal dumping not captured by the EPR rule, there are several immediate issues that cut against this strategy for cleanups. The issues with CERCLA demonstrate the difficulty in getting private entities to indemnify the government for clean up. However, this may not necessarily be true for tires as the original producer for the tires likely produced after 2000 can be tracked. Second, this is a novel legal application of producer responsibility and would likely fail because most of the tires found are illegally dumped.

Projected Outcomes

Sustainability: Medium-Low

Relatively low staffing requirement for the D.C. government. The whole concept is that the producers, either individually or through a PRO, are tasked with handling the lion’s share of the duties imposed. Most staffing from the government will be in the early set up such as drafting the law or regulation, initial collection point approvals, and enforcement. However, there is the issue of burden shifting here because it does not solve the intrinsic issue of a lack of recycling and disposal capacity for tires in the DMV area. If national tire companies are commanded by D.C. law or regulation to take-back all tires sold in the area, they will have to find a way to connect to private recyclers that have the capacity to accept more tires. This may cause the covered companies to ship tires to other areas, imposing environmental costs on those areas. There is also a possibility that, absent monitoring, the PRO could dispose of tires in an environmentally damaging manner.

Cost Minimization: Medium-Low

As noted by OECD, cost is of particular concern in setting up an EPR regime. There are high initial costs to the District of Columbia, but then costs are passed to the producer and consumer. Assuming an average cost of around $3 per new tire purchased, the fee imposed can cover financing of the PRO and its operations. But, this is a cost that is levied directly on the consumer and is cost prohibitive. Further, if this exact fee is imposed on old tires as well, there is an equity problem.
Effectiveness: Medium-High

Under an EPR system, every new tire sold would theoretically be tracked and disposed of by the producer. Although there may be some tires that are illegally dumped, now via the ADF, the fee for the tire is paid by the initial consumer up front, meaning the disincentive of a fee paid upon disposal is moved. D.C.’s PaintCare program claims up to 4% paint recovered (Paint Care, 2021). However, the success of this program is difficult to measure because the vast majority of the paint is used. A more helpful metric of probable success is the Belgian Tire EPR, which has had a recovery rate of 84.96% (OECD, 2016). Further, now enforcement is partially directed at the producer via compliance and disclosures rather than the individual.

Political Feasibility and Legality: Medium-High

The first part of the proposal, setting up a PRO for tire producers to take responsibility for the disposal of tires in the district, is likely very feasible. Such measures have been passed before and the popularity of EPR is spreading. However, there are entry points for industry lobbying and legal challenges. The producer liability piece of the proposal is extremely vulnerable to lobbying and legal challenges.

Alternative 4: Tire Education Campaign

The problem with illegal tire dumping in the Anacostia River is largely the structure of how tire disposal works through the area, but it is a possibility that educating stakeholders of the tire industry could lead to greater awareness and environmental consciousness that in effect helps to reduce pollution. An education campaign can take many different forms to accommodate the community, and is generally low cost. Anacostia Riverkeeper can invest resources and partner with local organizations to raise environmental awareness, and emphasize the importance of watersheds and how pollution affects the local ecology. The benefit of this policy option is that there are already many frameworks in place throughout this region to implement environmental education beyond what the Anacostia Riverkeeper already has in place. There are also many different ways that an education campaign can take place.

There is an abundance of watershed programming for K-12 education, including programs that Anacostia Riverkeeper participates in, such as guided boat tours for community members and elementary and middle school students through the Anacostia River Explorers Program. Project WET is a nonprofit organization that specializes in training educators to teach about watersheds. Resources can be pulled from this organization to educate youth (DOEE, 2023). The Anacostia Watershed Society also hosts a Watershed Stewards Academy that aims to “equip and support community leaders to recognize and address local pollution problems in their nearby streams and rivers” (Anacostia Watershed Society, 2023). From our findings it seems there is an abundant amount of watershed education within the D.C. area, but there is little focus on tire education for retailers and consumers. A tire specific education campaign can be helpful in reducing illegal tire dumping into the Anacostia River.
The Department of Transportation’s National Highway Traffic Safety Administration launched a Tire Education Campaign in 2014 that aimed to educate consumers and retailers on tire buying, tire pressure and inflation, treadwear, aging, and replacing tires. An environmental aspect can easily be added to something like this, and this model can be applied to the local level throughout the D.C. Department of Transportation and Department of Energy and Environment (DOEE). There also can be an added component that is almost closer to a certification system. The D.C. Government in conjunction with any local organization, including Anacostia Riverkeeper, that already works closely with DOEE, can help to administer an educational program for automotive industry businesses such as new and used tire dealerships. Business owners and operators would undergo training, such as a day-long in person event, to develop a comprehensive understanding of the most sustainable method to discard tires, and the effects that illegal dumping has on local ecology. They would receive resources from the DOEE and other local stakeholders, and need to pass a series of inspections to ensure proper actions are followed. At the completion of this training, merchants can receive a certification that can be displayed in their storefront, and additional outreach can be done to encourage consumers to shop from these businesses to encourage other businesses to participate in the program. It could help create a culture of change, encourage proper behavior, and prevent businesses from outsourcing their disposal to third parties that lead to the illegal dumping. The DOEE, in conjunction with the D.C. Department of Commerce, D.C. Department of Licensing and Consumer Protection, and D.C. Department of Small & Local Business Development would be responsible for administering the accreditation process and ensuring proper records are maintained of certified retailers. The funds for this would ideally be an added fee that goes into obtaining a D.C. business license, which can range from $50 to $1,100, depending on the size and income of the business (DLCP, n.d). Because this is a minor fee, $50 is substantial. The main cost for this initiative would be providing the staffing which is estimated to be about $120,000 per year. Staffing for this initiative would increase as more businesses pay the fee, and the program begins to pay for itself.

Anacostia Riverkeeper or the D.C. Department of Energy and the Environment can also sponsor a tire specific campaign targeted at consumers to teach them how to dispose of their tires, and encourage them to shop from certified retailers. This could consist of social media posts, posters placed in tire and car dealerships, and outreach events that explain the disposal cost, where to dispose of tires, and the harm of not disposing of tires properly. The target audience would be automotive users and consumers, and would ultimately lead to behavior change and the creation of environmental stewardship that can lead to a natural decline of tire pollution.

**Projected Outcomes**

*Sustainability: Medium-Low*

Education programs ideally can be sustainable if educators are trained, and funding is granted year after year. Proper staffing needs to be put in place to ensure that training programs and curriculum are continued. If the certification framework were to be adopted, staffing would be needed to be put in place to also lead these trainings and manage and track the certified
retailers. Careful tracking of retailer certifications would be essential to ensure that historical records are maintained and the program is successful for years to come.

Cost Minimization: Medium

The cost from an education program or campaign would mostly come from the development or adaptation of resources, and enlisting staff to run the programs. There are already organizations that have resources to train educators and increase knowledge of watersheds. This is definitely lower cost than alternatives such as the D.C. Government Action Plan because there are less concrete components, and offers a lot of flexibility. Many of the resources and framework needed for this policy alternative already existed and either need to be adopted or advanced. A lot of the educational component can occur on social media and through already existing websites and blogs, it would just take the manpower to be able to ensure it happens. There could be an added cost to retailers for obtaining the certification, but the cost on consumers is next to none.

Effectiveness: Medium-Low

This policy alternative is likely to be less effective than other options because it does not address the root cause of the problem, which is the lack of locations for tire disposal. This program would also predominantly run on an honor system until there is proper staffing to consistently audit the businesses that are participating in this program. However, there is a chance that the more aware retailers and consumers are of the issue, the more likely money and resources are to go to solving this problem.

Political Feasibility and Legality: Medium-High

Ultimately the political feasibility of this option should be high, because it comes at no cost to consumers, and ultimately better informs their decisions. There may be push back from retailers who do not want to have either participate in the program or compete with retailers who do choose to participate in the program. There is no legal controversy about this policy option as it is solely programmatic.

Alternative 5: Tracking System

The District of Columbia lacks a centralized solid monitoring and tracking system to detect the movement of used/waste tires. The city has severely limited public solid waste databases, notably data on used/waste tires and illegally disposed tires. This ultimately adds another barrier to law enforcement's effort against illicit tire disposal. The California Department of Resources Recycling and Recovery's (CalRecycle) "Waste Tire Manifest System" is being assessed as a policy alternative. The system's major functions include monitoring and tracking tire generation, transportation, and disposal activities in order to support and improve enforcement actions against illegal tire dumpers. The policy alternative is analyzed using the four designed criteria to see if it can be applied to the soil of the District of Columbia.
Projected Outcomes

Sustainability: High

In 2021, California had 14.3 million motor vehicles registrations, while D.C., Virginia, and Maryland altogether had 5.3 million (D.C. alone had 200,000) (Carlier, 2023). In 2018, California generated roughly 511.3 thousand tons of waste tires, while D.C. generated approximately 247.3 tons (D.C. Department of Public Works, 2018; California Department of Resources Recycling and Recovery, 2018). Based on these statistics, the Waste Tire Manifest System of California runs at a far higher capacity. Since its launch in 2003, over the past 20 years, the system has been a successful crucial component of California's waste tire management sector (California Department of Resources Recycling and Recovery, 2021).

The EPA provides the District a permit to release stormwater from its Municipal Separate Storm Sewer System (MS4) into U.S. waters in line with the Clean Water Act of 1972 (D.C Department of Energy and Environment, 2019). All automobile body shops and stations in the District that drain into the MS4 are designated as key sources of stormwater pollution and are subject to DOEE inspections and enforcement. Thus, the D.C. Stormwater Inspection is responsible for monitoring, recording, and enforcing the operations of tire dealers, auto body shops, and waste tire haulers, and it is funded by the Stormwater Permit Compliance Enterprise Fund (Enterprise Fund) (GreenWrench Technical Assistance, (n.d); D.C Department of Energy and Environment, 2022a). Over the last five years, the annual amount of the Enterprise Fund has been around $13.5 million, with $6.2 million (46%) of it going toward system implementation, staff/administration, permit/registration, cleaning, and monitoring/inspection. On the other hand, the average yearly funding for the CalRecycle is $42.4 million, and similar services fund consumption specified in the D.C.'s Enterprise Fund would be roughly $24 million (57%) (D.C Department of Energy and Environment, 2016, 2022a; California Department of Resources Recycling and Recovery, 2016, 2021). Considering these comparisons of capacity and operational costs, the initial investment for the Waste Tire Manifest System in D.C. is estimated to be somewhat higher. However, staffing/administration costs for the CalRecycle are around 20% of the budget, based on 73 staff members, but D.C.'s is 27%, based on 60 staff members, running 13 employees less (California Department of Resources Recycling and Recovery, 2021; D.C Department of Energy and Environment, 2022). This suggests that the District of Columbia has a sound foundation for launching the Waste Tire Manifest System, and that if implemented, the system has the potential to sustain for a long time. Furthermore, even if the initial investment funds needed tend to be relatively higher, the system has the ability to reduce administration costs over time given its track record of running more staff members at less cost than the District of Columbia.

Cost Minimization: Medium-High

Any individual or business transporting more than 10 used/waste tires must be registered as a waste tire hauler with CalRecycle and bonded for $10,000 under the Waste Tire Manifest System. The surety bond's intention is to safeguard the obligee (state or the public) who suffers financial losses as a result of the waste tire hauler's illegal conduct or regulatory breaches (California Department of Resources Recycling and Recovery, n.d).

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When tires are illegally abandoned along the Anacostia River, whether or not collected by volunteers, the National Park Service is ultimately responsible for the cost of cleaning, loading, transporting, and disposing of those waste tires at designated facilities (Q. Molner and T. Sherard, personal communication, Feb 23, 2023). As a result, all economic and environmental costs are borne by federal taxpayers and local communities. The Waste Tire Manifest System, on the other hand, features a cost-effective component meant to cover (totally or partially) the costs of illegal tire dumping clean-up, with the goal of ensuring that waste tire hauler businesses pay the cost if they engage in illegal behavior. Based on the analysis (see Appendix D), $10,000 is nearly enough to cover the cost of 500 illegally discarded waste tires along the Anacostia River. According to Anacostia Riverkeeper's clean-up data from the previous five years, there was an average of 1435 illegally discarded tires along the river per year. As a result, the policy alternative could decrease the National Park Service's clean-up costs by at least 35% while having no or minimal cost effect on other stakeholders other than waste tire hauler businesses that cause or may cause tire pollution.

**Effectiveness: Medium**

The Comprehensive Trip Log (CTL) form is an essential part of the Waste Tire Manifest System. The form's principal function is to monitor the flow of waste tires from their initial site of generation to their final destination of disposal. The CTL form is made up of three separate forms, each of which contains a tear-off receipt that must be completed by the hauler for every transaction. The generator and end use facility examine the receipt for completeness and accuracy and sign the CTL receipts that the hauler completes. Another critical component of the Waste Tire Manifest System is the tire program identification (TPID). Each party that handles waste tires, including as generators, transporters/haulers, and disposal facilities, is issued a specific identification number by CalRecycle. The TPID number has the purpose of monitoring and identifying the precise location where each party creates, distributes, and disposes of waste tires (California Department of Resources Recycling and Recovery, n.d).

Waste tire permits enable enforcement officers to examine and monitor used/waste tire generators, transporters, and waste facilities for making sure that CTL log manifests are accurately completed and reported to CalRecycle. The accumulation of manifests will enable the creation of a consolidated database, which will ultimately allow investigators to examine waste tire haulers' operations, locations, and identification of anomalous or suspicious pickups and drop-offs, all of which are indicators of illicit dumping. These audits will aid in the early discovery of businesses that are in misconduct. Furthermore, the database has the ability to significantly reduce the time required to locate the offender (California Tire Recycling Act, 1989).

The system also significantly supports border monitoring along the US-Mexico border. The technology allows the California Highway Patrol (CHP) and CalRecycle's enforcement teams to work together to monitor highway checkpoints and the flow of illicit tire exports/imports via California ports in the border area (California Tire Recycling Act, 1989). Wards 7 and 8 are the District of Columbia's boundary wards. Montgomery and Prince George's Counties in Maryland border the District to the northwest and east. Arlington County in Virginia, across the Potomac River, borders the District to the west. What exacerbates D.C.'s illegal waste tire dumping dilemma is that numerous tire haulers from neighboring states, mainly Virginia and
Maryland, load those waste tires and illegally dump them in D.C. Both Virginia and Maryland have waste tire hauler regulation in place, whereas D.C. law is vague (Maryland OneStop, n.d; Virginia Department of Environmental Quality, n.d). However, the waste tire hauler regulations in Maryland and Virginia are not as elaborate and tailored as the Waste Tire Manifest System. If neighboring regional states do not have a system of similar or equivalent quality to the Waste Tire Manifest System, the efficiency of tracking in border areas may not be as effective as anticipated.

**Political Feasibility and Legality: Medium-Low**

Since the 1960s, the District of Columbia has faced a number of controversies, roadblocks, stagnation, and criticism about solid waste management (Seldman, 2017). Under Mayor Grey's administration (2011–2015), the city for the first time introduced an ambitious environmental focused plan called "Sustainable D.C. Plan," which was enacted into law as the Sustainable Solid Waste Amendment Act of 2014 (D.C Department of Energy and Environment, n.d). D.C. published the citywide diversion rate (16.11%) for the first time in its history in its 2018 Solid Waste Diversion annual report. The citywide diversion rate comprised waste tires 247.3 ton (≈ 24800 tires) (D.C. Department of Public Works, 2018). However, no additional details were provided as to how that number was obtained. There is very little, if any, D.C. used/waste tire information and data available to the public. Despite the fact that the city is the county's political center, waste management has never been one of its strong suits. The District’s solid waste reporting database, namely the used/waste tires information record and recycling, are still in their early phases. This implies that D.C. officials have been staunchly opposed to upgrading the city's solid waste management. It also suggests that cultivating tire management and sophisticated used/waste tire tracking systems may not have widespread political support.

Under the National Traffic and Motor Vehicle Safety Act of 1966, specifically Sections 574.7 and 574.8, all tire manufacturers, tire independent dealers, and tire distributors are required to record the tire identification number (TIN) of the new tire(s) sold or leased, the purchaser's name and address, as well as the dealer's name and address. Despite the fact that new tires are the only ones tracked by the federal law, it indicates that a basic tire tracking system exists at the federal level across the U.S. in both tire dealers and distributors (Chern, 2014; National Traffic and Motor Vehicle Safety Act, 1966). This monitoring approach, however, is only intended to track new tires; no state, including the District of Columbia, has adapted the TIN code report to extend the requirement on the tracking system when tires become used or waste tires. Mandating tire retailers and businesses to record the TIN code of their acquired used/waste tires has never been legalized in the country.
Assessing Trade-Offs and Recommendations

Recommendations

Based on the analysis and weighting in Figure 5, it was found that the D.C. Government Action Plan was the most effective policy option for the city to adopt in mitigating tire pollution. With high political feasibility and sustainability, it is believed that this alternative will not only be effective in reducing instances of illegal tire dumping in the area, but will also be able to sustain itself and be a long-term solution to the issue. Given the similar success of like plans in other states, this alternative is predicted to be the best option.

Policy Alternative Matrix

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weight</th>
<th>Status Quo</th>
<th>DC Gov’t Action Plan</th>
<th>Education Program</th>
<th>Extended Producer Responsibility</th>
<th>Tracking System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability</td>
<td>15%</td>
<td>Low (1)</td>
<td>High (3)</td>
<td>Medium-Low (2)</td>
<td>Medium-Low (2)</td>
<td>High (5)</td>
</tr>
<tr>
<td>Cost Minimization</td>
<td>40%</td>
<td>Medium (3)</td>
<td>Medium-High (4)</td>
<td>Medium (3)</td>
<td>Medium-Low (2)</td>
<td>Medium-High (4)</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>30%</td>
<td>Low (1)</td>
<td>Medium-High (4)</td>
<td>Medium-Low (2)</td>
<td>Medium-High (4)</td>
<td>Medium (3)</td>
</tr>
<tr>
<td>Political Feasibility &amp; Legality</td>
<td>15%</td>
<td>Medium-High (4)</td>
<td>High (5)</td>
<td>Medium-High (4)</td>
<td>Medium-High (4)</td>
<td>Medium-Low (2)</td>
</tr>
<tr>
<td>Score Unweighted</td>
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<td>9</td>
<td>18</td>
<td>11</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>Score Weighted</td>
<td></td>
<td>2.25</td>
<td>4.30</td>
<td>3.85</td>
<td>2.90</td>
<td>3.60</td>
</tr>
</tbody>
</table>

**Figure 5:** Completed Scoring Matrix for Weighted Policy Alternatives

Trade-Offs

Given the viable option of the D.C. Government Action Plan, there were some noticeable tradeoffs. It scored medium-high in effectiveness, which was only matched by the Extended Producer Responsibility alternative. This alternative does require a big investment at the inception, but after 5 years, the fee will allow the project to be self-sufficient which will put a lower cost burden on the district. The fee does both apply to new and used tires, which could put a higher cost burden on those who are buying used tires, which could be those with lower incomes, many who live in Ward 7 and 8. However, the layout of the program will give back to the community in ways that will positively impact them, and the $1.00 fee is not too heavy a burden.

This alternative does not address the lack of recycling facilities to bring scrap tires to. However, with the District having a program that is putting a greater emphasis on regulating scrap tires, market conditions could cause new tire recycling facilities to pop up, and the District will have more funding to bring tires to recycling plants that are further away. The D.C. government action plan is unique in that the allocation of funds can be altered based on the needs
of the Anacostia watershed. Which means, depending on how the needs of the system change it could include new aspects, like parts of the tracking system and education program. Many states have reduced their fee because of the success of the program and it does not need to be as far reaching, which could be a possibility as well.

**Limitations of Analysis**

The alternatives focused on addressing the issue of illegal dumping in the Anacostia Watershed by preventive and adaptive measures. One part of the landscape that has caused illegal dumping in the region is the limited number of recycling facilities. This analysis does not address this aspect directly. With increased focus and funds on illegal tire dumping, market forces may naturally cause more availability of recycling facilities, or allow the District to travel further to dispose of tires. The availability of data also limited the analysis. Estimating cost and effectiveness was done with the data that was accessible, but that might not be the full picture. This team is confident that the analysis is able to capture the issue and address that issue. The effectiveness of this analysis would only be enhanced if there was additional data to guide our findings.

**Conclusion**

In summation of this extensive project, this group came to a more well-rounded understanding on tire pollution and the dangers it poses to D.C. Additionally, through numerous interviews with organizations and concerned residents as well as surveys with auto shops, the team gained useful knowledge and expertise on mitigating the issue. It was largely found that D.C. struggles with assessing an under-researched problem such as this one and has a hard time finding solutions when funding and investment is minimal. However, through this team’s research and recommendations, D.C. will have a better opportunity to mitigate tire pollution in the Anacostia River and create a more sustainable environment for all residents.
Appendix A: Statutes


(a) It shall be unlawful for any person to dispose or cause or permit the disposal of solid waste, hazardous waste, or medical waste in or upon any street, lot, park, public place, or any other public or private area, whether or not for a commercial purpose, unless the site is authorized for the disposal of solid waste, hazardous waste or medical waste by the Mayor.

(b)(1) Any person who violates subsection (a) of this section shall be liable to arrest. (2) Any person who disposes of solid waste which is neither hazardous nor medical waste in violation of subsection (a) of this section, shall be guilty of a misdemeanor, and shall be subject to a fine not to exceed $5,000 for the first offense and $10,000 for each subsequent offense, or shall be imprisoned for a period not to exceed 90 days, or both. Any person who disposes of solid waste for a commercial purpose shall be guilty of a felony, and shall be subject to a fine for each offense not to exceed $40,000, or shall be imprisoned for a period not to exceed 5 years, or both.

D.C. Code Ann. § 47-2832.02 (c–e) (West, 2023) Tire dealers

The District of Columbia’s statute for tire disposal for tire dealers passed in 2013. Empowers the Mayor to issue rules pertaining to the storage of waste tires. Stipulates that no license shall be issued to any waste tire generator that fails to provide the Mayor with information concerning the site's location, size, and the approximate number of waste tires that have been accumulated at the site, which may not exceed 500.


D.C.’s regulation for defined tire dealers disposal of tires. Stipulates that dealers must maintain a license with the city and a licensee shall establish and maintain a contractual agreement with a waste tire hauler, or its equivalent, for the removal of waste tires, at a minimum of every three calendar days, from the licensee’s property.


(a) By April 1, 2016, a producer of paint sold at retail in the District, or a representative organization in which the producer is a member, shall submit a plan for the establishment of a paint stewardship program to the Mayor for approval. The plan shall:

1) Minimize District involvement in the management of postconsumer paint by reducing its generation, promoting its reuse and recycling, and implementing agreements to collect, transport, reuse, recycle, and dispose of postconsumer paint using environmentally sound management practices;

2) Provide for convenient and available collection of postconsumer paint that, at a minimum, provides for collection rates and convenience equal to or greater than the collection programs available to consumers before the paint stewardship program and addresses coordination of the paint stewardship program with existing household hazardous waste collection infrastructure;
3) Ensure the program addresses coordination with local nonprofit building material reuse organizations without charge to the organizations;

4) Identify each producer participating in the program and the brands of paint sold in the District by each producer;

5) Describe sufficient funding for the paint stewardship program, including a funding mechanism for securing and disbursing funds to cover administrative, operational, and capital costs, including the assessment of charges on paint sold by producers in the District. The funding mechanism shall provide for a paint stewardship assessment for each container of paint sold in the District by producers and the assessment shall be remitted to the representative organization, if applicable; and

6) Describe how postconsumer paint will be managed in the most environmentally and economically sound manner, including following the sustainable solid waste management hierarchy established in section 102 of the Sustainable Solid Waste Management Amendment Act of 2014, enacted on September 23, 2014.
Appendix B: Map provided by Kent & Kelly Fothergill

Color coded map of tire removal since October 2022. Anacostia River
Total tires = 58
## Appendix C

Table 1: Semi-Structured Interview Participants

<table>
<thead>
<tr>
<th>Number</th>
<th>Organization</th>
<th>Job Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>U.S. Forensic</td>
<td>Professional Engineer/Tire Expert/Fire Investigator</td>
</tr>
<tr>
<td>2</td>
<td>Environment Protection Agency</td>
<td>Environmental Geologist</td>
</tr>
<tr>
<td>3</td>
<td>Ward 8 Woods</td>
<td>Executive Director</td>
</tr>
<tr>
<td>4</td>
<td>Residents/Kayakers</td>
<td>Concerned Anacostia Watershed Residents</td>
</tr>
<tr>
<td>5</td>
<td>Environment Protection Agency</td>
<td>Standards and TMDLs Section Chief</td>
</tr>
<tr>
<td>6</td>
<td>Environment Protection Agency</td>
<td>Branch Chief</td>
</tr>
<tr>
<td>7</td>
<td>Pope Branch Stream Restoration Project</td>
<td>Environmental Protection Specialist</td>
</tr>
<tr>
<td>8</td>
<td>Friends of Anacostia Park</td>
<td>Friends Corps Grounds Team</td>
</tr>
<tr>
<td>9</td>
<td>The Metropolitan Police Department of the District of Columbia (Environmental Crime Unit)</td>
<td>Police Officer</td>
</tr>
<tr>
<td>10</td>
<td>Department of Energy and Environment</td>
<td>Watershed Planner</td>
</tr>
<tr>
<td>11</td>
<td>The Metropolitan Police Department of the District of Columbia (Environmental Crimes Unit)</td>
<td>Inspector</td>
</tr>
<tr>
<td>12</td>
<td>AASHTO</td>
<td>Program Director for Environment</td>
</tr>
</tbody>
</table>
Appendix D

Calculation Based on $10,000 Bond Coverage of How Many Tires' Clean-Up Costs the Bond May Cover

According to Title 17 § 802 of the D.C. Municipal Regulation (Waste Tire Storage), no tire dealer should store more than 500 waste tires at their location. As a result, this calculation assumes that if a single tire dealer violates the legislation, the bond coverage can cover the cleanup cost of the whole 500 waste tires per event.

500 tires (the maximum number of tires that can be stored at a tire dealer's facility in D.C.)

Disposal Cost = $2 at the facility (Baltimore City Department of Public Work, 2017). Most illegally dumped tires in D.C. are taken to Baltimore for additional processing.

Environmental restoration cost = $5. It was meant to incorporate the environmental restoration cost of tire pollution in this phase of the calculation, which is an exceptionally rare cost assessment. This sort of estimation is frequently excluded from the cost of tire pollution cleaning. However, this research revealed that tire pollution has a detrimental impact on both human and environmental quality. The environmental restoration cost per tire is estimated using the California Westley Tire Fire 1999 case study (Trainex, n.d).

\[
\begin{align*}
500 \times 2 &= \$1,000 \\
500 \times 5 &= \$2,500 \\
\text{Total:} &= \$3,500
\end{align*}
\]

3 Dump Trucks: Because a tire is a solid trash with volume, the cubic yard measurement is vital for determining how many waste tires may be carried per truck. Dump trucks can typically transport 10-14 cubic yards waste (Lynch Truck Center, n.d). Per cubic yard, there are around 12 loose passenger tires (California Department of Resources Recycling and Recovery, n.d (a)). Based on this, it takes about 3 drum trucks to transport 500 waste tires.

According to an illegal tire dumping incident that occurred in January 2023, cleaning up 1000 illegally dumped tires in Southeast D.C. took three business days. It is predicted that cleaning 500 waste tires will take 14 hours (one business day (8) plus 6 hours) (Roussey, 2023).

**Labor and Truck Cost** (D.C. Department of Public Works, 2017)

$500 Utility Cost (per truck)

1 Dump Truck = 1 driver and 2 loaders
Driver = $24.50 per hour
Loader = $19.70 per hour

Day 1 (Truck #1 and 2)
2 (drivers) x 8 (hours) x $24.50 = $392
4 (loaders) x 8 (hours) x $19.70 = $631

Day 2 (Truck #3)
1 (driver) x 6 (hours) x $24.50 = $147
2 (loader) x 6 x $19.70 = $237

**Total:** $392 + $631 + $147 + $237 + ($500 x 3) = $2,907

**Miles and Gasoline**

Washington, D.C. to Baltimore = 40 miles (round trip 80 miles)
80 (miles) x 3 (trucks) = 240 miles
5 miles/gallon (U.S. Department of Energy, 2020)
240 miles = 48 gallon gasoline

Total: 48 x $4.4 (diesel price, American Automobile Association, 2023) = $211

Total: $3,500 + $2,907 + $211 = $6,618 > $10,000 bond value
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