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# Stakeholders From Multiple Sectors Views and Policy Approaches to Marine Debris Removal: A Qualitative Case Study of Virginia's Elizabeth River

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**STAKEHOLDERS FROM MULTIPLE SECTORS VIEWS AND POLICY**

**APPROACHES TO MARINE DEBRIS REMOVAL:**

**A QUALITATIVE CASE STUDY OF VIRGINIA'S ELIZABETH RIVER**

by

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# ABSTRACT

STAKEHOLDERS FROM MULTIPLE SECTORS VIEWS AND POLICY APPROACHES TO
MARINE DEBRIS REMOVAL: A QUALITATIVE CASE STUDY OF VIRGINIA'S
ELIZABETH RIVER

Robin Rene' Dunbar
Old Dominion University, 2024
Chair: Dr. Juita-Elena Yusuf

Marine debris is a wicked problem and there is a call for action for stakeholders from across multiple sectors to address this issue in Virginia. Marine debris can have negative impacts on navigation, aquatic life, recreation, and economies. Research is rapidly growing on ocean debris, but so far, it is limited regarding estuarine river debris in an industrial port and harbor. River systems function as pathways to the sea for the transport of plastic pollution that can be detrimental due to animal ingestion, entanglement, and accumulation. Views and policies about marine debris removal are unknown among stakeholders of Virginia's Elizabeth River, home to the world's largest naval base and a world-class port. The Elizabeth River was previously identified as one of three most toxic tributaries in the Chesapeake Bay, and it has the highest sea level rise on the east coast of the United States. During flood episodes and waves generated by ships, macro plastics (> 25mm) can remobilize and travel from the river to the bay and to the ocean. To gain a deep understanding of the complexity of the Elizabeth River's marine debris problem, a qualitative case study was implemented and included in-depth interviews and a content analysis. This research contributed to the literature on Narrative Policy Framework (NPF) illustrating the value of qualitative studies in the policy process and how stakeholders from multiple sectors use narratives to tell the story of marine debris in the Elizabeth River. Thirty-one stakeholders from nine sectors participated; the stakeholders included representatives from the government, public, private, nonprofit, military, resident, academic, volunteer and

fisher sectors. This study answered: *1.) What are the views of stakeholders from multiple sectors on the marine debris problems at the mouth of the Elizabeth River? 2.) Which stakeholders are considered in addressing marine debris issues? and 3.) What is the match between the views of stakeholders' and policies to address marine debris?*

Key words: marine debris, Elizabeth River, stakeholder views, stakeholder policy approaches, Qualitative Narrative Policy Framework

*This thesis is dedicated to all the generations in my family whose choices resulted in the opportunity for me to reach for the stars and acquire the first doctorate degree in our family's tree of knowledge. The seed was planted by my father who set the pace and acquired the family's first bachelor's degree while my talented mother taught me the value of combining art with science, and my sister who always provided love and laughter. This is also dedicated to my sweet daughter Orion, named after the celestial warrior, whom I wanted to demonstrate the importance of being able to stand on your own two feet and do what you love to the best of your ability. And to the man of my dreams, Jon, who is on the same doctorate quest - I offer this from the Vikings, "It is not the numbers that win the victory, but those that charge forward with the most vigor."*

# ACKNOWLEDGMENTS

*To the dream team, my dissertation committee, it is with immense gratitude that I extend many, many thanks to each of you for your words of wisdom, the hours you have dedicated for guidance and editing this manuscript and for your commitment as mentors and scholars to help others learn the way. It was an extreme honor to have Dr. "Wie" Yusuf not only as my committee chair and advisor, but also as my mentor. Thank you for the many pivotal conversations we had that helped lead me to this research. Asking questions and being curious now no longer feels like a barrier. You helped me to grow as a graduate from thinking about the next steps to the broader possibilities for the advancement of science inquiry. I would also like to thank Dr. Jennifer Whytlaw and Dr. Marina Saitgalina for their "spot on" feedback throughout the entire process. It was also a true gift to have both of you take the time to review each chapter and provide recommendations that were essential for the completion of this work. I am also grateful to the scholars that developed the Narrative Policy Framework and those that continue to engage in studies that support the value of narratives in the policy process. I would also like to acknowledge the participants that I interviewed, the heroes that are dedicated to removing the marine debris from the beautiful Elizabeth River. The Elizabeth River's marine debris story now has a new chapter and together we will find a solution to this pollution.*

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**CHAPTER I**

**INTRODUCTION**

**BACKGROUND**

Marine debris is defined as any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, and disposed of or abandoned into the marine environment or the Great Lakes (NOAA.gov, 2023). The focus of this study was large macro marine debris that is greater than 25mm (Agamuthu, 2019). The increasing volume of marine debris in the ocean is becoming a major conservation concern that requires investigation (Sutherland, 2019). It is recognized as a global rising pollution problem (Galgani, 2015; Ryan, 2018; Thompson, 2015), and it impacts wildlife, human health, safety, habitats, and economies, along with tourism, recreation, and fisheries (Register et al., 2021).

A 2018 report by the Department of Marine and Coastal Resources noted that at least 300 marine animals die, on average, from consuming fishing gear and plastic-based waste annually; marine litter also has the potential to have great economic implications to maritime activities, such as fisheries and it impacts recreational uses, causing a loss of touristic value (Lusher, 2018; UNEP, 2014). Regarding economic impacts to industries, direct costs from marine debris include navigational hazards and damages to vessels and machinery and indirect costs related to recreational use losses due to water impairment (Galimany, 2019). One study showed that to reduce marine debris accidents in ports, it is necessary to provide policy support, improve effectiveness of collection methods, maintain multisector cooperation, and establish best practices for marine debris management (Song, 2022).

Marine debris originates from three main sources (land, oceans, and rivers) and most of the debris is plastic (Galgani, 2015; Jambeck, 2015; Register et al., 2021). River emissions account for millions of metric tons of this debris (Lebreton et al., 2017; Schmidt, 2017) and due to its persistent nature, it could take hundreds of years to remove marine litter from the natural environment (Nguyen, 2022). Since 1980, plastic pollution has increased tenfold and there is a need for global intervention, laws, enforcement, and compliance regarding discharge of plastics into coastal waters (Borrelle et al., 2020; Ekong, 2023). Scientists predict that without global action, 100-250 million tons of plastic pollution will annually enter oceans by the year 2025 (Jambeck, 2015). In addition, floating debris serves as a platform for non-native invasive species to raft long distances; this can result in negative impacts to biodiversity and conservation efforts (Barry, 2023).

## STAKEHOLDERS VIEWS AND POLICIES ABOUT MARINE DEBRIS

Stakeholder participation is crucial in solving environmental problems (Du et al., 2019). Complex problems require both top-down and bottom-up initiatives introduced by stakeholders from multiple sectors (Dijkstra, 2021). When it comes to policy formulation, actors are often engaged in coalitions that allow them to participate in policymaking collectively, rather than individually (Howlett, 2020). Environmental issues such as marine debris are affected by "political ideologies, values, education, professional training, and community experience, and they vary greatly across society among scientists, policymakers, and the public," (Kraft, 2018, page 9). There are also knowledge gaps regarding marine debris sources, pathways, hotspots, and impacts (Kandziora, 2019).

Finding a solution to the marine debris problem requires systemic change, with participation by stakeholders from multiple sectors (Lau, 2020). Solutions may include actions such as organizational recycling, governmental policy making, waste management improvements, the raising of awareness, prevention and consumer education (Frantzi, 2021; Napper & Thompson, 2020; Prata, 2019; Schnurr, 2018). Innovations are also needed and some examples include floating barriers and containment booms, in-stream litter collection devices or 'trash traps', mapping strategies for monitoring such as aqua drones, autonomous vehicles, reuse of discarded plastics, deep-sea bottom debris retrieval machines and biodegradable plastics (Andriolo, 2020; Barcelo & Pico, 2020; Battawi, 2022; Jung, 2010; Parker-Jurd, 2022; Williams, 2019). In addition, risks of policy failure or ineffectiveness may be minimized by ensuring participation by all key interest groups and citizen "stakeholders" (Kraft, 2018). Without this, policy disagreements and implementation can be adversely affected (Daley, 2007, 2012).

Several global efforts aiming at reducing and preventing marine debris and impacts include the *Global Partnership on Marine Litter*, the *Honolulu Strategy*, and the G7 countries (UNEP, 2015). The *Global Partnership on Marine Litter* (GPML) was launched in 2012 and is a multi-stakeholder partnership including private sector, civil society, non-governmental organizations, and regional bodies to prevent marine litter from land and sea-based sources (GPML, 2023). Developed in 2012, global stakeholders developed the *Honolulu Strategy* to address the growing awareness of the accumulation and impact of plastic wastes in marine systems and also argued that each local, regional, or national organization must set its own targets based on its needs and capabilities (UNEP, 2015). In 2018, the G7 countries (Canada, France, Italy, Germany, United Kingdom, and the European Union) developed a strategy for

healthy oceans, seas and resilient coasts with a focus on science, data, sustainable oceans, fisheries, plastic waste, and marine litter (IISD, 2018).

There is also a move toward creating sustainable and resilient societies at the local level through an increased awareness by all stakeholders (Lohr et al., 2017). Watershed stakeholders include those living next to, or relying on, natural resources in need of protection, such as a river, bay, or ocean. They may also include those interested in watershed management and protection, such as the government, the public, enterprises, nonprofits, and other organizations and individuals (Qui, 2014). Examples of successful efforts at the local level include marine and coastal conservation actions for the critically endangered Atlantic Humpback Dolphin (Minton, 2022) and drought risk management (McEwen et al., 2022). There is also a development toward including stakeholders with a focus on both solutions to land-based waste management and riverine waste, since flooding, heavy rains, and extreme weather contribute to the marine debris problem (Kandziora, 2019). This study addressed the views and policies of stakeholders from nine sectors regarding marine debris removal from Virginia's Elizabeth River – a Chesapeake Bay tributary that is experiencing the highest sea level rise on the U.S. east coast as well as daily frequent flooding (Tompkins, 2014).

**THIS RESEARCH STUDY**

The overarching focus of this qualitative case study was to assess the views and policy approaches for marine debris removal from stakeholder organizations from multiple sectors that utilized or played a policy role affecting Virginia's Elizabeth River. Most stakeholders were located near the mouth of the Elizabeth River where the port and the naval base are located. In research, the Narrative Policy Framework (NPF) has been established as a major policy theory

(Shanahan, 2018), and it has produced compelling empirical analyses (Schlaufer, 2022; Stauffer & Kuenzler, 2021). Through a qualitative application of the Narrative Policy Framework this study included a meso- (organization) level of analysis, to better understand the stakeholders' views and approaches to marine debris removal, along and assessed this phenomenon as a story.

The aim of this qualitative study was to apply the Narrative Policy Framework to assess views about marine debris and then to translate them to narrative story elements (setting, characters, plot, and morals) that result in a cohesive story that references a policy stance for marine debris removal. The NPF is based on the idea that policy narratives are strategically constructed by stakeholders to influence public policy (McBeth, 2012). The application of the NPF framework to this study for instance could have illustrated marine debris as the villain, with stakeholders from multiple sectors portrayed as heroes who implemented policies and strategies for removing marine debris. Another finding could have shown the stakeholders or communities as the villains.

Two claims are made within this research and include 1.) Views about marine debris vary among stakeholders according to the sectors that they represent, and 2.) Policy approaches about the marine debris removal vary among stakeholders according to the sectors they represent. Although studies are beginning to include the role of policy regarding marine debris, (Kandziora, 2019; Sheavly & Register, 2007) less research includes reviewing marine debris action plans of policies (Vince & Stoett, 2018). This research will also complement initiatives and goals at the federal, state, and local levels in the U.S. Environmental Protection Agency's (U.S.EPA) *Clean Water Act* (1972) 33 U.S.C. §1251 et seq., *NOAA's Mid-Atlantic Marine Debris Action Plan* (2021), the 2021-2025 *Virginia Marine Debris Reduction Plan* (Register & McKay, 2016), and the *2022 Elizabeth River Watershed Action Plan* (ElizabethRiverProject, 2022).

Environmental awareness is based on knowledge, attitudes, and behaviors, which are applied with actions (Kencanasari, 2019). The main source of marine litter are humans and changing awareness and behavior is key to tackling litter escaping into the natural environment (Pahl, 2017). Improving awareness regarding marine debris issues could lead to large scale benefits although it is difficult to develop consistent, relatable engagement if communities are disconnected from impacts (Joshi, 2023). There has been a rising demand for environmentally friendly business practices among stakeholder groups with external pressures from legislators, environmental groups and employees, but implementation is low (Gadenne, 2009). To better understand why marine debris occurs is to understand littering behaviors in regions linked to the marine environment (Campbell, 2014). Stakeholders can begin to manage marine debris if they know the magnitude, sources, impacts and knowledge of the problem (Williams, 2019).

To play a role in ensuring there is a healthy Elizabeth River coastal ecosystem and communities, an instrumental, qualitative, embedded case assessment of the marine debris in the Elizabeth River was implemented. In-depth interviews answered: RQ1: *What are the views of stakeholders from multiple sectors on the marine debris problems at the mouth of the Elizabeth River?* RQ2: *Which stakeholders are considered in addressing marine debris issues? and* RQ3: *What is the match between the views of stakeholders' and policies to address marine debris?* Types of stakeholders in the Chesapeake Bay include federal, state, and local agencies, municipalities, residential communities, agriculture, fishers, and environmentalists (Heikkila & Gerlak, 2005). For this study, stakeholders from multiple sectors mainly located at the mouth of the Elizabeth River or that utilized or played a policy role affecting the Elizabeth River were sought to participate.

**CONTRIBUTIONS**

The contribution of this study consisted of exploring what the narrative views and policies of specific respondents were, regarding marine debris removal in Virginia's Elizabeth River. Findings contributed to the Narrative Policy Framework and included studies on environmental policies and multiple stakeholder research. There is a gap in understanding marine debris as a villain in the Narrative Policy Framework and this study contributed to this application. Findings also supported Old Dominion University's Institute for Coastal Adaptation and Resilience (ICAR)'s mission to further resilience research, education, collaboration, and supported the sharing of responsibility for interconnected tasks to achieve complex goals (McNamara, 2012). In addition, collaboration between stakeholders from multiple sectors should be cultivated to develop further strategies aimed at mitigating environmental problems throughout communities (Morris, 2019).

This study was instrumental for goal and initiatives in the *Virginia Marine Debris Reduction Plan* (Register & Witmer, 2021). Interviewing the organizations at the river's mouth such as the world's largest military naval base, a world-class port and those that use the river such as watermen and city officials revealed what policies and protocols were in place and what needs to be developed to create a litter-free Elizabeth River. Figure 1 illustrates the Elizabeth River and stakeholders from multiple sectors that are located at the river's mouth. There are over thirty organizations representing the government, public and private businesses, nonprofits, military, educational institutions, residential communities, and the maritime industry.

**Figure 1**

*Stakeholders at the Mouth of Virginia's Elizabeth River*
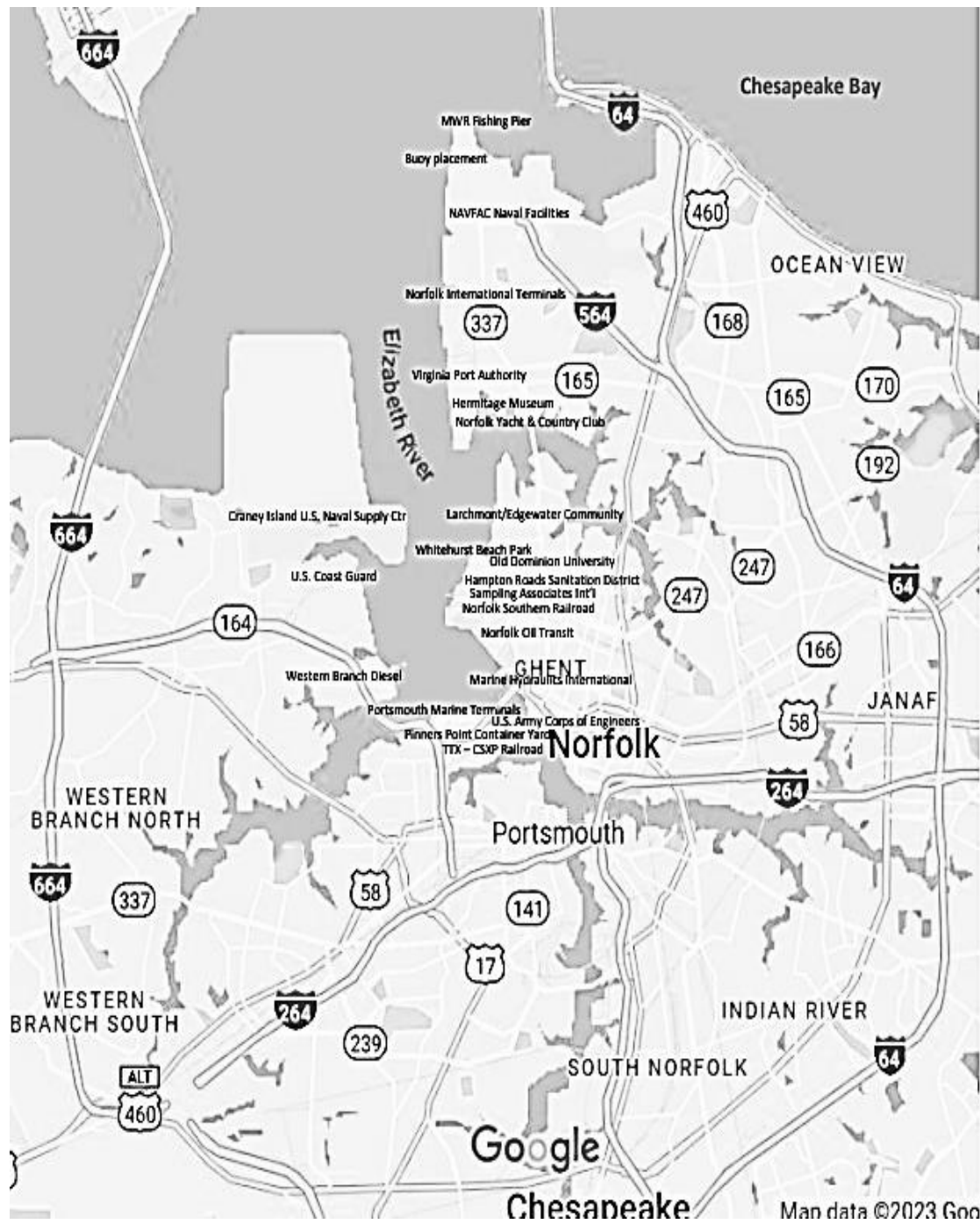


*Source.* Created by Robin Dunbar with Google Maps.

Findings from this study will be shared with federal, state and local organizations that include the National Oceanic and Atmospheric Administration (NOAA), the Virginia Institute of Marine Science (VIMS), Clean Virginia Waterways, the Elizabeth River Project (ERP), the Ocean Conservancy, the Smithsonian Environmental Research Center, and Old Dominion University's Institute for Coastal Adaptation and Resilience (ICAR); each has marine debris, wetland, and resilience initiatives. In addition, this information will be shared at conferences, online, and through publications. The research was designed for replication by other researchers and included a road map, lessons learned, and valuable information that others can put into practice.

In summary, to address gaps in knowledge regarding marine debris problems in Virginia's Elizabeth River a qualitative case study was implemented to assess the views and policies among stakeholders from multiple sectors. In-depth interviews were implemented to better understand the marine debris problem that the stakeholder's are observing. The Narrative Policy Framework was applied to gain a deeper understanding of stakeholders from multiple sectors views and policy approaches to marine debris.

**CHAPTER II**

**LITERATURE REVIEW**

**MARINE DEBRIS**

Floating debris circulating in the sea from shipwrecks has been written about as early as 700 B.C.E. in the Greek epic poem *Odyssey*, "…Zeus thundered and hurled his lightning at the ship…ripped the sides from the keel and snapped the mast…to meet the whirlpool's terror…" (Kline, 2004). In 1870, Commander Matthew Fontaine Maury, an oceanographer who collected samples and charted the ocean in the classic *Twenty Thousand Leagues Under the Sea* (Chapter 11), described how floating debris can accumulate in an ocean gyre in the Sargasso Sea "if … any floating substance, be put into a basin, and a circular motion be given to the water, all the light substances will be found crowding together near the center of the pool…and the Sargasso Sea is the center of the whirl" (Verne, 1869-71). In the 1970s, with the popularization of plastics (Lebreton et al., 2019), surface samples of the western Sargasso Sea began to contain plastic pellets (Carpenter & Smith, 1972). This was followed by an increase of reports of plastic debris entanglement of birds, seals, turtles (Ryan, 2015) and polystyrene in fish (Kartar et al., 1973).

Since 1980, the oceans plastic pollution has increased tenfold and one study suggested that plastics may be slowly circulating between coastal environments with repeated episodes of beaching, fouling, and resurfacing (Lebreton et al., 2019). Plastics do not biodegrade like natural materials, and they can last for hundreds of years in their original form as we are using a permanent material for very temporary uses (Geyer, 2017). Plastic research also shows that plastics can shed and fragment into smaller pieces and have the potential to negatively impact aquatic animals and wildlife (Jambeck, 2015; Rivers-Auty, 2023). As illustrated in Table 1 there

is not a global standardized size to utilize for data collection of marine debris and plastics. Macro

debris, which is the focus of this study, is defined as debris measuring more than 2.5cm or 25mm

if viewed by land or surface water and greater than 5cm, 50mm or 2 inches if observing at sea.

The definition used in this study is consistent with the National Oceanic and Atmospheric

Administration's recommendation referenced in the *Marine Debris Monitoring and Assessment:*

*Recommendations for Monitoring Debris Trends in the Marine Environment* (Lippiatt, 2013).

**Table 1**

*Examples and Sizes of Marine Debris and Plastics*

| Nano | Micro | Meso | Macro | Mega | Reference |
|---|---|---|---|---|---|
| fibers from clothing, personal care products, pharmaceuticals, rubber dust from tires | microbeads, personal care products, fragments, polystyrene balls | bottle caps, cigarette filters and butts, candy wrappers, plastic pellets | bottles, cans, plastic bags, plastic utensils, fishing line, balloons | fishing nets, traps, ropes, construction debris | |
| 1 to < 1000mm | 1 to < 1000μm | 1 to < 10nm | 1 cm or 10mm and larger | | (Hartmann, 2019) |
| < 1μm | < 5mm | 5 to 20mm | >20mm | >1000mm | (UNEP, 2017) |
| | 1 to 5mm | | 2.5cm | | (EuropeanCommission, 2013) |
| | < 5mm | 5 to 25mm | >25mm | | (Arthur, 2009) (Masiá et al., 2021) (Nunez, 2023) (Thompson et al., 2009) |
| | < 2mm | 2-20mm | >20mm | | (Barnes, 2009) (Cheshire, 2009) (Pon, 2023) (Ryan et al., 2009) |
| | | | | >100mm | (Ramos, 2019) |
| | | | 2.5cm or 25mm >5cm, 50mm, or 2 inches if at sea | | (Lippiatt, 2013) |

Research on ocean marine debris has continued to rapidly grow, despite rivers being a major pathway for the movement of macroplastics (Lechthaler, 2020; Schmidt, 2017). Rivers connect most of the global land surface to the marine environment (Schmidt, 2017), and they are the circulatory system of the continents. They drain seventy-five percent of the earth's land surface, and provide habitat and food for many organisms (AmericanRivers.org, 2021). Researchers have estimated annual river litter inputs to the ocean to be about 2.4 to 4 million tons (Lebreton et al., 2017; Schmidt, 2017). There is limited research regarding the fate of debris in riverine estuaries, especially those that serve as sinks with limited flushing as is the case with Virginia's Elizabeth River (Kim et al., 2001; Ledieu et al., 2022; Maclean et al., 2021; Van Emmerik et al., 2022). In 2001, scientists researched the river's flushing characteristics and found that the mouth of the Elizabeth River shows the fastest flushing (about 6.5 tidal cycles or 3 days) and where surface water would exchange into the connecting waterways (Kim, 2001). This study will address a gap in research of marine debris at organization's mainly located at the mouth or main stem of the Elizabeth River.

**THE ELIZABETH RIVER**

This case study focused on marine debris problems in the Elizabeth River in southeast Virginia of the United States. The joining of the Atlantic Ocean, Chesapeake Bay and the Elizabeth River makes this area an economic hub for one of the world's busiest ports and home to the largest U.S. naval base and the oldest naval shipyard (NAVSEA.navy.mil, 2017). The United States population in 2024 is about 336,072,986 with nearly 40% living in coastal shoreline counties and these areas are growing nationally and globally due there access to maritime ports (Ache et al., 2015; Hauer, 2022; Neumann, 2015; NOAA.gov, 2013; USCensus, 2024). The United States is a maritime nation (Greenberg, 2021) and there is limited research on

marine debris in these complex port areas (Shirakura, 2021; Torres, 2015) where ships can be impacted by marine debris such as getting entangled in propellers and can cost millions of dollars to cleanup and dispose of annually (Bergmann et al., 2015; Galimany, 2019; Hong, 2017; Kuhn, 2015). Statistics show that shipping contributes 11% of the waste discharged at sea and can include garbage pollution (Sherrington et al., 2016; Zhang, 2021).

The Elizabeth River is a tidal urban estuary that is located at the mouth of the Chesapeake Bay. The adjoining James River, Nansemond River and Elizabeth River make up Hampton Roads, one of the world's largest natural harbors (Matuszeski, 2020). The Elizabeth River is one of the Bay's most polluted rivers for many reasons including a growing population, industrial accidents, and runoff. To date, most research has focused on the river's highly elevated levels of Polycyclic Aromatic Hydrocarbons (PAHs) in the sediments due to historic pollution from several defunct wood creosote facilities, and Polychlorinated Biphenyls (PCBs), a toxic substance banned in 1979 and mainly utilized in paints for ships (Di Giuolio & Clark, 2015; U.S.EPA, 2022).

The brackish Elizabeth River is a six-mile tidal (250 square miles) estuary that consists of the Western, Eastern, Southern and Lafayette Branches that flow through the cities of Chesapeake, Norfolk, Portsmouth, and Virginia Beach and have a population of about 600,000 (Census.gov, 2020). The mouth of the Elizabeth River is two miles wide and as seen in Figure 2 the EPA designated it impaired waters, for which technology-based regulations and other required controls are not stringent enough to meet the water quality standards set by states (U.S.EPA, 2020a, 2022). Norfolk Naval Station is located at the mouth along with the Port of Virginia that has container facilities and some of the largest cranes in the world.

**Figure 2**

*Mouth of the Elizabeth River Designated as Impaired*
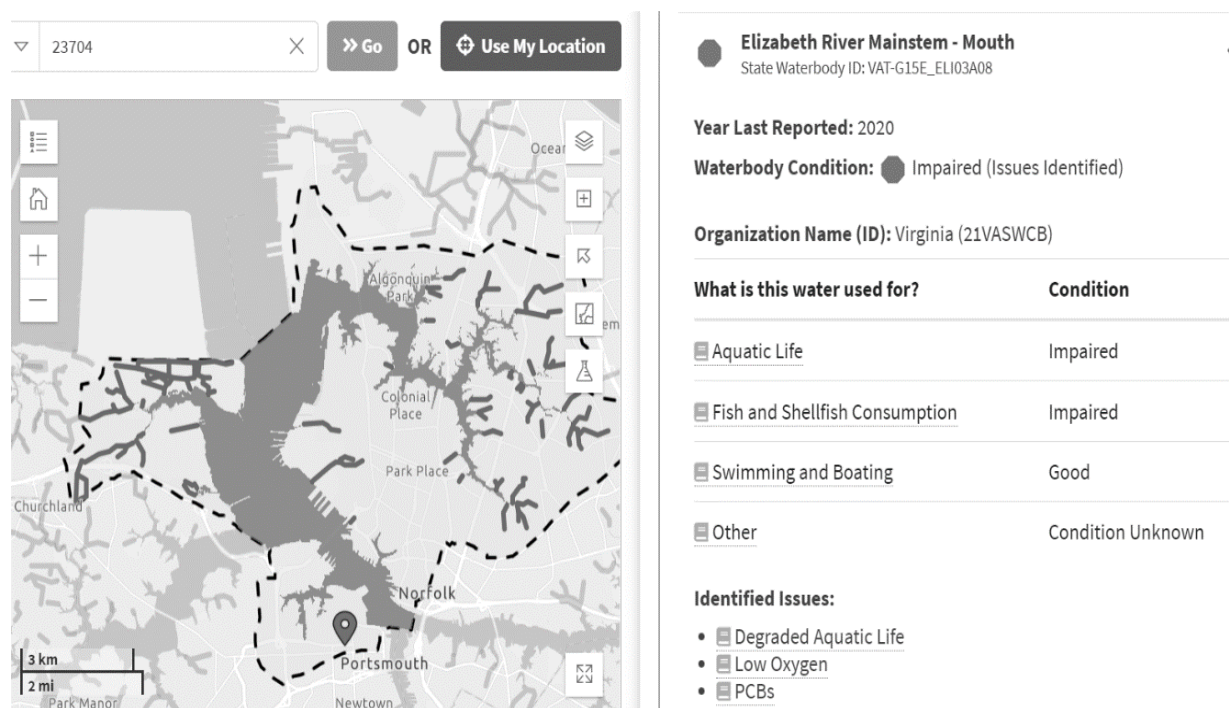


*Source.* (U.S.EPA, 2020a).

The Elizabeth River is known for its maritime history and according to historian and author Amy Yarsinske that published, *The Elizabeth*, (2007), in the early 1600s, Captain John Smith explored the Elizabeth River and named it in honor of Princess Elizabeth Stuart, the daughter of King James I. The exact date is unknown. A major port was established on the river, near the mouth of the Chesapeake Bay and the Elizabeth River played important roles in American history in the context of shipbuilding, military and trade of corn, lumber, tobacco, and rum (Wertenbaker, 1962). Negative impacts on the health of the river began during the early European settlement and included the clearing of forests.

In the 1800s, the river was dredged twice its depth and filled in two thirds of its original width, resulting in the loss of wetlands and shallows that provide critical habitat (Nichols, 1986).

During the 19th and 20th centuries, the population increased along with industry, military, shipping, and runoff. In a 1976 report required by the U.S. Environmental Protection Agency and the U.S. Congress, the Virginia State Water Control Board called the Elizabeth River one of the worst water pollution problems in the state (U.S.EPA, 1977). In 1993, the U.S. EPA listed the river as one of three regions of concern in the Chesapeake Bay due to chemical contamination along with the Baltimore Harbor in Maryland and the Anacostia River in Washington, D.C. (U.S.EPA, 1994). Among the sources of pollution in the Elizabeth River have been wood treatment facilities due to the demand for wood to build docks and railroads (Di Giuolio & Clark, 2015).

Over time, the Elizabeth River began to accumulate marine debris as research supports urban areas are primary sources of litter (Cowger et al., 2019; Jambeck, 2015; Lebreton et al., 2017). To the researcher's knowledge, there is a gap in the literature on macro marine debris in the Elizabeth River. There are about nine main categories of marine debris that include glass, metal, paper, plastics, processed lumber, rubber, textiles, other miscellaneous debris, and large debris greater than one-foot (Cheshire, 2009; Opfer et al., 2012; Pon et al., 2023). These categories follow guidelines from *NOAA's Marine Debris Shoreline Survey Field Guide* (Opfer, 2012) and the *United Nations Environmental Program and Intergovernmental Oceanographic Commission Guidelines on Survey and Monitoring of Marine Litter* (UNEP, 2009). Visible surface marine debris includes plastics, construction materials, treated wood and food and beverage containers. Some become invisible in areas that are out of sight and out of mind, such as its wetlands and the river's bottom. Debris accumulates along the shore by the wind, the tidal cycles, illegal dumping, and improper disposal of waste and includes large items such as tires, appliances, and grocery carts. Debris on the river's bottom include abandoned derelict vessels,

ghost crab pots, and lost fishing gear that can impede the navigation of maritime vessels (Jambeck et al., 2015). Stewardship, awareness and policies are needed to reduce the litter on the land since over 80% of the debris originates from the land (Jambeck et al., 2015).

**POSSIBILITIES TO REMOVE MARINE DEBRIS**

This study was implemented in an industrialized harbor that may not be right for all marine debris removal technology. A barrier to address marine debris is developing and applying new technologies for removal (Senevirathna, 2020). Harbors cannot be shut down with over 2,000 vessels such as military and container ships, tugboats, barges, ferries, recreational vessels, and cruise ships traversing annually (VirginiaMaritimeAssociation, 2022). There are multiple ways of collecting and removing macro marine debris from coastal and riverine environments that include skimmer boats, nets, trash traps, booms, divers, and community volunteers. Removal methods and technology have been implemented to address debris that can be found on the land and water. Some efforts focus on finding areas where the debris accumulates such as the garbage patches in ocean gyres. Other efforts address debris that has washed ashore, exited out of storm drain outfalls, sunk to the bottom, or is floating on the surface. Seven main methods of removal include netting, skimming, barriers, trapping, GPS, bottom retrieval with machines, and bubble barriers.

**NETTING**

Netting is a way to capture marine debris via a moving vessel that scoops up floating debris into a cargo net such as *The Jellyfishbot,* a portable, remote controlled mini catamaran that has been launched in fifteen French ports and internationally in Singapore, Japan, Norway, and Switzerland. The *Jellyfishbot* costs around $12,000 US dollars and is a compact, bright yellow

vehicle that has the benefit of fitting in narrow spaces in dense seaside ports and marinas. The

nets trap debris into a net dragged behind its twin hulls and it has also cleaned up several oil

spills from industrial sites (Franklin, 2018). Another example is *The Holy Turtle* that cost $1

million U.S. dollars and was designed for shallow waters with a goal to clean the thirty-two

square mile Honduran island of Roatán that has rainforests, mangroves, and beaches. It has a

1,000-foot boom inspired by oil spill containment systems and it was developed by SodaStream

and partners with the capacity to remove twenty tons of surface debris in one round (Pasquier,

2022). It is towed by two vessels and forms a U-shape as it moves across the water. Floating

debris is captured through large holes on the bottom half of the contraption (Kotecki, 2018). The

weakness of netting technology is that the nets may need to be replaced often, and although

macro debris is caught, micro debris is not.

**SKIMMING**

Skimming devices intercept floating trash that is then raked into a basin with a conveyor

belt. One example is *Mr. Trash Wheel* in Maryland that was built for about $720,000 with public

and private funds. The wheel works at very low speeds to deter wildlife and is usually in use

during rainstorms when trash enters the harbor via nearby rivers and storm drains

(MrTrashWheel, 2023). Another example is the solar powered machine named *FRED* the

"Floating Robot for Eliminating Debris" that is in San Diego that uses conveyor belts for

eliminating debris up to five meters long. The nonprofit Clear Blue Sea launched *FRED* to

remove debris from oceans, rivers, and waterways. The project is funded entirely by a group of

unpaid interns, small donations and it moves slowly with an alert to warn animals of its presence.

When *FRED* is full of debris it is sent to a mothership or back to land to offload its contents and

receive repairs if needed. The plastics are processed for recycling or provided to scientists for

research (OurTechnology, 2023). To protect floating gardens from marine debris in the Chicago River, the nonprofit Urban Rivers developed *Trashbot*, a remote-controlled small robot about the size of a kid's raft. This device skims the surface for debris and is outfitted with GPS to track its progress and deter theft. All that is needed in an internet connection and once the machine is full, the debris is offloaded at a collection point. This device is in development as a prototype and costs about $20,000. Concerns about this device include maintenance costs, theft, damage, and software hacking (Altrubots.com, 2023).

**BARRIER**

Barrier devices are placed in a river and often include floating booms that use the current to guide trash to a large wire-mesh collection container. Nets and barriers do not go to the bottom of the water column to limit any harm to aquatic life. Examples include Germany's Plastic Soup Foundation machine called The *Bandalong Litter Trap* that relies on the river's current to direct the debris through the collection booms and into a collection basin (PlasticSoupFoundation, 2019). Another example is the Netherland's *Interceptor*, a solar-powered catamaran that is designed to be moored in rivers, autonomously removes river debris and costs about $760,000 U.S. dollars. Large debris such as tree trunks are deflected with the nose of the vessel and floating debris goes into an opening in its bow and then a conveyor belt carries the trash into a dumpster in the middle of the machine. A message is sent to a local operator via text when it is full and needs to be emptied (TheOceanCleanup, 2019). Another example is The *WaterGoat*, a trash barrier launched in 2006 designed for streams, canals, ponds, and lakes where there is fast moving, fluctuating waters. Over two hundred are located in the United States, it costs around $3,200 U.S. dollars and trash can be cleaned out with three workers in less than two hours (WaterGoat, 2022). The weakness of this technology is that it will likely only collect surface

debris and operators must empty the containers (Helinski et al., 2021).

**TRASH TRAPS**

Trash Traps are floating devices that are anchored and work like a sinkhole where litter is captured in a bucket. An example is in Thailand that has 900 canals that connect to the sea and is ranked sixth among countries releasing the most garbage into the sea (Sabatira, 2020). They hope to install nine trash traps this year with a solar powered prototype that is made of pipe and netting. Gates open and close to entrap up to 700kg of trash (OpenDevelopmentThailand, 2019). Another example is found across from the mouth of Virginia's Elizabeth River at Hampton Roads Sanitation District (HRSD) in Newport News. HRSD developed a trash collector mimicking whale baleen that filters surface debris into wire mesh baskets. It costs about $10,000 to develop and an additional $30,000 a year in staff time to manage. The device originated from a facility competition among staff teams to create an innovation to remove the debris accumulating at their facility that is located on the James River (Hafner, 2020). A weakness of trash traps is that they only remove macro debris, and they need operators to empty the basins.

**GPS**

GPS devices aid with finding and tracking large debris such as abandoned nets. One example is the nonprofit SMART that uses GPS trackers to help collect debris in the Pacific Ocean in Konolulu, Hawaii. A cargo ship named Kwai has collected about forty tons of plastics from the Great Pacific Garbage Patch by tracking GPS devices that mariners attached to abandoned nets over a year. The GPS devices they used cost a total of $1,600 and they are working to buy 150 more for seafarers to continue to attach to debris. Data can also be collected to better understand how the debris accumulates and travels (SMART, 2019). The weaknesses of

this technology for marine debris removal are the labor needed and theft of the GPS units.

**BOTTOM RETRIEVAL**

Bottom debris retrieval initiatives are less researched, but an example is one initiative that took place in the Mississippi Sound and north-central Gulf of Mexico where 2,904 derelict crab pots were removed to improve the shrimping industry. The cost of this removal initiative was $35,595 per year or $53 per derelict crab trap. It did result in collaboration among watermen and non-watermen and increased the awareness of the impact of abandoned crab pots on the fishing industry (Rodolfich et al., 2023). Another example is the *Robotic Seabed Cleaning Floating Platform* in Venetian Lagoon, Italy, which utilized eight winches to pull up underwater debris. In addition, an aspiration system sucked up smaller litter and a gripper grasped and removed larger items like tires (Gouttefarde et al., 2020). The weakness of this technology is the expense and depth of the water may present complications.

**BUBBLE BARRIER**

Still in the trial phase, The *Bubble Barrier* is a technology intended for rivers to catch plastic litter before it reaches the seas and oceans. A plastic tube with holes is placed diagonally on the bottom of a river or canal and compressed ambient air from the tube creates a bubble curtain. A continuous upwards current pushes plastic to the surface and the sides of the river where it enters a catchment system, it is then removed by operators or volunteers. This technology addresses 80% of the macro and micro surface debris and 50% the underwater debris such as plastics. It costs about $124,000 U.S. dollars and needs a compressor to operate. The good news is that ships and aquatic life can pass through it, but heavier debris such as metals may not be caught. It's not recommended for a river that has changing conditions and the size of

the bubbles is still being researched (Helinski, 2021). There is a gap in the literature for best approaches for marine debris removal and reduction in busy industrial ports. This study will address if stakeholders from multiple sectors in Virginia's Elizabeth River are removing debris and how. It will also address what types of debris they are observing, barriers, challenges, and ideas for solutions to the pollution.

**MARINE DEBRIS IS A WICKED PROBLEM**

Litter is a persistent threat to our global waters (Barnardo, 2021) and marine debris is a complex, wicked problem, and there is a call for action for multi-stakeholders, including nonprofits, government agencies, and businesses, to help address this issue (Register et al., 2021). Specifically, the impacts of plastic pollution are uncertain, complex and 'wicked' without a clear solution (Landon-Lane, 2018). In 1968, Garrett Hardin's article, *The Tragedy of the Commons*, addressed the global misuse of resources and the tendency for society to prioritize personal gain above public good. The tragedy of the commons regarding pollution is mainly in "fouling our own nest" (Hardin, 1968, p.1245). This emphasizes that marine debris is not a priority, is someone else's problem, and has led to millions of tons of debris flowing into our water bodies over years and years. In 1973, Horst Rittel, a German urban planner, argued that nearly all public policy issues are "wicked" -- meaning that they are "tricky, malignant, vicious and aggressive" (Rittel & Webber, 1973). A wicked problem has multiple causes and lacks an obvious and accurate solution, and the stakeholders in this study will likely have outcomes versus a solution to the marine debris problem in the Elizabeth River. The stakeholders' narratives will be analyzed against Rittel's ten characteristics illustrated in Table 2 and shared in the results.

**Table 2**

*Ten Characteristics of a Wicked Problem*

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1. There is no definitive formulation of a wicked problem.
2. Wicked problems have no stopping rule.
3. Solutions to wicked problems are not true-or-false, but good-or-bad.
4. There is no immediate and no ultimate test of a solution to a wicked problem.
5. Every solution to a wicked problem is a "one-shot operation" because there is no opportunity to learn by trial-and-error, and every attempt counts significantly.
6. Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan.
7. Every wicked problem is unique.
8. Every wicked problem can be a symptom of another problem.
9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution.
10. The planner has no right to be wrong.

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*Source*. (Rittel & Webber, 1973).

**WICKED CHARACTERISTICS OF MARINE DEBRIS**

**Attribute 1:** There is no definitive formulation of a wicked problem. Wicked problems are impossible to define (Dentoni, 2018). Wicked problems can have undefined causes with different contested understandings and strongly held beliefs and values. It is not possible to easily describe a wicked problem. Hence, Rittel and Webber's first attribute seem most appropriate for today's marine debris problems because the act of defining marine debris can be viewed in different ways as illustrated in Table 3. Marine debris can be seen both as a challenge and as a barrier when seeking solutions, sharing information, and fostering collaboration (Rittel & Webber, 1973). Since it is not possible to describe the marine debris problem easily, defining the problem is entangled in finding solutions. Defining marine debris is a social problem that involves

stakeholders from multiple sectors with different views and policies, and this wicked problem

can affect entire communities' cultures, social behaviors, and economies (NOAA.gov, 2022).

The complexity of marine debris lies in a multitude of areas such as origination, composition,

governance, economic costs, and measurable rate to name a few (Landon-Lane, 2018). It is also

a cross-cutting crisis that impacts natural and human environments globally (Vince & Stoett,

2018).

**Table 3**

*Definitions of Marine Debris*

| | |
|---|---|
| Any man-made object discarded, disposed of, or abandoned that enters the coastal or marine environment. It is also known as marine litter. Such human-created waste may enter directly from a ship, or indirectly when washed out to sea via rivers, streams, and storm drains. | (USLEGAL.Com, 2006) |
| Waste ranging from small, everyday items, such as cigarettes and discarded plastic bottles, to larger objects, such as abandoned fishing gear and vessels found in the ocean or Great Lakes environment—poses economic and environmental challenges and is an issue of growing local, national, and international concern. | (GAO, 2019) |
| Any persistent solid material that is manufactured or processed and directly or indirectly, intentionally, or unintentionally, disposed of or abandoned into the marine environment 15 C.F.R. § 909.1(a), 33 C.F.R. § 151.3000(a). | (NOAA.gov, 2023) |
| Any persistent, manufactured or processed solid material discarded, disposed of, or abandoned in the marine and coastal environment. | (UNEP, 2005) |

**Attribute 2:** Wicked problems have no stopping rule. Rittel and Webber's second attribute that

describes a situation with no stopping rule and never really an endpoint can lead to burnout,

stress, depleted resources, and the formation of an attitude that what one has accomplished thus

far is "good enough" (Rittel & Webber, 1973, p. 162). These complex problems do not expose a

final resolution that signals when they are solved. Marine debris pollution impacts are examples

of issues that seem impossible to solve in a way that is simple or final. With an ordinary

problem, one can tell when one has reached a solution, but with a wicked problem, the search is

endless. There is an opportunity, though, to strive for doing more and better. Marine debris comes in many forms, ranging from small plastic cigarette butts to 4,000-pound derelict fishing nets, plastic bags, glass, metal, foamed plastic, tires, and abandoned vessels (NOAA.gov, 2022). Unavoidable spillages of all forms of marine debris make it utterly unrealistic to have a target of zero plastic entering the ocean (Landon-Lane, 2018). Marine debris does not stay put – rather, it travels, and it can take a long time to degrade (NOAA.gov, 2022). Buoyant plastic debris rarely stays near its source; hence, the actions of one state may affect adjacent states (Landon-Lane, 2018).

**Attribute 3:** Solutions to wicked problems are not true-or-false, but good-or-bad. Real-world problems include "open boundaries and have no well-determined solution" (Verweij & Thompson, 2006). Webber and Rittel's attribute number three states that "solutions to wicked problems are not true-or-false, but good-or-bad" (Rittel & Webber, 1973, p. 163). Possible solutions to complex problems should reflect the least negative consequences and the most good, since impacts may shift over time and may require flexible approaches to problem solving (Head, 2014). Finding solutions to problems is challenging, and the perceptions and values of what is right and wrong can vary, with even good intentions resulting in bad outcomes. Rittel shared, during a lecture in 1969, that "There is no way to minimize regret and even if one does not act, one can regret not acting" (Skaburskis, 2008, p. 279). It is impossible to find solutions independently that will satisfy everyone. Policy makers have had great difficulty in understanding and responding effectively to complex or wicked problems (Head, 2014). Marine debris affects everything: the environment, economy, fishing, navigation, human health and safety, coral, wildlife and aquatic animals (NOAA.gov, 2022). There is no single or best solution to ecosystem management because of the ever changing dynamics (DeFries, 2017). The goals

and desires of stakeholders present a major obstacle in river governance and require the involvement of large numbers of stakeholders; this can make achieving a consensus difficult, and some may find it hard to determine what is the source of the problem (Duckett et al., 2016).

**Attribute 4:** There is no immediate and no ultimate test of a solution to a wicked problem. The world is faced with severe, complex wicked problems for which finding answers seems impossible. Severe problems are complicated with layers of issues that may be disconnected, with each requiring a different plan of action. Wicked problems haunt our societies and, according to Rittel and Webber, they are defined as social and cultural issues that are inherently impossible to solve (Rittel & Webber, 1973). Rittel and Webber's fourth Attribute, "There is no immediate and no ultimate test of a solution to a wicked problem" tells us that quickly implementing "big and expensive" actions as definite solutions can be irreversible, and if one tries to reverse, more wicked problems can follow (Rittel & Webber, 1973, p. 163). It would be impossible for only one course of action to be the solution to a wicked problem, so being open, flexible, and prepared is essential. Trying or testing solutions will take patience, with prolonged periods of successes and failures that may seem endless. Marine debris can cause lots of problems for people, ecosystems, wildlife, and our economy (NOAA.gov, 2022). Effective prevention is a long-term process that must begin at the ground level with smarter consumer choices, industrial consciousness, and responsibility (Vince & Stoett, 2018). The urgency to find solutions for marine plastic pollution is exacerbated by the projected rise in plastic waste generation: the global estimate of mismanaged plastic waste is expected to triple by 2060 (Lebreton & Andrady, 2019).

**Attribute 5:** Every solution to a wicked problem is a "one-shot operation" because there is no opportunity to learn by trial-and-error, and because every attempt counts significantly (Rittel & Webber, 1973, p. 163). Rittel and Weber may be saying, in Attribute 5, that once a solution is implemented to a wicked problem, it may leave irreversible long-term traces that cannot be undone. In other words, once the attempt to solve a wicked problem has begun, there is no going back and starting over or that solutions could change the landscape, thus requiring different solutions. An example of an attempt to solve the marine debris problem that cannot be irreversible is this: some items were made to biodegrade, but instead, they have broken down into smaller pieces that are more easily for marine life to ingest. Marine debris is a cross-cutting crisis that impacts both natural and human environments globally, and long-term "holistic approaches" are needed that include interdisciplinary solutions (Vince & Stoett, 2018, p. 200). Marine debris can also pick up "hitchhikers" and can transport non-native species that attach themselves to the debris and travel to areas where they otherwise would not be found (NOAA.gov, 2024) .

**Attribute 6:** Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan. Experiments for trying solutions for wicked problems do not end when we think they will, and there is little to guide us in our search for solutions (Andersson, 2018). Rittel and Webber's Attribute 6 may be viewed as an epistemological claim of the way in which we believe and understand wicked problems and solutions (Ruhl, 2020). There is no "one-size-fits-all" solution to the problem of marine debris (Jentoft & Chuenpagdee, 2009), and communities around the country are affected by marine debris in different ways (NOAA.gov, 2020). Due to the uncertain, complicated, and interlinked impacts of plastic use and disposal,

plastic pollution has been deemed a 'wicked' problem with uncertain solutions that may trigger rebound effects (Landon-Lane, 2018).

**Attribute 7:** Every wicked problem is unique. Since this is true, attempts at solutions to each particular problem will likely be incompatible with another problem (Andersson, 2018). Webber and Rittel's Attribute 7 highlights that it is likely that not only are the wicked problems unique, but their solutions may be, as well. Marine debris crosses boundaries and is dynamic, complex, and a global problem that impacts wildlife, potentially human health, water quality, and the economy (Domanski & Laverty, 2021). Marine debris is hard to track and to quantify, and its distribution in the ocean is poorly mapped with a lack of knowledge of what is floating on the surface, sunk to the bottom, or washed ashore (Van Sebille et al., 2020).

**Attribute 8:** Every wicked problem can be a symptom of another problem. Every problem is interconnected to other problems (Ackoff, 1974). Attribute 8 of Rittel and Webber's wicked problems states, "Every wicked problem can be a symptom of another problem" and this can be demonstrated to include marine debris (Rittel & Webber, 1973, p. 165). Every day, three million tons of waste are discarded worldwide, and it has been estimated that this will increase to six million tons per day by 2025 (Hoornweg, 2013). In 2016, the U.S. population produced the largest mass of plastic waste in the world and had the largest annual per capita plastic waste generation of the top plastic waste generating countries (>100 kg) (Law, 2020). New marine species are found to have either ingested plastics or to have become entangled in it (Ryan, 2018). Wicked problems often have a "linking" characteristic wherein one move impacts another with consequences (Head, 2022, p. 30). A wicked problem is tangled with other problems with multiple root causes. Problem solvers must be courageous to take on wicked problems because

they can be seen as liable for the actions they take, with consequences having a significant impact that may be hard to justify.

**Attribute 9:** The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The wickeder the problem, the more important the world view (Skaburskis, 2008). Rittel and Webber's Attribute 9 states that "The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution" (Rittel & Webber, 1973, p.166). They also state that, because you cannot rigorously assess your hypotheses and because each problem is unique, you cannot approach these issues with applied solutions; instead, you must select solutions that are the most plausible at the time (Rittel & Webber, 1973). Social groups increasingly exhibit significant differences in aspirations, values, and perspectives that confound the possibility of clear and agreed solutions (Head & Alford, 2015). Multiple user groups have multiple objectives for the ocean commons, some of which may be conflicting (Landon-Lane, 2018). The most significant obstacle in attributing liability to the polluting is proving that significant "transboundary environmental harm" has occurred (Landon-Lane, 2018).

**Attribute 10:** The planner has no right to be wrong (Rittel & Webber, 1973). There is little opportunity for a planner to be wrong since, with the uncertainty of wicked problems, there is no immunity (Levin, 2012). The goal of leaders making decisions and policies should be to improve the world in which people live, and they are responsible, liable, and accountable for consequences of their decisions and actions. Complex problems are often part of a web of multiplying issues where there will not be a solution to fix it all. Marcus Aurelius, the emperor of the Roman Empire, wrote "...we can accommodate and adapt….for the impediment to action

advances action and what stands in the way becomes the way" (Holiday, 2015). Planners must be courageous and bold, and they must prepare for worst case scenarios, rather than assume that nothing will go wrong. They must tackle the problems and embrace the risks. Compared to other materials, single-used plastics are slow to biodegrade, taking tens to thousands of years depending on the type of plastic and the environmental conditions (Chamas, 2020). We do not know what will happen if there is no change. We do know that the amount of debris will continue to grow as more and more enters our ocean, and this will worsen impacts on the environment and on navigation, vessel safety, and the economy (NOAA.gov, 2022).

**STAKEHOLDERS**

It has been claimed that "most problems that matter to society are wicked problems, or at least have wicked aspects" (Norton, 2012, p. 449). There can be diverse, opposing views and perspectives shared by different stakeholders and no single solution that is agreed upon by all. "Any solution to a wicked problem will significantly affect a wide range of stakeholders, and cannot be separated from human ethics, values and social equity" and it could lead to outcomes that inform decision-makers and policy, thus to help solve wicked problems (Parrott, 2017, p. 2005). In addition, when making decisions about a natural resource like the Elizabeth River, trade-offs may be necessary and complicated by the stakeholders views (Akbari, 2022). For the purpose of this study stakeholders are defined as "those that are both affected by and affecting the problem, and are, at the same time, participating in the process of formulating and solving it" (Banville, 1998, p. 18). Stakeholders must be involved in the effort to effectively reduce and control marine debris and its environmental impacts and outcomes may require expertise from various sectors (Bergmann, 2015). For this study, each stakeholder represented a subset of stakeholders or a sector as illustrated in Table 4 since marine debris is a transversal issue that

affects multiple sectors (Scrich, 2024). These stakeholders were representatives from the

government, public, private, nonprofit, academic, military, volunteer, residential and fisher

sectors. Information sharing, engagement and feedback is essential to stay informed and learn

**Table 4**

*Why the Nine Sectors in this Study Care about Marine Debris Removal*

| SECTOR | INTEREST IN MARINE DEBRIS |
|---|---|
| **Government** | "The Federal Government has recognized that marine debris can be dealt with effectively through a comprehensive approach that is local in scale, global in scope, directed at source prevention, and designed to both educate and empower communities to take action" (IMDCC, 2018). "A number of laws provide a framework authorizing U.S. federal work on marine debris, and federal agencies have exercised these authorities to prevent marine debris and respond to its adverse impacts on interjurisdictional, community, and individual levels" (Scrich, 2024). |
| **Public** | Marine debris can impact the economy of communities and the nation through adverse effects on tourism and recreation (Scrich, 2024). "At the community level, prevention measures such as waste management and stormwater infrastructure depend on the needs of particular communities, and marine debris response requirements vary based on geography, exposure to environmental disasters, and response networks at the local, state, and regional levels (McCoy, 2021). |
| **Private** | Complementary expertise and authorities of multiple agencies and partner organization complement federal marine debris prevention and response (McCoy, 2021). Marine debris negatively affects a wide range of industries including shipping, yachting, tourism and recreation (Owens, 2018). Plastics and other single-use items, including food and beverage packaging, are a big part of our waste stream and a very visible part of the marine debris problem (NOAA.gov, 2020). |
| **Nonprofit** | At the individual scale, outreach, education, and coordination approaches can facilitate behavior change, including consumer choices and individual waste disposal practices, without direct regulation of individual choice (McCoy, 2021). |
| **Academic** | Making university campuses more sustainable, aesthetically attractive and promoting environmentally friendly practices have become an important goal around the world (Sarı, 2023). Campuses are communities of people and reducing litter benefits health, safety, environment and the community (Creighton, 1998). |
| **Military** | Large or obscured marine debris in navigational channels can lead to vessel damage and navigational hazards (Scrich, 2024). |
| **Volunteer** | Debris makes shorelines unattractive and potentially hazardous, harmful to wildlife and forces communities and governments to spend funds for maintenance (Sheavly & Register, 2007). Cleanups can help individuals change their littering behavior (Owens, 2018). |
| **Resident** | Marine debris is a growing global problem that poses a major threat to the environment, the economy, human safety, and potentially human health (McCoy, 2021). |
| **Fisher** | Marine debris discourages people from fishing, and boating (Sheavly & Register, 2007). |

regulatory requirements and or marine debris removal policies and practices (Rinfret, 2021). Controlling and reducing debris in the marine environment is a significant challenge and all stakeholders must be dedicated to developing removal strategies, opportunities and policies. "A solution to a wicked problem will only be durable if it is one that is collectively developed by the affected parties" (Parrott, 2017).

**WHY MULTIPLE SECTORS CARE ABOUT MARINE DEBRIS**

Marine debris can harm species and habitats, obstruct navigational waterways, cause economic loss to fishing industries and coastal communities, and threaten human health and safety (NOAA.gov, 2019). "Preventing and cleaning up marine debris can be addressed by ensuring a comprehensive approach that is local in scale and global in scope, directed primarily at source prevention and education. Investing in prevention and education will reduce the threat of marine debris to wildlife and habitats, and future conservation efforts are likely to be less costly, more flexible, and more successful over time" (Guertin, 2022).

The nine sectors in this study had various motives, incentives, strategies and goals regarding marine debris litter. The government sector had federally authorized debris removal projects to keep the nation's channels safe and navigable were led by organizations such as the U.S. Army Corps of Engineers and the U.S. Coast Guard. The public sector provided expertise and a local focus on community needs such as waste and stormwater management, economic benefits and recreation and tourism opportunities with the assistance of residential fees and government funding. Marine debris can also cause stormwater backups, damage to equipment and can be too much for the staff to handle. Marine debris can also negatively impact the private sector's marine industries that rely on shipping, recreation and tourism and a strong economy. In addition, private organizations that utilize plastics and single-use items are part of the waste

stream and alternatives are necessary to tackle this problem. The nonprofit sector had goals to

protect, restore and conserve natural resources and could provide marine debris outreach and

education, forums to coordinate marine debris removal strategies and cleanups with volunteers.

The academic sector included communities of students, faculty, administrators and staff that

implement research and a learning platform where aesthetics, health and safety can be impacted

by marine debris and litter. The volunteer and resident sectors wanted to live in communities that

were beautiful, safe and healthy for people and wildlife. Marine debris can also impact the value

of their properties and cause damage to wetlands, storm water systems, streets and waterways.

The fisher sector wanted healthy waterways where aquatic life thrives and safe waters for

navigating their vessels. Marine litter is a transboundary governance problem as it crosses sectors

(Hastings & Potts, 2013). It is complex to measure the impacts due to the wide range of sectors

impacted by marine litter and the solution of the marine litter problem requires expertise from

multiple sectors including industries, science, policy, authorities, nonprofits and citizens

(Bergmann et al., 2015).

        To gain an understanding of the views and approaches to marine debris removal one-on-

one, in-depth interviews were implemented reflecting Andrea's study (2020) to understand

stakeholder views and awareness about marine debris affecting Greece's Amvrakikos Wetlands

National Park. The researchers investigated how the local stakeholders face the issue of marine

debris and its connection with policies and activities by collecting data with in-depth interviews.

Twenty-three stakeholders participated and represented regional authorities, fishermen

associations, municipalities, environmental centers, development agencies and higher education

research institutes. Findings showed that the stakeholder's' supported sustainable marine debris

management as a major goal in terms of policy planning and effective implementation of specific measures along with the introduction of monitoring and data collection (Andrea, 2020).

## MARINE DEBRIS SEVERITY AND STAKEHOLDERS

Challenges in studying marine debris include understanding what types of litter, concentrations, and sources are necessary to address local impacts (Bennett-Martin et al., 2016). Inadequate management of plastic waste has led to contamination of our neighborhoods, oceans, coasts, rivers, and terrestrial environments (Jambeck, 2015). In addition, there are serious environmental justice concerns about how plastic production, landfills, and incinerators present disproportionately negative impacts on communities of Black, Indigenous, and people of color (Coccia, 2020). Plastic pollution and marine debris are of local, regional, national, and global concern (Register & McKay, 2016). About 80% is the estimate of the world's plastic waste from land-based sources that enters the ocean and shores; it contains 60%-90% combinations of different plastics (Ardiansyah, 2022). *Virginia's 2016 Marine Debris Reduction Plan* states "While methods of determining abundance of marine debris vary, there is agreement that up to seventy-five percent is made up of plastics" (Register & McKay, 2016). The global plastic market size was valued at USD 579.7 billion in 2020 and is expected to expand at a compound annual growth rate (CAGR) of 3.4% from 2021 to 2028 (Grandviewresearch.com, 2020). Plastic pollution is caused by high demand, by production by humans, by improper disposal, and by plastic's inability to degrade (Wang, 2018).

Oceanographer Laurent Lebreton estimates that between 1.15 and 2.41 million tons of plastic flow from the global riverine system and into the ocean each year (Lebreton et al., 2017). Rivers carry trash over long distances and connect nearly all land surfaces with the oceans, "making rivers a battleground in the fight against sea pollution," explains Christian Schmidt, a

hydrogeologist at the Helmholtz Center for Environmental Research in Leipzig, Germany (Patel, 2018). Scientists have found plastic in hundreds of species, including in 44% of all seabird species, 86% of all sea turtle species, and 43% of all marine mammal species (EnvironmentVirginia.org, 2021). Ingesting these fragments of plastic is often fatal, and it can block food from entering an animal's stomach, resulting in the animal's starvation. Plastic debris causes the deaths of more than a million seabirds every year, as well as the deaths of over 100,000 marine mammals (UNESCO, 2021). Osprey also bring debris to their nests which can be entangled by their nestlings (Ryan, 2018).

Marine debris also comes from fishing and recreational vessels; merchant and cruise ships; petroleum, drilling, and military operations. Some vessels illegally discharge galley waste and trash, and some debris is washed or blown from vessels. In addition, abandoned derelict vessels threaten safe navigation and the environment (Register et al., 2021). Fishing related gear, balloons, and plastic bags pose the greatest entanglement risk to marine fauna (Wilcox et al., 2016). Fishing and shipping industries are also affected by marine debris damage to propellers and machinery. Sadly, abandoned, lost, or discarded fishing gear has the potential to continue fishing years after loss (commonly referred to as ghost fishing), so adoption of responsible fishing practices is essential.

A new challenge regarding litter was the increase in plastics use during COVID-19, although there is limited research on municipal solid waste management during this pandemic (Kulkarni & Anantharama, 2020). This increase in plastic debris impacted the normal waste management operations and not only posed a risk of virus transmission, but also created pollution in terrestrial and marine ecosystems (Mol & Caldas, 2020). The COVID-19 global pandemic, caused by severe acute respiratory syndrome (SARS-CoV-2), is known to be easily

transmissible from one person to another (Parashar & Hait, 2021). The Centers for Disease Control and Prevention recommended the use of double-lined garbage bags, disinfecting wipes, masks, and disposable gloves when cleaning and disinfecting homes (CDC, 2021). It is estimated that, globally, 3.4 billion single-use face masks/face shields were discarded daily because of the COVID-19 pandemic (Benson, 2021). The amount of plastic waste globally generated since the COVID-19 outbreak is estimated daily at 1.6 million tons (Benson, 2021). Plastics can be a protector, but also a polluter, since many are light, blow in the wind, and float in our waters if they are not properly disposed of. Regarding negative impacts plastics can cause to animals, Elizabeth River rehabilitators share that, during COVID-19, they could not keep up the number of animals injured by plastics such as fishing line (Dunbar, 2021).

Without improvements to the waste management system, by 2050, an estimated 12 billion metric tons of plastic litter will end up in landfills and in the natural environment (Geyer et al., 2017). Our current waste management system is inefficient to deal with our increased dependence on plastic mainly due to inappropriate waste management practices and improper disposal of plastics (Chen, 2015). Individual responsibility, corporate action, and government policy are all necessary to keep us from transitioning from one disaster to another (Vanapalli, 2021). The unexpected quantity and fluctuations in waste require a dynamic response from policymakers (Sharma et al., 2020). In addition, to addressing views and policies regarding marine debris removal in this study, information was gathered about what types of marine debris stakeholders observed and how they removed the debris. Scientific data and narratives contributes to initiating and developing marine debris policy initiatives (Nielsen, 2023).

**MARINE DEBRIS POLICIES AT THE FEDERAL, STATE, AND LOCAL LEVELS**

Stakeholders from different levels of government are important to approach marine debris although in the current landscape much is regulatory. There are different approaches to marine debris but for the purpose of this study federal, state, and local policies will be reviewed regarding marine debris. In the United States, often three levels of government play a role in the implementation of environmental law that includes federal, state and local levels although, it is the local governments that are ultimately responsible for pollution control (Switzer, 2019). Local litter policies are included in this study to address the impact of land debris on the marine environment. Land-based debris is washed, blown, or discharged into nearby waterways by rain, snowmelt, and wind. Both legal and illegal waste handling practices also contribute to marine debris and sources include illegal dumping, public littering, poorly covered dumpsters and dump trucks, sewer overflows, fishermen and other shore-based activities (Sheavly & Register, 2007).

Capturing the complexities of marine debris requires the full participation of all actors concerned with the use of waterways and in this case from the Elizabeth River to the Chesapeake Bay and the Atlantic Ocean. The importance of policies on public awareness and views can have an effective role and actors must include policymakers, companies, industries, civil society, and scientists (Pais, 2023). There is a gap in research with a focus on the important role of local governments in implementing federal and state environmental statutes (Switzer, 2019) and this case study will focus on the Elizabeth River's stakeholders from multiple levels that operate facilities located on the river, and utilize or play a role in policy affecting the river.

Environmental policy is the course of government action in response to social problems (Kraft, 2018). Before the 1800s, state and local governments managed natural resources and decisions of water resources were left in the hands of property owners and private industry

(Morris et al., 2013). As illustrated in Appendices A and B, in the 1970s the momentum picked up on water protection and the U.S. Environmental Protection Agency and the National Oceanic and Atmospheric Administration (NOAA) was established as part of the *National Environmental Policy Act* (NEPA.gov, 2021). Over time, water pollution legislation moved towards a stronger federal role, and Congress passed the *Clean Water Act of 1972* (U.S.EPA, 1972). A national goal was established that all surface waters should be "fishable and swimmable." The act gave states, as well as the Environmental Protection Agency, the authority to regulate industrial point sources of pollution and municipal wastewater treatment facilities.

According to the EPA nonpoint source pollution is the Nation's largest water quality problem and generally results from land runoff caused by rainfall that carries natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters and ground waters (U.S.EPA, 1996). Most relevant to this study is *The Marine Debris Act*, (Public Law 116-224) enacted in 2006 and amended in 2012, 2018, and then became *The Save Our Seas 2.0 Act of 2020* (U.S. EPA, 2020b). The act requires NOAA and the Interagency Marine Debris Coordinating Committee (IMDCC) to coordinate a program of marine debris research and activities. The program also includes federal agencies and non-governmental organizations, industry, academia, states, and tribes and requires "identifying sources, prevention, removal and to address the adverse impacts of marine debris on the economy of the United States, marine environment and navigation safety" (NOAA.gov, 2019). The IMDCC also promotes best management practices, shares information, and submits biennial reports to Congress with updates on achievements, and recommendations. It also authorizes NOAA to work on marine debris around the world by establishing a Marine Debris Foundation, a Genius Prize for Save Our Seas Innovation, and requires several new reports and studies on different aspects of marine

debris (U.S.EPA, 2020b). Prior federal laws did not directly target marine debris, but addressed waste management, pollution, and discharges into the ocean (McCoy, 2021).

There have also been initiatives at the Mid-Atlantic regional level that includes the Mid-Atlantic Regional Council on the Ocean, MARCO that believes addressing the problem of marine debris requires collaboration across multiple levels of government with partners in the private sector and the public. MARCO along with five states that include Delaware, New Jersey, Virginia, Maryland, New York, Pennsylvania and the District of Columbia coordinates a work group and activities that support the *Mid-Atlantic Marine Debris Action Plan* (MARPB, 2016). Regarding policies MARCO is supporting research on lessons-learned and public perception of existing marine debris policies in the region to inform future marine debris-related policy development. The assessment will be completed by December 2024 and will measure public support for new laws and policies that aim to reduce the sources of marine debris through a regional survey and synthesis. MARCO has also supported legislation § 29.1-556.1 where release of certain balloons prohibited; civil penalty; community service (U.S.Legal.com, 2021b). They are also continuing to implement marketing campaigns and education regarding best practices and impacts of balloons.

At the state level, the nonprofit Clean Virginia Waterways at Longwood University along with over 100 diverse stakeholders, developed the *Virginia Marine Debris Reduction Plan* as a statewide roadmap for nonprofit organizations, local governments, state agencies, regional partners, researchers, and industry to work together on sustained approaches to reducing the flow of marine debris into our coastal waters (Register et al., 2021). Actors for implementation include multi-agency efforts within state government, the Virginia General Assembly, and other policy makers who have a role in marine debris policies and laws along with people with diverse

expertise for fostering ideas for best practices to reduce marine debris. NOAA also has documents in place to respond to waterway incidents and they outline existing response structures at the local, state, and federal levels (NOAA, 2021).

In 1983, the U.S. Environmental Protection Agency identified several bodies of water, including the Elizabeth River, as impaired and additional federal legislation followed (U.S.EPA, 1983). *The Shore Protection Act of 1988* aims to minimize trash, medical debris, and other harmful material from being deposited into coastal waters because of inadequate waste handling procedures by vessels transporting waste (Govinfo.gov., 1988). Under *The Ocean Dumping Ban Act*, ocean dumping of industrial waste and sewage sludge was stopped in 1988 and 1992. States began to implement management measures to reduce polluted runoff as required by section 315 of the *Clean Water Act* and the *Coastal Zone Management Act Amendments of 1990* (U.S.EPA, 1972, NOAA.gov, 1990). *The Pollution Prevention Act of 1990*, (U.S. EPA, 1990) endorsed by Congress said that pollution prevention laws must include pollution reduction goals, plans, facility assessments, and provisions on information and technical help. States then began to help facilities conduct voluntary assessments to identify pollution sources and develop strategies. This approach, called *Strategic Environmental Assessment* (SEA), addresses the environmental considerations and consequences of proposed policy, plan, and program initiatives before specific projects have been identified (U.S.Legal.com, 2021b).

## VIRGINIA LITTER LEGISLATION

This study includes state litter legislation because local governments have responsibilities in implementing environmental policies for public health and safety, economic interests, and pollution control and are often constrained in decision-making by state policies (Switzer, 2019). Land-based sources of litter such as plastic bags and food containers are washed or blown

into rivers and water-based sources include abandoned derelict vessels and fishing gear and crab pots. Trash is also intentionally or accidentally released by recreational boaters, cruise ships, merchant vessels, and military ships. Deteriorating shoreline structures can also become marine debris, such as pilings from old piers and bulkheads.

Like many states, Virginia is underfunded and ill-equipped to manage the flow of litter that is polluting our roads, neighborhoods, and waterways. The Commonwealth's policies were implemented using an outdated study that included limited data of only two miles of roads to determine the state's baseline litter tax (LitterFreeVirginia.org, 2021). In 1979, Stephen Runkle, the author of the study said, "It should be understood that the results only included twenty sites and should not be generalized for the entire Virginia highway system" (Runkle, 1979). The litter analyzed in 1979 does not reflect the litter we have today, and it includes aluminum cans, which are no longer the top littered item. Aluminum has been replaced by plastic bags, polystyrene food containers, plastic cutlery, food wrappers, and plastic bottles (Register et al., 2021).

In 2021, legislation § 29.1-556.1 was an authorized amendment that was originally bill HB 2159 regarding prohibiting release of certain balloons that includes civil penalty and community service (USLegal.com, 2021a and b). This legislation "prohibits any individual 16 years of age or older or other person, including a corporation, from intentionally releasing, discarding, or causing to be released or discarded any nonbiodegradable balloon outdoors and provides that any person convicted of such violation is liable for a civil penalty of $25 per balloon, to be paid into the Game Protection Fund. The bill provides that if a person under the age of 16 releases a balloon at the instruction of an adult, the adult shall be liable for the civil penalty. Current law prohibits a person from knowingly releasing 50 or more such balloons

within an hour and sets the civil penalty at $5 per balloon, with the proceeds deposited into the Lifetime Hunting and Fishing Endowment Fund" (U.S.Legal.com, 2021b).

Virginia has enacted litter legislation and policies to address some common and harmful sources of marine debris. Recent policies include H.B. 534 that allows local governments to place a five-cent tax on shopping bags. "Any city or county in Virginia may impose a 5-cent tax on each disposable plastic bag provided to shoppers in local grocery stores, convenience stores, and pharmacies. The city or county needs to pass an ordinance to begin applying this tax. The store collects the tax at the time of the sale. Money raised by this tax goes to support environmental cleanup, litter and pollution mitigation, or environmental education efforts, or to provide reusable bags to recipients of SNAP or WIC benefits" (TaxVA.gov, 2022). Currently, the Elizabeth River watershed cities have not adopted this tax. In 2020, legislation § 58.1-1707, regarding litter tax for businesses, was raised, for the first time in 43 years, from $10 to $20 for businesses that manufacture, wholesale, distribute, or sell products from fourteen categories that include food for human or pet consumption, groceries, tobacco, soft drinks, alcohol, newspapers and magazines, motor vehicle parts, paper products, glass and metal containers, plastic or synthetic fibers, cleaning products, non-drugstore sundry products, and distilled spirits. An additional annual litter tax (for each location that manufactures, sells, or distributes groceries, soft drinks, or beer) was raised from $15 to $30. So, a grocery store chain with 10 locations in Virginia will owe $50 ($20 plus $30) for each grocery store, or $500 total (TaxVA,gov, 2022).

**CODE OF VIRGINIA: LITTER**

- § 62.1-194.2. Throwing trash into or obstructing river, creek, stream, or swamp. It shall be unlawful for any person to throw or otherwise dispose of trash, debris, logs, or fell timber or make or cause to be made any obstruction which exists for more than a week

(accepting a lawfully constructed dam) in, under, over or across any river, creek, stream, or swamp, so as to obstruct the free passage of boats, canoes, or other floating vessels, or fish in such waters. The provisions of this section shall be enforceable by duly authorized state and local law-enforcement officials and by conservation police officers. Violations of this section shall be punishable as a misdemeanor under § 18.2-12; and each day for which any violation continues without removal of such obstruction, on and after the tenth day following service of process on the violator.

- 33.2-802 Dumping Trash Penalty (Virginia Law, 2021):

  a.  It is unlawful for any person to dump or otherwise dispose of trash, garbage, refuse, litter, a companion animal as defined in § 3.2-6500 for the purpose of disposal, or other unsightly matter on (i) public property, including a public highway, right-of-way, or property adjacent to such highway or right-of-way, or private property without the written consent of the owner or his agent.

  b.  If a person is arrested for a violation of this section and the matter alleged to have been illegally dumped or disposed of has been ejected from a motor vehicle or transported to the disposal site in a motor vehicle, the arresting officer may comply with the provisions of § 46.2-936 in making an arrest. Any person observed and the matter illegally dumped or disposed of has been ejected or removed from a motor vehicle, the owner or operator of the motor vehicle shall be presumed to be the person ejecting or disposing of the matter.

  c.  Any person convicted of a violation of this section is guilty of a misdemeanor punishable by confinement in jail for not more than 12 months and a fine of not less than $500 or more than $2,500, either or both. In lieu of the imposition of

confinement in jail, the court may order the defendant to perform a mandatory

minimum of 10 hours of community service in litter abatement activities.

Beyond this legislation, storm drains transport litter, pet waste, pesticides, fertilizers, motor oil and debris as runoff. Debris accumulates in sewers, and it can increase flood risks (Adam et al., 2020). Under the *Clean Water Act* (U.S. EPA, 1972), government-owned and operated storm sewer systems are regulated as point sources and are called municipal separate storm sewer systems (MS4s) (Register et al., 2021). Permits are managed by the Virginia Department of Environmental Quality, and they require MS4 owners to reduce the discharge of pollutants and litter to protect rivers, wetlands, and bays (VADEQ, 2021).

In summary, marine debris is a wicked problem that requires stakeholders from multiple sectors to be committed and engaged to find marine debris solutions. There is limited research on marine debris problems in an urban, industrialized, and polluted area such as the Elizabeth River that is home to a world-class port with historic significance. This study addressed the gap in knowledge on the views and policies of stakeholders from multiple sectors that use or play a role in policy affecting the river. Although there is a menu of removal methods and technology it is unknown if the Elizabeth River stakeholders are employing them. Federal, state, and local levels of government must be involved although local governments are responsible for pollution. There has been some progress in Virginia litter laws, but more is needed to address the influx of litter and marine debris.

**CHAPTER III**

**THEORY AND CONCEPTUAL FRAMEWORK**

**NARRATIVE POLICY FRAMEWORK**

To gain a better understanding of the marine debris problem in an industrial river and harbor, this study employed the Narrative Policy Framework to assess stakeholders' views and perspectives about marine debris removal in Virginia's Elizabeth River. A narrative is "a story with a sequence of events, unfolding in a plot that is populated by dramatic moments, symbols, and archetypal characters that culminate in a moral to the story" (Jones & McBeth, 2010, p. 329). Human beings order their social reality through narrative and the need to tell a compelling story (Jones & Crow, 2017). Narratives are also especially important with "wicked problems" (Rittel & Webber, 1973) that include value-based conflict and resist resolution such as climate change (Rein & Schon, 1996; Veselkova, 2017). Scientists tend to rely on probability, uncertainty, frequency, and magnitude, but people communicate their realities through narratives or stories with character, plot, and settings (Jones, 2014b). Often to persuade each other, stories include sharing information, experiences and opinions and these narratives can be part of the policy process (Crow & Lawlor, 2016; Wolton & Crow, 2022). In addition, narratives in policymaking can play a crucial role in sharing beliefs (Veselkova, 2017).

In a 2010 issue of *Policy Studies Journal* (Jones & McBeth, 2010) the Narrative Policy Framework (NPF) was named for the purpose of understanding the role of narrative in the policy process. Conceived at the Port Neuf School of Narrative (McBeth et al,. 2014) NPF's initial purpose was to scientifically understand the relationship between narratives and the policy process (Shanahan et al, 2011) and since has expanded to non-scientific (Jones & Radaelli, 2015)

and science and policy communication (Crow & Jones, 2018; Guenther, 2020; Jones & Crow, 2017; Raile, 2022). The NPF was introduced as a quantitative approach to the study of policy narratives and originated in the United States with application mainly to environmental policy (Jones & McBeth, 2010; Schlaufer, 2022). Smith and Larimer, who had originally questioned whether NPF would be successful, answered their own question with "Yes! This array of estimation techniques and methodologies used by NPF scholars should be commended, not scorned" (Smith, 2015, p. 174).

The NPF has been reflected in research since the 1980s and stems from a postpositivist framework (Fischer, 2003; Hajer, 1995; Jones et al., 2014; Majone, 1989; Roe, 1992; Stone, 2012) and is intended to help researchers make sense of the policy process and gain a scientific understanding of the stories people tell about public policy and then be able to predict the policy process necessary (Jones et al, 2020). NPF was introduced through research in multiple fields including English (Herman, 2003), psychology (Polkinghorne, 1988), communication (Kinder, 2007), and political science (Berinsky, 2006) where storytelling was explored in social and political life (Jones & Crow, 2017). The NPF has also been applied across different contexts and researchers argue that narratives are important to gain a better understanding through comparison, openness and multiple levels of analysis (Smith-Walter, 2020).

**POST POSITIVIST ONTOLOGY**

This dissertation's study reflected a postpositivist ontology and epistemological positions included empiricism and constructivism (interpretive) (Creswell & Miller, 2000). Empirical elements were acknowledged since policymakers' stories have components that are engineered in accordance with their ideas and qualitative researchers are encouraged to adopt a more constructivist epistemological approach since they believe in pluralistic, interpretive, open-

ended, and contextualized (e.g., sensitive to place and situation) perspectives toward reality (Creswell & Miller, 2000). Although quantitative research is appreciated, this dissertation's qualitative study included an inductive inquiry approach with semi-structured interviews, open-ended questions, coding and a content analysis. Stakeholders represented groups or sectors and share their views and perspectives from their observations, senses and experiences with Elizabeth River's marine debris. Jones (2016) argued that qualitative methods are critical for the NPF's development for more detailed descriptions and inductive forms of inquiry where sample sizes, access and salience may limit quantitative approaches (Gray & Jones, 2016).

## FORM AND CONTENT IN NPF

NPF is an empirical approach that posits that "the policy-makers' stories have generalizable components and are built and crafted in accordance to their ideas" (Rodrigues, 2020). These policy narratives are at the center of the policy process. As illustrated in Table 5, they begin with a problem and include core components of form (structure: setting, plot, characters and moral) and content (values, and beliefs) (Shanahan et al, 2018). NPF must include at least two elements – one character and the context related to a policy and highlight dynamics, beliefs and actor behavior within the policy process (Jones, 2014b; Jones et al., 2014; Shanahan et al., 2017).

The goal of the NPF is to analyze the impact of the narratives on policy outputs and theorizes that actors use narratives to develop and mold the policy process (Gupta et al., 2022; O'Leary, 2017). Weible and Carter argue that policy process research can be advanced by 1.) extending policy process research beyond its typical scope of inquiry, 2.) clarify theoretical black boxes commonly exhibited by policy process literature and 3.) enhance the explanatory potential of policy process theories by identifying undervalued causal factors (Weible & Carter, 2017).

For instance, analysis of narratives of public managers actions and their relationships with the structures and environments in which they operate (Sowa & Lu, 2017) and other sectors including relationships with government entities (Bushouse, 2017) could provide fuller, understandings of public policies, the processes in which they are embedded, and their impacts on society (Weible & Carter, 2017).

**Table 5**

*Narrative Policy Framework Form and Content*

| | CHARACTERISTIC | DEFINITION |
|---|---|---|
| | Policy Problem | Policy problems are usually presented in the form of a story with a beginning, middle and end and have a transformation, moral, action or result (Uldanov et al., 2021). |
| | Policy Narratives | Core elements: setting, characters, plot and moral (Shanahan, 2018). |
| **FORM** | Setting | Policy phenomena such as legal and constitutional parameters, geography, evidence, economic conditions, norms, or other features (Sabatier, 2018). |
| | Plot | A plot is the storyline, ties the characters with the setting and often begins with blame, decline, or conspiracy (Stone, 1989). |
| | Characters | Every policy narrative must have characters that are somehow affected by the actions of others and are the emotional aspect of policy stories and there will also be a hero who offers a solution to prevent the victim from being harmed or solves the problem. (Jones, 2014a; McBeth, 2005; Verweij & Thompson, 2006). |
| | Moral | The point or moral of the story is what the listener is supposed to take with them and is often the solution to the problem. |
| **CONTENT** | Beliefs | Set of values or beliefs (Shanahan, 2018). |
| | Strategies | Manipulate or control the policy process (Shanahan, 2018). |

As in this study, stakeholders can share powerful narratives that describe a problem in need of solutions in order to advocate for and understand the world around them (Jones & McBeth, 2010; Jones et al., 2014). Policy problems are usually presented in the form of a story

with a beginning, middle and end and have a transformation, moral, action or result (Uldanov et al., 2021). According to the NPF, narratives have the following characteristics that include a policy problem, solutions (moral to the story), setting, plot and characters. The setting and plot help create an argument that there is a problem that must be solved through policy action (Wolton & Crow, 2022).

**SETTING**

The setting is where the narrative takes place and could include ideas, facts, scientific information such as number of waterways impacted by debris or legal rules that affect a body of water (Shanahan et al., 2011). "Some of the features will be taken for granted by all actors engaging the policy narrative, while other features of the setting, such as a particular scientific finding presented as evidence, might be quite contested" (Jones, 2018, p. 728).

**PLOT**

A plot is the storyline, ties the characters with the setting and often begins with blame, decline, or conspiracy and often has a beginning, middle and end (Jones, 2018; Stone, 1989). There are two kinds of plots that include stories of change with the rise or decline of something and stories of power with helplessness or corruption (Stone, 2012). The plot can reveal what elements of the setting are active, dormant, or left out (Jones, 2017).

**CHARACTERS**

As illustrated in Table 6, every policy narrative must have characters that are somehow affected by the actions of others and are the emotional aspect of policy stories (Jones, 2014a; McBeth, 2005; Verweij & Thompson, 2006). There will also be a hero who offers a solution to prevent the victim from being harmed or solves the problem. Additional characters could include

beneficiaries (Weible et al., 2016) that are positively affected by the proposed policy solution, allies who help the hero (McBeth, 2005) and opponents who are not villains but oppose a policy or the hero (Merry, 2015).

**Table 6**

*Narrative Policy Framework Characters*

| CHARACTER | DEFINITION |
|---|---|
| **Heroes** | Fix or attempt to fix a problem and may be praised (Peterson et al., 2022). |
| **Villains** | Do harm or are blamed for the problem (Peterson et al., 2022). |
| **Victims** | Receive sympathy and are harmed by the problem (Peterson et al., 2022). |
| **Allies** | Their policy position is like-minded and in agreement with the author of the policy and they help the hero (McBeth, 2005). |
| **Opponents** | Their policy position is in disagreement with the author, and they may receive blame although often less harsh than the villain (Merry, 2015). |
| **Beneficiaries** | They are affected by the proposed policy solution (Weible, 2016). |

**MORAL**

The narrative policy follows a process and ends with a call to action, a policy solution, or a moral to the story often after debate (Ney, 2000; Shanahan, 2018). The point or moral of the story is what the listener is supposed to take with them and is often the solution to the problem. To support policy goals, advocates can use narratives to influence decision-makers and the public (Wolton & Crow, 2022). This study had policy recommendations and outcomes versus one policy solution since marine debris is a wicked problem without one solution (Rittel & Webber, 1973).

**BELIEFS AND NARRATIVE STRATEGY**

Belief systems should capture systemic meaning-making in relevant populations so that when individuals interact with policy narratives and the elements (hero, villain, policy outcomes or solutions) the narrative will be illuminated and related to those elements among relevant populations (Jones, 2018). For instance, in this study all the stakeholders were portrayed as heroes removing the marine debris where there was too much for them to handle. The policymakers that support environment issues may be supportive of this narrative while those that don't may gently place it to the side. In addition, narrative strategies are utilized to influence public policy and include the "devil-angel shift" and causal mechanisms (Uldanov et al., 2021). The devil shift includes characters that are powerful, evil, and vicious and the angel shift includes characters that are celebrated as heroes as in this study's case. The devil shift could be used to name, shame, and blame where the angel shift may be used in winning scenarios. Additional strategies could include building consensus (containment) or dramatically expand the conflict. If losing – the strategy may be to draw attention to the problem and expand the conflict, costs and pitfalls (Gupta et al., 2014). For instance, in this study, stakeholders shared there was a lack of manpower, supplies, and equipment to tackle the river's marine debris problem that is dangerous and expensive to remove. If using containment – the strategy may be to reduce attention to the problem and focus on the benefits. Causal mechanisms are intentional (villains create trouble), mechanical (unanticipated events led the villain to create the problem) and accidental (unintentional). In this study, the marine debris removal is being tackled from all directions be each of the sectors to the degree that they can handle it.

**QUALITATIVE NARRATIVE POLICY FRAMEWORK IMPLEMENTATION**

The Qualitative Narrative Policy Framework (QNPF) is an extension of the NPF. To implement QNPF, Grays and Jones (2016) were the first to conduct a qualitative NPF research study and they analyzed policy narratives, strategies and actors surrounding the U.S. campaign finance reform (Gray & Jones, 2016). They kept the NPF in place in terms of assumptions, narrative elements, and level of analysis but they recalibrated the NPF to incorporate qualitative methods for data coding, analysis and evaluation. They also recommended following these steps that closely align with this study. 1.) identify and describe the policy issue; 2.) choose the method for research design and collect the data by implementing in-depth interviews; 3.) analyze the data with coding; and 4.) present the policy narrative elements including the settings, characters, plots, and morals of the story and policy outcomes. To prove the QNPF they collected data via twenty-nine interviews with key stakeholders in the United States campaign finance arena regarding campaign finance reform. They recruited participants through a snowball sampling technique, conducted and recorded semi-structured interviews by phone, transcribed utilizing ATLAS.ti and deductively coded with these elements: setting, plots, characters, and policy solutions. Inductive coding facilitated their narrative strategy code to identify the intentional use narrative elements to persuade support. Findings showed that NPF is well-suited for qualitative methodologies without compromising the original intent of NPF (Gray & Jones, 2016).

QNPF was chosen for this dissertation study to better understand Virginia's Elizabeth River marine debris problem, stakeholder views about marine debris and their approaches to marine debris removal and policies. In addition, there was an absence of studies that applied QNPF to marine debris problems in U.S. industrial ports and harbors, specifically the Elizabeth

River. Although this study included the QNPF, both NPF and QNPF are referenced. This also provided an opportunity to contribute to the NPF and QNPF literature.

**MESO LEVEL OF ANALYSIS**

This study applied the QNPF with a meso or group level of analysis by grouping stakeholders in nine different sectors although elements of all levels were present. Researchers can apply QNPF to study the role of the narrative at different levels of analysis that includes helping shape the policy processes and outcomes and include the micro, meso, and macro levels. The micro-level researchers study how narratives influence individuals, the meso-level includes multiple individuals or groups, and the macro-level includes an institution or culture (Uldanov et al., 2021). An example of micro-level (individual) is analyzing public opinion to understand how an audience is swayed by policy narratives or an individual's risk behavior to an environmental hazard (Shanahan, 2013). In this study, although the stakeholders were representing a group or sector and sharing their perspectives and views of an organization, their individual actions, voice and recommendations were included. Meso-level (group) analysis is the most frequently explored and could be utilized to analyze policy outcomes. An example may be assessing a community for hazards and disaster studies such as this study's focus on a marine debris problem. The Elizabeth River is an industrial working river with many sectors that have varied interests in the Elizabeth River from the port, military, shipyards, fishing, to tourism and recreation. The macro-level (community or society) is less studied and includes an analysis of an institution or societal scale policy outcome and process. The QNPF can help organize the narrative and give meaning to the policy, but actors can manipulate the meanings by changing narratives (Jones & Radaelli, 2015). This study is a case study of the Elizabeth River and an overall narrative emerged that represented all the sectors. Therefore, although this study

implemented a meso-level analysis, elements of the micro and macro level were included.

**FIVE CORE ASSUMPTIONS FOR NPF**

This study aligned with the NPF five core assumptions listed below (Shanahan, 2018).

**1.) Social Construction of Policy Realities:** Meaningful parts of policy reality are socially constructed although NPF accepts that there is an objective world independent of human perception (Jones, 2018). NPF also assumes that the important part of reality is what people believe something means so it focuses on the social constructions people use to interpret and define the world (Jones, 2018). Social construction shapes how we view and interpret facts and prioritize solutions in the policy process. For instance, in this study different narratives existed about the riverine marine debris problem, where it originated, what was the cause and what were possible solutions for removal. These narratives can influence policy decisions about the Elizabeth River's marine debris problem.

**2.) Bounded Relativity:** People are bound by their identities, belief systems and strategies they use to organize concepts, objects and relationships (Jones et al., 2022). Variation is bounded and thus is not random, but rather, has some stability over time. In other words, there are limits to the kinds of interpretations people will make and meaning making is bound when striving to impose order on the understanding of the world (Jones, 2018).

For instance, in this study each participant was bound by their individual beliefs as a representative of one of the nine sectors.

**3.) Generalizable Structural Elements:** NPF adopts a structuralist approach to narrative (Shenhav, 2015), where narratives contain identifiable and measurable elements. Narratives have specific and identifiable structures, and it is appropriate to categorize, count, and perform statistical operations on policy narratives (Jones et al., 2022). For instance, in this

study the narratives that participants shared included structural elements such as characters, setting, plot, and morals that were analyzed to better understand the Elizabeth River marine debris problem and possible policy outcomes.

4.) **Three Interacting Levels of Analysis:** Narratives work at three interacting levels: micro (individuals), meso (groups), and macro (cultural and institutional). NPF levels of analysis are not theorized to operate independently, the choice of the level(s) is dynamic and helps determine the scale and sample size (individual, group, or culture) on which the research is focused (Shanahan, 2018). For instance, in this study individuals (micro) represented one of the nine sectors (meso) while sharing their views and perspectives about their river that reflects a historic, industrial working harbor (macro) that the communities rely on as a natural resource.

5.) **The *Homo Narran* (storyteller and listener) Model of the Individual:** Storytelling plays a central role in how people organize and communicate information (Shanahan et al., 2017). NPF assumes emotion precedes reason and narratives are the foundation role as the primary heuristic in human cognition, communication and decision making (Jones, 2018). For instance, in this study narratives emerged that included a description of the setting, characters, plot, moral and beliefs. All the stakeholders took actions to remove the marine debris as heroes although they also felt like victims sharing there was too much marine debris to manage. Their narratives included a beginning, middle and end that included recommendations for new policies and amendments.

## RESEARCH THAT UTILIZES THE NARRATIVE POLICY FRAMEWORK

The Narrative Policy Framework is a policy theory that scholars utilize to contribute to building a knowledge of how narratives have a role in the policy process including during policy

decisions, implementation, regulation and evaluation (Shanahan, 2018). NPF is utilized to assess how narratives were developed by actors during the policy processes, how they affected opinions and preferences and the extent that narratives varied across competing coalitions (Schlager, 2014). The NPF is being widely tested, continually improved, and applied in a variety of policy areas including expanding character types and digital media as revealed as massive repositories of narrative data and comparative methods (Shanahan, 2018). A systematic review of applications for the NPF showed that 69.8% (74 of 106) of empirical NPF articles were completed in the United States alone and prior to 2014 they were mostly published with environmental focus (Radaelli, 2013). Since, the NPF has increasingly been applied to a variety of public policy fields that include energy policy, health policy and gun control (Jones, 2014b; Jones & Song, 2014; Pierce, 2014). To better understand NPF application in environmental policy research, below are eight examples of studies that have applied the NPF.

**1.) *Characters Matter: How narratives shape affective responses to risk communication***
(Shanahan et al., 2019)

This study focused on the flood risks on the Yellowstone River to seek to advance the science of narratives in risk communication. Real time affective responses with science messages were measured that included scientific information in the narrative. Ninety participants were exposed to eight science messages about flood risks. Twelve group sessions and forty-five interviews were implanted. Dial response technology was utilized to capture the participants' responses second-by-second as they heard conventional and narrative science messages. Characters portrayed in the messages were hero, victim, and victim-to-hero. Findings showed that characters' matter, science language evoked negative responses, narrative science messages had greater variance in affective responses, characters in actions lead to different affective responses,

hero and victim-to-hero elicit positive affective responses and victim characters produced negative responses. When characters were first introduced along with the flooding problem, the audiences were not engaged, however, when the drama of characters in action is presented, they did depend on the type of character. Heroes reveal increasing positive affective responses, with a sharper and higher positive affective increase for the victim-to-hero narrative; the victim narrative dips toward negative affective responses. Thus, the drama of characters in action matters in audience experience of narrative transportation (Shanahan, 2019).

**2.)** *Strategic Policy Narratives: A narrative policy study of the Columbia River Crossing* (Brewer, 2021)

NPF was used in this study to conduct content analysis on 370 public documents from competing coalitions in relation to the Columbia River Crossing project, a wicked policy issue in Portland, Oregon and Vancouver, Washington region. The content spanned a ten-year period to fully understand how coalitions strategically use policy narratives. To these authors, containment occurs when a coalition uses a policy narrative downplaying the benefits and concentrated costs to dissuade new participants and keep the status quo. Expansion occurs when a coalition uses a policy narrative depicting concentrated benefits and downplaying the costs to draw in more participants and expand the scope of conflict. The results suggest that competing coalitions will use narrative strategies that expand or contain the scope of conflict. Also, shocks to a policy subsystem could result in a shift in the narrative strategies. The findings of this study are important to meeting the gap in applications of NPF at the local level and to better understand that coalitions are strategic and use policy narrative in specific intentional ways. This study is also important to local governments in the United States that deal with wicked problems (Brewer, 2021).

**3.)** *Shaping the Scope of Conflict in Scotland's Fracking Debate: Conflict management and the Narrative Policy Framework* (Stephan, 2020)

This study applied a narrative lens to policy actors' discursive strategies in the Scottish debate over fracking. Based on a sample of 226 newspaper articles and drawing on key elements of the NPF, the research examined how policy coalitions have characterized their supporters, opponents, and the Scottish government. It also explored how actors have sought to expand or contain the scope of conflict to favor their policy objectives. Findings showed that the NPF analysis offered empirical insight into the Scottish policy dispute over fracking that equally have comparative value for the wider literature on fracking and other conflicts over energy policy. NPF enhanced the understanding of the dynamics of adversarial strategies and policy conflicts over fracking and beyond (Stephan, 2020).

**4.)** *Cultural Characters and Climate Change: How heroes shape our perception of climate science* (Jones, 2014a)

This research examined how narrative communication structures influenced the public's perceptions of risks and policy preferences in relation to climate change. Researchers implemented an Internet-based survey experiment to expose 1,500 census-balanced U.S. respondents to climate change information. Findings showed that explanations of the public's perceptions of risk and climate change policy preferences should more explicitly account for the role of dominant climate narratives. Narrative structure was found to play a prominent role in shaping many of the climate-change-opinion-related dependent variables examined including policy preferences and character affect. Respondents had a more positive affect for the hero and the preferred policy solution and lower level for villains showing that narrative structure matters (Jones, 2014a).

**5.)** *A Narrative Policy Framework Analysis for Wildfire Policy Discussions in Two Colorado Communities* (Crow et al., 2017)

This study examined media coverage from two cases of catastrophic wildfire in Colorado to understand the evolving policy narratives over time, with specific attention to three key NPF variables: policy problems, solutions, and characters. Findings indicated that narratives concerning disasters are different than other policy issues in ways that are vital to understand as scholars apply and refine the NPF. The type of policy narratives used by policy actors and the narrative elements may be related to the phases of the disaster cycle and the disaster narratives analyzed contained a greater number of heroes and nonhuman actors as compared to policy narratives in other issue areas. The findings indicated that the NPF is indeed a useful tool for understanding policy making in a disaster context, but also that scholars should consider the differences presented in this article for future application (Crow et al., 2017).

**6.)** *An Angel on the Wind: How heroic policy narratives shape policy realities* (Shanahan, 2013)

A meso-level empirical illustration of NPF was implemented for a case study of Cape Wind's proposal to install wind turbines off Nantucket. This was the first study to examine intercoalition cohesion or the extent to which a coalition tells the same story across narrative elements, narrative strategies, and policy beliefs. A content analysis of policy narratives over an eight-year period resulted in 201 narratives to analyze as public consumption documents found on the Internet. To understand what the coalitions were involved in, they identified a coalition that shared the same policy output. There was a Pro-Wind Farm coalition and Anti-Wind Farm Coalition. This dispute over wind farms in Massachusetts allowed exploration of a new policy issue where coalitions with environmental and business groups aligned on both sides of the

debate. Importantly, this policy debate produced a winner and a loser and differences in the use of narrative elements, strategies, and policy beliefs of the policy winner and loser were observed. Findings showed the two different coalitions used different narratives, characters, and provided a different solution to the policy problem. Also, the winning coalition developed a celebratory narrative and solutions were more prevalent than the losing coalition. The losing coalition became entrapped in a devil shift and kept attacking the opposing coalition as a villain. Future NPF applications will need to test whether the angel and devil shift are simply a psychological effect (winning leads to positive narratives and losing to negative narratives) or a deliberate strategy (Shanahan, 2013).

**7.)** *Trash or Treasure: Recycling narratives and reducing political polarization*

(Lybecker, 2012)

This study examined whether liberals and conservatives differ in their use of frames of recycling. A quantitative survey of students, faculty, and staff at a regional university resulted in 429 participants. There were two recycling stories representing conservative and liberal principles. The conservative narrative included a duty-based narrative with recycling as a solution to a local problem and conservative principles such as individual responsibility, and good business sense. Citizens and society were the victims of non-recycling with increased costs for goods and landfill expansion and local government were the villains for not implementing recycling. The liberal narrative included an engaged citizen with voting as the way to keep elected officials accountable for supporting recycling. Recycling was a solution to a menu of environmental problems like climate change and energy use. Corporations were the villains and society, and citizens were the victims. The participants were asked to rate their level of agreement with each story that reflected a duty-based story, or the engaged citizen story. Findings showed that that

recycling discussions should not solely emphasize climate change, energy, boycotting businesses and blaming corporations because though this frame would mobilize liberal and engaged citizen recyclers, it might repel conservatives and duty-based citizens. Also, framing recycling in terms of good business sense, individual responsibility and a way to save landfill costs works to gain support from conservatives and liberals (Lybecker, 2012).

**8.)** *Narrators and Narratives: A study of climate and air issues in Delhi, India*

(Costie & Olofsson, 2022)

This study examined policy narratives and actors who tell stories that include air quality and climate issues in Delhi, India. Informal interviews were conducted to choose the organizations to collect content data from. These organizations were active in the air and climate issue in Delhi and the content was coded and analyzed. Focusing on the narrator, they found patterns in the narratives and trends towards hero-centric narratives and the relationship between using traditional characterizations. NPF was utilized to connect the narrators to the narratives. The research also analyzed how power dynamics within a pluralist society is understood. Findings showed that it is important how narrators construct narratives in the policy process since they play a key role in shaping public opinion and are strategic tools of policy actors interested in influencing the political agenda. This research found that narrator type influences certain elements within the context of air and climate issues in Delhi, India. Industry narrators portrayed themselves as heroes while the government were the villains and the hero. Hero-centric stories abound with the public commonly characterized as the recipient of the actions of heroes and villains, and research institutions and advocacy groups played an important role in political discourse (Costie & Olofsson, 2022).

Beyond environmental policy, the application of NPF has been included in research for many different topics including: drug policies in Australia (Fitzgerald, 2013); obesity (Clemmons, 2012); border policy (Lybecker, 2015); policy regimes (May, 2013); comparative public policy (O'Bryan, 2014); 1980s U.S. foreign policy toward El Salvador (Kusko, 2013); an education policy change post-World War II to open education for all (Veselkova & Beblavy, 2014); better understand United States and international public policies (Ertas, 2015); the European Union (Radaelli, 2013); and U.S. gun policy (Merry, 2015).

## NARRATIVE POLICY FRAMEWORK RELEVANCE FOR THIS STUDY

Today, the pollution in the marine environments of the world is of major concern (Avery-Gomm, 2019; Haward, 2018). The Narrative Policy Framework can be applied to help better understand the local marine debris phenomenon from stakeholders representing multiple sectors that has not been previously studied, regarding marine debris in the Elizabeth River. More attention is needed to local policies since "there has been a lack of scholarly attention to how well the framework applies to local policy problems" (O'Donovan, 2018, p. 534). Also, a more cohesive narrative and more cooperation may be expected (Brewer, 2021). Schleicher notes that "state and local governments…are closer to the people, promote more innovation, and produce outputs that are a better fit than for … a large nation" (Schleicher, 2017, p. 763).

As seen in Stone's research, stories include narratives about how things good and bad can offer hope for complex problems (Stone, 2012). Exploration of narratives and the NPF building blocks applied to a local setting may contribute to a better understanding of the power of policy narratives to mitigate "wicked" environmental challenges. Defining the narrative characters was essential to guiding this research study. Although characters are often individuals, agents, or groups (public/private), environmental problems or non-human characters (ex. global warming)

have been identified as villains and are seen as having agency (Shanahan, 2018). In contrast, some argue that, if the proposed character cannot take action or do harm, then it cannot be a character, since it cannot make decisions or do something in the policy arena (Weible, 2016).

The deductive aspect of this study's coding included NPF's policy narrative codes: setting, plots, characters, and policy solutions (moral) and inductively coded for emerging patterns, themes and concepts (Gray & Jones, 2016). Below are examples of possible participants' responses prior to the analysis of this dissertation. Findings are in the Results Chapter 5 in this dissertation.

- **Setting:** Participants were asked to describe the marine debris problem in the Elizabeth River. Participants may share that it was good, terrible, bad, better, an eyesore, etc.
- **Villain:** In this study the villain represented the cause(s) of the marine debris problem, how often they saw the debris and where it originated. A possible response could be the marine debris was caused by the weather, it originated with people, and they saw it mainly after storms.
- **Heroes:** In this study heroes were the problem fixers and were taking action to remove the debris. A possible response could be that the heroes were volunteers that participated in litter cleanups.
- **Plot:** In this study, participants were asked what were their policies, practices and barriers to removing the marine debris. A possible response could be that they took nets and removed debris from the river at their organization's site daily although there was not a written policy, and they lack the resources to acquire more trash bins.
- **Belief:** In this study, participants were asked what they believed was the role of the local and federal government in managing marine debris. A possible response could be that they

believed the federal government should support banning all plastics and the local government should support recycling.

- **Moral/Policy:** In this study, participants were asked what were their suggestions on policies for management of marine debris at their organization. A possible response could be that they want their current litter policy to specifically address marine debris.

Different methods of data collection are utilized for NPF application that include content analysis, interviews, surveys, and observations. For this study, interviews and content analysis were implemented. A systemic analysis of NPF application showed that content analysis is most frequently used and showed researchers analyzed newspaper articles and offline documents such as policy documents, reports and legislation and interviews ranked second (Schlaufer, 2022). How individuals perceive the problem can frame the problem and could significantly affect the extent to which it will be high on the political agenda as well as the degree of political action that is taken (Maeland & Staupe-Delgado, 2020).

In summary, this dissertation's study reflected a postpositivist ontology and epistemological elements that were empirical and socially constructed. The Qualitative Narrative Policy Framework was applied with a meso level analysis to better understand a local marine debris phenomenon from stakeholders representing multiple sectors and to contribute to a thin amount of existing knowledge on Virginia's Elizabeth River macro marine debris problem. Researchers can apply the Qualitative Narrative Policy Framework (QNPF) to study the role of the narrative at the micro (individual), meso (group) and macro (cultural) levels of analysis that could help shape the policy processes and outcomes. The Narrative Policy Framework (NPF) is an empirical approach used to uncover, highlight and analyze the impact of the narratives on policy outputs (Palm et al., 2022). Policy narratives have a policy problem, solutions (moral to

the story), setting (context), plot (beginning, middle and end) and characters (heroes, villains, and victims) (Jones & McBeth, 2010). The moral to the story is the solution to the policy problem and it often includes policy actions (Palm, 2022).

CHAPTER IV

RESEARCH DESIGN AND METHODS

**INTRODUCTION OF CHAPTER**

This chapter describes the research design and the justification for utilizing the qualitative research method with interviewing and content analysis. Also included is information on participant selection, data collection methods and how the interviews were coded. Information about the protection of human subjects is included. This study was reviewed and determined as exempt research by Old Dominion University's Institutional Review Board (see Appendix C). This chapter concludes with sections on validity, reliability, dissemination, and limitations.

**OVERVIEW OF THIS STUDY**

To gain an understanding of the complexity of Virginia's Elizabeth River marine debris problem, a qualitative, single instrumental, case study was implemented that included cross-sectional, in-depth interviews and content analysis. With an inductive bottom-up approach, the intent of this study was to address gaps in the literature that included the need to understand the views and policy approaches of riverine marine debris removal in an industrialized port at the meso organizational level and to make contributions to the Narrative Policy Framework (NPF) that lacks qualitative studies (Gray & Jones, 2016). NPF has its roots in the method of content analysis and this research included reviewing maps, strategic plans, and legislation regarding marine debris in the Elizabeth River (McBeth, 2005). The study methodology was consistent with those used in other NPS studies.

**RESEARCH QUESTIONS AND CLAIMS**

Guiding the case study methodology are the following research questions:

RQ1: What are the views of stakeholders from multiple sectors on the marine debris problems at

the mouth of the Elizabeth River?

RQ2: Which stakeholders are considered in addressing marine debris issues?

RQ3: What is the match between the views of stakeholders' and policies to address marine

debris?

**QUALITATIVE NARRATIVE POLICY FRAMEWORK STUDIES**

To date the NPF has primarily drawn upon quantitative methods such as surveys,

statistical content analysis, and experiments to study policy narratives with only a number of

qualitative studies (Pierce, 2014). This study's intent was to build upon this small number of

qualitative studies by providing a marine debris study that applied the QNPF where narratives

emerged about the Elizabeth River's marine debris problem along with policy recommendations.

When searching for research studies that applied the Qualitative Narrative Policy Framework

most studies noted that they used the Narrative Policy Framework that included qualitative

methods versus the QNPF. Although extensive research was not performed, the following studies

did utilize the QNPF.

**1.)** *Competing Public Narratives in Nutrition Policy: Insights into the ideational barriers of*
*public support for regulatory nutrition measures* (Cullerton, 2022)

This study investigated how policy messaging can better resonate with a target audience. They

examined the frames and narratives used by the Australian public when discussing nutrition

policies. They conducted 76 street intercept interviews to illustrate how competing narratives

vary. Findings showed a moderate to high level of support for all nutrition policies although the

nutrition policies perceived to be most intrusive to personal freedoms and were the least popular among the public. The QNPF showed two distinct settings in the narratives that included concern for the community or concern for self. Villains were identified as parents and the food industry; victims were identified as children and the farmers. The plot focused on individuals making poor choices because they were uneducated versus the powerful food industry, controlling people and the government (Cullerton, 2022).

**2.) *A Qualitative Narrative Policy Framework? Examining the policy narratives of U.S. campaign finance regulatory reform*** (Gray & Jones, 2016)

This study assessed compatibility between qualitative methods and the NPF by applying classic qualitative criteria to a case study of examining policy narratives in the U.S. campaign finance reform. Drawing on 29 thirty-five-minute interviews mainly by phone from key stakeholders in the U.S. campaign finance arena. They included traditional NPF policy narrative codes: setting, plots, characters, and policy solutions. They looked at competing policy narratives with democratic values that exhibited variation in how victims and harm are defined, and how blame is attributed to villains, what policy solutions were put forth, and policy narrative communication strategies. Their analysis revealed that expression and equality stories about campaign finance are quite different although with one point of convergence identified. Both groups seemed willing to agree that whatever system was in place, it would favor incumbents. The intent was to apply the qualitative method in the NPF for the framework's overall development. The researchers submit that there is value and a need for both quantitative applications of the NPF and QNPF. This research also produced a guide on how to conduct QNPF (Gray & Jones, 2016).

**3.) *Exploring the Policy Narratives of the War on Diabetes: A qualitative narrative policy framework*** (Ow Yong et al., 2023)

This qualitative study built on an earlier study to explore the extent to which the 'War on Diabetes' could be explained by ideas of NPF among the general public. This study followed Gray and Jones' guide and included 40 in-depth semi-structured interviews including those with and without diabetes, the caregivers and social service agencies. Two distinct groups emerged 1.) those that viewed War on Diabetes as for "everyone" highlighted the need to embed further relevant policies on physical exercise and healthier eating and drinking in schools and workplaces, embark on nationwide aggressive testing and treatment of diabetes, and ensure continuous public engagement and persuasion through financial and individual incentives and 2.) those who saw War on Diabetes as only for "healthy and pre-diabetic individuals" suggested expanding public funding for personalized care and diabetes management devices. Additional recommendations included that it will also need to strengthen private primary care to detect and treat diabetes; and ensure age-relevant platforms to address knowledge deficiency, stigma and access issues. Advancing diabetes prevention and management in the context of War on Diabetes will need attention to consider the interest and differing views of these two population groups. This study did advance the  NPF to explain diabetes mellitus management among the general public. It also help shift the traditional model of using primarily quantitative surveys for micro-level analysis to using a qualitative approach to improve study design and survey instruments (Ow Yong et al., 2023).

**QUALITATIVE MARINE DEBRIS STUDIES**

Qualitative research attempts to understand and make sense of a phenomena from the participant's perspective (Merriam, 2002). Qualitative methods that include interviews have been used regarding marine debris research as early as an exploratory study in 1992 that investigated the impacts of marine debris from a nearby dumpsite on subsistence fishermen in Indonesia (Nash, 1992). The study included interviewing sixteen fisherfolk about the impacts of waste on their fishing methods and the main types of marine debris they were observing. The study found that plastic bags were the most common type of marine debris reported and they caused injuries due damage to propellers and fishing gear. A more recent qualitative marine debris study was conducted in Karachi, Pakistan, to understand waste management practices and key contributors to ocean litter (Ahmad, 2023). Interviews were conducted with twenty-one government, fisher and boater stakeholders that were recruited via snowball sampling. The results indicated that restaurants, export units, boat construction, tourist, and commuter activities were the primary sources of marine pollution and  plastic was the most prevalent. Another qualitative study on marine debris included content analysis to trace the evolution of marine litter policies in China since 1982 with one hundred and seventy-one policy documents (Cui, 2021). Key findings demonstrated that governance had become broader, and the policy focus had shifted from quantity reduction to more environmentally friendly practices and future policies to improve the legal system, focus on technology, and to establish land and water-based waste management practices.

**THIS RESEARCH DESIGN**

This research was a qualitative, exploratory, single instrumental, case study (Creswell & Poth, 2018; Yin, 2009) with open-ended, semi-structured research questions (Stake, 2005) and a

focus on a river's marine debris problem in an industrial port and harbor. Qualitative research employs various strategies of data collection and this study included utilizing the Qualitative Narrative Policy Framework approach with in-depth interviews, content analysis and the context of Virginia's Elizabeth River (Creswell & Poth, 2018). This study is also considered a single, instrumental, case study because the researcher focused on an issue, the marine debris problem and then selected a bounded case, Virginia's Elizabeth River to illustrate this issue (Creswell & Poth, 2018). Narratives are compared between nine stakeholder groups from different sectors that include government, private and public businesses, nonprofits, academic institutions, residential communities, fishers, military, and volunteers. This research aimed for a better understanding of the marine debris phenomenon in Virginia's Elizabeth River, where there is a specific problem within an urban and industrial port setting.

As illustrated in Table 7, this study utilized Gray and Jones Qualitative Narrative Policy Framework (2016). Gray and Jones (2016) Qualitative Narrative Policy Framework process includes 1.) identifying and describing the policy issue; 2.) choosing the method for research design; 3.) collecting and analyzing the data with coding; and 4.) presenting the policy narrative elements including the settings, characters, plots, and morals of the story and policy outcomes.

**Table 7**

*Gray and Jones Qualitative Narrative Policy Framework*

| GRAY AND JONES (2016) QNPF PROCESS | THIS STUDY |
| --- | --- |
| **Identify and describe the policy issue.** | This study assessed views and policies about marine debris removal that were unknown among stakeholders of Virginia's Elizabeth River. |
| **Choose the design and method for research design.** | This research study included in-depth, semi-structured interviews with 31 stakeholders from 9 sectors and a content analysis. |
| **Collect and analyze the data.** | Three pilot interviews were administered to test the method and questions. In-depth interviews were implemented until data saturation. The data was professionally transcribed, coded, and analyzed at the meso level. A content analysis followed that included marine debris strategies, and legislation. |
| **Present the policy narrative elements including the settings, characters, plots, and morals of the story and policy outcomes.** | Findings were included in this dissertation, disseminated to stakeholders, via conferences and with the intent to publish. Findings included the narrative policy framework elements, comparison of stakeholder views and perspectives on marine debris removal and marine debris removal policy outcomes. |

Source (Gray & Jones, 2016).

1.) **The Plan:** For this qualitative research study, views and polices about marine debris removal that are unknown among stakeholders of Virginia's Elizabeth River were assessed from in-depth interviews that are regarded as the most effective method in sampling research (Kiochos, 1993).

2.) **Research Design:** This study was a qualitative case study design that included in-depth, semi-structured interviews, content data analysis, and the Qualitative Narrative Policy Framework approach with the context of Virginia's Elizabeth River. Qualitative research locates the observer in the world and consists of a set of interpretative practices that make the world visible (Denzin & Lincoln, 2011).

3.) **Collect and Analyze Data:** With an inductive strategy, to begin, three pilot interviews were administered to test the validity of the semi-structured questions. Analysis of the pilot

interviews, testing and refining the interview is part of the procedures for preparing and

conducting interviews (Creswell & Poth, 2018; Majid, 2017). This was followed by in-depth

interviews for a total of thirty-one stakeholders from multiple sectors and until data

saturation. Data saturation is reached when there is little to no new information being

obtained (Weller, 2018). The interviews were then transcribed, coded, and analyzed.

Comparative analysis of the views and perspectives of the stakeholders from multiple

sectors, narrative elements, and outcomes for marine debris removal was included in the

Results Chapter of this dissertation. A content analysis was also implemented that included

reviewing maps, strategies, and legislation pertinent to Virginia's Elizabeth River marine

debris problem.

**4.)  Disseminate Results:**  Findings were disseminated to stakeholders, via conferences and

through publishing.

## DATA COLLECTION

To gain an understanding of the views and approaches to marine debris removal one-on-

one, in-depth interviews were implemented in this study as the primary strategy for collecting

data. Stakeholders located in the main stem or the watershed of Virginia's Elizabeth River or that

utilize or play a role in policies affecting the river were recruited via snowball sampling. Data

collection for this research occurred between July 27, 2023, and January 15, 2024, and began

with three pilot interviews. Interviews are usually restricted by time (Bell, 2022), and in this

study interviews were scheduled up to sixty-minutes. Data was collected until there was data

saturation that was reached when the same information continued to be repeated over and over.

This included stakeholders recommended to participate and answers to interview questions.

**PROCEDURE FOR DATA COLLECTION**

Cresswell and Poth (2018) state that "interviews and observations are a common data collection method for case study approaches" and their interview process was utilized for this study as illustrated in Table 8 (pp. 150 and 166).

**Table 8**

*Procedure for Conducting Interviews*

| | **CRESSWELL AND POTH'S PROCEDURE FOR INTERVIEWING** | **PROCEDURES UTILIZED FOR THIS STUDY** |
|---|---|---|
| 1 | Determine the open-ended questions to utilize during the interview. | Ten open-ended questions were developed that were grouped in four themes and aimed to answer this study's main research questions. |
| 2 | Determine participants based on sampling procedures. | Participants were recruited via snowball sampling. |
| 3 | Distinguish the type of interview based on the mode and interactions. | A semi-structured approach was implemented with follow-up questions for rich dialogue in a conversational manner. |
| 4 | Collect data using adequate recording devices. | A Zoom audio device was utilized during in-person interviews and interviews were recorded via Zoom for virtual interviews. |
| 5 | Design and use an interview protocol to guide interactions. | A script was developed and utilized during each interview for consistency and to ensure procedures were followed. |
| 6 | Refine interview procedures through pilot testing. | A pilot interview was conducted, recorded, coded, and analyzed. Edits were made to the script and questions following review by the Chair of the researcher's dissertation committee. |
| 7 | Locate a distraction free place for interviews. | Interviews took place virtually with Zoom or on-site at the organization in their conference room. |
| 8 | Obtain informed consent notification from the participants. | Informed consent was obtained from each participant. |
| 9 | Follow good interview procedures. | Criteria was followed per the International Review Board's (IRB) protocol. |
| 10 | Decide transcription logistics. | Transcription Wing was utilized for professional transcription. |

*Source.* (Creswell & Poth, 2018).

**1.) Step: Determine the open-ended questions to utilize during the interview.**

For this study, ten open-ended questions were presented in a conversational manner to maintain openness, and allow the participants to provide their personal opinions (Yin, 2014). They addressed this study's three research questions, four predetermined themes and the Qualitative Narrative Policy Framework criteria. Questions also targeted the specific narrative components that are the building blocks of policy narratives and that include four core policy elements: setting, characters, plot, and moral of the story (Shanahan, 2018). The interview was a social interaction that also included organic follow up questions that allowed for rich narratives and clarification of information (Rubin, 2012). Below are the interview questions for this study and how they were grouped that included the theme, research question and QNPF criteria.

**Theme 1: Knowledge of the Marine Debris Problem**

**Research Question***:* What are the stakeholders from multiple sectors' views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?

**Interview questions:**

- How would you describe the marine debris pollution in the Elizabeth River? (setting)

- What types of marine debris do you see most frequently in the Elizabeth River? (setting)

- From your perspective what do you see as the cause of the marine debris problem? (villain)

**Theme 2: Origination of Marine Debris**

**Interview questions:**

- How often are you seeing marine debris in the Elizabeth River? Daily? Weekly? (villain)

- What is your perspective on where the marine debris is originating? (villain)

- What are ways marine debris is impacting your organization's progress? (victim)

**Theme 3: Management of Marine Debris**

**Research Question:** Which stakeholders are considered in addressing marine debris issues?

**Interview questions:**

- What are your organization's policies and practices for marine debris reduction/removal? (plot)

- What are barriers your organization may have to reducing marine debris in the Elizabeth River? (plot)

**Theme 4: Suggestions for Marine Debris Management**

**Research Question:** What is the match between the views of stakeholders' and policies to address marine debris?

**Interview questions:**

- What are your suggestions on policies for management of marine debris in your organization? (policies)

- What do you believe is the role of the local and federal government in managing marine debris? (belief)

**2.)   Step: Determine participants based on sampling procedures.**

To examine the marine debris problem in the Elizabeth River as illustrated in Table 9 thirty-one participants from multiple sectors were recruited to participate in this study and represented federal, state, and local government, public and private organizations, nonprofits, academic institutions, fishers, residential communities, military organizations, and volunteers. The researcher made sure there was also at least one participant representing each of the nine groups. A minimum of fifteen interviews were necessary to ensure enough data (Bertaux, 1981; Guest, 2006). Voices of the stakeholders from multiple sectors were included to assess and better

understand of this complex marine debris problem, explore policy outcomes, and contribute to the literature (Creswell & Poth, 2018). Participants were recruited via the snowball method and until the data was saturated (Aguboshim, 2021; Yin, 2014) and the researcher recognized no new data or information was forthcoming (Lincoln & Guba, 1985). Interview protocol was followed, consent was acquired, the purpose of the study was shared, a script was utilized, and participants could stop the interview at any time if they didn't want to participate.

Participants in the first group included six top-level administrators in the government that had direct responsibility in protecting and restoring wetlands, maintaining the storm drain system, protecting the coast and maintaining safety, security, and operations of the port. Regarding marine debris, these people were in a leadership role and could prioritize marine debris removal with their staff and departments. Their concern was damaged habitat, clogged storm drains, polluted shorelines and impeded navigational channels.

The second group of five stakeholders included dock masters of marinas, environmental managers of the Elizabeth River tunnels and navigational pilots from private organizations. They had direct responsibility for safe navigation and docking and responsible fisher practices. These people monitored the channel for large debris that could cause vessel accidents and debris that could damage propellers and equipment. In addition, the fisher's equipment such as crab pots, nets, and line were monitored to avoid abandonment, getting lost or causing vessel damage.

**Table 9**

*Number of stakeholders per sector and types of participants*

| Sector | Number of Stakeholders | Types of Organizations Participants Represented |
|---|---|---|
| Government | 6 | Top level administrators that had direct responsibility in protecting and restoring wetlands, maintaining the storm drain system, protecting the coast and maintaining safety, security and operations of the port. |
| Private | 5 | Dock masters of marinas and environmental managers of the Elizabeth River tunnels and navigational pilots. |
| Public | 4 | Top level administrators in waste management, stormwater, and sanitation where residents pay tax and utility fees for services. |
| Nonprofit | 8 | Program managers at riverfront museums, festival grounds, a river restoration, and an animal protection organization. |
| Academic | 2 | Staff from landscaping and grounds maintenance, a sailing center and innovation program. |
| Resident | 1 | Represented a large civic league community encompassing several large neighborhoods. |
| Fisher | 1 | Fourth generation waterman that grew up in the Elizabeth River watershed. |
| Military | 2 | Navigational officers and engineers. |
| Volunteer | 2 | Helped remove marine debris from wetlands, shoreline and the river outside of the channel. |
| TOTAL | 31 | |

The third group of four stakeholders included top-level administrators from public organizations in waste management, stormwater, and sanitation where residents pay taxes and fees for services. These people were responsible for litter cleanups, litter education, stormwater education, maintenance, and waste management. They were also responsible for identifying the types and quantities of debris, recruiting volunteers, and educating the public about debris.

The fourth group of eight stakeholders included program managers from nonprofit organizations at riverfront museums, festival grounds, a river restoration, and an animal protection organization. These people were responsible for water-based activities such as rowing and sailing, and land-based activities on trails and at parks located by the river. They observed marine debris during their activities that included how it could injure wildlife, and habitat.

The fifth group of two stakeholders included staff from an academic institution from landscaping and grounds maintenance, a sailing center, and an innovation program. These people were responsible for educating adults at a university and maintaining the grounds and landscaping. Marine debris and litter were often observed on the campus and stewardship actions that can help were included in their trainings and activities.

The sixth group included one stakeholder that represented residents from a large civic league community encompassing several large neighborhoods on the river. The civic leagues were responsible for sharing problems, working on solutions, and supporting ideas. These people also worked together on litter cleanups, kept streets free of debris to reduce storm drain runoff and blockages and maintained trash bins.

The seventh group included one fisher and seafood restaurant owner. The fisher was a fourth-generation watermen that relied on healthy crabs, oysters, and fish for his livelihood. He was responsible for following the state guidelines as a commercial fisher and made sure his equipment was not abandoned or lost in the river.

The eighth group included two stakeholders that included navigational officers and engineers in the military. They were responsible for maintaining a safe and navigable channel and responding to complaints and alerts about possible large debris in the river's channel. They were concerned about large debris that could impede navigation or cause accidents with vessels such as planks of wood, appliances, vehicles, vessels, fishing gear, buoys, etc. They were also responsible for keeping journals and data related to removal of debris.

The ninth group included two volunteers that helped maintain wetlands and the river outside of the channel. They participated in litter cleanups that included removing debris in places along the shore that are hard to reach by land. They were not required to participate in

debris removal, but instead volunteered their services and were self-motivated. By categorizing the stakeholders from multiple sectors in this study into nine groups, various perspectives on marine debris removal in the Elizabeth River were gained and triangulated data obtained from these nine groups of participants were achieved.

**3.)    Step: Distinguish the type of interview based on the mode and interactions.**

A semi-structured, inductive approach was implemented to allow for follow-up questions and rich dialogue in a conversational manner. This was needed to gain an understanding of the complexity of Virginia's Elizabeth River marine debris problem in an industrialized port at the meso organizational level (Gray & Jones, 2016).

**4.)    Step: Collect data using adequate recording devices.**

The interviews were recorded with an audio recording device provided by the researcher or virtually by the Zoom online platform.

**5.)    Step: Design and use an interview protocol to guide interactions.**

A script, questions and analysis criteria were developed to assess the validity of the interview questions. Table 10 includes an example of the script outline that was utilized for conducting this study's interviews. It included an introduction, the purpose of the study, consent, and demographic questions.

**Table 10**

*Example of a Script for Conducting Interviews*

| | |
|---|---|
| **Introduction** | Good morning! Thank you for participating in today's interview. This research study is titled: Stakeholders from Multiple Sectors Views and Policy Approaches to Marine Debris Removal: A Qualitative Case Study of Virginia's Elizabeth River. This interview is being recorded to assess this semi structured interview process and questions and will last up to sixty minutes. By participating in this study there are no risks, benefits, or costs to you, and you will not receive an incentive or compensation for participating. The results from today's interview will be assessed by myself and committee members at Old Dominion University to assess the rigor of the questions and interview process before the research begins. This interview will be utilized as data in the research and at any time you are free to stop the interview. All personal identifiers from this interview will be removed. |
| **Purpose of the Study** | This is a qualitative case study to assess stakeholders from multiple sectors views and policy approaches for marine debris removal with organizations mainly located near the mouth of the Elizabeth River. |
| **Consent** | To confirm are you over 18 and willing to participate in this interview? |
| **Demographic Info** | Could you share the name of your organization and title? Could you share your gender and age? (Optional) Could you share how many years you have worked for this organization? Would you describe your organization as: Government, Public, Private, NGO (nonprofit), Military, Academic, Resident, Volunteer or Fisher |
| **Questions to Ask at the End of a Pilot Interview** | Do you have other information regarding Elizabeth River's marine debris problem you would like to share? Did any of the questions make you feel uncomfortable? |

**6.) Step: Refine interview procedures through pilot testing.**

Pilot interviews began on July 27, 2023, and were followed by an assessment to decide if

adjustments were required to the interview questions. It is important to refine the interview

questions through pilot testing to develop relevant lines of questions (Yin, 2014). For this study,

very little refinements were required, and therefore this pilot interview was included in the data

sample Below are the questions used to assess the pilot interview.

- Did the questions serve as a guide, prompt discussion, and allow participants to tell their

  own story on their own terms?

- Do the questions need to be reworded so that the respondents are motivated to answer as completely and honestly as possible?

- Were the questions clear, simple?

- Did the questions allow for follow-up questions getting respondent to elaborate his/her answer, such as "Could you say more about that? What do you mean by that? What did you do then?

- Do the questions need to be rearranged for the interview to flow more naturally?

- Did the last question provide some closure for the interview and leave the respondent feeling empowered, listened to, or otherwise glad that they talked to me?

- Do the questions reflect the narrative policy framework characteristics?

- Do the questions help answer the research questions?

**7.) Step: Locate a distraction free place for interviews.**

For this study, the interviews were conducted either virtually on Zoom or at the participants organization in the conference room.

**8.) Step: Obtain consent from the participants.**

Informed consent was obtained by the participants, and they met the requirement of being 18 years of age or older. Each participant was also allowed to withdraw at any time.

**9.) Step: Follow good interview procedures.**

The researcher followed good interview procedures and triangulation was included by including multiple perspectives from the nine groups of stakeholders from different sectors in this study. Disclosing only positive results was avoided, contrary findings were reported, and cause and effect was avoided. The researcher analyzed the data with a clear and unbiased mind and re-evaluated the data to ensure that pre-existing assumptions were avoided. Another research

provided validation by reviewing  the coding process, providing feedback, and reviewing the

conclusions to address gaps in the argument and/or to affirm that the conclusions were sound and

reasonable. Participants were provided the opportunity to review their transcribed interviews to

ensure the interpretation was representative of their beliefs. Follow up questions were included in

the interviews to support interpretations and to increase confidence that the data was legitimate.

**10.) Step: Decide transcription logistics.**

The interviews were transcribed professionally by Transcription Wing.


**CONTENT ANALYSIS**

Although in-depth interviews were mainly used in this study, content analysis of

documents were also used to triangulate the findings. Reviewing strategies and legislation that

applies to marine debris in Virginia's Elizabeth River provided the researcher with more

information to answer RQ3, *"What is the match between the views of stakeholders' and policies*

*to address marine debris?"* and helped to better understand what policies and strategies are

currently in place that may be relevant to the marine debris in the Elizabeth River. Google Maps

was also used to identify the location of the organizations and where marine debris was being

observed. The following were included in the content analysis and the researcher utilized these

items to make recommendations for marine debris policies and further research.

1.)   the *Clean Water Act* (1972) 33 U.S.C. §1251 et seq. (U.S EPA, 1972)

2.)   *NOAA's Mid-Atlantic Marine Debris Action Plan* (NOAA.gov, 2021)

3.)   *2021-2025 Virginia Marine Debris Reduction Plan* (Register & McKay, 2021)

4.)   *the Rivers and Harbor Act of 1899* (Govinfo.gov, 1899)

5.)   the *Save Our Seas Act of 2018* (U.S. EPA, 2020b)

6.)   The *Virginia Litter Tax and Code* § 62.1-194.2, § 18.2-12, § 33.2-802 (TaxVA.gov, 2022)

7.)   *MS4 Permit* (VADEQ, 2024)

8.)   *The Elizabeth River Watershed Action Plan* (Elizabethriver.org, 2022)

**DATA CODING AND ANALYSIS**

This dissertation utilized an inductive approach for data coding and analysis. This approach does not include predefined coding categories, but instead the researcher was immersed in the text data until themes and concepts arose from the data. Creswell and Poth (2018) share that the qualitative researcher "engages in meaning making of the data…to gather evidence that supports themes and the interpretations" from the participants words (p. 52). In addition, Cresswell and Poth (2016) recommend coding the data, combining the codes into categories and making comparisons in tables, charts or graphs (pp. 183-184).

To begin the process, data from the interviews were transcribed verbatim. The interviews were professionally transcribed by Transcription Wing, an outside source. Codifiers were assigned to each transcript to protect anonymity of the participants. The transcripts were  saved on the researcher's external password protected hard drive assigned for this study. The researcher carefully read each transcript for errors and checked to see if any audio was flagged as unintelligible by Transcription Wing.

Each transcript was printed with a margin on the right side of the paper to allow space to begin the open coding analysis and for initial codes to emerge instead of using preexisting codes (Creswell & Poth, 2018). The initial coding was implemented manually by the researcher by reading a paragraph at a time. The initial coding corresponded to the participant's answers to each of the ten main interview questions and were carefully written in the right-hand margin of the transcription sheets. When coding, the researcher kept the following questions in mind that were recommended by Cresswell and Poth (2018):

- Was the code expected information that researcher hoped to find?

- Was the code surprising information that researcher did not expect to find?

- Was the code conceptionally interesting or unusual information?

- Was the code detailed information about the case study?

     After the initial coding, each transcript was read again allowing for new insights. As illustrated in Table 11 after the coding was completed, the codes were then referred to as categories and transferred to the participant's coding sheets. Noteworthy quotes were also documented on the coding sheets in the participant's comment section. This strategy helped to inform the development of categories (Creswell & Poth, 2018). For this research, each participant was assigned a thirteen-page coding packet that included a coversheet with their assigned codifier and demographics. The coding sheets utilized in this research can be found in the Appendices E.

**Table 11**

*Example of a Coding Sheet*

| Stakeholder Comment | Theme 1: Knowledge of the Marine Debris Problem |
|---|---|
| | **Research Question Being Addressed:** What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River? **Interview Question (Setting):** What types of marine debris do you see most frequently in the Elizabeth River? |
| | **CATAGORIES** |
| | Plastics |
| X | Old Pilings and Boards |
| X | Food Containers and Wrappers |
| X | Cigarette Butts/Filters |
| | Water Bottles |
| X | Industrial Waste |
| | Metal Cans |
| | **Participant's Comments: "**Marine debris includes items from an individual's lunch like food wrappers, cigarette butts and cigars from smokers and industrial waste such as our biggest items seen, big heavy boards and pilings." |

As seen in Table 12 as each participant's coding sheet was completed, the categories were then transferred to the analysis sheets to better analyze the nine groups' responses. Blank analysis sheets can be found in the appendices. Once all the data was documented on the analysis sheets, the next step the researcher performed was focused coding to reexamine the categories and determine if any should be combined.

**Table 12**

*Example of Analysis Sheet*

**Theme 1: Knowledge of the Marine Debris Problem**
**Research Question Being Addressed:** What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?
**Interview Question (Setting):** What types of marine debris do you see most frequently in the Elizabeth River?

|  | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| **Categories** | | | | | | | | | |
| Plastics | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 2 | 2 |
| Wood and Paper | 4 | 3 | 2 | 2 | 2 | | | 1 | |
| Food and Beverage Containers | 3 | 3 | 3 | | 2 | | 2 | | 1 |
| Styrofoam | 4 | 4 | 4 | | | 2 | | | |
| Fishing Gear | | | 4 | 3 | | | | | 1 |
| Recreation | | | | 3 | 3 | | | | |
| Abandoned Vessels | 3 | | | 2 | | | | 1 | |
| Industry | | | | | | | | 2 | |

| | |
|---|---|
| Plastics | 28 |
| Wood and Paper | 14 |
| Food and Beverage Containers | 14 |
| Styrofoam | 14 |
| Fishing Gear | 8 |
| Recreation | 6 |
| Abandoned Derelict Vessels | 6 |
| Industry | 2 |

To build a richer narrative from each participant's views and perspectives about marine debris removal, additional information was also gathered from the participant's transcript that included if any of the ten wicked problem attributes were mentioned and then an overall analysis on the plot. Additional sheets to capture this information was also included in the analysis packets.

For the final step, the researcher reviewed the analysis sheets to compare the perspectives and views on marine debris removal of the nine groups and compared the narrative attributes i.e., setting, characters, plot, morals, and policy outcomes. For comparison, a table was created as seen in Table 13 to gain a better understanding of each of the group's narratives regarding their views and perspectives about marine debris removal in Virginia's Elizabeth River. In addition, a reflection section was included with the findings to ensure that research questions were addressed, that the findings have been compared to those in the literature, and that the Qualitative Narrative Policy Framework aligned with the study. In addition, with a "lessons learned" approach, the researcher's personal view of the findings was completed that included limitations and recommendations for future research (Creswell & Creswell, 2020).

**Table 13**

*Example of Comparing the Victim Narrative Across Nine Sectors*

|  | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Vol. |
|---|---|---|---|---|---|---|---|---|---|
| **Victim** | Too much debris to manage | Too much debris to manage | Too much debris to manage | Too much debris to manage | Too much debris to manage | Too much debris to manage | Too much debris to manage | Debris is dangerous expensive and too much debris to manage | Too much debris to manage |

**VALIDITY**

This dissertation's study reflected a postpositivist ontology and epistemological positions included empiricism and constructivism (interpretive) (Creswell & Miller, 2000). This study's paradigm stance is most closely aligned with the use of systematic procedures with clearly identified procedures (Creswell & Poth, 2016). As seen in Table 14 the validity paradigm assumptions of this study included a combination of postpositivist, constructivist and the lens of the researcher, participant, reviewer, and reader (Creswell & Miller, 2000). The researcher's lens included assessing and analyzing participants perspectives from nine sectors through interviews in order to build a coherent justification for categories (Creswell & Poth, 2018; Yin, 2014). Researcher reflexivity included peer debriefing with colleagues and mentors that provided an alternative perspective and engaged in healthy dialogue and to consider alternate explanations. In addition, three pilot interviews were conducted and reviewed by a colleague prior to full implementation. These conversations enhanced rigor and credibility of the research by ensuring the process was relevant to the QNPF framework and literature. The lens of the participants included member checking where each participant was provided the opportunity to review the transcription from their interview for accuracy. It was noted if a participant chose not to review, did not respond, or couldn't be located. The lens of the reviewers and readers included thick, rich descriptions when sharing the nine groups' narratives of marine debris removal in the Elizabeth River. The findings of this study will be shared via access at conferences, lectures and through publications (Creswell & Creswell, 2020). Negative or discrepant information that was counter to the themes was presented in the findings (Yin, 2014). By presenting this contradictory evidence, the account became more realistic and more valid.

**Table 14**

*Validity Procedures Within the Lens and Paradigm Assumptions*

| PARADIGMS | Postpositivist | Constructivist |
|---|---|---|
| **LENS** | | |
| **Researcher** | Reflexivity (Pilot Interviews, Peer and Colleague Debriefing and Positionality) | |
| **Participants** | Member Checking | |
| **Reviewers and Readers** | | Thick, Rich Descriptions |

Adapted from (Creswell & Miller, 2000).

## RELIABILITY

For ensuring reliability, the steps of the procedures were documented in this dissertation (Yin, 2009). In addition, the following steps were also implemented to ensure reliability (Gibbs, 2007). First, the researcher checked the transcripts for mistakes made during transcription including assuring there was not a shift in the meaning of the codes during the process of coding. Second, the codes were cross-checked twice. Lastly, generalization was avoided, and rich descriptions were included as much as possible.

## POSITIONALITY STATEMENT

Ms. Dunbar is a full-time Ph.D. candidate at Old Dominion University in the Public Administration and Policy program, and she is the Deputy Director for Education for the nonprofit Elizabeth River Project, whose focus is to create a healthy urban river through collaboration. She has always lived in the Elizabeth River watershed in Virginia, and her twenty-three-year career combines art and science. She believes in the power of storytelling, and that rich dialogue can lead to the development of lifelong stewards of the Blue Planet. She enjoys

collaborating on ways to reduce marine debris in our waterways and mentoring others to follow their dreams.

## DEPENDABILITY

In this research study, an audit trail is logical, traceable and documented (Lincoln & Guba, 1985). My transparency includes detailing the research design, data collection criteria and procedures, and following the QNPF process. The results of this study can be repeated with the QNPF and the same data collection procedures although my results may not be replicable in a scientific sense similar to Gray and Jones (2016).

## CREDIBILITY

Utilizing the legitimized QNPF provided credibility to this qualitative study. The NPF has a history of producing valid and reliable findings (Shanahan et al., 2018) and Gray and Jones (2016) proved the QNPF has the same degree of validity and reliability when used with rigorous qualitative methods. Professionally transcribed data was also utilized to inform the analysis and the QNPF formed the deductive coding schemes followed by inductive coding to form the final categories and themes.

The results from this study can also be transferred to other context such as another industrial port or harbor utilizing the QNPF. This will allow for studies in different policy areas or comparisons with similar QNPF and NPF studies. As noted in Gray and Jones (2016), a theoretical bridge is provided by NPF for qualitative and quantitative studies by allowing for comparison, evaluation and critique of theoretical objects such as characters and plots.

CHAPTER V

RESULTS

**INTRODUCTION OF CHAPTER**

This chapter examines the views and perspectives of stakeholders from nine sectors

regarding a marine debris problem in an industrial port and harbor. Specifically, it seeks to

explore narratives, themes, policies, strategies and outcomes in Virginia's Elizabeth River among

thirty-one stakeholders regarding marine debris removal. As will be seen through a comparison

analysis and utilization of the Narrative Policy Framework, a dominant narrative emerged among

all the sectors that included the setting, characters, plot, moral and belief.

The urban Elizabeth River is a living and working river that includes historical shipyards,

the world's largest naval station and a modernized port with the deepest channel on the east coast

that is important for navigation. It also runs through four cities and serves as the gateway to the

Chesapeake Bay and the Atlantic Ocean. Because it is strategically important, the government,

organizations, and communities are actively supporting the water and land-based litter removal

at varying levels. Thus, administrators, personnel, residents and volunteers were recruited to

participate in this study to gain multiple insights about what actions are being implemented to

address the marine debris in the Elizabeth River. Thirty-one stakeholders participated and their

average age was forty-nine years old, and sixty-five percent were male and thirty-five percent

female.

Based upon analyses of the transcribed interviews, this chapter begins by addressing

research questions one and two combined due to applying a comparison analysis approach and

the Narrative Policy Framework where characters and their views and actions regarding marine debris emerged together.

Research question one (RQ1) is, *"What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?"*

Research question two (RQ2) is *"Which stakeholders are considered in addressing marine debris issues?"*

The discussion will begin with the overall narrative that emerged from all the sectors followed by the narrative of each sector. This will be followed by a comparison analysis discussed in two sections that reflect the claims of this study that stated, "Views about marine debris vary among stakeholders according to the sectors that they represent." and that "Policy approaches about the marine debris removal vary among stakeholders according to the sectors they represent." This is followed by addressing research question three and a content analysis of marine debris legislation, strategies and policies.

Research question three (RQ3) is *"What is the match between the views of stakeholders' and policies to address marine debris?"*

The chapter ends with a summary that pulls all the findings together.

**THE NARRATIVE THAT EMERGED OVERALL**

Data saturation was met when information repeated over and over again and included stakeholders being recommended to participate and answers to the interview questions. Based upon the analysis of the transcribed interviews from all stakeholders, a dominant narrative emerged representing the nine sectors that included the setting, characters, plot, moral and belief. As illustrated in Table 15 all sectors described Virginia's Elizabeth River setting as terrible and the marine debris they saw most frequently was all sorts of plastics. Weather was believed to be

the villain or the main cause of the debris problem, which included the wind, tide and rain. They observed the marine debris daily, and they viewed people as the origin. They all viewed themselves as heroes removing the debris and also shared that nonprofits and the government were taking the most action. They also saw themselves as victims and claimed there was too much debris to manage. The barriers they faced included lack of resources such as workers and supplies followed by people taking responsibility to remove and reduce marine debris. The moral was that they have suggestions regarding policies and strategies for marine debris management within their organizations. And the overall belief of all sectors was that the local government has a larger role in managing the marine debris versus the federal government. All the stakeholders' narratives described a story of interference where the marine debris was described as a problem and then got better due to their actions as heroes, but then got worse or hard to manage due to barriers, lack of policies, influx of debris, etc. They also all believed that a portion of marine debris comes from accidental causes that does not include humans.

**Table 15**

*Overall Summary of All Sectors Utilizing the Narrative Policy Framework*

| | |
|---|---|
| **SETTING** | Marine debris is terrible, and they observe plastics most frequently. |
| **VILLIAN** | Weather is the main cause of the marine debris problem. They observe marine debris daily and believe it originates with people. |
| **HERO** | All organizations are removing marine debris although government and nonprofits (NGOs) are taking the most action. |
| **VICTIM** | There is too much debris to manage. |
| **PLOT** | All organizations are removing marine debris and resources followed by people taking responsibility are the main barriers. All sectors' narratives described a plot of interference where the marine debris was described as a problem that got better due to the work of a hero, but then got worse for some reason such as a barrier, lack of policies, influx of debris, etc. |
| **MORAL** | They have suggestions for policies followed by strategies for marine debris management within their organizations. |
| **BELIEF** | They believe the local government has a larger role in managing the marine debris. |

**ANALYSIS OF THE OVERALL NARRATIVE**

By utilizing the QNPF, an overall narrative emerged where all the stakeholders viewed that there was a marine debris problem and they viewed plastic most frequently. This addressed RQ1, *"What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?"* Prior to this research, it was unknown if there was a marine debris problem and if there was, it was unknown to what degree, what kind of marine debris was being observed and what were the origins and potential causes. In order to influence policy, the researcher must engage with relevant stakeholders and seek their views and perspectives because policy is shaped and influenced by a diverse set of stakeholders at the global, national and local levels (Balane et al., 2020). This study's findings about Virginia's Elizabeth River plastic problem complements the *2022 Public Perception Survey of Plastic Pollution* findings seen in Table 16, where 55% of 901 registered Virginia voters ranked plastics floating in the ocean as the second highest serious problem, the voters are deeply concerned about plastic pollution and are they ready to support policies to decrease it (McKay et al., 2022).

**Table 16**

*Ranking of Top Concerns in 2022 Public Perception Survey of Plastic Pollution*

| | | | | |
|---|---|---|---|---|
| 1 | Inflation and cost of living | 76% | **Policies to Reduce Plastic Pollution** | |
| 2 | Plastic floating in the ocean | 55% | Require less plastic in packaging | 76% |
| 3 | Plastics/toxins contaminating food | 47% | Shift the costs of recycling programs onto producers | 71% |
| 4 | Chemicals/toxins in environment | 44% | Deposits on beverage bottles and cans | 65% |
| 5 | Loss of natural areas and habitat | 42% | Cigarette litter fee | 63% |
| 6 | Climate change | 42% | Ban single-use plastic grocery and shopping bags | 63% |
| 7 | Lack of good-paying jobs | 42% | Ban polystyrene food containers | 61% |
| 8 | The ongoing effects of COVID-19 | 38% | | |
| 9 | Pollution sources located close to where people live | 31% | | |
| 10 | Severe weather events | 28% | | |
| 11 | Trash and litter in your community | 24% | | |

*Source.* (McKay et al., 2022).

In this study, weather emerged as the main cause of the marine debris problem and the stakeholders believed the marine debris originated with people. There has been an overall increase in total precipitation including the frequency of heavy rainfall events in Virginia that has ramifications for…stormwater management…(Allen & Allen, 2019). Derek Loftis, Assistant Research Scientist at the Virginia Institute of Marine Science explained, "unfortunately, the Elizabeth River is experiencing frequent high tide flooding even on days without rain" (Loftis et al., 2020). Nicole LeBoeuf, assistant administrator of NOAA's National Ocean Service says, "the flooding is only going to increase in the future" (LeBoeuf, N. (2023). With flooding comes runoff, litter, and debris that travels through the stormwater system that empties into the river. In addition, rubbish can get trapped in wetlands and be pulled back into the river during tidal cycles, or flood events. This recirculation of debris can affect water quality, wildlife that lives in and around the river and hinder navigation. Findings in this study are also in agreement with the local stakeholders' recommendations in the *Our Elizabeth, Strategy for Community-Wide Action to Restore the Elizabeth River 2022* specifically Action 3 to reduce pollution from coastal flooding by implementing strategies such as trash collections, storm drain cleanouts and public awareness campaigns prior to storms or flooding and for partners to gather data that can lead to meaningful policies to reduce litter in the Elizabeth River (Elizabethriver.org, 2022). Stakeholders in this study recommended strategies for preparation prior to storms such as securing yard items and trash bins and implementing cleanup of marine debris from the river immediately after storms. In addition, the stakeholders in this study believed the marine debris originated with people and this supports the local stakeholders in the *Our Elizabeth Strategy* that also want to develop actions that address a behavior change among the communities to reduce plastics and land-based behaviors to make littering un-cool (Elizabethriver.org, 2022).

The overall narrative that emerged in this study also addressed RQ2, *"Which stakeholders are considered in addressing marine debris issues?"* The thirty-one stakeholders in this study represented government, private, public, nonprofit, academic, resident, fisher military and volunteer sectors. These nine sectors chosen to represent the Elizabeth River watershed reflected the organizations mainly located at the mouth of the river where the port is located and those that utilize the river or play a role in policy affecting the river. Sectors were also chosen based on a watershed management study that recommended to include stakeholders from the state, federal and local government, nongovernmental organizations such as river watch citizen groups, volunteer monitoring, educational institutions, and private industries (Erdogan, 2012). Aside from organized groups additional stakeholders such as residents and those who utilize the river such as the military and fisher sectors were also included as essential to successful management.

An additional stakeholder group to be considered for future research either in the broader Elizabeth River or other waterbodies would be an Environmental Justice sector. The U.S. Environmental Protection Agency defines "environmental justice" as the just treatment and meaningful involvement of all people regardless of race, color, national origin, Tribal affiliation, or disability, in agency decision-making and other Federal activities that affect human health and the environment (U.S.EPA, 2024). For this study, the Elizabeth River Project's *Environmental Justice Mapping Tool* (EJMT) developed by the Virginia Institute of Marine Science (Elizabethriver.org, 2024) was utilized to indicate a *Combined Environmental Vulnerability Indicator* that was generated through a statistical analysis (Principal Component Analysis) that looks at the combined distribution of multiple environmental stressors (11 indicators from *Environmental Justice Screen Environmental Indicators*). As seen in Table 17 scores ranged

from 4.689 to -2.80, higher scores indicate that the census block is vulnerable to many different environmental stressors. Lower scores indicate that a census block is vulnerable to only 1-2 environmental stressors (Elizabethriver.org, 2024). The overall *Combined Environmental Vulnerability Indicator* score averaging all the stakeholder's location in this study was -2.24 Low. This means that environmental justice indicators were not high at organizations that participated in this study.

**Table 17**

*Environmental Justice Mapping Tool 11 Environmental Indicators and Rankings*

| 11 Environmental Indicators | Ranking | |
|---|---|---|
| EJ Index for Particulate Matter (PM2.5) | **Very High** | 4.689 to 13 |
| EJ Index for Ozone | **High** | 1.484 to 4.688 |
| EJ Index for Diesel Particulate Matter | **Moderate** | -0.619 to 1.4839 |
| EJ Index for Air Toxics Cancer Risk | **Low** | -2.799 to -0.62 |
| EJ Index for Respiratory Hazard Index | **Very Low** | -8.34 to -2.80 |
| EJ Index for Traffic Proximity and Volume | | |
| EJ Index for Lead Paint Indicator | | |
| EJ Index for Superfund Proximity | | |
| EJ Index for Risk Management Plan Proximity | | |
| EJ Index for Hazardous Waste Proximity | | |
| EJ Index for Wastewater Discharge Indicator | | |

*Note.* The eleven environmental indicators and the Environmental Justice Index state percentile for the selected census block group compared to all block groups in Virginia. Source (Elizabethriver.org, 2024).

All the stakeholders in this study addressed marine debris issues in the Elizbeth River. They all took action as heroes to remove marine debris although the nonprofit and the government sectors were seen overall by the stakeholders as taking the most action that included keeping the channel navigable, volunteer clean ups, street sweeping, and unclogging stormwater

drains. The majority of the stakeholders were unaware of the removal actions being implemented by each of the sectors, although they also did not accuse another sector of contributing to the marine debris problem. Although all the stakeholders agreed there was a marine debris problem, they also agreed there was too much to manage. This is important to include in the narrative because it can help in the policy process when problem-solving that includes 1.) agenda-setting (recognized the problem), 2.) policy formulation (solution is proposed), 3.) decision-making (solution is chosen and legitimized), 4.) policy implementation (solution is put into action) and 5.) policy evaluation (the monitoring of the results) and in some cases 6.) the choice to either maintain, replace or terminate the policy (Howlett et al., 2020).

The overall narrative that emerged also addressed RQ3, *"What is the match between the views of stakeholders' and policies to address marine debris?"* As seen in Table 18 all the stakeholders had recommendations for marine debris policies, amendments or strategies and they believed the local government has the larger role in managing the debris. All the sectors wanted a contact list for marine debris removal, and they wanted the local government to play the bigger role in managing the marine debris because there was too much for each of the sectors to manage. The government and the military wanted abandoned derelict vessel policies because this is a barrier for them, and they are aware of other cities that have found solutions. Sectors that had viewed other rivers (Government, Military, Academic Sailing Team) felt that the Elizabeth River was not as bad as others they had seen, but they also had recommendations for policies.

**Table 18**

*Match Between Stakeholder Views and Policies to Address Marine Debris*

| | Views | Recommendations for Policies |
|---|---|---|
| **Government** | Moderate, Some areas worse than others and accumulation areas | • Need policies amended to include marine debris.<br>• Need policies for abandoned derelict vessels.<br>• Need a contact list for marine debris removal.<br>• Need strategies to remove debris in hard-to-reach places.<br>• The government believed the federal government should bear the expense of marine debris removal and put filters on storm drains and maintain them.<br>• Need to do a better job of sharing our story. |
| **Private** | Terrible, more after a storm | • Need a contact list for marine debris removal.<br>• Recycling to return.<br>• Policing of the shoreline.<br>• Implement litter cleanups.<br>• Keep streets and neighborhoods clean. |
| **Public** | Terrible, accumulation areas | • Council wants marine debris as a priority.<br>• Adopt plastic bag fee.<br>• Enforce Virginia Litter Code, policies and fines.<br>• Budget for equipment to manage storm water systems and hire more staff.<br>• Need a contact list for marine debris removal.<br>• Outreach and education.<br>• Need more staff.<br>• Government should support the U.S. Corps of Engineers and find global solutions to plastic.<br>• Local leaders should participate in cleanups. |
| **Nonprofit** | Terrible, more after a storm, accumulation areas | • Need marine debris written into organizational policies.<br>• Need policies to approve staff to volunteer for litter cleanups and get paid.<br>• Need policing the shoreline.<br>• Need a contact list for marine debris removal.<br>• Need more volunteers that are engaged.<br>• Outreach and education.<br>• Local government to have boats designed to police shorelines and pick up large debris.<br>• Need strategies to remove debris in hard-to-reach places.<br>• Share success stories.<br>. |
| **Academic** | Moderate, more after a storm | • Need policing of shorelines.<br>• Need more trash cans and staff to manage them in areas that don't have them like parking lots.<br>• Need more digital trash cans to collect data.<br>• Need a contact list for marine debris removal.<br>• Outreach for communities to help. |
| **Resident** | Terrible | • Policies to incentivize people not to litter and volunteer. |
| **Fisher** | Moderate, more after a storm | • Develop a task force team to remove marine debris after a weather event.<br>• Need permits to include litter and marine debris policies. |
| **Military** | Not as bad as other rivers, more after storm | • Need policies for abandoned derelict vessels.<br>• Need more staff |
| **Volunteer** | More after storm | • Adopt plastic bag fee and reduce polystyrene containers. |

Also worth noting was the public sector was the only one that recommended local leaders to participate in cleanups. They felt local leadership needed to have boots-on-the-ground to better understand the marine debris problem. In addition, the nonprofit sector wanted success stories of cleanups shared with the organizations and the government felt they weren't doing a good job sharing their story on keeping the channel navigable. The recommendations the sectors made came from barriers that they were experiencing at their organizations. They shared how they could do more if these recommendations were acknowledged and implemented either through policies, budget amendments or practices.

**NARRATIVE OF EACH SECTOR**

An overall narrative emerged for each sector as illustrated in Table 19 and views about marine debris did vary among the stakeholders according to the sectors that they represented.

**GOVERNMENT**

**Setting:** Six stakeholders were interviewed for this study and represented the Port of Virginia, the United States Corps of Engineers, and the local government. The government sector described the Virginia's Elizabeth River as not as bad as other rivers and with accumulation areas of debris of all sorts of plastics, wood and large items. According to some stakeholders, for example,

> "I do not think we are as bad as some places. It could be better. It is a constant complaint
> of all sorts of litter. Abandoned derelict vessels are a huge problem. Some areas are
> worse than others. We have actually had large pieces of piers, floating docks that are
> broken away, large pieces of piers. The tide pushes marine debris into the stormwater

system. Debris can get pushed up into a cove and then up into the system" (Government

Sector Participants).

**Villain:** Weather, people and vessels were believed to be the villains or the main causes of the

debris problem. Respondents observed the marine debris daily, and they viewed people as the

origin. They also believed that a portion of marine debris came from accidental causes that did

not include humans. According to some stakeholders, for example:

"There is poor behavior actions by citizens…illegal dumping and not reporting of areas

that need cleanups. People have cut lines of abandoned derelict vessels that they view as

an eyesore" (Government Sector Participants).

**Table 19**

*Summary of Sectors with Narrative Policy Framework*

| | Government | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| **Setting** (description of marine debris in the Elizabeth River) | Debris accumulates. See most frequently plastics, wood and large items. Not as bad as other rivers. | Debris is terrible after a storm. See most frequently plastics, wood, food and beverage containers. | Debris is terrible. See most frequently plastics. | Debris is terrible after a storm. See most frequently plastics. | Debris is moderate. See most frequently large items, plastics and recreation items. | Debris is terrible and moderate. See most frequently plastics, food and beverage containers. | Debris is moderate. See most frequently plastics. | Debris is moderate. Not as bad as other rivers. Most frequently saw plastics, wood and abandoned derelict vessels. | Debris is moderate. See most frequently plastics. |
| **Villian** (the cause, how often marine debris is seen, and where is it originating) | The weather, people and vessels are the cause. See the debris daily. Originates from people. | The weather is the cause. See the debris daily. Originates from people. | People are the cause. See the debris daily. Originates from people and the stormwater system. | The weather and people are the cause. See the debris daily. Originates from people. | Streets and the storm system are the main cause. See debris daily and after rain. Originates from stormwater system. | Weather is the cause. See the debris weekly. Do not know where it is coming from. | Weather is the cause. See debris daily. Originates from people, vehicles, vessels and aging infrastructure. | Weather is the cause. See the debris daily and weekly. Originates from aging infrastructure and weather. | People are the cause. See the debris daily. Originates from people and aging infrastructure. |
| **Victim** (impact to organization's progress) | Too much debris to manage and it is dangerous. | Expensive and too much debris to manage. | Too much debris to manage. | Too much debris to manage. | Too much debris to manage and it is dangerous. | Too much debris to manage. | Too much debris to manage and expensive. | Debris is dangerous, there is too much debris to manage, and it is expensive. | Too much debris to manage and it is dangerous. |

| Continued | Government | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| **Hero** (who is taking action) | Government, public, private, nonprofit organizations and fishers are taking the most action. | Private organizations and fishers are taking the most action. | Public organizations are taking the most actions. | Government, nonprofits, residents and volunteers are taking the most action. | Academic institutions are taking the most action. | Residents are taking the most action. | Fishers are taking the most actions. | Goal is to remove threats to navigation and enforce the law. | Nonprofits are taking the most actions. |
| **Plot** (what are organizations policies, practices and barriers for marine debris reduction and removal) | Story of interference.* Actions include legislation, policies, and strategies and marine debris removal. Barriers include resources, people taking responsibility and city leaders and decision makers. | Story of interference.* Action include marine debris removal. Barriers include people taking responsibility. | Story of interference.* Actions include marine debris removal. Barriers include people taking responsibility. | Story of interference.* Actions include marine debris removal. Barriers include resources and people taking responsibility. | Story of interference.* Actions include marine debris removal. Barriers include resources and people taking responsibility and marine debris is dangerous. | Story of interference.* Actions include marine debris removal. Barriers include resources and the tide. | Story of interference.* Actions include marine debris removal, education and outreach. Barriers include people taking responsibility. | Story of interference.* Actions include marine debris removal. Barriers include practices and marine debris is dangerous. | Story of interference.* Actions include marine debris removal. Barriers include city leaders and decision makers, people taking responsibility and the tide. |
| **Moral** (suggestions for marine debris management in their organization) | Suggest policies and strategies. Policies are in place and some need amending. | Suggest policies and strategies. Policies work and some need amending. Policies have unintended consequences | Suggest policies and marine debris removal. Policies are in place, need amending and enforced. Policies have unintended consequences | Suggest policies, strategies and marine debris removal. Policies are in place and work. | Suggest policies, strategies and marine debris removal. Policies are in place, need amending. | No policies are in place. Suggest strategies and policies that encourage and incentivize people. | Suggest policies and marine debris removal. Policies are in place and work. | Suggest policies. Policies are in place and work. | Suggest policies, strategies and marine debris removal. Policies are in place and work. |

| Continued | Government | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| **Belief** (believe the role of local and or federal government in managing marine debris) | Some debris includes humans, and some is accidental. Believe the government should bear the expenses and the local government had the larger role in managing marine debris. Aware of legislation and policies to follow | Some debris includes humans, and some is accidental. They are not aware of legislation and policies but still act. Believe the government should bear the expenses. Believe the local government had the larger role in managing marine debris. | Some debris includes humans, and some is accidental. Aware of some legislation and policies to follow. Believe the local government had the larger role in managing marine debris. | Some debris includes humans, and some is accidental. They are not aware of legislation and policies but still action. Believe the local government had the larger role in managing marine debris. | Some debris includes humans, and some is accidental. They are aware of some legislation and policies but still action. Believe the local government t had the larger role in managing marine debris. | Some debris includes humans, and some is accidental. They are not aware of legislation and policies but still action. Believe the Government should bear the expenses. Believe the federal government had the larger role in managing marine debris. | Some debris includes humans, and some is accidental. They are not aware of legislation and policies but still action. Believe the local government had the larger role in managing marine debris | Some debris includes humans, and some is accidental. Aware of legislation and policies to follow. Believe the federal government had the larger role in managing marine debris. | Some debris includes humans, and some is accidental. They are not aware of legislation and policies but still action. Believes new policies are needed. |
| **Data** (was data collected by organization) | One stakeholder collects data but only share internally. | One stakeholder collects data but only share internally. | Two stakeholders collect data, and one only shares internally. | Two stakeholders collect data. | One stakeholder collects data with electronic trashcans, but it is only shared internally. | They do not collect data. | They do not collect data. | They collect data and share only internally. | They do not collect data. |

**Hero:** They viewed themselves as heroes and also took action with an awareness of marine debris legislation and policies. In addition, one stakeholder collected data on the weight of the debris that also included sediment and another stakeholder collected data on the type and location where the marine debris was found. Both only shared their data internally with their organization. They also shared that the nonprofit, public, private and fisher sectors also took action. According to some stakeholders for example:

"I think our city honestly does probably as much or more than a lot of the other localities here in the region. We have an outreach coordinator who has worked on marine debris issues and tailoring some messaging to the public about prevention and proper disposal. We do not keep data on types but just pounds that we suck out of pipes with trucks, and it includes sediment. We measure at a waste management facility that has a pad that the trucks dump it on" (Government Sector Participants).

"I deal with what washes up in the marshes and it is a constant complaint of all sorts of litter. A full 20-foot wooden 10-inch piling washed up and we had a city crew go out there to help get the piling out of the homeowners back yard and the marsh because there is no way the homeowner could have taken care of that. Abandoned derelict vessels are a huge problem. We investigate, send legal notices that the owner must remove from the wetlands, the city comes to remove, we fine, we take owners to court, and put liens on the property" (Government Sector Participants).

"The police and fire department will come across something, not sure what to do with it, they will give me a call, then we try to work through the program on how to get rid of it.

There was an incident with six containers that fell off a ship in the river. When they

floated, they drifted out to the channel. Then three or four of them sunk in the channel

and the other three or four we were able to grab with boats and pull them in alongside the

dock quickly. We were able to get some lines on it, so we helped secure it, so we knew

where they were. The ones that sunk, they just did not lay on their side, they stood

straight up. I think it sunk with its doors in the mud on the bottom, so it was sticking 40-

feet up and that reduced the channel to 5-feet. It took six hours on a Sunday afternoon

and then the boxes were up, and the channel was clear" (Government Sector

Participants).

"We have worked to develop and then update and then continue to implement the

Virginia Marine Reduction Plan which meshed quite well with NOAA's MidAtlantic

Marine Debris Action Plan. So, the federal government is talking to the state government

to align the goals. We had a policy recommendation that turned into a law which was

really a budget amendment. It was $3 million dollars to the Virginia Marine Resources

Commission which is the only state agency that has the authority to remove the

abandoned derelict vessels at the state level. So that was a direct law that came out of a

plan and with that generated policy recommendations. The federal government is

providing the crucial funding." (Government Sector Participants).

**Victim and Plot:** They also saw themselves as victims and claimed there was too much debris to

manage, and it was dangerous. The barriers they faced included a lack of resources such as

workers and funds, people taking responsibility to remove and reduce marine debris and city

leaders and decision makers supporting marine debris removal initiatives. According to some

stakeholders for example:

> "It is a constant cleanup and who is going take care of this sort of thing? The city does
>
> not have a dedicated crew that goes into wetlands and especially behind private property.
>
> It is up to the homeowner to get out in the wetland and remove the marine debris. How
>
> do we get people to stop littering and care about the environment? We do not have people
>
> that can actually go out and pick up litter and trash" (Government Sector Participants).

> "We do not have enough supplies. We have three trucks that run all day, every day, and
>
> sometimes at night cleaning out stormwater systems in response to complaints. The last
>
> couple of years we have had the inability to keep staff. We had some storm systems that
>
> were so clogged up that we had to literally hire contractors, and they spent a week on one
>
> in the last year, literally just clearing up a couple of blocks worth of pipe that were
>
> completely blocked. …debris can travel directly to the river and cause blockages and
>
> expensive maintenance" (Government Sector Participants).

> "I would be heartbroken and frustrated if one of my family members or friends were out
>
> on their boat running at night and hit this thing. Vessels get kicked out of marinas and
>
> then need to tie up somewhere. It can cost $10,000 to $20,000 for a marine contractor to
>
> remove a vessel" (Government Sector Participants).

**Moral and Belief:** The moral was that they have suggestions regarding policies and strategies

for marine debris management within their organizations. In addition, they believed that

government should bear the expenses and the local government had the larger role in managing

marine debris. According to some stakeholders for example:

"Although localities are underfunded…they can work with local authorities and private entities whereas the state would be a little bit harder…we are not regulating building codes and ordinances and we do not have law enforcement officers patrolling and making citations. The city should respond to complaints, educate and engage enforcement. Expand the park ranger program that has areas where trash accumulates and respond to illegal dumping, especially in wetlands. Would like to see police enforcing the litter code" (Government Sector Participants).

"I think where it gets clunky and it gets extremely frustrating is, with the state of New Jersey where they have the laws, and they can immediately react to derelict and abandoned vessels. Let us stop playing around. Let us get in there and grab it, and just get rid of it. It is ridiculous. Look at New Jersey for abandoned derelict policies that work. More stakeholder engagement in the process of abandoned derelict vessels to review lessons learned and then share those practices. We believe work group reports and recommendations lead to policy regarding the abandoned derelict vessel problem" (Government Sector Participants).

"We have a number of policies that talk about litter and debris and what to do, but not on marine debris. Amend a policy to include not just litter but marine debris. The bad players in industry, just need to be turned over to the Department of Environmental Quality and let them go through the enforcement process, but at the end of the day, I do not really see a lot of industries here that are littering in the river. Mr. Trashwheel is not an option. It would require a lot of maintenance since we have a saltwater environment.

The rollers would not hold up. Also, it would not address hard to reach places"

(Government Sector Participants).

"I think the role of the local government is more education about keeping litter from the

street because it will wash down the storm drains. The cleaner you keep neighborhoods,

the cleaner you are going to keep the water, and if you can make them care about where

they live, then you may be able to make them care about what is at the end of the street,

like the creek. In my mind, it really originates there" (Government Sector Participants).

**PRIVATE**

**Setting:** Five stakeholders were interviewed for this study and represented marinas, harbor pilots

and those that manage the Elizabeth River's tunnels. The private sector described Virginia's

Elizabeth River as terrible and saw plastics, wood and food and beverage containers most

frequently. According to some stakeholders for example:

"For me, it is terrible, to be honest with you. There's been an increase in plastic

products… It is an eyesore. Mainly see single-used plastics…water bottles, plastic bags.

We see dirty plastic bottles and plastic bags. The biggest problem is probably those little

white cigarillo tips" (Private Sector Participants).

"Severe, especially after a storm. It has gotten worse. Large pieces of lumber and limbs

from trees after storms. We see some paper in various stages of deterioration.

We see abandoned derelict vessels, pilings, fenders and dock debris. Just random wooden

debris floating and there is definitely dock debris. Other things we see daily are cups and

food containers" (Private Sector Participants).

**Villain:** Weather was believed to be the villain or the main causes of the debris problem. Daily, they observed the marine debris, and they viewed people as the origin. They also believed that a portion of marine debris came from accidental causes that did not include humans. According to some stakeholders for example:

"New dock boards come loose during high tides and nor'easters. Certain locations, you can really tell when there has been a high tide. See more debris after a storm. See pilings after storm events" (Private Sector Participants).

**Hero, Victim and Plot:** They all viewed themselves as heroes removing the debris along with fishers. They also saw themselves as victims and claimed there was too much debris to manage, and it was expensive. One of the stakeholders did collect data, but only shared internally within their organization. The barrier they faced included people taking responsibility to remove and reduce the marine debris. According to some stakeholders for example:

"We walk the docks and remove debris with nets. There are trashcans bolted to the dock with lids securely tied all along the dock and they are emptied daily by the dock hands. We skim whatever we can out of the basin. Primarily staff removes the debris" (Private Sector Participants).

"We have a sediment basin that can capture debris and then filter water over a knee wall. We will pump these tanks and remove debris. We have five storm drains that go directly to the Elizabeth River and have filters on all of those" (Private Sector Participants).

"I think people do not care and there is no enforcement. Everybody says that we get fined for litter, but that does not exist. At low tide,  literally the water comes up to our property,

and there is a chain linked fence, and there is just crap everywhere. We are by a bridge

and trash and litter is thrown out of cars in the tunnel" (Private Sector Participants).

"We spend a lot of manpower cleaning up the debris. Trashcans are expensive. Once or

twice a year, we experience entanglement in propellers. We do not have enough staff, so

we hire a contractor that removes the litter before mowing. Manpower is the big issue.

We do not really have in the budget enough money to have someone that would go

through the riprap and pick up the plastic bottles, etc. There are limited nets to retrieve

debris out of the water and they are not conveniently located" (Private Sector

Participants).

**Moral and Belief:** The moral was that they had suggestions regarding policies, amendments,

and strategies for marine debris management within their organizations. They also had policies

with unintended consequences. In addition, they believed that government should bear the

expenses and the local government had the larger role in managing marine debris. They were not

aware of marine debris legislation and policies. According to some stakeholders for example:

"We have corrective action for our employees if they walk by litter and do not pick it up

because we need to be part of the solution and if there's litter and filth in the river, trash,

and debris everywhere, we do not have a viable business. We are still developing our

volunteer policy for staff to participate in cleanups" (Private Sector Participants).

"We had recycling, but it was not working. People kept putting the wrong items in the

recycling bin. I would like to see recycling, but it did not really work here. Noone is

policing the shoreline. Need to improve how streets are maintained regarding debris.

Local government needs to support nonprofits and work together" (Private Sector

Participants).

**PUBLIC**

**Setting:** Four stakeholders were interviewed for this study and represented the local stormwater

and waste management divisions, an environmental commission and a sanitation district. The

public sector described Virginia's Elizabeth River as terrible and saw plastics most frequently.

According to some stakeholders for example:

> "Plastic bags are horrific in Norfolk and along our waterways. Everywhere you go you
>
> see plastic bags. We still have a long way to go. I am surprised at the amount of material.
>
> That has been the most shocking. You see this beautiful, natural resource, the Elizabeth
>
> River, and it is just horribly abused. Mostly what we see are bottles like Gatorade"
>
> (Public Sector Participants).

**Villain:** People were believed to be the villain or the main cause of the debris problem. They

observed the marine debris daily, and they viewed people and the stormwater system as the

origin. They also believed that a portion of marine debris comes from accidental causes that does

not include humans. According to some stakeholders for example:

> "The rain picks it up and puts it into the system. After storms, there was a lot of debris in
>
> the river. There are accumulation spots under the Brambleton Bridge and near a
>
> stormwater outfall by a historic cemetery. Wind is blowing items around during storms
>
> and people are not preparing for storms" (Public Sector Participants).

> "I witnessed first-hand the issue of plastic pollution clogging up the edges of the river
>
> and it is being pulled in probably in multiple directions and potentially even through the

stormwater system and through its outfalls in a large part. Most frequently see plastic

bottles, a 100%, yes!" (Public Sector Participants).

**Hero, Victim and Plot:** They all viewed themselves as heroes removing the debris. Two of the

stakeholders did collect data and one only shared internally. They also saw themselves as victims

and claimed there was too much debris to manage. The barrier they faced included lack of

resources and practices. According to some stakeholders for example:

Staff participated in a contest and utilized a filter bar screen that trapped all of the larger

things that are bigger than a quarter of an inch. Then stuff gets collected into a dumpster.

We do it because they are that sort of mindset of making the river better for future

generations, it is part of our moral fiber. Our interests go beyond the property line. We

can do something that can also help this little spot. Styrofoam was the one thing that we

noticed a lot of including Styrofoam boxes. I always find countless kid's balls. Difficult

to manage the amount of debris (Public Sector Participants).

"Debris is clogging up the edges of the river. They are not bagging the trash. There is

poor personal waste management. We need to limit our amount of solid waste.

Dumpsters have loose items that get blown out, outsiders dump their trash in there, and

the dumpster is not properly secured. There are overflowing waste baskets and trash bins.

There is poor waste management in parks, public right of ways, bus stops, etc. We have a

person who is designated to do nothing but education and outreach on pollution

prevention" (Public Sector Participants).

"We have more volunteers than ever, but the amount of debris is increasing. Volunteers were seeing medical syringes and getting injured trying to get debris that was stuck in the rocks and hard to reach places. The city is doing an excellent job of deploying the resources to ensure that residents and businesses and faith organization have what they need to do litter cleanups. We are responsible for ensuring that people understand how to manage their residential waste. We collected 200,000 pounds of litter and debris in 2022" (Public Sector Participants).

**Moral and Belief:** The moral was that they had suggestions regarding policies, amendments, and enforcement. They also had policies with unintended consequences. In addition, they believed that the local government had the larger role in managing marine debris. According to some stakeholders for example:

"I think the local government's role ought to be one of trying to minimize the marine debris. They should engage with the citizens to make sure that stuff gets done properly and if not, there is a fining system. The problem we have with the city is that they do not engage the fine. We do not take people to court, and we do not fine them. Nobody is really enforcing the littering code. Code of Virginia and the Municipal Code of Norfolk states it is illegal to litter and illegally dump debris. The minimum fine has increased from $250 to $500 and up to $2,500 and 100 days in jail. We aligned with the State Code" (Public Sector Participants).

"We need to increase staffing for outreach education and mentor other cities with proven policies like Roanoke, Washington D.C. and Philadelphia. A policy needs to be created that if a litter item has the name of the business on it, the business is fined. Roanoke has

this policy. Also, we need to move forward on the preventable measures like a plastic bag fee. We work on advocacy and education. We are working on advocating to the city leadership on the plastic bag tax which the Commonwealth of Virginia allows localities to do which is to put a five-cent tax on throwaway plastic bags and four-cents would come back to the city which they could use for providing reusable bags and to provide for environmental things for the city. Why can't we outlaw plastic bags altogether?" (Public Sector Participants).

"Our biggest problem is getting volunteers to get out to deal with these issues. We have very few people that want to put the time and sweat equity to get things done. I think our biggest issue is trying to get people engaged to do what needs to be done. We do not have enough staff. We would like four to five more people to go to schools to educate youth about marine debris and litter and partner with realtors and developers to develop waste management plans. We talked to the city about a kayak program where you pick up trash. People want more trash bins around the city, but it is hard to manage them. "People need to put trash in a bag and put in a secured proper place. Recycling was not working, and it was too hard. People were putting the wrong items in the recycling bins. We need to identify who can take responsibility and then take action due to litter traveling. Adopt-a-Spots are increasing, and they need management, and we lack staff. We are expanding programs to include Adopt-A-Bin, a trashcan" (Public Sector Participants).

"We have an MS4 permit. We were demonstrating how street sweeping can have a positive impact and an unintended consequence was that now they are adding it to the permit requirements. Street sweeping helps keep debris out of the stormwater system.

Residents pay a stormwater fee in their utility bill that funds the permit and the things listed in the permit. We are applying with grants for hydrodynamic systems, installing BMPs in line with stormwater systems in areas where we know there is a lot of litter. We want to install trash tracks to capture debris before it goes into the river. Street sweeping is being added in our MS4 permit as a regulation. We have done it for aesthetics not pollution prevention. They added for help with maintenance. The MS4 permit is around $40,000 and is based on the population. It is very expensive to replace aging terracotta pipes. They are not designed to withstand intense rainstorms. We put a slip line in the pipe to extend its lifespan and this is cheaper than replacing the pipe. We need trained people and mechanics. Sweepers and vacuum machines are expensive, and they need maintenance. Sweepers are about $300,000 and vacuum sweepers are about $400,000" (Public Sector Participants).

"I have been trying to talk to the folks with the city to figure out some way we could put some catch basins at some of the drainage areas...or netting on the outfalls to try to catch some of that debris. Putting nets on outfalls becomes cost-prohibitive because there is so much debris that is coming out of there especially during storms. The maintenance of nets and trying to keep them cleaned is a problem. Then if they back up from so much debris, the water floods the streets which is something we were trying to avoid" (Public Sector Participants).

"The city does not manage dumpsters. It is a Virginia Health Department issue, and they are understaffed. Would like to see the city providing reusable bags for everyone.

We need better management of dumpsters on construction sites. We have lots of

complaints when dumpsters are overfilled. We need to try to improve safety for cleaning

up marine debris at our site" (Public Sector Participants).

**NONPROFIT**

**Setting:** Eight stakeholders were interviewed for this study and represented riverfront museums,

event planners, sailing and rowing groups, and a river restoration and animal protection

organization. The nonprofit (Sangomla) sector described Virginia's Elizabeth River as being

terrible after a storm and saw plastics most frequently. According to some stakeholders for

example:

"Trash gets in the river every single day from different places. You will see hard hats, or

large plastic sheets in the summer, it is a lot more every day, so the plastic bottles and

plastic bags and those kinds of items. I think the most common thing we take out of the

water is plastic. Like there are larger pieces of plastic from plastic bags to plastic bottles

to hardhats. That is probably what we are taking out of the water the most. We always see

bottles…plastic and straws. I am seeing a combination of big bottles, various plastics and

a fair amount of people's smoking devices. We see six-pack rings and single-used plastic

debris. All these things are extremely damaging to the environment including the ocean

not just the Elizabeth River but everywhere. On a typical day, you will see floatables like

bottles. We have found plastic floating furniture. We tend to get a bottle uptick, I would

say, around the more seasonal times because there are more people on the water. We

collected 570 cigarette filters. Debris is just there and does not matter what season. It is

bad…There is an infinite amount of stuff to collect" (Nonprofit Sector Participants).

"After a storm is runoff. We put out warnings to be extra cautious after a storm because

there is a higher chance of debris in the water. Debris enters from wind, rain and runoff.

There seems to be an uptake of litter after we have storms. More trash in the water after

storm events" (Nonprofit Sector Participants).

**Villain:** Weather and people were believed to be the villains or the main cause of the debris

problem. They also believed that a portion of marine debris came from accidental causes that did

not include humans. Daily, they observed the marine debris, and they viewed people as the

origin. According to some stakeholders for example:

"The Elizabeth River is an urban river with a lot of major cities that the river goes

through. I think in those more populated areas, there seems to be an uptake of trash. Just

neighborhoods and businesses or urban areas. Cruise ships dock at our site and can have

8,000 passengers going on and off the vessel daily and trash bins fill up fast. I would

most associate the problem with a behavioral issue – people do not know marine debris is

an issue. They do not care, or they think that someone else is going to take care of it for

them. People need to start noticing the litter. I think that is a large private problem. They

just do not see it; it is not in their world view. I think there is just sometimes a block that

if they do not live near the river or a body of water, they are blind to it. It is just not

within their perspective to notice it, or that yes, they just do not see it. I think it is a mix

of people tossing it and from tidal flooding" (Nonprofit Sector Participants).

"In the winter we tend to notice more industrial debris. Like when storms come through,

you will find hardhats from the shipyard, or large plastic sheets. Littering seems to be a

huge cause, but there also seems to be an uptake of litter after we have storms. They need

to know how to properly dispose of items. You see quite a bit more floatables after a high

tide event when it floats out of the reeds. We see a lot more after storms because the tide

is higher, and so it comes in and then debris will be left in areas that are referred to as

wetland buffers. Debris also enters during events at Towne Point Park, and from the

wind, rain and runoff. Debris travels in many directions including the stormwater system

and exits from the outfalls into the river. Floatables are washed out of the storm system.

There are more powerboats, more debris and more stuff in the river. After we see high

tides there are a lot more floatables and a lot more bigger debris that comes floating out

of the reaches and again you find pieces of docks that are hazardous to us. The rowing

shells are thin fiberglass, and the nails can puncture the boats" (Nonprofit Sector

Participants).

**Hero and Victim:** They all viewed themselves as heroes removing the debris and they also saw

themselves as victims and claimed there was too much debris to manage. Two of the

stakeholders did collect data. According to some stakeholders for example:

"A walker saw a bird distressed and entangled in debris under a bridge. The bird escaped

but they alerted us to the debris problem under the bridge, a difficult area to access.

We have thirty trail ambassadors that patrol the trails and do litter cleanups. They have

picked up 200 pounds of debris. At least once a month we do a litter pickup and then a

few times throughout the year we do a large-scale litter cleanup. This year alone we

picked up 2,000 pounds of trash from our litter cleanups and last year we picked up 4,000

pounds. I do not think we could do it alone with just staff which is why our volunteers

play a huge role in our mission. Our volunteers are really fantastic in helping us manage

the litter in the areas that we do litter cleanups. Keep Norfolk Beautiful organizes

volunteer cleanups on the banks of the creeks into the wetlands and then gets volunteers on big days such as Clean the Bay Day, Coastal Cleanup Day, etc. Marine debris travels and gets trapped on other sites of our property such as a public dog park. Debris often travels to other nearby areas where it gets trapped" (Nonprofit Sector Participants).

"We fight hard to keep our model level River Star Business status with the nonprofit Elizabeth River Project by having exhibits on the impacts of plastic marine debris and how marine debris travels in the currents. We collect marine debris data including identification and quantity of marine debris collected in the Seabins. We upload the data to Ocean Conservancy's Marine Debris Tracker. Since 2018 we have collected 8,097 items, 285 pounds of which 570 were cigarette butts and 1,373 were food wrappers. We also looked at the date on the food wrapper to see how long the item may have been in the water and think about how long it takes items to decompose. We have a Green Team that works with volunteers and allies such as Keep Norfolk Beautiful an Festevents to keep our site and the Elizabeth River clean and free of marine debris. Our maintenance staff will go and net out the debris. Volunteers remove marine debris from three Seabins that are marine debris collection devices that collect marine debris directly out of the water with a water pump and catch basin" (Nonprofit Sector Participants).

"We put out warnings to rowers when we are having severe tides or a storm coming through to warn people to be extra cautious because there is a higher chance of debris in the water. We make concerted efforts about every six weeks to pick up trash. We get six to ten bags of it. Treated wood shows up often a couple of hundred to four hundred pounds of treated wood. We could not remove it all in one cleanup, but once we were

able to really go after it, we could see the vegetation improve in those areas. There was

section of a dock with 12-foot oakwood boards with nails protruding. Washed up wood is

a large proportion of it, treated wood, not branches but things from people's dock. With

some of the cleanups I have done, I see wood from rundown piers that are falling apart,

so a lot of the wood and some construction materials. We oftentimes will try to pick up

large pieces of drifting wood. We have some probably six-to-ten-foot pieces of lumber

that are manmade processed lumber. We legitimately got a floating dock that was

probably eight by four feet. We have an orange construction barricade five feet long and

three feet tall that we pulled out of the river this summer, which we now use to block off

our crane. We recovered a bike and a shopping cart. Our largest items are old wood

pilings. We have had punctures in boats from wood that was partially submerged. It is

difficult to see debris when rowing in the dark and in the morning dawn. There are 12-

foot boards with nails protruding. Dangerous stuff" (Nonprofit Sector Participants).

**Plot:** The barrier they faced included a lack of resources and people taking responsibility.

According to some stakeholders for example:

"The weirdest things I have seen are tires with rims attached. There was a mattress right

there on an embankment. We see tires. We see a significant amount of fishing gear. We

see a lot of fishing line for sure. We have found some abandoned crab pots. We see trash

from trucks, discarded fishing gear along the Elizabeth River trail, during floods, runoff

from storms and the tide pulling it into the river, debris from cars going over a bridge

with windows open and new development construction debris. We see litter from

individuals that eat lunch or smoke cigarettes onsite or nearby. We see litter that is

intentionally mismanaged, the wind blows it, or trash cans are either full or not available.

Who is responsible for a polluted area, who do we call to find out how to get that cleaned up and taken care of? Who can we immediately go to for handling litter? The hardest part of our job is hauling wood out a lot of times. There are big pieces of wood right now that are too big for any of us to deal with. We do not have the equipment or enough muscle. There are a couple of big pieces that I do not know what to do. Small debris that has been broken up is hard to identify" (Nonprofit Sector Participants).

**Moral and Belief:** The moral was that although they have marine debris policies in place, they also had suggestions regarding policies, strategies, and marine debris removal. In addition, they were taking actions without knowledge of marine debris legislation, and policies and believed that the local government had the larger role in managing the marine debris. According to some stakeholders for example:

"There needs to be new policies for abandoned derelict vessels and policies for capturing runoff from storm drains. We need to have people dedicated to combing the shores occasionally, particularly for the treated wood floating around. If there was some way for local government to have boats that are designed to look for that stuff or even to hold people accountable for dilapidated docks and such, that would really, I think, make a difference" (Nonprofit Sector Participants).

"The biggest thing is making ourselves aware of what is out there regarding marine debris, not just the policies, but what organizations that we can work together with. We shared the results in our city's weekly newsletter. Another big thing the city is doing is paying staff for four hours of volunteer service annually. This has helped with our lack of manpower. Our organization works in a bubble and focuses on the marine debris in the

Elizabeth River at our organization's site. We want a clean healthy river and the trash I see in the river hinders that" (Nonprofit Sector Participants).

"Have people dedicated to combing those shores occasionally, particularly for the treated wood floating around. If they see it, just grab it. If there was some way for local governments to have boats that are designed to look for that stuff or even to hold people accountable for dilapidated docks and such, that would really, I think, make a difference. I personally think that on a local government side, our local leaders could be a little bit more involved with these major cleanups to be there and actually pick up the litter and be involved in the cleanup to show people that they care about it, that it is important, and they want to protect our working waterfront and they are also taking part in the protection. Not just on the policy side, but actually getting involved and funding efforts for leadership to participate at the local level in cleanups. I think that the federal government must do a better job at streamlining the identification of abandoned vessels and allow them to be identified as abandoned and removed. The State should fund wetland projects that trap litter. I think litter is a local problem" (Nonprofit Sector Participants).

"I think it would be great to have more litter cleanups. More volunteers and more frequent cleanups. I think that knowledge is power, and I think the best way to mitigate the litter in our river is to have the public have a general understanding of how the litter gets into the river. Teaching the importance of the watershed and teaching to not put loose items in your trashcan and making sure all loose items are in trash bags. I think it just takes a little bit of knowledge and some compassion. I think if organizations and

businesses could find ways to not use those items and use more sustainable items. The biggest issue is making sure the trash is emptied frequently enough that the wind does not blow the trash back out of the trash cans. There could be a few more trash cans and structures where maybe there is a long distance in between trash cans, but I also know that getting people to use the trash can is sometimes part of the battle. We need more trashcans. Cigarette butts and filters are going to continue to be marine debris items until the laws are put into place" (Nonprofit Sector Participants).

**ACADEMIC**

**Setting:** Two stakeholders were interviewed for this study and represented a local university's grounds and landscaper and sailing coach. The academic sector described Virginia's Elizabeth River as moderate including after a storm and saw plastics, large and recreation items most frequently. According to some stakeholders for example:

"The river is absolutely cleaner than it was when I first started working here. I think it is probably improved compared to rivers that we have spent time sailing on. Things we most frequently see are soda bottles and single-used plastics. There were sheets of plastic and a lot of plastic garbage. We see some large timbers, pilings or bollards. We have a very large piece of wood that is probably three feet by two feet. After storms there is a lot of debris and there might be sections of people's docks. We have seen some commercial shipping debris like wood that was probably from a dock, or a pier system. We saw some furniture like a wooden dinner table chair. I found a tire off a Nissan Pathfinder and there was a gigantic steel ball that was the size of a Honda Civic. I have pulled several lime scooters out of the water and a golf cart. We also find bicycle parts" (Academic Sector Participants).

**Villain:** Streets and the storm system were believed to be the villain or the main causes of the debris problem. They also believed that a portion of marine debris came from accidental causes that did not include humans. Daily, they observed the marine debris including after rain and storms, and they viewed the stormwater system as the origin. According to a stakeholder for example, "Certainly, after a major storm there is a lot of debris. There might be sections of people's docks and so forth" (Academic Sector Participants).

**Hero and Victim:** They all viewed themselves as heroes removing the debris. One of the stakeholders did collect data utilizing electronic trashcans, but the data is only shared internally within the organization. They also saw themselves as victims and claimed there was too much debris to manage and its dangerous. According to some stakeholders for example:

> "We have people assigned to zones to do litter collection. In the event that we find large timbers from a dock or something, we have a backhoe and will wait for debris to get close to the shore and then we will scoop it out with the equipment, or we will have someone with waders to tie ropes to it and haul it out" (Academic Sector Participants).

**Plot:** The barrier they faced included a lack of resources, people taking responsibility, and the marine debris was dangerous. According to some stakeholders for example:

> "We have 300-acres and 267 trash bins to manage. Definitely not enough trash cans in the parking lot in fact zero. I know our coach boats and power boats, have hit logs and pilings that might be partially submerged. We certainly hit those before. We have had entanglement from fishing line also. It wrapped around the propellers and that caused damage because it cut the seals and caused water intrusion" (Academic Sector Participants).

**Moral:** The moral was that although they had marine debris policies in place, they also had suggestions for new policies and amendments. In addition, they were taking actions with knowledge of marine debris legislation, and policies and believed that the local government had the larger role in managing the marine debris. According to some stakeholders for example:

> "We have policies on litter collection and street sweeping that affects the river. Some of that is our MS4 permit plan and some of it is internal policy. We do not have a policy for removing litter on the shoreline. It is an abstract statement regarding litter in general. There needs to be a policy on picking up litter along the shore" (Academic Sector Participants).

> "Part of our governing rules are rules that prohibit any discharge of pollutants or trash. College sailing has an environmental policy that bans single-use water bottles, and so we have had that in place for twenty years. For all of our camps and clinics we require people to bring their own refillable water bottles. Parking services could do a better job as well as students and faculty members with their litter. We would like more digital data collecting trash cans. I think public outreach is a part of the localities responsibility and encouraging communities to help" (Academic Sector Participants).

**RESIDENT**

**Setting:** One resident was interviewed for this study and represented two large residential areas of the Lafayette and Larchmont communities. The residential sector described Virginia's Elizabeth River marine debris as moderate and saw plastics and food and beverage containers most frequently. According to some stakeholders for example, "It is pretty bad. I find mostly

plastics on the side of the river including Big Gulp plastic cups….and then a lot of plastic bags. I also get water bottles" (Resident Sector Participant).

**Villain:** Weather was believed to be the villain or the main cause of the debris problem. Daily, they observed the marine debris without knowing where it was coming from. According to the stakeholder for example, "It's worse after a storm has come. After a storm, there is lots of stuff out there. I mean, there is a lot of crap out there floating around after a big rain or a big wind" (Resident Sector Participant).

**Hero and Victim:** The stakeholder viewed himself as a hero removing the debris and as a victim and claimed there was too much debris to manage. The resident did not collect data. According to the stakeholder for example:

"I only go canoeing to clean up the trash. I got a car seat that was like hauling a whale. It is beautiful, however there's trash everywhere. The debris filled up my canoe with water….all kinds of muddy water….this was gross…it was about 20 pounds. It was sunk in about 3-feet of water, so the top was sticking out. So, I grabbed it, and it is like, "Yes!" (Resident Sector Participant).

**Plot:** The barrier faced included a lack of resources and the tide. According to the stakeholder for example:

"I am not sure where all this stuff is coming from? I really do not know, but there is plenty of it there. I need bigger grabbers. Need a nine-foot one. In a canoe is like, you are trying to reach in there with this grabber and you have to get through the reeds. There is definitely trash that you can only get to by water" (Resident Sector Participant).

**Moral and Belief:** The moral was unknown, and no policies were in place. They also believed that a portion of marine debris came from accidental causes that did not include humans. In addition, they were taking actions without knowledge of marine debris legislation, and policies and believed that the federal government had the larger role in managing marine debris and should bear the expenses.

> "They should encourage and incentivize people. Increasing fines is not going to help. Ex: Kayak fishers have an event where they fish and pick up trash at the same time. Winner is the one with the heaviest fish and heaviest trash" (Resident Sector Participant).

## FISHER

**Setting:** One fisher was interviewed for this study and was a fourth-generation waterman that grew up on the Elizabeth River. The fisher described Virginia's Elizabeth River marine debris as moderate and saw plastics most frequently. According to the fisher for example:

> "It has gotten better. Awareness of the debris is good. When I was little, there were less houses, and I do not remember seeing balloons and bottles. But I do remember seeing old docks breakoff. The back ends of the river see anything from plastic bags to water bottles" (Fisher Sector Participant).

**Villain:** Weather was believed to be the villain or the main cause of the debris problem. The fisher also believed that a portion of marine debris comes from accidental causes that did not include humans. Daily, the fisher observed the marine debris, and viewed people, vehicles, vessels and aging infrastructure as the origin. According to the fisher for example, "From the middle of the river out of the Eastern branch and leaving out on certain storms or high tides we will see wood and islands of stuff that is very dangerous" (Fisher Sector Participant).

**Hero, Victim and Plot:** The fisher viewed himself as a hero removing the debris, providing education and outreach and also as a victim and claimed there was too much debris to manage, and it was expensive. The fisher did not collect data. The barrier he faced included people taking responsibility. According to the fisher for example:

> "We have had to tie things up until we see the Army Corps of Engineers and then we have notified them and told them, Hey! You have a pile over there. They are the ones we would reach out to. Whatever we can pick up, we try to get, but the main thing is that we are aware of what we do on our boat. Make sure nothing blows out. We have a trash bag on the boat when we start – we put our ice in the bag and I tie a little knot and that is our trash bag for the day, so everything goes right in that trash bag. We pick up abandoned crab pots and try to recycle them. We just want to continue to preserve the river the best that we can, and we hope that our efforts our there are helping. We will sometimes see bait boxes floating. We will also pick up an abandoned crab pot. We tie things up and educate youth that are visiting the Learning Barge. When I visit the Learning Barge, I tell all the kids to tell their mom and dad to make sure they keep the river clean. People are being a little sloppy and letting litter get on the edge of the shoreline and they do not realize it ends up right in the bay. That is the biggest thing. During industrial work on the river like building a bridge brought debris, especially workers not disposing of lunch items properly and birds getting into it. Also, tugs and barges can hit old docks and cause the wood to break up. Also just wear and tear and break down….ends up being trash. Now they are schooled to protect the river around, to where we were just not trained that way" (Fisher Sector Participant).

**Moral and Belief:** The moral was that although the fisher had working marine debris policies in place, he also had suggestions for new policies for marine debris removal. In addition, they were taking actions without knowledge of marine debris legislation, and policies and believed that the local government had the larger role in managing marine debris. According to the fisher for example:

> "Fishing permits do not mention about litter or debris. I think someone should come up with some type of task team for these full moons and tides and get that on the table and then go ahead and address that. This would prevent somebody from getting hurt and it would help the river. If somebody goes out there for the first time or after the moon is full, they will get a bad perspective and whatnot. The biggest thing that I would say that would improve is if they had some type of team or some type of division when they knew these storms were coming. They need to create a task force to remove debris during full moons and storms. The day after the storm and after everything settled or the full moon is happening and then they know it is going to be a super moon or whatever, they would then go ahead and have people to get out. This is the perfect time to clean it and the perfect time to prevent an accident and be safe" (Fisher Sector Participant).

## MILITARY

**Setting:** Two stakeholders were interviewed for this study and represented the United States Coast Guard and the United States Corps of Engineers. The military sector described Virginia's Elizabeth River as moderate and not as bad as other rivers. They saw plastics, wood and abandoned derelict vessels most frequently. According to the stakeholders for example:

> "I think it is about average. Not bad if you are comparing to other rivers.

Most frequently you see….water bottles. The thing we see the most of is just small plastic bits…that are just little shreds of some sort of garbage. You have fenders, which are basically a buffer between a pier and a large boat, as big as a Volkswagen float around. The most common thing that would really catch your eye was what I called ship killers. These are waterlogged pieces of timber that are 99% underwater. We do not really see fallen trees anymore because it is not really a wooded watershed anymore. It is industrialized, but what you will see is like I said before, the piles that are dead men and the whalers, which are big boards" (Military Sector Participant).

**Villian:** Weather was believed to be the villain or the main cause of the debris problem. They also believed that a portion of marine debris came from accidental causes that did not include humans. They observed the marine debris weekly and daily, and they viewed aging infrastructure and weather as the origin. According to the stakeholders for example:

"It seems like storms affect things more than the tide does. Fenders, which are basically a buffer between a pier and a large boat float around. Those are less common, but they do tend to happen in the event something shakes them loose or they float out there…anytime there are high winds or a storm surge that just caused something to shake loose that might have been sitting or a king tide comes in, it takes something up and then carries it down river, we wind up seeing it then, and it is usually after those types of events, like a major marine event, that we'll see the most floating debris" (Military Sector Participants).

**Hero, Victim and Plot:** They all viewed themselves as heroes removing the debris and they also saw themselves as victims and claimed there was too much debris to manage, it was dangerous, and expensive. They collected data and shared only internally within the organization. The

barrier they faced included practices, and that marine debris was dangerous. According to the

stakeholders for example:

"We can only work on navigation projects that we are federally authorized for, and then

they are authorized by channel or by shoal. We get contacted a lot of ways but mainly by

vessels: tugs, the ferry, and pilots. We are talking about mainly dead men and whalers,

wood. We make sure that the waterways of the United States, the navigable ones, are

clear and well-maintained. Anytime there is a disruption to navigation, we go in and

remove it. Specific to our drift authorization, for the floating debris, we will go outside

the channels. If it is floating debris that is large enough to present a hazardous navigation,

that is kind of an important distinction…we focus on the larger debris that could be

hazard to a boat or a ship. We have two boats that we use regularly for the patrol that

have hydraulic cranes and that have timber claws on them. The crew will stab it with a

pipe pole, bring it in close to the boat, then bring it on board by hand. We use a crane for

larger debris. Our authorization is Monday through Friday, pretty much during daylight

hours 7am-4pm. We are also on emergency call. We work closely with all our port

partners, so the Coast Guard, Virginia Pilots Association, commercial entities, the

docking pilots, tug companies, residential areas down along the Elizabeth River. We

implement the Hampton Roads Drift Project. In the Elizabeth we go all the way down the

Elizabeth River proper before it breaks off into branches. So, past all the container

facilities, the naval base, Craney Island and the Coast Guard station. Then we do go up

the western branch to the second bridge. So, we go up the western branch a little way,

then down into downtown. We cover everything right downtown on the Elizabeth River.

So, Hospital Point, Waterside and all that. Then we will go down the southern branch for

several miles. We stop short of the Great Bridge Locks, and we do maintain the

Intracoastal Waterway. Once you connect to something and start to tow it, you cannot

disconnect. If any bridge were to go down, none of us can stay underneath them and if

there were a search and rescue case north of that bridge, it would restrict our crews"

(Military Sector Participants).

"We are concerned about the boating public in general. If there is something floating

around out there that might cause an unsafe situation, say all those piles that you would

not be able to see at night. If a small center console vessel were to hit one of those things

going 25 or 30 knots at night, it could be a real problem for us in the future. The safety of

the general public is always a concern for us. If they were to hit something while cruising

along at night, just outside of a channel, inside of a channel, it is a real problem. If it gets

to where it is like something really large and we have to tow it, we might give the Corps a

call to see if they are willing to take it or if we can bring it to them. We have the authority

to close the channel down. It is a standard practice for us post-storm to go out and do an

ATON verification (Aids to Navigation). We have the capacity to operate at least one

boat at any one given time. We have about 16 to 30 staff. Marine debris is a major cause

or concern with vessel traffic, and it is equally as important to clear the channel. We work

all hours of the night. Our primary mission is just search and rescue, law enforcement and

supporting the other shops here on base" (Military Sector Participants).

**Moral and Belief:** The moral was that although they had marine debris policies in place, and

they worked they also had suggestions for policies. In addition, they were taking actions to

remove threats to navigation and enforce the law and they believed that the federal government

had the larger role in managing the marine debris. According to some stakeholders for example:

"The Corps of Engineers is not centrally funded but project funded. The debris mission project has funding from most of the smaller cities that share Hampton Roads. There are only five districts in the country that have this drift authorization. On the east coast, it is Norfolk, Baltimore, and New York, and then on the West Coast, I think it is Sacramento and Seattle, but that is it. Congress authorizes the Drift Authorization. There are definitive gaps because we are focused on the federal navigation channel. We do not have the resources to become the trashmen of the Chesapeake Bay. Back to resource allocation and from the congressional authorization, I do not have the authority to go around and just pick trash up. More assets would help. We put a budget package in and sent it to Congress to fund on-call response in the evenings and on the weekend because, before, we were not funded for that. We did get some money from Congress to fund an on-call response. There used to be two shifts, now there is one" (Military Sector Participants).

**VOLUNTEER**

**Setting:** Two volunteers were interviewed for this study and represented a wetland master gardener and a sailing program. The volunteer sector described Virginia's Elizabeth River marine debris as moderate, and they saw plastics most frequently. People were believed to be the villain or the main cause of the debris problem. According to the stakeholders for example:

"We get a huge amount of cigarillo tips. A shocking amount of plastic bags, and bottles wind up in that spot. We found a plastic bottle with three fake $100 dollar bills. We find consumer products like bottles and plastic bags. There are three categories of items that are seen, consumer goods, industrial stuff like hard hats and quite a bit of broken planks and docks that are fairly large. They are just floating around in an area" (Volunteer Sector Participants).

**Villain:** They observed the marine debris daily. They also believed that a portion of marine debris came from accidental causes that did not include humans. They viewed people and aging infrastructure as the origin. According to the stakeholders for example, "We know some of it is salt treated lumber that comes off people's docks. Debris increases after storms" (Volunteer Sector Participants).

**Hero, Victim and Plot:** They viewed themselves as heroes removing the debris and they also saw themselves as victims and claimed there was too much debris to manage, and it was dangerous. They did not collect data. The barriers they faced for reducing marine debris included city leaders and decision makers, people taking responsibility and the tide. According to the stakeholders for example:

> "We actually see fairly large pieces floating around and you think you should not sail over that. Because the wind changes the whole thing will float to the other side. At some point, you need to take it out because it is going to go back and forth. I am there to help plant with gardening gloves on and I am easily distracted by the trash because we are planting at low tide. You have to climb a railing to get under the bridge where debris accumulates. It is tricky to get out. There are wetlands that are not meant to be walked on and the debris gets trapped in there and it is hard to fish it out" (Volunteer Sector Participants).

**Moral and Belief:** The moral was that although they had marine debris policies in place that work, they also had suggestions for policies, and strategies for marine debris removal. In addition, they believed new policies were needed for the local and federal government to manage the marine debris. According to some stakeholders for example:

"I would really love to have a reusable bag that would preclude people from having single use plastic bags. I hope that when legislation is enforced about no Styrofoam containers hopefully that would be good because I can tell you it is a significant part of pollution in places. The better a city cleans up their mess, the less ends up in the river. Refuse, reduce, recycle, repurpose, and reuse" (Volunteer Sector Participants).

## VIEWS ABOUT MARINE DEBRIS

Based upon the analysis of the transcribed interviews from all the stakeholders, views about marine debris did vary according to the sectors that they represented. Before discussing those results, the sectors' views illustrated in the tables in this chapter reflect the number of times a view was emphasized and then those views were tallied according to the sector the stakeholder represented. In other words, if a government stakeholder continued to emphasize how terrible the marine debris pollution was in the river, it was tallied every time. This was to demonstrate the weight and richness of that sector's view. For example, to explain a total of three for describing the river debris as terrible, one government stakeholder could have said the river was terrible three times during their interview or three different government stakeholders could have each said the river was terrible once, etc.

## DESCRIPTION OF THE MARINE DEBRIS POLLUTION

To begin the discussion, as seen in Table 20 all sectors viewed the Elizabeth River to have a moderate amount of marine debris (cleaner, improved, better, average) although the private, public and nonprofit organizations had a stronger view of river's debris as terrible (increase in debris, an eyesore, shocking, bad). Their emphasis resulted in the Elizabeth River's marine debris pollution being viewed overall by all the sectors as terrible. According to some

stakeholders for example, "For me, it is terrible, to be honest with you. There is an infinite amount of stuff to collect. I am surprised at the amount of material" (Private, Public and Nonprofit Sector Participants). In comparison, according to the academic, fisher, military and volunteer sectors they described the river as moderate with debris worse after storms. According to some stakeholders for example, "Certainly, after a major storm…there is a lot of debris. Not as bad if you are comparing to other rivers" (Academic, Fisher, Military and Volunteer Sector Participants). Also worth noting is the government sector's emphasis on accumulating debris for example:

> "Some areas are worse than others. It is a constant issue with homeowners of having to clean the litter out of the marshes. It is getting into the stormwater system. The debris bounces off the bulkhead and then it travels to either side into the wetlands. There are particular areas you see a lot more debris. Items get trapped in the wetlands or along the shoreline" (Government Sector Participants).

**Table 20**

*How Each Sector Viewed the Elizabeth River's Marine Debris Pollution*

**Interview Question (Setting)**
*How would you describe the marine debris pollution in the Elizabeth River?*

| | Gov't | NGO | Private | Public | Academic | Fisher | Military | Volunteer | Resident |
|---|---|---|---|---|---|---|---|---|---|
| **CATEGORY** | | | | | | | | | |
| **Terrible** | 3 | 6 | 6 | 6 | | | | | 1 |
| **Moderate** | 4 | 1 | 1 | 2 | 3 | 2 | 2 | 2 | |
| **After a Storm** | 1 | 5 | 4 | 1 | 1 | 1 | 1 | 1 | |
| **Accumulates** | 8 | 3 | | 2 | | | | | |

| | |
|---|---|
| **Terrible** | 22 |
| **Moderate** | 17 |
| **After a Storm** | 15 |
| **Accumulates** | 13 |

**MOST FREQUENT TYPE OF MARINE DEBRIS SEEN**

As seen in Table 21 all sectors viewed plastic as the most frequent type of marine debris in the Elizabeth River. This included all sizes of plastics from cups to chairs.

**Table 21**

*What Each Sector Viewed as the Most Frequent Type of Marine Debris in the Elizabeth River*

| Interview Question (Setting) *What types of marine debris do you see most frequently in the Elizabeth River?* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | NGO | Gov't | Public | Private | Volunteer | Academic | Military | Fisher | Resident |
| **CATEGORY** | | | | | | | | | |
| **Plastics** | 15 | 9 | 9 | 8 | 5 | 4 | 3 | 3 | 2 |
| **Large Items** | 8 | 7 | 1 | 2 | | 5 | | | 1 |
| **Wood and Paper** | 7 | 6 | 2 | 7 | 2 | 1 | 2 | 1 | 1 |
| **Food and Beverage Containers** | 6 | 4 | 4 | 6 | 3 | 2 | 1 | | 2 |
| **Styrofoam** | 5 | 4 | 1 | 3 | 1 | 1 | 1 | | 1 |
| **Fishing Gear** | 3 | 5 | 1 | | 2 | 1 | | 1 | |
| **Recreation** | 1 | 1 | 1 | | 1 | 4 | | 1 | |
| **Abandoned Derelict Vessels** | | 3 | | 1 | | 1 | 2 | | |
| **Industry** | 2 | 2 | | 2 | 1 | 1 | | | |
| **Fabric** | | | 1 | | 1 | | | | |

| | |
|---|---|
| **Plastics** | 58 |
| **Wood and Paper** | 29 |
| **Food and Beverage Containers** | 28 |
| **Large Items** | 24 |
| **Styrofoam** | 17 |
| **Fishing Gear** | 13 |
| **Recreation** | 9 |
| **Abandoned Derelict Vessels** | 8 |
| **Industry** | 8 |
| **Fabric** | 2 |

According to the nonprofit sector that emphasized plastic the most for example:

> "You will find hard hats or large sheets of plastics. In the summer, it is a lot more every day,
> there are plastic bottles, plastic bags and those kinds of items. I think the most common thing
> we take out of the water is plastic. We always see bottles…plastic and straws. Like there are
> larger pieces of plastic from plastic bags to plastic bottles, to hardhats. That is probably what
> we are taking out the most. I am seeing a combination of big bottles and various plastics. We
> have found floating plastic furniture" (Nonprofit Sector Participants).

Navigational threats that included large, dangerous debris such as wood from docks, large items and abandoned derelict vessels were also mentioned across all sectors. The pieces of wood observed have been as large as twelve feet by four feet and were compared to the size of a Volkswagen. The government and military sectors have code names for the wood debris that included "whalers" horizontal large flat floating sections from docks and "dead men" which were the vertical long thick pieces of wood that could become easily waterlogged. The dead men were especially dangerous if the majority of it sunk underwater and could not be seen by a vessel. Although the government and military sectors observed accumulation areas of marine debris when patrolling the Elizabeth River, they did not think the Elizabeth River was as bad as other rivers. According to the military and government sectors, the debris they observed included for example:

> "We see abandoned derelict vessels, pilings, fenders and dock debris. Just random
> wooden debris floating and there is definitely dock debris. We have seen commercial
> shipping debris like wood that was probably from a dock. The most common thing that
> would really catch your eye was what I called ship killers. These are waterlogged pieces

of timber that are 99% underwater. There are reports of barrels. Sometimes we get large items like buoys or a cooler" (Military and Government Sector Participants).

In addition, all the sectors except the fisher believed there was an uptick in Styrofoam that was observed in chunks, as cups and to go container boxes. According to some stakeholders for example, "There is a lot of Styrofoam. I would say lots of large Styrofoam chunks. There are a lot of Styrofoam cups" (Stakeholder Participants).

## THE CAUSE OF THE ELIZABETH RIVER MARINE DEBRIS

As seen in Table 22 all sectors viewed weather as the cause of the Elizabeth River's marine debris problem especially nonprofits, government, private and public sectors. In addition, the military ranked weather as the cause likely due to their main goal was to keep the channel free of threats to navigation and they have the authority to close the channel due to inclement weather. According to some stakeholders for example:

"If we have high winds come through here, hurricane, tropical depression – it is standard practice for us post-storm to go out and do an ATON verification that stands for Aids to Navigation. We check to make sure navigational markers have not shaken loose or their chains severed or have not broken free making sure they are in the proper location and that the opposite channel is safe to transit as well. New dock boards come loose during high tides and nor'easters. Debris enters during events…and from the wind, rain and runoff. We see a lot more after storms because the tide is higher, and so it comes in and then debris will be left in areas that are referred to as wetland buffers. It seems like storms affect things more than the tide does" (Stakeholder Participants).

**Table 22**

*Sectors' Views of the Cause of the Marine Debris in the Elizabeth River*

**Interview Question (Character - Villian)**
*What do you see as the cause of the Elizabeth River marine debris problem?*

| CATEGORY | NGO | Gov't | Private | Public | Academic | Volunteer | Fisher | Military | Resident |
|---|---|---|---|---|---|---|---|---|---|
| **Weather** | 12 | 10 | 11 | 6 | 2 | 1 | 2 | 1 | 1 |
| **People** | 10 | 6 | 6 | 9 | | 3 | 1 | | |
| **Poor Waste Management** | 3 | | 2 | 6 | 2 | | 1 | | |
| **Vessels** | 2 | 6 | 1 | 1 | 1 | | | | |
| **Vehicles** | 3 | 1 | 1 | 4 | 1 | | 1 | | |
| **Aged Infrastructure** | 3 | 3 | 2 | 1 | 2 | 2 | 1 | | |
| **Streets and Storm System** | 2 | 2 | 3 | | 3 | | | | |
| **Businesses** | 2 | 1 | | 2 | | 1 | 1 | | |
| **Fishing Gear** | 2 | 1 | | | 1 | | | | |
| **Items Trapped** | 2 | 1 | 1 | | | 1 | | | |
| **Lack of Knowledge and Awareness** | 2 | 1 | | | | | | | |
| **No Enforcement** | | | 1 | | | | | | |

| | |
|---|---|
| **Weather** | 46 |
| **People** | 35 |
| **Aged Infrastructure** | 14 |
| **Poor Waste Management** | 14 |
| **Vessels** | 11 |
| **Vehicles** | 11 |
| **Streets and Storm System** | 10 |
| **Businesses** | 7 |
| **Items Trapped** | 5 |
| **Fishing Gear** | 4 |
| **Lack of Knowledge and Awareness** | 3 |
| **No Enforcement** | 1 |

In addition, people were ranked high as a cause of the marine debris problem in the Elizabeth River especially with nonprofits, the government, private and public sectors. According to some stakeholders for example:

"A lot of it is from trash that gets thrown down on the streets and goes right to the storm drains and shoots right to the waterways. There are poor behavioral actions by citizens and businesses regarding marine debris and litter. There is illegal dumping, and they are not reporting areas that need cleanups. People need to start noticing the litter. People are being a little sloppy and letting litter get on the edge of the shoreline and they do not realize it ends up right in the bay. That is the biggest thing. People are cutting the lines on abandoned derelict vessels that are an eyesore" (Stakeholder Participants).

Also worth noting, is that fishing gear was not seen a major cause nor was lack of knowledge, awareness or enforcement. This is important because some rivers experience negative impacts with fishing gear including navigational threats and damage to vessels due to entanglement. Damage to vessels from entanglement could be expensive and put essential vessels out of commission for periods of time, but from the stakeholders' perspective it was not as dangerous or frequent as other types of marine debris as shared by a stakeholder for example, "Once or twice a year we experience marine debris entanglement in our propellers" (Stakeholder Participant).

**HOW OFTEN SECTORS SAW THE MARINE DEBRIS**

As seen in Table 23 all sectors mainly saw the debris daily except the resident that only frequented the river by kayak once a week. It is important to note that although all stakeholders agreed that there was always marine debris in the Elizabeth River, they answered the question by

sharing how often they frequented the river. In addition, weather was mentioned as a driver for viewing marine debris. According to some stakeholders for example, "Trash gets into the river every single day from different places including non-point sources. I am confident that in front of the Chrysler Museum, the debris is there daily. We will get it if there is a south wind" (Stakeholder Participants).

**Table 23**

*How Often Each Sector Viewed the Marine Debris in the Elizabeth River*

**Interview Question (Character-Villian)**
*How often are you seeing marine debris in the Elizabeth River?*

| | NGO | Gov't | Private | Public | Academic | Volunteer | Military | Fisher | Resident |
|---|---|---|---|---|---|---|---|---|---|
| **Daily** | 6 | 5 | 5 | 3 | 2 | 2 | 1 | 1 | |
| **Weekly** | 2 | 1 | | | | | 1 | | 1 |
| **Only After Rain and Storm Events** | 1 | | 1 | 1 | 2 | | | | |
| **Monthly** | 1 | | | 1 | | 1 | | | |
| **During Our Big Cleanup Events** | | 1 | | | | | | | |
| **Never** | | | | | | | | | |

| | |
|---|---|
| **Daily** | 25 |
| **Weekly** | 5 |
| **Only After Rain and Storm Events** | 5 |
| **Monthly** | 3 |
| **During Our Big Cleanup Events** | 1 |
| **Never** | 0 |

**SECTORS' VIEW OF THE ORIGINATION OF THE MARINE DEBRIS**

As seen in Table 24 although overall people were viewed by all sectors as the origin of the Elizabeth River's marine debris, the stormwater system also ranked high. The stormwater system was designed for the rainwater to travel directly to the Elizabeth River and runoff is one of the river's biggest challenges.

**Table 24**

*The Origination of the Elizabeth River Marine Debris According to Sectors*

| Interview Question (Character - Villian) *What is your perspective on where it is originating?* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **NGO** | **Gov't** | **Public** | **Private** | **Volunteer** | **Academic** | **Fisher** | **Military** | **Resident** |
| **People** | 7 | 7 | 6 | 5 | 3 | | 1 | | |
| **Storm Water System** | 4 | 3 | 6 | 2 | | 2 | | | |
| **Weather** | 3 | 4 | 2 | 3 | | 1 | | | |
| **Vehicles** | 1 | | 4 | 3 | | | 1 | | |
| **Aging Infrastructure** | 4 | 2 | 1 | 1 | 1 | | 1 | 1 | |
| **Vessels** | | 3 | 1 | 1 | 1 | | 1 | | |
| **Poor Waste Management** | 1 | | 2 | | | | | | |
| **Accumulation Spots** | 1 | 1 | 1 | | | | | | |
| **I Don't Know** | | | | 1 | | | | | 1 |
| **Industry** | 1 | | | 1 | 1 | | | | |

| | |
|---|---|
| **People** | 29 |
| **Storm Water System** | 17 |
| **Weather** | 13 |
| **Aging Infrastructure** | 11 |
| **Vehicles** | 9 |
| **Vessels** | 7 |
| **Poor Waste Management** | 3 |
| **Accumulation Spots** | 3 |
| **Industry** | 3 |
| **I Don't Know Where It Is Coming From** | 2 |

According to some stakeholders for example:

> "The main vector is outfalls, the stormwater system and from upland areas of the water. Runoff from neighborhoods, businesses, industries and nonpoint sources is the cause. In addition, runoff directly enters the river from the stormwater outfall on our site that is turned on during big heavy rain events" (Stakeholder Participants).

## PERSPECTIVES ABOUT MARINE DEBRIS REMOVAL

Based upon the analysis of the transcribed interviews from all stakeholders, perspectives about marine debris removal did vary among stakeholders according to the sectors that they represented. Although, as seen in Table 25 overall, all the sectors said there was too much debris to manage, and it was dangerous. In addition, lack of volunteers was not considered the main way the marine debris was impacting their organization's progress although according to some stakeholders for example:

> "It is a constant cleanup and who is going to be taking care of this sort of thing. During litter cleanups, volunteers were seeing medical syringes and getting injured trying to remove debris stuck in hard-to-reach places. We paused the program" (Stakeholder Participants).

Some stakeholders felt marine debris was expensive to manage and some shared:

> "We had some storm drain systems that were so clogged up that we had to literally hire contractors, and they spent a week on one in the last year, literally just clearing up a couple of blocks worth of pipe that were completely blocked. We have taken plastic bottles into our jet suction of one of our boats and we had to take the suction system apart to remove the items in order to get it back in the water. We spend a lot of manpower cleaning up the debris. We have hit logs and pilings that might be partially submerged.

We certainly hit those before. We have had entanglement from fishing line also. It wraps

around the propellers" (Stakeholder Participants).

**Table 25**

*Ways the Marine Debris is Impacting the Sectors' Progress*

| **Interview Question (Character - Victim)** *What are ways marine debris is impacting your organization's progress?* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Gov't** | **Public** | **NGO** | **Private** | **Volunteer** | **Military** | **Academic** | **Fisher** | **Resident** |
| **Too Much Debris to Manage** | 9 | 5 | 4 | 1 | 2 | 1 | 1 | 1 | 1 |
| **Dangerous** | 5 | 1 | 2 | 1 | 1 | 1 | 1 | | |
| **Expensive** | 2 | 1 | 2 | 4 | | 1 | | 1 | |
| **Emotionally** | 2 | 1 | | 2 | | | | | |
| **Impacts Organization's Mission** | 1 | | 3 | | 1 | | | | |
| **Not Enough Volunteers** | | 2 | | | | | | | |
| **Lack of Policies/Codes** | 1 | 1 | | 1 | | | | | |

| | |
|---|---|
| **Too Much Debris to Manage** | 25 |
| **Dangerous** | 12 |
| **Expensive** | 11 |
| **Emotionally** | 5 |
| **Impacts Organization's Mission** | 5 |
| **Lack of Policies and Codes** | 3 |
| **Not Enough Volunteers** | 2 |

Only the government, nonprofits and volunteers felt like the marine debris was impacting their

organization's mission. According to some stakeholders for example:

"I am volunteering to help plant and I stop to pick up debris. Where there is tidal

flooding, we get marine debris on our trails. We want a clean healthy river, and the trash

hinders that" (Government, Nonprofit and Volunteer Sector Participants).

Although having a lack of policies and codes ranked low, government, private and public sectors shared for example, "We need policies to remove abandoned derelict vessels effectively and efficiently. Noone is enforcing the litter code. Noone is policing the shoreline for marine debris" (Government, Private and Public Sector Participants).

## MARINE DEBRIS REMOVAL ACTIONS BY SECTOR

All the stakeholders described themselves as heroes removing marine debris from the Elizabeth River as seen in Table 26. Some also mentioned partners or volunteers assisting with providing people, supplies and resources. According to some stakeholders for example:

"Keep Norfolk Beautiful recruit volunteers and provide supplies such as grabbers and bags. In 2022, we had 11,602 volunteers and collected 200,000 pounds of litter and debris and saved the city $814,800. Dept. of Environmental Health and Safety will organize shoreline cleanups with university clubs, and they will come in a few times a year to police the shore for litter" (Stakeholder Participants).

"The Corps of Engineers responds to complaints and picks up debris like wood. We work closely with all our port partners that includes the Coast Guard, Virginia Pilots Association, commercial entities, the docking pilots, tug companies, and residential areas down along the Elizabeth River" (Stakeholder Participants).

**Table 26**

*Ways Sectors' Remove Marine Debris*

| Interview Question (Plot) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *What are your organization's policies and practices for marine debris reduction/removal?* | | | | | | | | |
| | **NGO** | **Private** | **Gov't** | **Public** | **Academic** | **Military** | **Volunteer** | **Fisher** | **Resident** |
| **Marine Debris Removal Actions** | 17 | 8 | 6 | 6 | 4 | 2 | 2 | 1 | 1 |
| **Legislation, Policies & Strategies** | | 2 | 8 | 3 | 2 | | 1 | | |
| **Education and Outreach** | 4 | | 1 | 5 | | | | 1 | |
| **Keep Statistics and Data** | 2 | 1 | 1 | 2 | 1 | | | | |
| **Collaborate** | 1 | | 2 | | | 1 | | | |

| | |
|---|---|
| **Marine Debris Removal Actions** | 47 |
| **Legislation, Policies & Strategies** | 16 |
| **Education and Outreach** | 11 |
| **Keep Statistics and Data** | 7 |
| **Collaborate** | 4 |

As heroes, Table 27 illustrates the nine sectors' marine debris removal actions, policies

and strategies. The richest dialogues of the interviews were from asking, "What are your

organization's policies and practices for marine debris reduction and removal?" The stakeholders

shared different approaches for removing the debris whether by land or by water. They also had

different perceptions of the marine debris problem based on if they were in a vessel or on the

land. Those in vessels were concerned with large debris that was a threat to navigation while

those on land were mainly concerned with consumer products and plastics and were unaware of

the large wood from docks and piers that caused navigational hazards. Sector's shared removal

actions, policies and practices with the voice of a hero for example:

**Table 27**

*Examples of Sectors' Marine Debris Reduction and Removal Actions, Policies and Practices*

| Government |
| --- |

"I deal with what washes up in the marshes and it is a constant complaint of all sorts of litter. A full 20-foot wooden 10-inch piling washed up and a city crew helped get the pile out of the homeowners back yard and the marsh because there is no way the homeowner could have taken care of that. Abandoned derelict vessels are a huge problem. We investigate, send legal notices that the owner must remove from the wetlands, city comes to remove, we fine, we take owners to court, put liens on property" (Government Sector Participant).

"For the past three years we did Clean the Bay Day, we have had two pieces of heavy equipment there to assist us in removing the really large heavy pieces. We have policies about littering, and we have a whole EMS, Environmental Management System, and it applies to all of our terminals, anything inside of our fence line. We have a number of policies that talk about litter and debris, and not littering and what to do, but specifically that focus only on marine debris, we do not. I think we have had a decrease of debris on our terminals which should lead to a decrease in marine debris, but that's primarily due to land side policies and enforcement actions from the port police, but that's not to say that people or truck drivers, for example don't come on the terminal and toss a bottle out somewhere along the way. We have incorporated litter into a lot of our inspections. We go around on a quarterly basis and do a number of different types of facilities inspections, which includes looking at areas where we typically have flowing debris that will collect" (Government Sector Participant).

"In 2021 through 2025 marine debris has consistently been ranked as a high priority. Since 2014, we have worked to develop, update and implement the Virginia Marine Debris Reduction Plan which meshed quite well with NOAA's MidAtlantic Marine Debris Action Plan. So, the Federal Government is talking to the State Government to align the goals. They are very similar. We have four buckets, and one is abandoned derelict vessels, one is fishing gear, one is microplastics/microfibers, and one is sort of catch all consumer debris. So, both prevention and the removal. We had a policy recommendation that was turned into a law which was really a budget amendment for $3 million two years ago to the Virginia Marine Resources Commission (VMRC) which is the only state agency that has the authority to remove the vessels at the state level. That was a direct law that came out of a plan and generated policy recommendations. Federal government is providing the crucial funding, supplementary funding. The VMRC is the legal authority for removing vessels. They are working with localities with the grant program as well as tribes to give them the funding to remove those vessels. We have a permit that includes doing some litter survey work and we work with Keep Norfolk Beautiful to meet that requirement. We get a 5-year permit from the Department of Environmental Quality (VADEQ) and we are on the seventh year. The one before was 11 years" (Government Sector Participant).

"We removed six 40-foot containers that had fallen off a ship and drifted into the channel. We were able to get some lines on them, so we helped secure it, so we knew where they were. The one that sunk just did not lay on its side, it stood straight up. I think it sunk with its doors in the mud on the bottom, so it was sticking 40 feet up. Now you have reduced that channel from a 45-foot channel to a five-foot channel for lack of" (Government Sector Participant).

**Continued**

**Private**

"We walk the docks and remove debris with nets. It is part of the leaseholder's lease for boat owners to keep the area around their boat free of debris. Trashcans are bolted to the dock with lids securely tied all along the dock and they are emptied daily by the dock hands. We bought trash cans that have a lid on them, they are more like dock boxes that we have located on every dock. We also skim whatever we can out of the basin. Primarily staff removes the debris" (Private Sector Participants).

"We have a sediment basin that can capture debris and then filter water over a knee wall. We will pump these tanks and remove debris. We have five storm drains that go directly to the Elizabeth River and we have filters on all of those. There is a filter on our retention ponds that if they overflow, they will catch the debris, so it will not go in the river" (Private Sector Participants).

"We do not have debris policies, just good practices. Weekly tasks include dockhands to clean. Literally every opportunity we can. If I am taking my family out on a boat, we are bringing a trash picker-upper and a fishing net with us just in case we see something. My staff is allowed to take boats out whenever, and they do, and they will clean up litter as well, but any opportunity we have to participate in litter cleanups, whether it is Clean the Bay Day, we have done a couple different things with navy volunteers, we have done a couple different ones with Elizabeth River Project. Literally any opportunity we can, we jump on it. We care about that just as much as we do revenue impact, and that is just because if the water is filled with trash, what good are the boats? We have it written into even corrective action. If you walk by litter and you do not pick it up, that is a problem because we need to be part of the solution, and if there's litter and filth in the river, trash, and debris everywhere, we do not have a viable business" (Private Sector Participants).

| Continued |
| --- |
| **Public** |

"Staff participated in a contest and utilized a filter bar screen that traps all of the larger things that are bigger than a quarter of an inch and then stuff gets collected into a dumpster. We do it because they are that sort of mindset of making the bay and the rivers better for future generations. It is part of our moral fiber. Our interests go beyond the property line. We can do something that can also help this little spot" (Public Sector Participant).

"We aligned with the State Code. Code of Virginia and the Municipal Code of Norfolk states it is illegal to litter and dump. The minimum fine has increased from $250 to $500 to $2,500 and 100 days in jail" (Public Sector Participant).

"We have a MS4 permit. The Department of Environmental Quality Norfolk has a phase one permit. Regulatory. It does have some additional things to address floatables in it or to address marine debris such as street sweeping that has never been in the permit before. They added it, not us. We street sweep to try to prevent debris from getting into the stormwater system. We have system cleaning and maintenance" (Public Sector Participant).

"Virginia Pollutant Discharge Elimination System permit number determines what our final effluent house should look like. Regarding marine debris, there is a sentence that says, "No floatable material visible," at all our facilities" (Public Sector Participants).

**Nonprofit**

"On Fridays, volunteers remove marine debris from three Seabins, marine debris collection devices that collect marine debris directly out of the water with a water pump and net. We also utilize nets on poles to remove marine debris. It can take four staff to remove an old piling that has floated towards the Seabins. We tie the wood piling to the dock so that it does not float away and become an obstruction to the ships in the harbor while we are trying to remove it" (Nonprofit Sector Participants).

"We make concerted efforts about every six-weeks to pick up trash. We get six to ten bags of it. Especially in January. Treated wood shows up. Often a couple of hundred to four hundred pounds of treated wood. We could not get it all in one cleanup, but once we were able to really go after it, we could see the vegetation improve in those areas" (Nonprofit Sector Participants).

"We have thirty trail ambassadors that patrol the trails and do litter cleanups. They have picked up 200 pounds of debris. At least once a month we do a litter pickup and then a few times throughout the year we do a large-scale litter cleanup" (Nonprofit Sector Participants).

"This year alone we have picked up 2,000 pounds of trash from our litter cleanups and last year we picked up 4,000 pounds. I do not think we could do it alone with just staff which is why our volunteers play a huge role in our mission. Our volunteers are really fantastic in helping us manage the litter in the areas that we do litter cleanups" (Nonprofit Sector Participants).

"We hire and pay for a clean team for our events, and they are phenomenal. Like, it is amazing how clean our festivals are after how many people were there. We bring in more trash cans during events. Standard protocol is to hire the clean contractor. We provide all the equipment, bags, brooms, dumpster, etc. We try to be good partners" (Nonprofit Sector Participants).

"We pick up large pieces of drifting wood because they can damage our sailboats if they bang into them at the docks" (Nonprofit Sector Participants).

**Continued**

**Academic**

"We have people assigned to zones to do litter collection. In the event that we find large timbers from a dock or something, we have a backhoe and will wait for debris to get close shore and then we will scoop it out with the equipment, or we will have someone with waders and tie ropes to it and haul it out. The Department of Environmental Health and Safety will organize shoreline cleanups with university clubs, fraternities, and sororities and they will come in a few times a year to police the shore for litter" (Academic Sector Participant).

"We have policies on litter collection and street sweeping that affects the river. Some of that is our MS4 plan and some of its internal policy. We do not have a policy for removing litter on the shoreline. It is an abstract statement regarding litter in general" (Academic Sector Participant).

"Part of our governing rules prohibit any discharge of pollutants or trash. College sailing has an environmental policy that bans single-use water bottles, and so we have had that in place for 20 years. For all of our camps and clinics we require people to bring their own refillable water bottles. Sailing coaches remove debris along with students" (Academic Sector Participant).

**Resident**

"I only go canoeing to clean up the trash by the shoreline. On one occasion debris filled up my canoe with muddy water that was gross and weighed 20 pounds" (Resident Sector Participant).

**Fisher**

"Whatever we can pick up, we try to get, but the main thing is that we are aware of what we do on our boat. We have a trash bag on the boat. We just want to continue to preserve the rivers the best that we can, and we hope that our efforts our there are helping" (Fisher Sector Participant).

| | |
|---|---|
| **Continued** | |
| **Military** | "We make sure that the waterways of the United States, the navigable ones, are clear and well-maintained. Anytime there is a disruption to navigation, we go in and remove it. Specific to our drift authorization, for the floating debris, we will go outside the channels. If it is floating debris that is large enough to present a hazardous navigation, that's kind of an important distinction. We focus on the larger debris that could be hazardous to a boat or a ship. We have two boats that we use regularly for the patrol that have hydraulic cranes that have timber claws on them. The crew will stab it with a pipe pole, bring it in close to the boat, then bring it on board by hand. We use crane for larger debris. Our authorization is Monday thru Friday, pretty much during daylight hours 7am to 4pm. We are also on emergency call. We work closely with all our port partners, so the Coast Guard, Virginia Pilots Association, commercial entities, the docking pilots, tug companies, residential areas down along the Elizabeth River. We follow the *Rivers and Harbors Act* law, and the Corps was established to ensure the waters in the United States are navigable" (Military Sector Participant).<br><br>"We are concerned about the boating public in general. If there is something floating around out there that might cause an unsafe situation, say all those piles that you would not be able to see at night, and a small vessel were to hit one of those things going thirty knots, it could be a real problem for us. If it gets to where it is like something really large and we have to tow it, we might give the US Army Corps of Engineers a call to see if they are willing to take it or if we can bring it to them. We have the authority to close the channel down. It is a standard practice for us post-storm to go out and do an ATON verification, Aids to Navigation. We have the capacity to operate at least one boat at any one given time. We have a staff of 16-30 people. If marine debris is going to be a major cause or concern with vessel traffic, then it would be equally as important to clear the channel. We work all hours of the night. Our primary mission is just search and rescue, law enforcement and supporting the other shops here on base" (Military Sector Participant). |

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**Continued**

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**Volunteer**

> "I am stooping down and picking it up and putting it in a bag. Annual education
>
> requirements to maintain status. Environmental stewardship entails picking up the trash
>
> where you are and as wetland docents. We do these cleanups as part of shoreline
>
> management" (Volunteer Sector Participant).

---

Although collaboration ranked low, the government, military and nonprofits shared how it

helped them remove marine debris. This is also worth noting as a possible solution to the amount

of pollution being difficult to manage. According to some stakeholders for example,

> "Police and fire department will come across something, not sure what to do with it, they
>
> will give me us a call, then we try to work through the program on how to get rid of it.
>
> There is a core group of folks that get together to discuss approaching weather and plans
>
> to address safety and navigation. Decisions are made to help support the Coast Guard on
>
> how they plan to implement port conditions. All ports have a severe weather plan. Yes,
>
> there is a plan in place. It is all hazards. Most definitely, marine debris is a component of
>
> that. If the port is closed by the Coast Guard, it is what's called "port reconstitution" that
>
> has to occur. That is when there are strong winds or just strong heavy seas or currents that
>
> could impact, number one, the aids of navigation. If the buoys should move or if they
>
> should somehow sink, and buoys do sink….or like especially coming down from
>
> Chesapeake Bay, if we get a large amount of debris. You could see these pockets of
>
> debris fields that could maybe be impeding the channel or whatever, and so those have to
>
> be addressed before the Coast Guard can open up the shipping lanes to allow vessel
>
> traffic to safely start the transit within those waterways. That is one of the things that I

help the Coast Guard do is organize that event to patrol the channel. That is when all our local partners, if they are not busy ashore, will help them out. Their boats will get underway whenever they can be based on certain weather conditions. Then we will assign them sections of the channels to get underway to visually check the buoys. Also, all the boats have side-scanning sonar, and they will be able to look for any large anomalies on the seabed or the bed of the channel. If any of those things are detected, we immediately reach out to the sector command center, which now we get the Army Corps, or the National Oceanic and Atmospheric Administration (NOAA) involved through their hydrographic surveys and do what they do best in the channels. We use the police and fire boats if not using the Army Corps vessels. Surprisingly, it only takes all of us, about 25-30 vessels, about two hours depending on the availability of resources. This is in addition to the vessels with the Coast Guard, USACE and NOAA" (Government Sector Participant).

"We have partnered with the City's Keep Norfolk Beautiful department for litter cleanups on-site and at adjacent properties including Town Point Park to the left and the storm water outfall to the right. The Sail Team uses their boats to remove marine debris in hard-to-reach places. Additional housekeeping staff is scheduled when cruise ships and festivals are taking place to empty trash bins and ensure trash does not become marine debris. Nauticus's onsite restaurant is using recyclable and environmentally friendly products such as cardboard and not using straws. We are seeing less straws in the Seabins, debris capturing devices now" (Nonprofit Sector Participants).

**SECTORS' BARRIERS TO REDUCING MARINE DEBRIS**

Overall, as seen in Table 28 resources were the biggest barrier for sectors to reduce

marine debris in the Elizabeth River. The nonprofit, government and public sectors highly

emphasized resources as a barrier for example:

**Table 28**

*Sectors' Barriers to Reducing Marine Debris*

| **Interview Question (Plot)** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *What are barriers your organization may have to reducing marine debris in the Elizabeth River?* | | | | | | | | | |
| | **NGO** | **Gov't** | **Public** | **Private** | **Academic** | **Volunteer** | **Military** | **Resident** | **Fisher** |
| **Resources** | 11 | 10 | 10 | 3 | 2 | | | 1 | |
| **People Taking Responsibility** | 7 | 6 | 4 | 6 | 1 | 1 | | | 1 |
| **City Leaders and Decision Makers** | | 6 | 3 | 1 | | 2 | | | |
| **Practices** | 1 | 5 | 8 | | | | 2 | | |
| **Marine Debris is Dangerous** | 1 | 3 | 1 | 3 | 1 | | 1 | | |
| **Tide** | 3 | 3 | | 1 | | 1 | | 1 | |

| | |
|---|---|
| **Resources** | 37 |
| **People Taking Responsibility** | 26 |
| **Practices** | 16 |
| **City Leaders and Decision Makers** | 12 |
| **Marine Debris is Dangerous** | 10 |
| **Tide** | 9 |

"We do not have enough supplies. We have three trucks that run all day, every day and

sometimes at night cleaning out stormwater systems in response to complaints. Last

couple of years we have had an inability to keep staff. We are looking to purchase

hydrodynamic separators like Vortech. It uses hydraulics to separate out the sediment and litter and trap it and then allow water to go on through and we can clean those with our trucks easily and they are easy on maintenance. They are installed at the storm drain. We want to put them upstream of outfalls where we notice bad litter issues. We have five under design now. They want to install at a couple of sites where there is a lot of litter. They cost $100,000 per unit. The permit is $40,000. Admin fee annually is $8,000. Based on population. Very expensive to replace the aging terracotta small pipes. They are not designed to withstand intense rainstorms. We put a slip line in the pipe to extend its lifespan. Cheaper than replacing. We need trained people, mechanics. Sweepers and Vacuum machines are expensive and need maintenance. Sweepers are $300,000. Vacuum sweepers $400,000 (Public Sector Participant).

"Not enough staff, but we do have a landscaping contractor that removes litter before mowing. It can cost $10,000-$20,000 for a marine contractor to remove an abandoned derelict vessel. The city does not have a dedicated crew that goes into wetlands for marine debris removal and especially behind private property. People want more trash bins around the city, but it is hard to manage them. Our biggest problem is getting volunteers to get out to deal with these issues. We have very few people that want to put the time and the sweat equity to get things done. I think our biggest issue is trying to get people engaged to do what needs to be done. The hardest part is hauling that wood out a lot of times. There are big pieces of wood right now that are on parts that are too big for any of us to deal with. We do not have the equipment or muscle. There is a couple of big pieces that I do not know what to do" (Nonprofit, Government and Public Sector Participants).

"We need more manpower including housekeeping staff and volunteers. We would have more Seabins if we had more people to maintain them daily. Seabins can collect about 18 pounds a day, although they are expensive $5,000 each, need maintenance, parts are outside of the U.S., and they sit in the water all the time. They only capture debris less than 12 inches in diameter and fill with leaves and pinecones during the fall. We are not able to fully recycle on-site and some of us take items home to recycle. We need more funding. The Green Team funding is coming out of the volunteer resource budget" (Nonprofit Sector Participant).

"The U.S. Army Corps of Engineers is not centrally funded but project funded. We need projects and the debris mission has funding from most of the smaller cities that share Hampton Roads. There are only five districts in the country that have this drift authorization. On the East Coast, it is Norfolk, Baltimore, and New York, and then on the West Coast, I think it is Sacramento and Seattle, but that is it. Congress authorizes the Drift Authorization. Five districts in the country have this drift authorization. On the East Coast, it is Norfolk, Baltimore, and New York, and the West Coast, Sacramento and Seattle. There are definitive gaps because we are focused on the federal navigation channel. We do not have the resources to become the trashmen of the Chesapeake Bay. Back to resource allocation and from the congressional authorization, I do not have authority to go around and just pick trash up. More assets would help. We put a budget package in and sent it to Congress to fund on-call response in the evenings and on the weekend because, before, we were not funded for that. We did get some money from Congress to fund an on-call response. There used to be two shifts, now there is one" (Government Sector Participant).

In addition, people taking responsibility ranked high among the nonprofit, government, public and private sectors and according to some stakeholders for example:

"The City does not have a dedicated crew that goes into wetlands and especially behind private property. It is up to the homeowner to get out in the wetlands and remove the marine debris. The advantage of those who have bulkheads is that they do not have to see the trash. So, it is someone else's problem. It bumps off the bulkhead and then it will come to either side of it and travel. People need to put trash in a bag, put in a secured proper place. Identifying who can take responsibility and then take action due to litter traveling. Residents pay a stormwater fee in their utility bill that funds the permit and the things listed in the permit. Parking services as well as students and faculty members could do a better job with their litter" (Nonprofit, Government, Public and Private Sector Participants).

The government also felt that city leaders and decision makers created some barriers for example:

"The city does not have a dedicated crew that goes into wetlands and especially behind private property. Wetlands are on private property due to Norfolk being plotted in the 1900s, 1920, 1930s. Property lines extend out so that marsh area is actually above mean low water which is technically on private property. Where it becomes problematic is any time, they take something undertow, they put a line on it. Whether it is a broken-down vessel, whether it is an abandoned vessel, whether it is a piece of large debris, they now own it. They are responsible for it. Where are they going to take it? How are they going to get rid of it, right? Regarding aging docks and piers, I think that even though localities are underfunded, they have the authority to remove them, and they can work with private entities whereas the state, it is a little bit harder from the planning body when we are not

regulating building codes and ordinances and we do not have law enforcement officers

patrolling and making citations" (Government Sector Participants)

**MARINE DEBRIS OUTCOMES (POLICIES & STRATEGIES)**

As seen in Table 29, nonprofit and government sectors have the most marine debris

policies in place followed by the private and public sectors. Many sectors had litter policies but

not marine debris policies. The resident had good practices only.

**Table 29**

*Which Sectors Have Marine Debris Policies or Strategies*

|  | NGO | Gov't | Private | Public | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| **Yes** | 6 | 4 | 3 | 3 | 1 |  | 1 | 1 | 1 |
| **No** | 2 | 2 | 1 |  |  | 1 |  |  | 1 |
| **Yes, but need more** |  | 1 | 1 | 1 | 1 |  |  |  |  |

| | |
|---|---|
| **Yes** | 20 |
| **No** | 7 |
| **Yes, but need more** | 4 |
| **TOTAL** | 31 |

In addition, as seen in Table 30, the nonprofit sector felt their marine debris policies mainly

worked although they also thought amendments were necessary along with the private,

government, public and academic sectors. According to some of the stakeholders for example:

"Fishing permits do not mention litter or debris. We have a number of policies that talk

about litter but not specifically marine debris. Expand the park ranger program that has

areas where trash accumulates" (Stakeholder Participants).

**Table 30**

*Sectors' Perspective if Their Marine Debris Policies Work*

|  | NGO | Private | Gov't | Public | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| **Works** | 5 | 3 | 2 |  | 1 |  | 1 | 1 | 1 |
| **Does not Work** |  |  |  |  |  |  |  |  |  |
| **Needs Amending** | 1 | 2 | 2 | 2 | 1 |  |  |  |  |
| **Needs to Be Enforced** |  |  | 1 | 2 |  |  |  |  |  |
| **N/A** | 2 |  | 2 |  |  | 1 |  |  | 1 |

| **Works** | 14 |
|---|---|
| **Does not Work** | 0 |
| **Needs Amending** | 8 |
| **Needs to Be Enforced** | 3 |
| **N/A** | 6 |

As seen in Table 31, overall, the sectors, suggestions on policies and strategies for marine debris management was emphasized the most especially from nonprofit, public and government organizations. Stakeholders shared for example:

**Abandoned Derelict Vessels**

"New policies for Abandoned Derelict Vessels. Policies for capturing runoff from storm drains. We need to create awareness to empower members of the proper disposal of abandoned derelict vessels. Work group reports and recommendations lead to policy. …at a minimum, we can go out and place lights on the abandoned vessel to mark it to make sure it's at least marked at night so they can make a determination on what to do with it and if it has a trailer and an eye bolt or something we can connect the tow line to, we can get it out of the channel, anchor it somewhere safe at a designated anchorage area

until a determination is made on what to do with it" (Nonprofit, Public and Government

Sector Participants).

**Table 31**

*Sectors' Suggestions on Policies for Marine Debris Management*

| Interview Question (Policies/Moral)<br>*What are your suggestions on policies for management of marine debris in your organization?* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | NGO | Public | Gov't | Private | Fisher | Academic | Volunteer | Resident | Military |
| **Policies** | 10 | 9 | 6 | 4 | 2 | 1 | 1 | 1 | 1 |
| **Marine Debris Removal** | 9 | 8 | | | 2 | 2 | 1 | | |
| **Strategies** | 8 | 5 | 5 | 4 | | 1 | 1 | 1 | |
| **Resources** | 4 | 2 | 3 | 3 | | | | | |
| **Nothing** | | | | | | | 1 | | |
| **Unknown** | | | | | | | | | |

| | |
|---|---|
| **Policies** | 35 |
| **Strategies** | 25 |
| **Marine Debris Removal** | 22 |
| **Resources** | 12 |
| **Nothing** | 0 |
| **Unknown** | 0 |

### Marine Debris Policies

"Emerging concern and feedback from council members are requesting marine debris as

more of a priority. There is no one dedicated to getting the marine debris. We have

policies about littering, and we have a whole EMS program, Environmental Management

System and it applies to all our terminals, anything inside of our fence line. I think we

need more volunteers and policies that encourage and incentivize people" (Nonprofit,

Public, Resident and Government Sector Participants).

**Old Piers and Docks**

"Have people dedicated to combing those shores occasionally, particularly for the treated wood floating around. If they see it, just grab it. If there was some way for local governments to have boats that are designed to look for that stuff or even to hold people accountable for dilapidated docks and such, that would really, I think, make a difference" (Nonprofit, Public and Government Sector Participants).

**Plastic Bags**

"Move forward on preventable measures like a plastic bag fee. We are working on advocating to the city leadership on the plastic bag tax which the Commonwealth of Virginia allows localities to do which is to put a .05 tax on the throwaway plastic bags and the .04 would come back to the city which they could use for providing reusable bags and to provide for environmental things for the city. Also interested in abandoned derelict vessels and illegal dumping. Why cannot we outlaw plastic bags altogether" (Nonprofit, Public and Government Sector Participants).

"In 2018, we adopted a zero-plastic policy for the organization. We do not use plastic cups, plastic bottles, or trash bags. Instead, we use paper bags and things that are biodegradable and compostable. Our soap dispensers are glass and refilled. Our own policy towards it is to minimize our own footprint and not use things that are going to end up floating around for years, end up hurting fish, hurting birds, etc. If businesses along the river had similar restraints on the kind of plastic they use, knowing their proximity to the river, I think those are all things that are going to minimize debris in the river" (Nonprofit, Public and Government Sector Participants).

**Trash Cans**

"We need more trash cans. The biggest issue is making sure the trash is emptied frequently enough that the wind does not blow the trash back out of the trash cans. We would like more trash cans that monitor litter digitally. They report the volume and when full. Poundage and an email when full and times of day when litter spikes" (Nonprofit, Public and Government Sector Participants).

**Cleanups**

"A policy on picking up litter along the shore is needed. Just this year we established a new staff Green Team and it's not in our employee manual or City of Norfolk policies and procedures. Our Green Team is hoping to do more cleanups before and after our events and at adjacent properties. I think it would be great to have more litter cleanups and volunteers. We are still developing our volunteer policy for staff to participate in cleanups" (Nonprofit, Public and Government Sector Participants).

**Education**

"I think that knowledge is power, and I think the best way to mitigate the litter in our river is to have the public have a general understanding of how the litter gets into the river. Teaching the importance of the watershed and teaching not putting loose items in your trashcan, making sure all loose items are in trash bags. I think it just takes a little bit of knowledge and some compassion" (Nonprofit, Public and Government Sector Participants).

**Teams**

"I think if anyone were to come up with a task team for these full moons and tides and get that on the table and then go ahead and address that. This would prevent somebody from getting hurt and it would help the river. Also, when they knew these storms were coming. The day after the storm and after everything settled or the full moon or super moon is happening, then have people, volunteers or any organization clean it. This is the perfect time to clean it and the perfect time to prevent an accident and be safe.

We held a departmental forum to bring all the different departments together to discuss which department is the best to handle litter and marine debris and responses" (Nonprofit, Public and Government Sector Participants).

**Illegal Dumping and Enforcement and Stormwater System**

"Respond to illegal dumping, especially in wetlands. Recommend creating a policy that if a trash item has the name of the business the business is fined. Roanoke has this policy.

I have been trying to talk to the folks with the city to figure out….some way we could put some catch basins at some of the drainage areas….or netting on the outfalls to try to catch some of that debris" (Nonprofit, Public and Government Sector Participants).

**ROLE OF THE LOCAL AND FEDERAL GOVERNMENT PER SECTOR**

As seen in Table 32 the sectors believed the local government should play the larger role in managing marine debris by all sectors. The government sector believed the city government should respond to complaints, educate, enforce policies and keep neighborhoods clean; the private sector would like to see recycling return, policing of the shoreline, maintaining of street debris and support given to nonprofit organizations that implement litter cleanups; the public

sector believed the local government should have more staff to assist with education and

outreach, minimize marine debris and enforce policies and fines; the nonprofit sectors believed

the local government should share more marine debris stories, dedicate staff to cleaning the

shoreline, and require local leaders to participate in cleanups; the academic institution and the

resident believed there should be more outreach and engagement of communities to help; and the

fisher believed there should be a task force to remove marine debris during full moons, high tides

and extreme weather.

**Table 32**

*Sectors' Belief of Role of the Local and Federal Government*

| **Interview Question (Belief)** *What do you believe is the role of the local and federal government in managing marine debris?* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Gov't** | **NGO** | **Public** | **Private** | **Academic** | **Fisher** | **Volunteer** | **Resident** | **Military** |
| **Local Government** | 9 | 8 | 8 | 6 | 4 | 2 | 1 | | |
| **Federal Government** | 5 | 4 | 2 | 4 | | | | 1 | 1 |
| **Create New Policies** | 2 | 3 | 4 | | | 1 | 2 | | |
| **I Do not Know** | | 2 | | | | | | | |

| | |
|---|---|
| **Local Government** | 38 |
| **Federal Government** | 17 |
| **Create New Policies** | 12 |
| **I Do not Know** | 2 |

The federal government was seen to play a lesser role by all sectors and the government

sector believed the bad industrial players should be turned over to the Department of

Environmental Quality although they did not believe there are a lot of bad players; the public

sector believed that the federal government should support the U.S. Corps of Engineers and look at global solutions including requiring manufacturers to use less plastics; the nonprofit sector believed cigarette filters will continue to be a problem until laws are put in place and an accessible list of who to contact to help with marine debris removal should be developed; and a volunteer believed the plastic bag fee and phasing out of Styrofoam should be adopted. As seen in Table 33 mainly the government sector mentioned that the federal government should bear the expenses of marine debris removal. According to some government stakeholders for example:

"The federal government should continue to provide crucial and supplementary funding for abandoned derelict vessel programs and provide services and then share lessons learned with other coastal states. Congressional support is requested to fund an on-call response in the evenings and on the weekends for the U.S. Corps of Engineers to respond to potential navigational threats to the channel. Currently there is a smaller crew to support only one shift. We get a lot of calls on weekends and so forth and we could not respond to it. A cost-analysis would be recommended to evaluate if the increase in debris that we picked up would be worth the money because federal funds, all of them are tight. There is always an issue with vacancies and funds for equipment to separate out debris in the stormwater system. The federal government could provide the city government with the money to put filters on these storms drains and maintain these filters" (Government Sector Stakeholders).

**Table 33**

*Sectors' View of Who Should Bare the Expenses of Marine Debris Removal*

| Gov't | Private | Resident | Uknown | Collaborations | Public | NGO | Fisher | Military | Volunteer |
|-------|---------|----------|--------|----------------|--------|-----|--------|----------|-----------|
| 6 | 2 | 2 | 1 | 1 | | | | | |

**CONTENT ANALYSIS**

A deep dive of marine debris legislation and strategies that were relevant to Virginia's Elizabeth River was performed as seen in Appendices A and B. This was performed prior to the interviews to gain a better understanding of legislation or strategies that may be mentioned by the stakeholders. This analysis was essential to not only better understand legislation and policies that are in place regarding the Elizabeth River, litter and marine debris, but also to help frame the river's marine debris problem. The following were mentioned by the government sector 1.) the *Virginia Litter Code* (Virginia Law, 2021), 2.) *Municipal Separate Storm Sewer System* (MS4) permit (VADEQ, 2024), 3.) the *Virginia Marine Debris Reduction Plan* (Register et al, 2021), 4.) NOAA's *MidAtlantic Marine Debris Action Plan* (NOAA.gov, 2021), and 5.) the *Rivers and Harbor Act* of 1899 (Govinfo.gov, 1899).

**The *Virginia Litter Code* Section § 33.2-802 C**. says that, "any person convicted of a violation of this section is guilty of a misdemeanor punishable by confinement in jail for not more than 12 months and a fine of not less than $500 or more than $2,500, either or both" ("Virginia Law," 2021). According to a stakeholder for example:

> "The Code of Virginia as well as in the Municipal Code in Norfolk, states it is illegal to litter and illegally dump. It is increased from $250.00 minimum to $500.00 minimum fine to $2,500.00 and 100 days in jail. So, we kind of aligned with the state code. Now, on the backside of that, who is enforcing it. Nobody really" (Public Sector Participant).

**The *Municipal Separate Storm Sewer System* (MS4) permit** requires the city government to address runoff including marine debris that is carried directly to nearby streams, rivers and other bodies of water. According to one public sector stakeholder for example:

"The Department of Environmental Quality, DEQ, issues the MS4 permit, the municipal separate storm sewer system permit. We have a what they call a phase one permit. It was put in place back in the early 1990s for larger municipalities based on population. This is a five-year permit from the state. It is issued every five years. If they are not able to reissue it, then they do an administrative continuation of the permit which means you are still covered under the permit until you get your new permit. Six months prior to the permit expiring, you have to reapply for the permit and you pay an application fee and when you reapply, you more or less say the things that you've been doing and the things that you are going to plan on doing for water quality improvement or for capital projects or programmatic things, BMP's that are installed, there's all kinds of different things that are in the MS4 permit that is regulatory. I think we are on permit cycle three or four, I cannot remember off the top of my head since they were started to be issued. Our last permit did last like 10 years, our five-year permit lasted 10 years. This permit, we are into year seven I believe with the permit, but we did just recently get our draft revised permit from the state. We are reviewing it now. It does have some additional things to address floatables in it or to address marine debris in it such as street sweeping that has never been in our permit before. They added it. Yes. Well, we have always done it since before we even had a permit, but we did it more for maintenance of the stormwater system and aesthetics of the neighborhood than we did for pollution prevention. It is kind of a positive unintended consequence. So, it is a benefit, a great benefit of street sweeping, but that is not why the program was implemented. It was not implemented for water quality. It was actually implemented to help maintenance on the system. Yes, they just added it this year the first time in a lot of our permits down here in Hampton Roads, not just ours.

So, that is a new addition. We have to do education and outreach and then we have to assess the program and our Keep Norfolk Beautiful group actually does a litter index every year where they go around, and they assess the litter in specific areas. They have been doing that since the 90s and maybe early 2000, they have been doing it for a really long time. They have trends to see whether an area is doing better with litter or worse with litter. It is the same areas that they do every year. It is not the whole city. It is specific areas that – and then like I said, they have been doing those same areas for like 18-20 years or something like that. So, they can determine whether or not litter is improving or getting worse. I do not remember the permit fee off the top of my head, but I want to say it somewhere around $40,000.00. The fee set in state law, and it is based off of how many people, what is your population is, so it depends, they call it a large permit or small permit or medium permit. In Norfolk, as well as a lot of the Hampton Roads, large Hampton Road, municipalities, the residents pay a stormwater fee in their utility bill. So, that is what funds the MS4 permit and the majority of the things that are listed in the permit, the requirements of those things. There are some things that we do not fund, like for instance in our permit, it actually has a section in there that we have to inspect a certain amount of wastewater lines, which is weird to be in a stormwater permit. I have not quite understood that one yet, but it is in there and obviously the Department of Utilities pays for the inspection of their system, not us. Most of the other stuff that is in there, we fund, even if it needs to be done on another department's land. So, for instance, we have to have storm water pollution prevention plans for all of our municipal yards and stormwater funds all of those plans. The development of those plans are coordinated with

each individual operational unit, but we fund the consultant to write those plans for us"

(Public Sector Participant).

**The *Virginia Marine Debris Reduction Plan* (VMDRP) *and NOAA's MidAtlantic Marine Debris Action Plan* (MMDAP)** complement each other. Through a collaborative process the VMDRP was developed in 2021 involving Virginia marine debris stakeholders including representatives from state and local governments, nonprofit organizations, academia, industry and private business partners, regional bodies, natural resource managers, indigenous groups, and others (Register et al., 2021). It includes a framework for strategic action with priorities to reduce the impacts of marine debris  in Virginia. The MMDAP was created in 2021 by a voluntary, collaborative effort of 96 organizations in Delaware, Maryland, New Jersey, New York, Virginia, and the District of Columbia and includes a framework for strategic action to help reduce the impacts of marine debris on the Mid-Atlantic (NOAA.gov, 2021).  According to a government stakeholder for example:

> "These plans actually meshed quite well. So, the federal government is talking to the state government, and we are aligning the goals. They are very similar, almost verbatim for several given the nature of a lot of the coastal states facing the same challenge. There are four buckets. One is abandoned derelict vessels, one is fishing gear, one is microplastics and microfibers and one is sort of catch all for consumer debris. So, both prevention and then removal" (Government Sector Participant).

**The *Rivers and Harbor Act* of 1899 (33 U.S.C. Sec. 401 et seq.)** The United States Corps of Engineers is the main stakeholder patrolling the channel of the Elizabeth River daily implementing the Hampton Roads Drift project (HRD). Norfolk is one of five districts in the

nation that is authorized and funded by Congress to fulfill this project and also include

Baltimore, New York, Sacramento and Seattle. This began in 1899 with the *Rivers and Harbor*

*Act* (33 U.S.C. Sec. 401 et seq.) that authorizes the U.S. Army Corps of Engineers regulatory

permit program to protect navigable waters in the development of harbors and other construction

and excavation (Govinfo.gov, 1899). The Prevention of Obstructive Deposits, POD addresses

debris that has sunken to the bottom, but for this study is not relevant unless they have begun to

remove a large floating item and it then begins to sink. Once you have a line on an item, you

cannot abandon it and you must complete the removal. According to a government stakeholder

for example:

> "It goes back to the Rivers and Harbors Act. That is the authority. We do not get a
>
> choice. It is the law, and the Corps of Engineers was established to ensure the waters in
>
> the United States are navigable" (Government Sector Participant).

## SUMMARY OF CHAPTER

This chapter identified and described the overall Narrative Policy Framework elements

that emerged regarding Virginia's Elizabeth River marine debris problem. This included the

setting, characters (heroes, villains and victims), plot, moral and beliefs. The interview data

suggested that the views about Virginia's Elizabeth River marine debris and perspectives for

removal varied among stakeholders in the nine different sectors. Overall, Virginia's Elizabeth

River marine debris was viewed as terrible, and weather caused this problem that had originated

with people. All the stakeholders acted as heroes removing the villainous debris that was too

much to manage. Although they faced barriers such as a lack of resources, they had suggestions

regarding policies and strategies for marine debris management within their organizations and

felt the local government had the larger role. And while those with vessels viewed wood and

large items as dangerous and a threat to navigation those on land viewed plastics and runoff a bigger problem. In addition, the Elizabeth River is one of five harbors in the nation that has congressional authorization and funding for the U.S. Corps of Engineers to keep the channel clear of threats to navigation with the Drift Project. Finally, recommendations for solutions from the sectors included abandoned derelict vessels, policies, old piers and docks, plastic bags, trashcans, cleanups, education, teams, illegal dumping and enforcement, and storm water systems. While this chapter focused on the emerging overall and individual sector narratives about the marine debris problem and removal, the final chapter will include implications, and limitations and suggestions for future research

**CHAPTER VI**

**CONCLUSION**

**HOW THIS STUDY ACHIEVED RESEARCH AIMS**

The emergence of marine debris in industrial ports as a research area in the field of watershed management and environmental policy has gained attention from both scholars and practitioners due to the potential to inform decision makers and localities about how to manage marine debris successfully. Important questions often asked in marine debris studies include, "Who are the stakeholders? What kind of debris is being observed? Where did it originate? What are the impacts? and What are the policy solutions?" Regarding Virginia's Elizabeth River, these questions have not been answered until this study due to a lack of empirical research with this focus. This dissertation provides evidence to better understand how stakeholders from multiple sectors in an industrial river watershed like the Elizabeth River help to reduce macro marine debris at the local level and include policy outcomes and strategies.

To discover the narrative of Virginia's Elizabeth River marine debris phenomenon, qualitative research methods were employed that included interviews with key representatives from multiple sectors that observed marine debris for at least a year. Specifically, this study assessed views and perspectives of marine debris removal approaches with 31stakeholders from nine sectors that were recruited via a snowball sampling technique. They represent federal, state, and local government, public, private, nonprofit, academic, fisher, residential, military and volunteer sectors. This study used the Qualitative Narrative Policy Framework, QNPF, with a meso (group) level approach and the narratives that the participants shared included structural elements such as the setting, characters, plot, morals, and beliefs. Participants shared information

and their stories through in-depth, semi-structured interviews and answered this study's three research questions: RQ1, "*What are the views of stakeholders from multiple sectors on the marine debris problems at the mouth of the Elizabeth River?*" RQ2, "*Which stakeholders are considered in addressing marine debris issues?*" and RQ3, "*What is the match between the views of stakeholders' and policies to address marine debris?*" In addition, this study answers two claims that were made 1.) Views about marine debris vary among stakeholders according to the sectors they represent, and 2.) Policy approaches about marine debris removal vary among stakeholders according to the sectors they represent. To better understand the Elizabeth River's marine debris problem and policy outcomes Gray and Jones (2016) Qualitative Narrative Policy Framework process was followed. The interviews were transcribed by Transcription Wing, were coded, and analyzed following Creswell and Poth's (2018) inductive approach.

**MAIN FINDINGS**

**Overall Narrative:** During the analysis of this study, themes and categories emerged from the data and the QNPF helped to organize an overall narrative. More specifically, the results indicated that overall, stakeholders view Virginia's Elizabeth River marine debris as terrible. Daily, stakeholders most frequently view the villains as plastics that originated from people and that were caused by the weather. All stakeholders helped remove the marine debris as heroes and they view nonprofit and government sectors as taking the most action. As victims, they claim there was too much marine debris to manage along with a lack of resources and they felt people needed to take more responsibility. And finally, they believe that the local government had a larger role in managing the marine debris problem.

**Comparison Analysis:** Further findings show that although an overall narrative emerged, a narrative also emerged for each sector that helped to answer the first two research questions, RQ1, *"What are the views of stakeholders from multiple sectors on the marine debris problems at the mouth of the Elizabeth River?"* and RQ2, *"Which stakeholders are considered in addressing marine debris issues?"* Some key findings from this study follow.

First, this study found that views about marine debris varied among stakeholders according to the sectors they represented. For example, the government sector emphasized marine debris accumulated in some areas that were worse than others such as in the wetlands and along the shoreline. The nonprofit sector said that the most common things they took out of the river were plastics which included large items such as plastic furniture. The military sector were less concerned with plastics and more concerned about large pieces of wood from aging docks and piers that were potential threats to navigation and safety. The fisher sector viewed the marine debris worse after full moons and storms. The public sector viewed runoff from the stormwater outfalls as a main vector. The private sector viewed the river as an eyesore and the biggest problem was little white cigarillo tips. The academic sector viewed the river as improved. The resident sector viewed the river debris as pretty bad. And the volunteer sector shared that there was a shocking amount of plastic bags and bottles.

Second, this study found that each stakeholder shared their marine debris removal story in the voice of a hero. For example, private sector marina administrators shared that they provided residents of the marina with trashcans with secured lids, and they would walk the docks with nets daily and remove marine debris. The academic sector shared that they assigned people to zones to implement litter cleanups and the sailing team had removed large debris that included a scooter, tires and a golf cart. The resident sector had canoed for the sole purpose to remove

debris from the wetlands and once retrieved a waterlogged car seat that felt as heavy as a whale. The government sector had removed large debris from the river's channel that they viewed as a dangerous threat to navigation and the military sector patrolled the river day and night to keep the channel navigable and safe. The public sector removed litter from the streets to avoid it going into the stormwater system and the volunteer sector removed marine debris that was trapped in the wetlands. And the fisher sector educated youth about the importance of keeping debris out of the river and the nonprofit sector engaged volunteers in litter cleanups. Alternatively, while all sectors took action as heroes to reduce marine debris, they also viewed themselves as victims and shared that there was too much marine debris to manage.

Third, utilizing the Qualitative Narrative Policy Framework, all sectors identified the causes of the marine debris as villains not the marine debris itself that instead helped to describe the setting. In this study, thirteen villains were identified and included the weather, people, aging infrastructure, poor waste management, abandoned derelict vessels, accumulation spots, vehicles, streets and stormwater systems, businesses, items trapped, fishing gear and lack of knowledge, awareness and enforcement. As heroes, the stakeholders had different approaches, policies and practices to address the marine debris problem and the villains. For example, the military and government sectors prioritized removing large marine debris in the channel that threatened navigation such as abandoned derelict vessels and wood from aging docks and piers that had broken loose during strong tides, wind and weather. They referred to those villains as "whalers," "dead men," and "ship killers." As part of the *Rivers and Harbor Act of 1899* (Govinfo.gov, 1899), the Norfolk U.S. Army Corps of Engineers is one of five districts in the nation that is authorized and funded by Congress to keep the channel navigable and free of threats. In addition, the government and military sectors believe that the federal government should bear the expense

of the marine debris removal and the local government should play a larger role in managing the debris. Overall, the sectors' also view people as villains. People mismanage their waste, use lots of single-used plastics, clog up the stormwater systems and litter. Policy approaches to address the villainous people included administering enforcement of the *Virginia Litter Code* Section § 33.2-802 (C) (LitterFreeVirginia.org, 2021), adopting a plastic bag tax, phasing out Styrofoam containers and encouraging businesses to adopt zero-plastic practices.

**Policy Approaches:** Based on the data from this study, the sectors' narratives also answered the last research question, RQ3, *"What is the match between the views of stakeholders' and policies to address marine debris?"* This study found that policy approaches about marine debris removal did vary among the stakeholders, and the match reflected the barriers they had to remove the marine debris effectively and efficiently. According to the sectors they represented and each of the nine sectors had different policy recommendations and key findings from this study follow.

First, the data found that all sectors had recommendations for either marine debris policies, legislation or practices, but they did vary. For example, the fisher sector shared that fishing permits did not mention litter or debris and felt they should. The government sector said they had a number of litter policies, but they did not address marine debris and felt they should. The private sector wanted new policies to address removing abandoned derelict vessels and the nonprofit sector recommended that there should be incentives for businesses to go plastic free. The academic sector wanted more trash cans in areas that did not have any such as large parking lots and they wanted policing of the shoreline for illegal dumping. The public sector wanted the federal budget to include funds to better manage the stormwater systems and to purchase filters for outfalls and large, expensive equipment such as street sweepers and vacuums. And the

volunteer sector wanted legislation to support elimination of Styrofoam containers and adoption of the plastic bag tax.

Second, this study found that the sectors overall believe local governments should play a larger role in managing the marine debris. For example, they should respond to complaints, provide education and outreach, enforce litter policies, police the shoreline, encourage and engage in litter cleanups and keep neighborhoods clean.

Third, this study found that the sectors overall believe the federal government should play a lesser role and recommend that the government develop a resource list of who to contact for different types of marine debris removal such as large heavy debris floating in the channel, debris that has washed up in the wetlands, debris that has washed ashore, clogged stormwater systems, abandoned derelict vessels, litter cleanups, tires with and without rims, street sweeping, illegal dumping, and outreach and education. In addition, sectors recommend the government continue to support the U.S. Army Corps of Engineers to remove marine debris from the channel; continue to provide crucial funding for removal of abandoned derelict vessels and provide funding for equipment to manage the stormwater systems.

**CONTRIBUTIONS**

While providing empirical evidence that helped strengthen the Qualitative Narrative Policy Framework and findings of previous studies, this dissertation illuminates the value of narratives in the policy process of a local issue such as Virginia's Elizabeth River marine debris problem. This qualitative approach was also important to better understand the river's overall marine debris story that was unknown. In addition, this study provides a platform for stakeholders to share their stories along with their approaches to removing the debris and their recommendations for policy outcomes.

Findings from this research also have implications for better understanding the importance of keeping the river's channel navigable and the impact that macro debris can have on safety. Findings from this research also show the challenge in developing policies for a complex wicked problem when views and perspectives vary. Scholars and researchers from different fields can build upon this research in many ways that include developing comparative studies with other industrial ports and harbors. This research also has the potential to provide information which can be used to meet goals and objectives in regional and local strategies such as the *Virginia Marine Debris Reduction Plan* (VMDRP) (Register et al., 2021) and NOAA's *Mid-Atlantic Marine Debris Action Plan* (MAMDAP) (NOAA.gov, 2021*).* For example, for the VMDRP, this research helps support Action 1.1.1.3 where there is a lack of communication about marine debris research projects that are underway within Virginia. For the MAMDAP, this research helps support Action 1.2.1.1. to compile existing research on the Mid-Atlantic Marine Debris Collaboration Portal to enable analysis of information gaps, best practices and available resources. Some additional benefits are as follows:

First, with an inductive bottom-up approach, this study addresses gaps in the literature that included the need to understand the views and policy approaches of macro riverine marine debris removal in an industrialized port at the meso organizational level and to make contributions to the Narrative Policy Framework (NPF) that lacked qualitative studies (Gray & Jones, 2016). This qualitative study demonstrates how stakeholders from multiple sectors use narratives to tell the story of marine debris in the Elizabeth River. Narratives can affect the policy process during policy decision, regulation, evaluation and implementation and they are critical to understanding the policy process. This study also helped meet a gap in QNPF studies by demonstrating various types of villains that could emerge in environmental narratives. Prior

studies have questioned whether something like "global warming", or "democracy" could be seen as a character that can take action, but non-human characters retain their character status in most QNPF applications with verbs and adjectives offering affective orientation (Shanahan, 2018; Weible, 2016). For example, in this research, large floating debris in the river are seen as a villain due to it being a dangerous threat so in that context it could play that role when utilizing the QNPF. Additional contributions to QNPF research were products developed during this study that included an interview script, coding templates, a code book, pilot interview analysis tool and interview questions that are located in the Appendices of this dissertation.

Second, this study also helped contribute research where there is limited information on negative impacts of macro marine debris in an industrial port and harbor, specifically the Elizabeth River. The United States is a maritime nation (Greenberg, 2021) and there is limited research on marine debris in these complex port areas (Shirakura, 2021; Torres, 2015) where ships can be impacted by marine debris such as getting entangled in propellers and can cost millions of dollars to cleanup and dispose of annually (Bergmann et al., 2015; Galimany, 2019; Hong, 2017; Kuhn, 2015). This study also provides information of the level of Congressional support for Norfolk's U.S. Corps of Engineers as one of five districts in the nation that is funded for the *Drift Project*. Further research could include comparing the five districts marine debris problems and how each port is addressing marine debris removal.

Third, this study also provides findings to inform a gap in research to better understand the roles that the local and federal government have in implementing federal and state environmental legislation and policies regarding marine debris (Switzer, 2019). This study also demonstrates how Elizabeth River's stakeholders from multiple levels utilize or play a role in policy affecting the river and their level of knowledge about legislation that included the *Rivers*

*and Harbor Act of 1899* (Govinfo.gov, 1899) and the *Virginia Litter Code* Section § 33.2-802 (C) (LitterFreeVirginia.org, 2021). It also contributes information for regional and local leaders and decision makers about the marine debris problem in the Elizabeth River including some actions local stakeholders are taking to remove the marine debris and their recommendations for policies, strategies and practices that may help.

## LIMITATIONS AND FUTURE RESEARCH

While this research provides a richly detailed description of Virginia's Elizabeth River marine debris problem, it is not free from limitations. Below are limitations that should be taken into account when interpreting the results in the study followed by additional ideas for future research.

First, in this study the data was specific to Virginia's Elizabeth River, and it could be extended to other nearby waterbodies to draw more holistic results such as in this case, the Nansemond River or the James River. Similarly, this research should be tested in other cities or countries.

Second, this study could have included stakeholders located in other areas of the river such as the eastern, western and southern branches. In this study, data was accessed from stakeholders from multiple sectors that utilize or play a role affecting Virginia's Elizabeth River and were mainly located at the mouth of the river where the Port of Virginia is located. Future research could also be extended into the far reaches of the branches that is not patrolled for debris by the U.S. Coast Guard or U.S. Army Corps of Engineers due to possible bridge closures deeming their vessels unavailable for emergencies.

Third, although data saturation was met, additional stakeholders could be interviewed to address additional topics that emerged during the interviews. For example, stakeholders claimed

there was a lack of enforcement of the littering code. Additional information from the harbor or land-based police on the degree that the *Virginia Litter Code* Section § 33.2-802 (C) is enforced may be helpful (LitterFreeVirginia.org, 2021). In addition, coastal engineers could be interviewed to provide more information regarding the aging infrastructure in the river such as the piers and docks. This could help to better understand why the stakeholders were observing these large pieces of wood so frequently.

Fourth, to build upon this research, a quantifiable study could be implemented. For example, surveys could complement the semi-structured interviews or participants could be asked to collect and document data during their litter cleanups for a period of time to better inform the research about the type of debris being observed. Only 7 of the 31 stakeholders that were interviewed during this study collect data and none of them shared it externally. This information could help in making policy decisions and not knowing this information could mean that policies are being executed on assumptions. With limited funding, having data may also lead to making more effective decisions.

Fifth, this dissertation set the stage for additional marine debris research on industrial ports and harbors. To build upon this study, a few accumulation sites were identified by stakeholders, and the nine sectors could collaborate to determine strategies to deploy for marine debris removal in these areas. Also, additional research could include testing successful models for removal of abandoned derelict vessels. For example, the New Jersey port and harbor has a successful model that could possibly be applied to the Elizabeth River.

Sixth, in this study, sectors recommended the government develop a resource list of contacts of who to call for different marine debris issues. Future research could possibly include

the development and testing of this tool along with a survey and a questionnaire to evaluate its effectiveness.

Seventh, a challenge that emerged from this study was that the sectors had various policy approaches to remove marine debris in the Elizabeth River. This could present a major obstacle in river governance when striving to achieve consensus when developing policies. Also, future research could include a cost analysis and forums and roundtables to discuss the marine debris problem and prioritize the policy outcomes from this study.

Eighth, although this study included a meso level of analysis this study also included aspects of the micro (individual) and macro (cultural) levels. It can not be ignored that participants are individuals, and they are also part of a community in this case the Elizabeth River watershed. Participants were asked to provide answers representing one of the nine sectors, but reality is that their answers may or may not have represented the views and perspectives of the entire sector. This can be a challenge and limitation during interpretation and analysis and it is important to clarify to the participants before the interview that they will be representing a sector and their organization when sharing their views and perspectives.

**CLOSING SUMMARY**

The nature of marine debris as a wicked problem is what made the Qualitative Narrative Policy Framework appropriate for understanding perspectives of stakeholders from multiple sectors in this study. Capturing the complexities of marine debris requires the full participation of all stakeholders concerned with the use of waterways and in this case the Elizabeth River. Narratives have the power to shape beliefs and actions (Jones & McBeth, 2010) and this study applied the QNPF at the meso level to better understand a local riverine marine debris phenomenon with 31 stakeholders that represent nine sectors that had not been previously

studied. In this study, an overall narrative emerged that confirmed there was a marine debris

problem in Virginia's Elizabeth River. Overall, the stakeholders view the river's marine debris as

terrible, and it was caused by people and originated with weather. Plastics and large wood from

aging docks and piers were most frequently observed and although stakeholders removed debris,

they also believe there is too much to manage, a lack of resources, and that people needed to take

responsibility. Although the stakeholders were unaware of the removal actions of others, together

they were approaching the problem as heroes. They also believed that the local government had

the larger role managing the marine debris and recommended various policy outcomes. Although

they believed they may not be doing a good job sharing their story, in this study, the U.S. Corps

of Engineer's story did emerge. They shared they were authorized and funded by Congress to

keep the river's channel navigable and have been doing so since the *1899 Rivers and Harbor Act*

was enacted (Govinfo.gov, 1899). This confirmed the importance of continuing to find policy

solutions for Virginia's Elizabeth River marine debris pollution. This study connected the

elements of an important marine debris story about one of the nation's important ports and

harbors. The goal now is to share this story, Elizabeth River's marine debris narrative, and

include it in the policy process and achieve a cleaner and safer river for all.

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# APPENDICES

## Appendix A

*Marine Debris Federal Legislation and Regulations*

| Marine Debris Federal Legislation and Regulations | | Regulatory Component |
|---|---|---|
| **1899:** *Rivers and Harbors Act of 1899*, 33 U.S.C. 407, 409, 414, 415 | USACE | X |
| **1949:** *Anadromous Fish Conservation Act*, 16 U.S.C. 757a et seq | USFWS | |
| **1951:** *Marine Debris Act*, 33 U.S.C. 1951 et seq. | NOAA, USCG | |
| **1954:** *Flood Control Act of 1954*, Sec. 208. Amended Section 2 | USACE | |
| **1970:** *National Environmental Policy Act* (NEPA.gov) | EPA | X |
| **1972:** *Clean Water Act*, 33, U.S.C. 1321,1346 (f), 1342, 1329. Amended 2020 to include *Save Our Seas Act* | EPA, USCG, NOAA | X |
| **1972:** *Coastal Zone Management Act of 1972*, 16 U.S.C. 1456b | NOAA | |
| **1972:** *Magnuson-Stevens Fishery Conservation and Management Act,* 16 U.S.C. 1801 et seq. | NOAA, USCG | X |
| **1972:** *Marine Mammal Protection Act*, 16 U.S.C. 1402 | NOAA, MMC, USFWS | X |
| **1972:** *National Marine Sanctuaries Act*, 16 U.S.C. 1431 et seq. | NOAA | X |
| **1973:** *Endangered Species Act of 1973*, 16 U.S.C. 1531 et seq. | NOAA, USFWS | X |
| **1976:** *Resource Conservation and Recovery Act*, 42 U.S.C. 6901 | EPA | |
| **1982:** *Act to Prevent Pollution from Ships* (Capps), 33 U.S.C. 1901 et seq. Amended 1987 by the *Marine Plastic Pollution Research and Control Act* | USCG | X |
| **1986:** *Act authorizing the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control and for other purposes*. 33 U.S.C. 426m | USACE | X |
| **1988:** *Marine Protection, Research and Sanctuaries Act*, 33 U.S.C. 1401-1445 (Ocean Dumping Act) Title I & II | EPA, NOAA, USCG | X |
| **1988:** *Shore Protection Act*, 33 U.S.C. 2603 | EPA, USCG | X |
| **1990:** *Pollution Prevention Act of 1990*, 42 U.S.C. 1301-13109 et seq. | EPA, NOAA | |
| **1990:** *Driftnet Act Amendments of 1990*, 16 U.S.C. 1826 | NOAA, USFWS, DOS | X |
| **1966 & 1997:** N*ational Wildlife Refuge System Administration Act of 1966 & National Wildlife Refuge Improvement Act of 1997*, 16 U.S.C. 668dd | USFWS | |
| **2006:** *The Marine Debris Act* amended to *The Save Our Seas Act of 2018* (Public Law 115-265); *The Save Our Seas 2.0 Act of 2020* (Public Law 116-224) | NOAA | |
| **2015:** *Microbead-Free Waters Act of 2015*, P.L. 114-114 | FDA | |
| **2017:** *Robert T. Stafford Disaster Relief and Emergency Assistance Act,* 42 U.S.C. § 5121 et seq. | FEMA | X |

**Appendix B**

*Marine Debris Federal Legislation Regulatory Components*

| **Regulatory Components** |
| --- |
| **1899: *Rivers and Harbors Act of 1899*, 33 U.S.C. 407, 409, 414, 415** |
| The U.S. Army Corps of Engineers (ACOE) regulatory permit program to protect navigable waters in the development of harbors and other construction and excavation (Govinfo.gov, 1899). |
| **1970: *National Environmental Policy Act* (NEPA.gov)** |
| The National Environmental Policy Act, NEPA, into law in 1970 by President Nixon. It was established by Congress as a national policy for the environment, establishing the Council on Environmental Quality (CEQ), and for other purposes (NEPA.gov, 2021). |
| **1972: *Clean Water Act*, 33, U.S.C. 1321,1346 (f), 1342, 1329** |
| The Clean Water Act (CWA) regulates discharges of pollutants into the U.S. waters and the quality standards for surface waters. Under the CWA, EPA implemented pollution control programs including setting industry wastewater standards and the national water quality criteria for pollutants in surface waters (U.S.EPA.gov, 1972). It was amended in 2020 to include *Save Our Seas* for increasing education, awareness, grants, etc. |
| **1972: *Magnuson-Stevens Fishery Conservation and Management Act*, 16 U.S.C. 1801 et seq.** |
| The Magnuson-Stevens Fishery Conservation and Management Act (MSA) is the primary law governing marine fisheries management in U.S. federal waters and authorizes the conservation and management of the fishery resources found within the Exclusive Economic Zone of the United States, including anadromous species, through eight Regional Fishery Management Councils. In 1976, it extended U.S. fisheries jurisdiction to 200 miles and phased out foreign fishing and eight regional fishery management councils were established to manage the fisheries and promote conservation. It was amended in 1996 as the "Sustainable Fisheries Act" that focused on rebuilding overfished fisheries, protecting fish habitat, and reducing bycatch and in 2006 to the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act that mandated the use of annual catch limits and accountability measures to end overfishing, provided for limited access privilege programs, and called for increased international cooperation (Govinfo.gov, 1972a). |
| **1972: *Marine Mammal Protection Act*, 16 U.S.C. 1402** |
| The Marine Mammal Protection Act was signed into law by President Nixon and was the first act of the U.S. Congress to specify an ecosystem approach to wildlife management and protect marine mammals and create a Marine Mammal Commission. Taking marine mammals in prohibited and it enacts a moratorium on the import, export, and sale of any marine mammal, along with any marine mammal part or product within the United States. The Act defines "take" as "the act of hunting, killing, capture, and/or harassment of any marine mammal (Govinfo.gov, 1972b). |
| **1972: *National Marine Sanctuaries Act*, 16 U.S.C. 1431 et seq.** |
| The National Marine Sanctuaries Act (NMSA) authorizes the Secretary of Commerce to designate and protect areas of the marine environment as national marine sanctuaries that consist of designated marine waters and submerged lands and can extend up to the mean high-water line. The primary objective is to protect marine resources, such as coral reefs, sunken historical vessels, or unique habitats. The National Marine Sanctuary System includes 13 sanctuaries, and the management is delegated by the Secretary of Commerce to NOAA's Office of National Marine Sanctuaries (Govinfo.gov, 1972c). |

## Regulatory Components

**1973:** *Endangered Species Act of 1973*, **16 U.S.C. 1531 et seq.**

The purpose of the Endangered Species Act of 1973 is to prevent extinction and to recover species to the point where the law's protections are not needed. Section 9 prohibits unlawful 'take,' of such species, which means to "harass, harm, hunt..." Federal agencies can use their authorities to help conserve listed species. The Act also serves as the enacting legislation for endangered species of wild fauna and flora (Govinfo.gov, 1973).

**1982:** *Act to Prevent Pollution from Ships* **(Capps), 33 U.S.C. 1901 et seq. Amended 1987 by the** *Marine Plastic Pollution Research and Control Act* **MARPOL**

MARPOL, the International Convention for the Prevention of Pollution from Ships, prevents marine pollution from ships and addresses air pollution from ocean-going ships. The international air pollution requirements of Annex VI establish limits on nitrogen oxides ($NO_x$) emissions and require the use of fuel with lower sulfur content, protecting people's health and the environment by reducing ozone-producing pollution, which can cause smog and aggravate asthma. The requirements apply to vessels operating in U.S. waters as well as ships operating within 200 nautical miles of the coast of North America, also known as the North American Emission Control Area (ECA) (Govinfo.gov, 1982).

**1986: Act authorizing the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control and for other purposes. 33 U.S.C. 426m**

The Congress finds that debris in publicly maintained commercial boat harbors and the land and water areas immediately adjacent thereto threaten navigational safety, public health, recreation, and the harbor front environment. The Secretary of the Army with the Chief of Engineers, shall be responsible for developing projects for the collection and removal of debris from publicly maintained commercial boat harbors and from land and water areas immediately adjacent thereto (UScode.house.gov, 1986).

**1988:** *Marine Protection, Research and Sanctuaries Act*, **33 U.S.C. 1401-1445 (***Ocean Dumping Act***) Title I & II**

The Ocean Dumping Act makes it unlawful for any person to dump, or transport for the purpose of dumping, sewage sludge or industrial waste into ocean waters. Titles I and II prohibits (AND ATMOSPHERIC ADMINISTRATION, DEPARTMENT OF COMMERCE SUBCHAPTER A - GENERAL REGULATIONS PART 909 - MARINE DEBRIS § 909.1 Definition of marine debris for the purposes of the Marine Debris Research, Prevention, and Reduction Act.) transportation of material from the United States for the purpose of ocean dumping; (2) transportation of material from anywhere for the purpose of ocean dumping by U.S. agencies or U.S.-flagged vessels; (Ruhl) dumping of material transported from outside the United States into the U.S. territorial sea. A permit is required to deviate from these prohibitions. Under MPRSA, the standard for permit issuance is whether the dumping will "unreasonably degrade or endanger" human health, welfare, or the marine environment. EPA is charged with developing ocean dumping criteria to be used in evaluating permit applications (EPA, 1988b).

**1988:** *Shore Protection Act*, **33 U.S.C. 2603**

The Shore Protection Ace was created by the Title IV of the Ocean Dumping Ban Act of 1988 and prohibits the transportation of municipal or commercial waste within coastal waters by a vessel without a permit and number or other marking. Permits are not to run beyond renewable five-year terms and will terminate when the vessel is sold. EPA with the U.S. Coast Guard develops regulations governing the loading, securing, offloading, and cleaning up of such wastes from waste sources, reception facilities, and vessels. The goals of the regulations are to minimize deposit of waste into coastal waters during vessel loading, transport, and unloading, and to ensure that any deposited waste is reported and cleaned up (Govinfo.gov., 1988).

## Regulatory Components

**1990:** *Driftnet Act Amendments of 1990*, **16 U.S.C. 1826**

The U.S. Congress policy supports the Tarawa Declaration and the Wellington Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific; and secure a permanent ban on the use of destructive fishing practices with large-scale driftnets when fishing beyond the exclusive economic zone of any nation and all large-scale driftnets are biodegradable without threat to living marine life and driftnets are marked to identify the vessel and flag nation and the taking of nontarget fish species, marine mammals, sea turtles, seabirds, and endangered species or other species protected by international agreements to which the United States is a party is minimized and does not pose a threat to existing fisheries or the long-term health of living marine resources and parties agree to comply with the spirit of other international agreements and resolutions concerning the use of large-scale driftnets beyond the exclusive economic zone of any nation (Govinfo.gov, 1990).

**2006:** *The Marine Debris Act* **amended to** *The Save Our Seas Act of 2018* **(Public Law 115-265);** *The Save Our Seas 2.0 Act of 2020* **(Public Law 116-224)**

In 2006, NOAA, The National Oceanic and Atmospheric Administration Marine Debris Program was authorized by Congress to work on marine debris and was amended in 2012, 2018, and 2020. The Act requires the program to identify sources and prevent, reduce, and remove marine debris and address the economic impacts of marine debris on the United States, marine environment, and navigation safety. The Save Our Seas Act of 2018 (Public Law 115-265) was signed into law in October 2018 and amends and reauthorizes the Marine Debris Act for four years, promotes international action to reduce marine debris in our ocean, authorizes cleanup and response actions needed as a result of severe marine debris events, such as hurricanes or tsunamis, and updates the membership of the Interagency Marine Debris Coordinating Committee. Additionally, the Act authorizes and requires NOAA to work with other Federal agencies to develop additional outreach and education strategies to address sources of marine debris. The Save Our Seas 2.0 Act of 2020 (Public Law 116-224) was signed into law in December 2020. The Act contains three titles that enhance: (AND ATMOSPHERIC ADMINISTRATION, DEPARTMENT OF COMMERCE SUBCHAPTER A - GENERAL REGULATIONS PART 909 - MARINE DEBRIS § 909.1 Definition of marine debris for the purposes of the Marine Debris Research, Prevention, and Reduction Act.) the United States' domestic programs to address marine debris, (2) international engagement to combat marine debris, and (Ruhl) domestic infrastructure to prevent marine debris.

**2017:** *Robert T. Stafford Disaster Relief and Emergency Assistance Act*, **42 U.S.C. § 5121 et seq.**

The Administrator may provide for the use by State or local governments of Federal supply schedules of the General Services Administration for goods or services that are to be used to facilitate recovery from a major disaster declared by the President under the Robert T. Stafford Disaster Relief and Emergency Assistance Act to facilitate disaster preparedness or response, or to facilitate recovery from terrorism or nuclear, biological, chemical, or radiological attack (Govinfo.gov, 2017).

**Appendix C**

*IRB Determination of Exempt Status Letter*

OLD
DOMINION
UNIVERSITY

**OFFICE OF THE VICE PRESIDENT FOR RESEARCH**

**Physical Address**
4111 Monarch Way, Suite 203
Norfolk, Virginia 23508
**Mailing Address**
Office of Research
1 Old Dominion University
Norfolk, Virginia 23529
Phone(757) 683-3460
Fax(757) 683-5902

DATE: February 28, 2023

TO: Juita-Elena "Wie" Yusuf, PhD
FROM: Old Dominion University Institutional Review Board

PROJECT TITLE: [2011728-2] Multisector Stakeholder Views and Policy Approaches to Marine Debris Removal: A Qualitative Case Study of Virginia's Elizabeth River
REFERENCE #: 23-026
SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: February 28, 2023

REVIEW CATEGORY: Exemption category #3

Thank you for your submission of New Project materials for this project. The Old Dominion University Institutional Review Board has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will retain a copy of this correspondence within our records.

If you have any questions, please contact Olivia Trumino at 7576834636 or otrumino@odu.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Old Dominion University Institutional Review Board's records.

- 1 -                                                                 Generated on IRBNet

**Appendix D**

*Acronyms*

| | |
|---|---|
| CSIRO | Commonwealth Scientific and Industrial Research Organization |
| CWA | Clean Water Act |
| DFG | Derelict Fishing Gear |
| DOS | Department of State |
| ERP | Elizabeth River Project |
| FDA | Food and Drug Administration |
| ICC | International Coastal Cleanup |
| IMDCC | Interagency Marine Debris Coordinating Committee |
| MARPOL | International Convention for the Prevention of Pollution from Ships |
| MDMAP | Marine Debris Monitoring and Assessment Project |
| MDP | NOAA Marine Debris Program |
| MPPRCA | Marine Plastics Pollution Research and Control Act of 1987 |
| MS4 | Municipal Separate Storm Sewer Permits |
| NAMEPA | North Atlantic Marine Environment Protection Association |
| NGO | Non-governmental Organization |
| NOAA | National Oceanic and Atmospheric Administration |
| OC | Ocean Conservancy |
| OES | U.S. Department of State, Bureau of Oceans and International Environmental and Scientific Affairs |
| PSI | Product Stewardship Institute |
| SOLAS | International Convention for the Safety of Life at Sea |
| TFW | Trash Free Waters |
| USACE | U.S. Army Corps of Engineers |
| USEPA | U.S. Environmental Protection Agency |
| USCG | U.S. Coast Guard |
| USFWS | U.S. Fish and Wildlife Service |
| VMDRP | Virginia Marine Debris Response Plan |

**Appendix E**

*Code Book*

1. **Interview Question (Setting):** How would you describe the marine debris pollution in the Elizabeth River?

   **Terrible**
   - Huge
   - Severe
   - Bad
   - Significant
   - Always been a problem
   - Shocked at amount
   - Consistent
   - Infinite supply
   - Have a long way to go
   - Residents vocalizing
   - Increase
   - It's getting worse
   - It's an eyesore
   - It's improved, but still terrible

   **Moderate**
   - Could be better
   - Not as bad as other rivers
   - Cleaner than it was
   - I think it's about average

   **Accumulates**
   - Accumulates in coves, wetlands, hard to reach places, shoreline
   - Some areas worse than others
   - Higher amount up in the river's branches

   **After a Storm**
   - Noticed at different times
   - Some days worse than others

2. **Interview Questions (Setting):** What types of marine debris do you see most frequently in the Elizabeth River?

**Fishing Gear**
- Bait boxes
- Rope
- Fishing line
- Crab pots

**Plastics**
- Plastic bottles
- Bottle caps
- Gloves
- Straws
- Cigarette filters
- Personal care products

**Food and Beverage Containers**
- Chip bags
- Metal cans
- Glass bottles
- Candy wrappers

**Wood and Paper**
- Limbs and branches
- Pieces of docks (fenders)
- Pilings
- Paper
- Wipes

**Recreation**
- Golf balls
- Lime scooter
- Balloons
- Bicycle parts
- Dog toys
- Kids balls
- Pieces of boats
- Golf cart

**Abandoned Derelict Vessels**

**Industry**
- Hard hats
- I.D. badges
- Construction cones

**Styrofoam**
**Large Items**
- Decorated Christmas tree
- Ball moorings and anchors
- Golf cart
- Car fender
- Furniture
- Trash cans
- Mattress
- Tires
- Yard furniture
- Buoys
- Cooler
- Barrels
- Car seat
- Grocery cart
- Paraphenalia

3. **Interview Question (Character – Villian):** What do you see as the cause of the Elizabeth River marine debris problem?

**People**
- Households
- Discard plastics improperly
- Illegally dumped
- Trash on riverfront properties
- We have too much stuff

**Weather**
- Flooding
- Trashcans during storms and wind
- Rising sea levels
- Tidal

**Aged Infrastructure**
- Docks and piling

**Poor Waste Management**

- Dumpsters
- Not recycling
- Not composting
- Not enough trash and recycling cans
- Lack of trash cans

**Vessels**
- Untethered waste on vessels
- Boating activity
- Inherited a vessel
- Lack of funds for a vessel
- Unintended consequences with vessel (incarceration, passed, no registration)
- Disposal issue of vessel
- Vessel accident, collision, sinking
- Big steel ball mooring

**Vehicles**
- Untethered waste on trucks
- Vehicular traffic
- Flew out of car

**Businesses**
- Construction sites
- Nearby shipyards

**Fishing Gear**

**Items Trapped**
- In wetlands

**Streets and Storm System**
- Lots of outfalls
- Runoff
- How streets are maintained
- From parking lots
- Storm drains

**No Enforcement**

**Lack of Knowledge and Awareness**

4. **Interview Question (Character-Villain):** How often are you seeing marine debris in the Elizabeth River?

**Daily**
**Weekly**
**Monthly**
**Only After Rain and Storm Events**
**Never**
**During Big Cleanup Events**

5. **Interview Question (Character-Villian):** What is your perspective on where it is originating?

**People**
- Older generations didn't learn about taking care of the river environment
- Populated areas with neighborhoods and businesses
- Land
- Illegal dumping
- Fishing gear

**Accumulation Spots**
- Out of Site Spots

**Storm Water System**
- Runoff

**Poor Waste Management**
- Bins without covers
- Dumpsters that aren't managed

**Vehicles**
- Cars in tunnels
- Garbage trucks

**Vessels**
- Inherited vessel
- Accident collision, vessel sinking

**Aging Infrastructure**

**Weather**
- Wind blowing items
- Currents
- Heavy flood waters

- Heavy rain

**I Don't Know Where it is Coming From**

**Industry**
- Upstream from shipyard

6. **Interview Question (Character-Victim):** What are ways marine debris is impacting your organization's progress?

**Too Much Debris to Manage**
- Blockages in stormwater system
- Complaints daily
- Whatever washes up sits there unless carried out
- Smothers wetlands

**Emotionally**
- Sad to see
- Eyesore
- Frustrated

**Not Enough Volunteers**

**Expensive**
- Maintenance
- Damage to vessels

**Lack of Policies and Codes**
- Lack of enforcement code
- Can't help with abandoned derelict vessels

**Dangerous**
- Threats to navigation
- Entanglement

**Impacts Organization's Mission**
- Mission for a clean and healthy river
- Impacts events
- Teachable moment
- Use data in budget narratives

7.  **Interview Question (Plot):** What are your organization's policies and practices for marine debris reduction/removal?

    **Marine Debris Removal**
    - Volunteer recruitment and management
    - Litter cleanups (land and water)
    - Staff cleanups
    - Collaborate to patrol the channel during storms
    - Installed trash cans with lids
    - Street sweeping
    - Plant wetlands to trap debris
    - Filters on storm drains
    - Hire a contractor to remove debris during events
    - Call United States Army Corps of Engineers for removal
    - Use innovations

    **Education and Outreach**
    - Programs
    - Awareness and education
    - Advocacy
    - Handle complaints

    **Legislation, Policies & Strategies**
    - Virginia litter code
    - Permits
    - Master gardener training
    - Strategies developed
    - Funds and authorization to remove debris
    - Funds and authorization to remove abandoned derelict vessels
    - Rivers and Harbor Act of 1899
    - Implementing the Hampton Roads Drift Project
    - Rules that prohibit any discharge of pollutants or trash
    - Good practices
    - Weather service alerts

    **Keep Statistics and Data**
    - Collect data and share

    **Collaborate**
    - Patrol the channel during weather

8. **Interview Question (Plot):** What are barriers your organization may have to reducing marine debris in the Elizabeth River?

**People Taking Responsibility**
- Management of dumpster
- Identifying sources with litter traveling
- Responding only to complaints
- Identifying who can take responsibility
- Contractor cleans land not the river
- No one dedicated to getting the debris

**Resources**
- Not enough staff
- Need more funds
- Need more supplies and equipment
- Equipment needs maintenance
- Getting volunteers
- Need more trashcans and dumpsters
- Funding for maintenance of stormwater system
- Innovations are expensive

**Practices**
- Litter is not a priority over serious crime
- Enforcement of code
- Focus only on advocacy and education
- No written policies
- Looking for ways to improve our programs
- Permit regulations
- Stormwater pipes are well beyond lifespan
- Unknown litter management with visiting container ships
- Looking for ways to improve programs
- Put a line on debris and then you own it
- Can't patrol in areas where bridges would restrict navigation

**City Leaders and Decision Makers**
- Support reusable bags
- Support purchasing more trash and recycling cans
- Support phase out of Styrofoam
- Stakeholders' voices need to be heard
- Traditionally unheard voices need to be heard
- Need policies for abandoned derelict vessels that are achievable and affordable
- Federal government only authorizes projects
- Federal government approving funds for weekend debris patrol and removal
- Need policies for abandoned derelict vessels

**Tide**
- Pushing debris into the storm system
- Pushing debris into wetlands
- Pushing debris into hard-to-reach places
- Debris travel quickly at the mouth

**Marine Debris is Dangerous**
- Injuries from cleanups
- Infinite amount of debris
- Gaps in debris removal
- Plastic bag damage to a boat
- Entanglement from fishing line and traps

9. **Interview Question (Policies/Moral):** What are your suggestions on policies for management of marine debris in your organization?

**Nothing**

**Unknown**

**Policies**
- New policies
- Amended policies
- Regulations
- Enforce
- Storm drain filters
- Plastic bag tax
- Move away from Styrofoam
- Workgroup reports and recommendations lead to policy
- Plastic bottle deposits
- Banning single use plastics
- Need abandoned derelict vessel policies

**Strategies**
- Reduce, Recycle, Repurpose, Refuse, and Reuse
- Address aging infrastructure
- More stakeholder engagement
- Strategic plans
- Increase knowledge and awareness
- Education
- Mentor other cities
- Monitoring data
- Signage on storm drains
- Businesses use more sustainable products
- Add more trash and recycling cans

**Marine Debris Removal**
- Better management of dumpsters
- Collaborations
- Nonprofit organizations
- Volunteer cleanups
- Youth engagement
- Fishers removing debris
- Local leaders should participate in cleanups
- Increase litter cleanups
- Innovations
- Contractors to remove debris from land and river
- Make sure trash is emptied to avoid wind

**Resources**
- Funding
- Tools and Machines
- Increase staffing
- Provide litter supplies
- Knowing who to call to pick up big items
- Create a contact list of resources

10. **Interview Question (Belief):** What do you believe is the role of the local and federal government in managing marine debris?

**Local Government**
- Enforce fines
- Keep neighborhoods clean
- Hire more people for waste management
- Outreach and education
- Manage outfalls
- Collaborate
- Share your story
- Support staff volunteering in litter cleanups
- Police areas for litter
- Dumpsters should be covered and dumped before full
- Gather stakeholders for listening, feedback and strategies
- City staff emptying trash cans more frequently
- Trash cans needs lids that stay put
- Address aging infrastructure
- Improve waste management

**Federal Government**
- Provide litter programs
- Create a clear, accessible resource list for marine debris
- Police areas for litter
- Help haul heavy items away
- Provide funding
- Incentivize and encourage people
- Keep the channels navigable
- Federal money to cities for filters for storm drains and maintain them
- Funding for abandoned derelict vessels
- Funding for removal of fishing gear
- Fund debris removal projects with United States Corps of Engineers

**Create New Policies**
- Simple policies for abandoned derelict vessels
- Phase out Styrofoam
- Support plastic bag legislation
- Bottle deposit policies

**I Don't Know Enough to Make Recommendations**

**Appendix F**

*Code Sheet Template to Utilize with Code Book for Analysis*

| | Sector | Title | Age | Gender | Years with Organization |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | - | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |
| 13 | | | | | |
| 14 | | | | | |
| 15 | | | | | |
| 16 | | | | | |
| 17 | | | | | |
| 18 | | | | | |
| 19 | | | | | |
| 20 | | | | | |
| 21 | | | | | |
| 22 | | | | | |
| 23 | | | | | |
| 24 | | | | | |
| 25 | | | | | |
| 26 | | | | | |
| 27 | | | | | |
| 28 | | | | | |
| 29 | | | | | |
| 30 | | | | | |
| 31 | | | | | |

NUMBER OF STAKEHOLDERS BY SECTOR

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Sectors | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
| Number of Stakeholders | | | | | | | | | |

**Average Age:**
**Gender:   males   % and   females   %   Total Participants:**

## STAKEHOLDERS' VIEWS

OVERALL SUMMARY OF NARRATIVE POLICY FRAMEWORK FOR ALL SECTORS

| | |
|---|---|
| SETTING | |
| VILLIAN | |
| HERO | |
| VICTIM | |
| PLOT | |
| MORAL | |
| BELIEF | |

## COMPARING SECTORS VIEWS TO ADDRESS RESEARCH QUESTIONS

Research Questions

1. What are the stakeholders from multiple sectors views on the Elizabeth River marine debris

   problems at the mouth of the Elizabeth River?

2. Which stakeholders are considered in addressing marine debris issues?

3. What is the match between the views of stakeholders' and policies to address marine debris?

   - XXXX

# Theme 1: Knowledge of the Marine Debris Problem

**Research Question Being Addressed:** What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?

1. **Interview Question (Setting):** How would you describe the marine debris pollution in the Elizabeth River?

| Stakeholder Type Categories | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| Terrible* | | | | | | | | | |
| Moderate* | | | | | | | | | |
| Accumulates* | | | | | | | | | |
| After a Storm* | | | | | | | | | |
| TOTAL Number of Comments* | | | | | | | | | |

| TOTAL | |
|---|---|
| Terrible | |
| Moderate | |
| Accumulates | |
| After a Storm | |

**\*** The number of comments does not reflect one answer per participant, but instead the number of comments regarding this question.

**SOME PARTICIPANT QUOTES**

| TERRIBLE | Private | |
|---|---|---|
| | Public | |
| | NGO | |
| | Government | |
| | Resident | |

| MODERATE | Academic | |
|---|---|---|
| | Public | |
| | Military | |
| | NGO | |
| | Government | |
| | Volunteer | |
| | Fisher | |
| | Private | |
| | Resident | |

| ACCUMULATES | Public | |
|---|---|---|
| | NGO | |
| | Government | |

| AFTER A STORM | Private | |
|---|---|---|
| | Public | |
| | NGO | |
| | Academic | |
| | Government | |
| | Fisher | |
| | Volunteer | |

# Theme 1: Knowledge of the Marine Debris Problem

**Research Question Being Addressed:** What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?

2. **Interview Question (Setting):** What types of marine debris do you see most frequently in the Elizabeth River?

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| Fishing Gear | | | | | | | | | |
| Plastics | | | | | | | | | |
| Food and Beverage Containers | | | | | | | | | |
| Wood and Paper | | | | | | | | | |
| Recreation | | | | | | | | | |
| Abandoned Derelict Vessels | | | | | | | | | |
| Industry | | | | | | | | | |
| Styrofoam | | | | | | | | | |
| Large Items | | | | | | | | | |
| Fabric | | | | | | | | | |

| TOTAL | |
|---|---|
| Fishing Gear | |
| Plastics | |
| Food and Beverage Containers | |
| Wood and Paper | |
| Recreation | |
| Abandoned Derelict Vessels | |
| Industry | |
| Styrofoam | |
| Large Items | |
| Fabric | |

| PLASTICS | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| FOOD AND BEVERAGE | Government | |
|---|---|---|
| | NGO | |
| | Academic | |
| | Resident | |
| | Military | |
| | Volunteer | |

| WOOD AND PAPER | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| LARGE ITEMS | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| STYROFOAM | Government | |
| | Private | |
| | Public | |
| | NGO | |
| | Resident | |
| | Military | |
| | Volunteer | |

| FISHING GEAR | Government | |
|---|---|---|
| | Public | |
| | NGO | |
| | Academic | |
| | Fisher | |

| RECREATION | Public | |
|---|---|---|
| | NGO | |
| | Academic | |
| | Fisher | |
| | Volunteer | |

| INDUSTRY | Government | |
|---|---|---|
| | Private | |
| | NGO | |
| | Volunteer | |
| ABANDONED DERELICT VESSELS | Government | |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

# Theme 1: Knowledge of the Marine Debris Problem

**Research Question Being Addressed:** What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?

3.  **Interview Question (Character - Villian):** What do you see as the cause of the Elizabeth River marine debris problem?

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| People | | | | | | | | | |
| Weather | | | | | | | | | |
| Aged Infrastructure | | | | | | | | | |
| Poor Waste Management | | | | | | | | | |
| Vessels | | | | | | | | | |
| Vehicles | | | | | | | | | |
| Businesses | | | | | | | | | |
| Fishing Gear | | | | | | | | | |
| Items Trapped | | | | | | | | | |
| Streets and Storm System | | | | | | | | | |
| No Enforcement | | | | | | | | | |
| Lack of Knowledge and Awareness | | | | | | | | | |

| TOTAL | |
|---|---|
| People | |
| Weather | |
| Aged Infrastructure | |
| Poor Waste Management | |
| Vessels | |
| Vehicles | |
| Businesses | |
| Fishing Gear | |
| Items Trapped | |
| Streets and Storm System | |
| No Enforcement | |
| Lack of Knowledge and Awareness | |

| PEOPLE | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| WEATHER | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| AGED INFRASTRUCTURE | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| POOR WASTE MANAGMENT | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| VESSELS | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| VEHICLES | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| BUSINESSES | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| FISHING GEAR | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| ITEMS TRAPPED | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| STREETS AND STORM SYSTEMS | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| NO ENFORCEMENT | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| LACK OF KNOWLEDGE AND AWARENESS | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

## Theme 2: Origination of Marine Debris

**Research Question Being Addressed:** What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?

4. **Interview Question (Character-Villian):** How often are you seeing marine debris in the Elizabeth River?

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| Daily | | | | | | | | | |
| Weekly | | | | | | | | | |
| Monthly | | | | | | | | | |
| Only After Rain and Storm Events | | | | | | | | | |
| Never | | | | | | | | | |
| During Our Big Cleanup Events | | | | | | | | | |

| TOTAL | |
|---|---|
| **Daily** | |
| **Weekly** | |
| **Monthly** | |
| **Only After Rain and Storm Events** | |
| **Never** | |
| **During Our Big Cleanup Events** | |

| DAILY | Government | |
|---|---|---|
| | **Private** | |
| | **Public** | |
| | **NGO** | |
| | **Academic** | |
| | **Resident** | |
| | **Fisher** | |
| | **Military** | |
| | **Volunteer** | |

| **WEEKLY** | **Government** | |
|---|---|---|
| | **Private** | |
| | **Public** | |
| | **NGO** | |
| | **Academic** | |
| | **Resident** | |
| | **Fisher** | |
| | **Military** | |
| | **Volunteer** | |

| **MONTHLY** | **Government** | |
|---|---|---|
| | **Private** | |
| | **Public** | |
| | **NGO** | |
| | **Academic** | |
| | **Resident** | |
| | **Fisher** | |
| | **Military** | |
| | **Volunteer** | |

| **ONLY AFTER RAINSTORM EVENTS** | **Government** | |
|---|---|---|
| | **Private** | |
| | **Public** | |
| | **NGO** | |
| | **Academic** | |
| | **Resident** | |
| | **Fisher** | |
| | **Military** | |
| | **Volunteer** | |

| **NEVER** | **Government** | |
|---|---|---|
| | **Private** | |
| | **Public** | |
| | **NGO** | |
| | **Academic** | |
| | **Resident** | |
| | **Fisher** | |
| | **Military** | |
| | **Volunteer** | |

| DURING OUR BIG CLEANUP EVENTS | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |
| | | |

**5. Interview Question (Character - Villian):** What is your perspective on where it is originating?

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| People | | | | | | | | | |
| Accumulation Spots | | | | | | | | | |
| Storm Water System | | | | | | | | | |
| Poor Waste Management | | | | | | | | | |
| Vehicles | | | | | | | | | |
| Vessels | | | | | | | | | |
| Aging Infrastructure | | | | | | | | | |
| Weather | | | | | | | | | |
| I Don't Know Where It Is Coming From | | | | | | | | | |
| Industry | | | | | | | | | |

| TOTAL | |
|---|---|
| People | |
| Accumulation Spots | |
| Storm Water System | |
| Poor Waste Management | |
| Vehicles | |
| Vessels | |
| Aging Infrastructure | |
| Weather | |
| I Don't Know Where It Is Coming From | |
| Industry | |

| PEOPLE | | |
|---|---|---|
| | Government | |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| ACCUMULATION SPOTS | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| STORM WATER SYSTEM | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| POOR WASTE MANAGEMENT | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |
| VEHICLES | Government | |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| VESSELS | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| AGED INFRASTRUCTURE | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| WEATHER | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| I DON'T KNOW WHERE IT'S COMING FROM | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| INDUSTRY | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

# Theme 2: Origination of Marine Debris

**Research Question Being Addressed:** What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?

6. **Interview Question (Character - Victim):** What are ways marine debris is impacting your organization's progress?

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| Too Much Debris to Manage | | | | | | | | | |
| Emotionally | | | | | | | | | |
| Not Enough Volunteers | | | | | | | | | |
| Expensive | | | | | | | | | |
| Lack of Policies and Codes | | | | | | | | | |
| Dangerous | | | | | | | | | |
| Impacts Organization's Mission | | | | | | | | | |

| TOTAL | |
|---|---|
| Too Much Debris to Manage | |
| Emotionally | |
| Not Enough Volunteers | |
| Expensive | |
| Lack of Policies and Codes | |
| Dangerous | |
| Impacts Organization's Mission | |

| TOO MUCH DEBRIS TO MANAGE | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| EMOTIONALLY | Government | |
| --- | --- | --- |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| NOT ENOUGH VOLUNTEERS | Government | |
| --- | --- | --- |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| EXPENSIVE | Government | |
| --- | --- | --- |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| LACK OF POLICIES AND CODES | Government | |
| --- | --- | --- |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| DANGEROUS | Volunteer | |
|---|---|---|
| | Government | |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| IMPACTS ORG. MISSION | Volunteer | |
|---|---|---|
| | Government | |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

# Theme 3: Management of Marine Debris

**Research Question Being Addressed:** Which stakeholders are considered in addressing marine debris issues?

**Narrative Analysis (Character - Hero):** Who is taking action to reduce or remove marine debris?

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |  |

| GOVERNMENT | Government |  |
|---|---|---|
|  | Private |  |
|  | Public |  |
|  | NGO |  |
|  | Academic |  |
|  | Resident |  |
|  | Fisher |  |
|  | Military |  |
|  | Volunteer |  |
| NGO | Government |  |
|  | Private |  |
|  | Public |  |
|  | NGO |  |
|  | Academic |  |
|  | Resident |  |
|  | Fisher |  |
|  | Military |  |
|  | Volunteer |  |

| FISHER | Government |  |
|---|---|---|
|  | Private |  |
|  | Public |  |
|  | NGO |  |
|  | Academic |  |
|  | Resident |  |
|  | Fisher |  |
|  | Military |  |
|  | Volunteer |  |

| PRIVATE | Government | |
| --- | --- | --- |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |
| ACADEMIC | Government | |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| RESIDENT | Government | |
| --- | --- | --- |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| PUBLIC | Government | |
| --- | --- | --- |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| VOLUNTEER | Government | |
| --- | --- | --- |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |
| | | |

7. **Interview Question (Plot):** What are your organization's policies and practices for marine debris reduction/removal?

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| **Marine Debris Removal Actions** | | | | | | | | | |
| **Education and Outreach** | | | | | | | | | |
| **Legislation, Policies & Strategies** | | | | | | | | | |
| **Keep Statistics and Data** | | | | | | | | | |
| **Collaborate** | | | | | | | | | |

| TOTAL | |
|---|---|
| **Marine Debris Removal Actions** | |
| **Education and Outreach** | |
| **Legislation, Policies & Strategies** | |
| **Keep Statistics and Data** | |
| **Collaborate** | |

| MARINE DEBRIS REMOVAL ACTIONS | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| EDUCATION AND OUTREACH | Government | |
| --- | --- | --- |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| LEGISLATION, POLICIES AND STRATEGIES | Government | |
| --- | --- | --- |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |
| KEEP STATISTICS AND DATA | Government | |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| COLLABORATE | Government | |
| --- | --- | --- |
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

# Theme 3: Management of Marine Debris

**Research Question Being Addressed:** Which stakeholders are considered in addressing marine debris issues?

8. **Interview Question (Plot):** What are barriers your organization may have to reducing marine debris in the Elizabeth River?

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| People Taking Responsibility | | | | | | | | | |
| Resources | | | | | | | | | |
| Practices | | | | | | | | | |
| City Leaders and Decision Makers | | | | | | | | | |
| Tide | | | | | | | | | |
| Marine Debris is Dangerous | | | | | | | | | |

| TOTAL | |
|---|---|
| People Taking Responsibility | |
| Resources | |
| Practices | |
| City Leaders and Decision Makers | |
| Tide | |
| Marine Debris is Dangerous | |

| PEOPLE TAKING RESPONSIBILITY | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| RESOURCES | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| PRACTICES | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| CITY LEADERS AND DECISION MAKERS | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| TIDE | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| MARINE DEBRIS IS DANGEROUS | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

## Theme 3: Management of Marine Debris

**Research Question Being Addressed:** Which stakeholders are considered in addressing marine debris issues?

**Narrative Analysis from Interview (Plot)**

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| Story of Decline | | | | | | | | | |
| Story of Interference | | | | | | | | | |
| Story of Change as an Illusion | | | | | | | | | |
| Marine Debris is Terrible | | | | | | | | | |
| Marine Debris Problem is a Conspiracy | | | | | | | | | |
| Marine Debris Problem is the Victim | | | | | | | | | |
| Marine Debris Removal is a Victory | | | | | | | | | |

## Total

| | |
|---|---|
| | **No Plot =** No plot was present. |
| | **Story of Decline =** If the marine debris in the Elizabeth River is described as going from good to worse and now something must be done. |
| | **Story of Interference =** If the marine debris problem is described as terrible and then gets better due the work of a hero, but then gets worse for some reason such as a barrier, lack of policies, influx of debris, etc. |
| | **Story of Change as an Illusion =** If the individual thought they knew if the marine debris problem was changing or getting worse, but then realized the problem was different (either getter better or getting worse) |
| | **Marine Debris is Terrible =** If the marine debris problem is described as terrible, that this situation must be accepted because it cannot change, but then the respondent describes how it could change. |
| | **Marine Debris Problem is a Conspiracy =** If the marine debris problem is described as a conspiracy in which a small group knows how to reduce and remove the marine debris but has not, for their own benefit. |
| | **Marine Debris Problem is the Victim =** If the marine debris problem is described as moving from fate to control but locates the control in hands of those suffering from the problem. |
| | **Marine Debris Removal is a Victory = 7** The marine debris was removed due to policies and/or actions that work. |

# Theme 4: Suggestions for Marine Debris Management

**Research Question Being Addressed:** What is the match between the views of stakeholders' and policies to address marine debris?

9. **Interview Question (Policies/Moral):** What are your suggestions on policies for management of marine debris in your organization?

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| **Nothing** | | | | | | | | | |
| **Unknown** | | | | | | | | | |
| **Policies** | | | | | | | | | |
| **Strategies** | | | | | | | | | |
| **Marine Debris Removal** | | | | | | | | | |
| **Resources** | | | | | | | | | |

| | |
|---|---|
| **TOTAL** | |
| **Nothing** | |
| **Unknown** | |
| **Policies** | |
| **Strategies** | |
| **Marine Debris Removal** | |
| **Resources** | |

| NOTHING | | |
|---|---|---|
| | **Government** | |
| | **Private** | |
| | **Public** | |
| | **NGO** | |
| | **Academic** | |
| | **Resident** | |
| | **Fisher** | |
| | **Military** | |
| | **Volunteer** | |

| UNKNOWN | | |
|---|---|---|
| | **Government** | |
| | **Private** | |
| | **Public** | |
| | **NGO** | |
| | **Academic** | |
| | **Resident** | |
| | **Fisher** | |
| | **Military** | |
| | **Volunteer** | |

| POLICIES | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| STRATEGIES | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| MARINE DEBRIS REMOVAL | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| RESOURCES | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

**Narrative Analysis from Interview (Morals/Policies)**

Marine debris policies are in place at the organization.

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| Yes | | | | | | | | | |
| No | | | | | | | | | |
| Yes but need more | | | | | | | | | |

| TOTAL | |
|---|---|
| **Yes** | |
| **No** | |
| **Yes, but need more** | |

| YES | Government | |
|---|---|---|
| | **Private** | |
| | **Public** | |
| | **NGO** | |
| | **Academic** | |
| | **Resident** | |
| | **Fisher** | |
| | **Military** | |
| | **Volunteer** | |

Marine debris policy doesn't work.

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| Works | | | | | | | | | |
| Doesn't Work | | | | | | | | | |
| Needs Amending | | | | | | | | | |
| Needs to Be Enforced | | | | | | | | | |
| N/A | | | | | | | | | |

| TOTAL | |
|---|---|
| Works | |
| Doesn't Work | |
| Needs Amending | |
| Needs to Be Enforced | |
| N/A | |

| WORKS | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| DOESN'T WORK | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| NEEDS AMENDING | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| NEEDS TO BE ENFORCED | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| N/A | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

Marine debris is from accidental causes that don't include humans.

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| Yes | | | | | | | | | |
| No | | | | | | | | | |
| A Portion | | | | | | | | | |

| TOTAL | |
|---|---|
| Yes | |
| No | |
| A Portion | |

| A PORTION | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

Marine debris policies have unintended consequences.

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| Yes | | | | | | | | | |
| No | | | | | | | | | |
| N/A | | | | | | | | | |

| TOTAL | |
|---|---|
| Yes | |
| No | |
| N/A | |

| YES | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| NO | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

If money was suggested, who would bear the expenses.

| Gov't | Private | Public | NGO | Resident | Fisher | Military | Volunteer | Didn't Name a Source | Collaborations |
|---|---|---|---|---|---|---|---|---|---|
| | | Government | | | | | | | |
| | | Private | | | | | | | |
| | | Public | | | | | | | |
| | | NGO | | | | | | | |
| | | Academic | | | | | | | |
| | | Resident | | | | | | | |
| | | Fisher | | | | | | | |
| | | Military | | | | | | | |
| | | Volunteer | | | | | | | |

# Theme 4: Suggestions for Marine Debris Management

**Research Question Being Addressed:** What is the match between the views of stakeholders' and policies to address marine debris?

10. **Interview Question (Belief):** What do you believe is the role of the local and federal government in managing marine debris?

|  | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| **Local Government** |  |  |  |  |  |  |  |  |  |
| **Federal Government** |  |  |  |  |  |  |  |  |  |
| **Create New Policies** |  |  |  |  |  |  |  |  |  |
| **I Don't Know** |  |  |  |  |  |  |  |  |  |

| TOTAL |  |
|---|---|
| **Local Government** |  |
| **Federal Government** |  |
| **Create New Policies** |  |
| **I Don't Know** |  |

| **LOCAL GOVERNMENT** | Government |  |
|---|---|---|
|  | **Private** |  |
|  | **Public** |  |
|  | **NGO** |  |
|  | **Academic** |  |
|  | **Resident** |  |
|  | **Fisher** |  |
|  | **Military** |  |
|  | **Volunteer** |  |

| **FEDERAL GOVERNMENT** | Government |  |
|---|---|---|
|  | **Private** |  |
|  | **Public** |  |
|  | **NGO** |  |
|  | **Academic** |  |
|  | **Resident** |  |
|  | **Fisher** |  |
|  | **Military** |  |
|  | **Volunteer** |  |

| CREATE NEW POLICIES | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| I DON'T KNOW | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

## Narrative Analysis from Interview: Is Data Collected by Organization?

| | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| Yes | | | | | | | | | |
| No | | | | | | | | | |

| Total | |
|---|---|
| Yes | |
| No | |

| YES | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

| NO | Government | |
|---|---|---|
| | Private | |
| | Public | |
| | NGO | |
| | Academic | |
| | Resident | |
| | Fisher | |
| | Military | |
| | Volunteer | |

# Code Sheet

| Identification Codifier | 1   2   3   4   5   6   7   8   9   10   11   12   13   14   15 |
|---|---|
|  | 16  17  18  19   20   21   22  23   24  25   26  27  28  29  30 |

| Date of Interview | |
|---|---|

| Unit of Analysis | Line = 1 | Paragraph = 2 |
|---|---|---|

| Sex | Male = 1 | Female = 2 |
|---|---|---|

| Age | |
|---|---|

| Number of Years with Organization | |
|---|---|

| Job Title | |
|---|---|

| Observed Marine Debris in the Elizabeth River at the organization's site | Yes = 1 | No = 2 |
|---|---|---|

**Stakeholder Type**

| | |
|---|---|
| | Government |
| | Private |
| | Public |
| | NGO |
| | Academic |
| | Resident |
| | Fisher |
| | Military |
| | Volunteer |

| Snowball Recruiting | Recommendation of another participant. |
|---|---|
| | |

# Theme 1: Knowledge of the Marine Debris Problem

**Research Question Being Addressed:** What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?

1. **Interview Question (Setting) :** How would you describe the marine debris pollution in the Elizabeth River?

| | |
|---|---|
| | Huge Problem |
| | Terrible |
| | Better |
| | Not as Bad as Other Rivers I Have Seen |
| | Increase in Pollution |
| | Accumulates in Hard-to-Reach Places |
| | Accumulates in Coves |
| | Accumulates in Wetlands |
| | Some Areas Worse than Others |
| | Accumulates at the Shoreline |
| | **Participant's Comments:** |

## Theme 1: Knowledge of the Marine Debris Problem

**Research Question Being Addressed:** What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?

2. **Interview Question (Setting):** What types of marine debris do you see most frequently in the Elizabeth River?

| | |
|---|---|
| | Plastics |
| | Old Pilings and Boards |
| | Food Containers |
| | Abandoned Derelict Vessels |
| | Fabric |
| | Cigarette Butts/Filters |
| | Water Bottles |
| | Industrial Waste |
| | Metal Cans |
| | **Participant's Comments:** |

## Theme 1: Knowledge of the Marine Debris Problem

**Research Question Being Addressed:** What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?

3. **Interview Question (Character - Villian):** What do you see as the cause of the Elizabeth River marine debris problem?

| | |
|---|---|
| | People |
| | Weather |
| | Aged Infrastructure |
| | Poor Waste Management |
| | Illegally Dumped |
| | Tidal |
| | Untethered Waste on Vessels |
| | Trash on Riverfront Properties |
| | Construction Sites |
| | Dumpsters |
| | We Have Too Much Stuff |
| | Vehicular Traffic |
| | Not Recycling |
| | Not Composting |
| | Runoff |
| | Businesses |
| | **Participant's Comments:** |

## Theme 2: Origination of Marine Debris

**Research Question Being Addressed:** What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?

4. **Interview Question (Character-Villian):** How often are you seeing marine debris in the Elizabeth River?

|   |   |
|---|---|
|   | Daily |
|   | Weekly |
|   | Monthly |
|   | Only After Rain Events |
|   | Never |
|   | **Participant's Comments:** |

5. **Interview Question (Character - Villian):** What is your perspective on where it is originating?

|   |   |
|---|---|
|   | Illegal Dumping |
|   | Hot Spots |
|   | By Outfalls and Stormwater System |
|   | Bins Without Covers |
|   | Dumpsters that Aren't Managed |
|   | Vehicles |
|   | Vessels |
|   | Aging Infrastructure |
|   | Runoff |
|   | Out of Site Spots |
|   | **Participant's Comments:** |

## Theme 2: Origination of Marine Debris

**Research Question Being Addressed:** What are the stakeholders from multiple sectors views on the Elizabeth River marine debris problems at the mouth of the Elizabeth River?

6. **Interview Question (Character - Victim):** What are ways marine debris is impacting your organization's progress?

| | |
|---|---|
| | Too Much Debris to Manage |
| | Not Enough Stuff |
| | Emotionally |
| | Not Enough Volunteers |
| | Lack of Enforcement Code |
| | Blockages in Stormwater System |
| | Maintenance Time and Expensive |
| | **Participant's Comments:** |

## Theme 3: Management of Marine Debris

**Research Question Being Addressed:** Which stakeholders are considered in addressing marine debris issues?

**Narrative Analysis from Interview: (Character - Hero):** Who is taking action to reduce or remove marine debris?

| Stakeholder Type | Gov't | Private | Public | NGO | Academic | Resident | Fisher | Military | Volunteer |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

**Participant's Comments:**

7. **Interview Question (Plot):** What are your organization's policies and practices for marine debris reduction/removal?

| | |
|---|---|
| | Volunteer Recruitment and Management |
| | Expanding Programs for Litter Cleanups and Adopt-A-Spot |
| | Following Litter Code of Virginia |
| | Keeping Statistical Date |
| | Awareness and Education |
| | Use Innovations |
| | Collect Data and Share |
| | Collaborate |
| | Permit |
| | **Participant's Comments:** |

# Theme 3: Management of Marine Debris

**Research Question Being Addressed:** Which stakeholders are considered in addressing marine debris issues?

8. **Interview Question (Plot):** What are barriers your organization may have to reducing marine debris in the Elizabeth River?

| | |
|---|---|
| | People Taking Responsibility |
| | Not Enough Staff |
| | Enforcement of Code |
| | Litter Is Not a Priority Over Serious Crime |
| | Management of Dumpster |
| | Identifying Who Can Take Responsibility and Action Due to Litter Traveling |
| | City Leaders and Decision Makers Supporting Purchasing Reusable Bags for Everyone |
| | Need More Funds |
| | Need More Supplies |
| | Equipment Needs Maintenance |
| | Tide Pushing Debris into the Stormwater System |
| | Not Enough Supplies |
| | Responding Only to Complaints |
| | Funding for Eequipment |
| | **Participant's Comments:** |

# Theme 3: Management of Marine Debris

**Research Question Being Addressed:** Which stakeholders are considered in addressing marine debris issues?

**Narrative Analysis from Interview (Plot)**

| | |
|---|---|
| | **No Plot** = No plot was present. |
| | **Story of Decline** = If the marine debris in the Elizabeth River is described as going from good to worse and now something must be done. |
| | **Story of Interference** = If the marine debris problem is described as terrible and then gets better due the work of a hero, but then gets worse for some reason such as a barrier, lack of policies, influx of debris, etc. |
| | **Story of Change as an Illusion** = If the individual thought they knew if the marine debris problem was changing or getting worse, but then realized the problem was different (either getter better or getting worse) |
| | **Marine Debris is Terrible** = If the marine debris problem is described as terrible, that this situation must be accepted because it cannot change, but then the respondent describes how it could change. |
| | **Marine Debris Problem is a Conspiracy** = If the marine debris problem is described as a conspiracy in which a small group knows how to reduce and remove the marine debris but has not, for their own benefit. |
| | **Marine Debris Problem is the Victim** = If the marine debris problem is described as moving from fate to control but locates the control in hands of those suffering from the problem. |
| | **Marine Debris Removal is a Victory** = 7 The marine debris was removed due to policies and/or actions that work. |

## Theme 4: Suggestions for Marine Debris Management

**Research Question Being Addressed:** What is the match between the views of stakeholders' and policies to address marine debris?

9. **Interview Question (Policies/Moral):** What are your suggestions on policies for management of marine debris in your organization?

| | |
|---|---|
| | Nothing |
| | Better Management of Dumpsters |
| | New Policies |
| | Collaborations |
| | NGO |
| | Money |
| | Tools/Machines |
| | Amended Policies |
| | Strategic Plans |
| | Regulations |
| | Monitoring Data |
| | Education |
| | Volunteer Cleanups |
| | Youth Engagement |
| | Increase Staffing |
| | Mentor Other Cities |
| | Provide Litter Supplies to People |
| | Other |
| | Unknown |
| | Enforce Policy |
| | **Participant's Comments:** |

**Narrative Analysis from Interview (Morals/Policies)**

Marine debris policies are in place at the organization.

|  | Yes |
|---|---|
|  | No |
|  | Yes but need more |

Marine debris policy doesn't work.

|  | Works |
|---|---|
|  | Doesn't Work |
|  | Needs Amending |
|  | Needs to Be Enforced |
|  | N/A |

Marine debris is from accidental causes that don't include humans.

|  | Yes |
|---|---|
|  | No |
|  | A Portion |

Marine debris policies have unintended consequences.

|  | Yes |
|---|---|
|  | No |
|  | N/A |

Organization is taking actions without knowing if marine debris policies exist.

|  | Yes |
|---|---|
|  | No |

If money was suggested, who would bear the expenses.

| Gov't | Private | Public | NGO | Resident | Fisher | Military | Volunteer | Didn't Name a Source | Collaborations |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |  |

## Theme 4: Suggestions for Marine Debris Management

**Research Question Being Addressed:** What is the match between the views of stakeholders' and policies to address marine debris?

**10. Interview Question (Belief):** What do you believe is the role of the local and federal government in managing marine debris?

| | |
|---|---|
| | Enforce Fines |
| | Create New Policies |
| | Hire More People for Waste Management |
| | Outreach and Education |
| | Manage Outfalls |
| | Provide Litter Programs |
| | Collaborate |
| | Share Your Story |
| | Support Staff Volunteering in Litter Cleanups |
| | **Participant's Comments:** |

**Narrative Analysis from Interview: Data Collected by Organization**

| | |
|---|---|
| | Yes |
| | No |

**Narrative Analysis: Wicked Attributes Mentioned During the Interview**

| | |
|---|---|
| | **1:** There is no definitive formulation of a wicked problem. |
| | **2:** Wicked problems have no stopping rule. |
| | **3:** Solutions to wicked problems are not true-or-false, but good-or-bad. |
| | **4:** There is no immediate and no ultimate test of a solution to a wicked problem. |
| | **5:** Every solution to a wicked problem is a "one-shot operation" because there is no opportunity to learn by trial-and-error, and every attempt counts. |
| | **6:** Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan. |
| | **7:** Every wicked problem is unique. |
| | **8:** Every wicked problem can be a symptom of another problem. |
| | **9:** The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution. |
| | **10:** The planner has no right to be wrong. |

# VITA

## Robin Rene' Dunbar

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Old Dominion University, Norfolk, VA 23529, rdunb002@odu.edu

### EDUCATION

| | |
|---|---|
| PhD, Candidate (ABD) in Public Administration and Policy | Old Dominion University, Norfolk, Virginia |
| Dissertation: *Stakeholders from Multiple Sectors Views and Policy Approaches to Marine Debris Removal: A Qualitative Case Study of Virginia's Elizabeth River* | Anticipated Graduation Spring 2024 |
| | Dr. Juita-Elena "Wie" Yusuf, Advisor, Chair |
| | Dr. Jennifer Whytlaw, Committee Member |
| | Dr. Marina Saitgalina, Committee Member |
| Certification: *Preparing Future Faculty* | |
| M.A. Humanities, Cultural & Human Geography | August 2021, Old Dominion University |
| Thesis: *RIVEROLOGY: Promoting Stewardship of Rivers through Youth Participation in Science and Art* | |
| B.S., Interdisciplinary Human Resources | August 1993, Old Dominion University |

### LEADERSHIP & MENTORING

| | |
|---|---|
| Presidential Award of Excellence in Science, Mathematics, Engineering and Mentoring | November 2019 |

Received the PAESMEM award from the National Science Foundation and the White House. Twelve recipients received this national honor, and this was in recognition of mentoring college students, the development of STEM curriculums and programs, and serving as a model leader to youth.

### PROFESSIONAL EMPLOYMENT & RELATED EXPERIENCE

| | |
|---|---|
| Deputy Director, Education for the nonprofit Elizabeth River Project, Norfolk, Virginia | January 2000 - present |

For twenty-three years, created and led award-winning environmental education programs to inspire youth to make restoration of the Elizabeth River a reality and help create a resilient community. Educates 30,000 PreK-university students annually. Responsible for an annual budget of $700,000, supervises twenty staff and has managed over $2.7million in grants to date. Teaching Philosophy: *"I believe students must get outdoors. My programs include Joseph Cornell's Stages of Flow Learning that awaken enthusiasm and Froebel's innovation of children learning by exploring, getting dirty and being close to wildlife. I prioritize offering yearlong meaningful watershed environmental experiences (MWEEs) to create lifelong stewards and I develop activities that include critical thinking to promote environmental literacy and foster youth innovators and problem solvers."*

### PROFESSIONAL DEVELOPMENT

- Team Science, Alan Alda Center for Communicating Science (2023)
- Meaningful Watershed Educational Experience 101 Chesapeake Bay Program (Jan. 2020)
- Certified National Geographic Educator (March 2019)
- Earth Force Train-the Trainer, *Student-Led Action Civics* (June 2019)
- EarthWatch Scientist, Climate Change Expedition, Andorran Pyrenees Mountains, France (2019)

### PUBLICATIONS

Environmental Education

- Dunbar, Robin (2021). *RIVEROLOGY: Promoting Stewardship of Rivers through Youth Participation in Science and Art*, http://proxy.lib.odu.edu/login?url=https://www.proquest.com/dissertations-theses/riverology-promoting-stewardship-rivers-through/docview/2583420778/se-2
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