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### Micro Plastics and Their Implications for Human Health: An Environmental Justice Approach

Alexis Smith

Salve Regina University, alexis.smith@salve.edu

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# **Micro Plastics and Their Implications for Human Health: An Environmental Justice Approach**

## **Introduction**

Before beginning this essay I want you to consider this question: Can you imagine a life without plastic? Think of all of the plastic that you have used this past week. Did you drink out of a plastic water bottle? Did you buy something in a plastic container? The answer is almost certainly, yes. It is not my intention to make you feel bad about your use of plastic. I, the writer of this essay, would be a hypocrite if I were trying to shame you of your plastic use. Because as I write this, I am drinking my coffee out of a plastic to-go cup. I only request that you consciously remember and consider this question while you read this essay.

This essay does not offer a solution - it merely focuses on an issue that warrants more scientific research and discussion. I do not make any claims as to being an expert on this topic nor do I make any as a scientist. I am simply analyzing the current literature, scientific research and media coverage of an issue that necessitates more attention. This essay is broken down into various sections: information literacy and value based perspectives, critical thinking and interdisciplinary approaches, diversity awareness and cultural competence and ethical reasoning and direct action. The first thing that must be emphasized in this discussion is what environmental justice is. The Environmental Protection Agency (EPA) defines environmental justice as the “fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies”.<sup>1</sup> When we consider the implications of micro plastics in the environment on the human condition we must understand *whom* these implications can affect and *how* these implications might affect them, this is discussed in the diversity awareness and cultural competence section. We comprehend these implications through scientific research, media coverage, literature and discussion. These subjects are discussed in the information literacy section. In the critical thinking and interdisciplinary approaches section the various ways to understand and approach the issue of micro plastics will be considered. Finally, the ethical reasoning and direct action section introduces the actions we can take today and analyzes the issue of micro plastics in accordance with the mercy mission of Salve Regina University.

## **Information Literacy and Value Based Perspectives**

In 2011 it was estimated that 300 million tons of plastic were produced that year globally.<sup>2</sup> Since then the estimated plastic production has only increased, growing 3.4% in 2015.<sup>3</sup> With millions of tons of plastic being produced every year, where is it all going? Some of this plastic ends up in landfills, others in recycling plants where it is melted down to be converted for another use, while the rest ends up in the environment. It is estimated that 8 million tons

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<sup>1</sup> "Learn About Environmental Justice." EPA. January 11, 2017. Accessed May 04, 2017. <https://www.epa.gov/environmentaljustice/learn-about-environmental-justice>.

<sup>2</sup> Wassener, Bettina. "Raising Awareness of Plastic Waste." The New York Times. August 14, 2011. Accessed May 04, 2017. <http://www.nytimes.com/2011/08/15/business/energy-environment/raising-awareness-of-plastic-waste.html>.

<sup>3</sup> "World Plastics Production 1950-2015." *Plastics Europe: Association of Plastics Manufacturers*. Accessed May 05, 2017.

<https://committee.iso.org/files/live/sites/tc61/files/The%20Plastic%20Industry%20Berlin%20Aug%202016%20-%20Copy.pdf>.

of plastic washes from land into the ocean every year.<sup>4</sup> It takes 450 years for the average piece of plastic to degrade with some taking over 1,000 years.<sup>5</sup> Consequently, the millions of tons of plastic that are washed into the ocean every year remain there for hundreds of years. Efforts to clean up these trillions of pieces of plastic that have accumulated in the ocean have recently been developed and will begin to be implemented in 2017, focusing on locations of larger accumulations of trash such as the great pacific garbage patch.<sup>6</sup> The greater problem of plastic pollution in the ocean is not the issue that is primarily being discussed, though micro plastics are a consequence of this. Micro plastics are, put simply, the degradation of larger pieces of plastic. As plastics degrade they are not seamlessly absorbed into the environment because they are composed of materials that do not naturally occur. Instead, as plastic degrades it breaks down into smaller and smaller particles; eventually, once these particles reach a diameter equal or less than 5mm they are classified as micro plastics.<sup>7</sup> Micro plastics smaller equivalent, nano-plastics, are classified as such when they reach less than 1mm.<sup>8</sup> Micro plastics are not just created by the degradation of larger pieces of plastic though, they are also manufactured for use in cosmetics, tools and more.<sup>9,10</sup>

Why are these small, seemingly innocuous, pieces of plastic alarming? Because they are everywhere, and scientist do not exactly know the impact of their presence yet.<sup>11</sup> What scientists do know is that these small pieces of plastic are synthetic polymers and that they have been found at varying levels within the food chain.<sup>12,13</sup> A polymer is not something that is inherently bad, it is simply a molecular structure consisting of multiple units bonded together. Many polymers occur naturally but they can also be synthetic.<sup>14</sup> Plastic is an example of a synthetic polymer, but it is an unstable polymer that binds to other pollutants in

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<sup>4</sup> Lytle, Claire Le Guern. "When The Mermaids Cry: The Great Plastic Tide." Plastic Pollution. January 2017. Accessed May 04, 2017. <http://plastic-pollution.org/>.

<sup>5</sup> O'Connor, Kari. "How Long Does It Take a Plastic Bottle to Biodegrade?" Educational Articles and Tips from Postconsumers. October 31, 2011. Accessed May 04, 2017. <http://www.postconsumers.com/education/how-long-does-it-take-a-plastic-bottle-to-biodegrade/>.

<sup>6</sup> "Technology." The Ocean Cleanup. Accessed May 04, 2017. <https://www.theoceancleanup.com/technology/>.

<sup>7</sup> Walsh, Nick Paton. "What Is a Microplastic? - CNN Video." CNN. November 30, 2016. Accessed May 04, 2017. <http://www.cnn.com/videos/us/2016/11/30/microplastic-animation-explainer-midway-plastic-island-orig-io.cnn>.

<sup>8</sup> Da Costa, Joao Pinto, Patricia S.M. Santos, Armando C. Duarte, and Teresa Rocha-Santos. "(Nano)plastics in the Environment – Sources, Fates and Effects." *Science of The Total Environment* 566-567 (October 1, 2016): 15-26. Accessed May 4, 2017. doi:<https://doi.org/10.1016/j.scitotenv.2016.05.041>.

<sup>9</sup> Vidal, John. "Microplastics Should Be Banned in Cosmetics to save Oceans, MPs Say." The Guardian. August 23, 2016. Accessed May 04, 2017. <https://www.theguardian.com/environment/2016/aug/24/microplastics-ban-in-cosmetics-save-oceans-mps-say-microbeads>.

<sup>10</sup> "Micro Molding." MicroPEP. Accessed May 04, 2017. <http://www.pepmicropep.com/>.

<sup>11</sup> US Department of Commerce, National Oceanic and Atmospheric Administration. "What Are Microplastics?" NOAA's National Ocean Service. April 13, 2016. Accessed May 04, 2017. <http://oceanservice.noaa.gov/facts/microplastics.html>.

<sup>12</sup> Fries, Elke, Jens H. Dekiff, Jana Willmeyer, Marie Theres Nuelle, Martin Ebert, and Dominique Remy. "Identification of Polymer Types and Additives in Marine Microplastic Particles Using Pyrolysis-GC/MS and Scanning Electron Microscopy." *Environmental Science: Processes and Impacts*, no. 10 (August 08, 2013). Accessed May 4, 2017. doi:10.1039/C3EM00214D.

<sup>13</sup> Farrell, Paul, and Kathryn Nelson. "Trophic Level Transfer of Microplastic: *Mytilus Edulis* (L.) to *Carcinus Maenas* (L.)." *Environmental Pollution* 177 (2013): 1-3. EBSCO. Accessed April 4, 2017.

<sup>14</sup> "BBC - Standard Grade Bitesize Chemistry - Plastics : Revision." BBC News. Accessed May 04, 2017. <http://www.bbc.co.uk/bitesize/standard/chemistry/plasticsandothermaterials/plastics/revision/1/>.

the environment such as pesticides.<sup>15</sup> This means that plastic molecules that already contain harmful chemicals bind to other harmful chemicals in the environment. These pollutants can then, from binding, become an entirely different chemical.<sup>16</sup>

Studies have shown a presence of micro plastics in freshwater systems that supply drinking water to large populations. One study revealed the presence of micro plastics in the Great Lakes with a concentration around highly populated areas.<sup>17</sup> The Great Lakes is the largest freshwater system in North America, supplying 35 million people with drinking water.<sup>18</sup> This implies that micro plastics are present in drinking water that 35 million people are consuming every day. As not much is known about micro plastics in freshwater systems, not much study has been done and the implications of plastic in drinking water on human health are not yet understood.

While not much is known about micro plastics in freshwater systems, some information is known about micro plastics in oceans globally. Micro plastics have been found at varying levels within the ocean.<sup>19</sup> They have also been found among varying levels of the food chain within the stomachs and tissues of various aquatic organisms.<sup>20</sup> There has been a study done regarding trophic transfer of micro plastics upon ingestion of an animal with micro plastics in its system, and those have revealed that micro plastics do transfer from one trophic level to another upon consumption of that organism.<sup>21</sup> While this study was done within a controlled lab environment, another study revealed micro plastic presence in mussels that were specifically cultured for human consumption. It established that, “when consuming an average portion of mussels (250 g wet weight) one consumes around 90 particles. An average portion of 6 oysters (100 g ww) contains around 50 particles.” Based on their findings, they then estimated that, “European top consumers will ingest up to 11,000 microplastics per year, while minor mollusc[sic] consumers still have a dietary exposure of 1800 microplastics [per] year.”<sup>22</sup> Further study on the implications of the consumption of micro plastic on human life have not been done, and there is no current study underway on this issue. However, there have been studies on what the consumption of micro plastics do to marine life.

Consumption of micro plastics are fairly common among marine life.<sup>23</sup> While studies on micro plastic ingestion are relatively new, there have been some done regarding the

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<sup>15</sup> "Microplastics and the Threat to Our Seafood." Ocean Health Index. Accessed May 04, 2017. <http://www.oceanhealthindex.org/news/Microplastics>.

<sup>16</sup> Fries, Elke, Jens H. Dekiff, Jana Willmeyer, Marie Theres Nuelle, Martin Ebert, and Dominique Remy. "Identification of Polymer Types and Additives in Marine Microplastic Particles Using Pyrolysis-GC/MS and Scanning Electron Microscopy."

<sup>17</sup> Zbyszewski, M., Corcoran, P. L., Hockin, A. (2014). "Comparison of the distribution and degradation of plastic debris along shorelines of the Great Lakes, North America," *Journal of Great Lakes Research*, 40(2), p. 288-299. Accessed April 20, 2017.

<sup>18</sup> Grant, UW Sea. "Great Lakes and Wisconsin Water Facts." University of Wisconsin Sea Grant Institute. Accessed May 04, 2017. <http://www.seagrant.wisc.edu/Home/AboutUsSection/PressRoom/Details.aspx?PostID=796>.

<sup>19</sup> US Department of Commerce, National Oceanic and Atmospheric Administration.

<sup>20</sup> Farrell, Paul, and Kathryn Nelson. "Trophic Level Transfer of Microplastic: *Mytilus Edulis* (L.) to *Carcinus Maenas* (L.)."

<sup>21</sup> Idib

<sup>22</sup> Cauwenberghe, Lisbeth Van, and Colin R. Janssen. "Microplastics in Bivalves Cultured for Human Consumption." *Environmental Pollution* 193 (2014): 65-70. EBSCO. Accessed April 4, 2017

<sup>23</sup> Depledge, MH, F. Galgani, C. Panti, I. Caliani, and MC Fossi. "Plastic Litter in the Sea." *Marine Environmental Research* 92 (December 2013): 279-81. Accessed May 5, 2017. doi:<https://doi.org/10.1016/j.marenvres.2013.10.002>.

accumulation of micro plastic within the aquatic organism and what this accumulation causes. In mollusks, micro plastics collect in the gut. If this collection of micro plastics does not block the gut leading to the death of the animal they move to the circulatory system. Once in the circulatory system, some micro plastics pass through the organism while some retain in the tissue.<sup>24</sup> In fish the ingestion of micro plastic effects their behavior. Some consequences of micro plastic ingestion that have been found in fish include reduced reproductive ability, decreased feeding ability, abnormal behavior and death.<sup>25</sup> If humans are eating these aquatic animals that contain micro plastic, and the ingestion of micro plastic adversely effects these animals, what does this mean for human health?

Media coverage on micro plastic research has been appropriate in regards to timing, meaning that as studies are published on micro plastics there seems to be corresponding articles on popular news sites such as CNN and BBC. On CNN you can find a video explaining what a micro plastic is and it's currently known effects on the aquatic food chain, along with many articles describing the current research on micro plastics and their effect on the environment.<sup>26</sup> On BBC you can find additional articles of a similar variety.<sup>27</sup> In addition to micro plastics coverage in the media, there has been some legislative action taken on a type of micro plastic called microbeads which are tiny plastic beads that were commonly used in facial soaps for exfoliation purposes. Microbeads were banned in 2015 by President Obama after studies showed they were increasingly present in and polluting United States waterways.<sup>28</sup> While microbeads have been banned, micro plastics have not been addressed in United States legislation. Additionally, not much research has been conducted on micro plastics effect on the environment within the United States. Part of the reason of this being there is no standardized method to effectively count micro plastics. The National Oceanic and Atmospheric Association expands on this stating:

As an emerging field of study, not a lot is known about microplastics and their impacts yet. The NOAA Marine Debris Program is leading efforts within NOAA to research this topic. Standardized field methods for collecting sediment, sand, and surface-water microplastic samples have been developed and continue to undergo testing. Eventually, field and laboratory protocols will allow for global comparisons of the amount of microplastics released into the environment, which is the first step in determining the final distribution, impacts, and fate of this debris.<sup>29</sup>

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<sup>24</sup> Browne, Mark Anthony, Tamara Susan Galloway, Awantha Dissanayake, and Richard C. Thompson. "Ingested Microscopic Plastic Translocates to the Circulatory System of the Mussel, *Mytilus Edulis* (L.)." *Environmental Science and Technology* 42, no. 13 (July 2008).

<sup>25</sup> Lusher, AL, M. McHugh, and RC Thompson. "Occurrence of Microplastics in the Gastrointestinal Tract of Pelagic and Demersal Fish from the English Channel." *Marine Pollution Bulletin*, 2012. Accessed May 4, 2017. doi:<http://dx.doi.org/10.1016/j.marpolbul.2012.11.028>.

<sup>26</sup> Walsh, Nick Paton. "What Is a Microplastic? - CNN Video." CNN. November 30, 2016. Accessed May 04, 2017. <http://www.cnn.com/videos/us/2016/11/30/microplastic-animation-explainer-midway-plastic-island-orig-io.cnn>.

<sup>27</sup> Kinver, Mark. "Video Captures Moment Plastic Enters Food Chain." BBC News. March 11, 2017. Accessed May 05, 2017. <http://www.bbc.com/news/science-environment-39217985>.

<sup>28</sup> Pallone, Frank. "H.R.1321 - 114th Congress (2015-2016): Microbead-Free Waters Act of 2015." Congress.gov. December 28, 2015. Accessed May 05, 2017. <https://www.congress.gov/bill/114th-congress/house-bill/1321>.

<sup>29</sup> US Department of Commerce, National Oceanic and Atmospheric Administration. "What Are Microplastics?" NOAA's National Ocean Service. April 13, 2016. Accessed May 04, 2017. <http://oceanservice.noaa.gov/facts/microplastics.html>.

The NOAA, or National Oceanic and Atmospheric Association, is a government agency within the United States Department of Commerce tasked with the purpose of evaluating the conditions of the oceans and atmosphere through environmental research.<sup>30</sup> With the recent election of United States President Donald Trump the NOAA has faced the proposition of an incredible budget cut to their programs.<sup>31</sup> This would mean research on topics that affect human health such as micro plastics could be delayed or completely terminated.

Social media discussion on the topic of legislatures defunding the NOAA and other related programs has been popular while the issue of micro plastic is less popular with the last post on twitter regarding the subject being over a month ago.<sup>32,33</sup> Discussion of micro plastic on Facebook is much more popular. There are many informational videos covering micro plastics on Facebook created by news websites, magazines and researchers. These informational videos have been widely shared and discussed.<sup>34</sup>

In addition to these conversations online there are two informational documentaries called *A Plastic Ocean* and *A Plastic Paradise* that have respectively been released in 2016 and 2013.<sup>35,36</sup> These documentaries cover the current accumulation and effects of plastics on oceans and marine life worldwide and what it may mean for the future. The release of these films could have sparked much conversation regarding plastic consumption and pollution; however, not much discussion has been done other than the documentary *A Plastic Paradise* having a corresponding twitter account.<sup>37,38</sup> Conversations on social media are necessary for the public's knowledge and understanding of plastics and their effect on the environment. Increasing the study and awareness of micro plastics can increase awareness of our impact as a species and allow us to make further educated decisions on the actions we will take on plastic use in the future. Discussion can also lead to further developments on cleaning pollution.

## Critical Thinking and Interdisciplinary Approaches

The cumulative reality today is that our way of life, as a species, is unsustainable. Research shows that we are consuming plastic daily, effectively poisoning ourselves while subsequently poisoning the earth around us through the production and accumulation of

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<sup>30</sup> *ibid*

<sup>31</sup> Mooney, Chris. "Proposed Budget for Commerce Would Cut Funds for NOAA." *The Washington Post*. March 16, 2017. Accessed May 05, 2017. [https://www.washingtonpost.com/business/economy/proposed-budget-for-commerce-would-cut-funds-for-noaa/2017/03/15/6c93d864-09ad-11e7-93dc-00f9bdd74ed1\\_story.html?utm\\_term=.c7c2f3e2388a](https://www.washingtonpost.com/business/economy/proposed-budget-for-commerce-would-cut-funds-for-noaa/2017/03/15/6c93d864-09ad-11e7-93dc-00f9bdd74ed1_story.html?utm_term=.c7c2f3e2388a).

<sup>32</sup> "Defunding+noaa+ - Twitter Search." *Twitter*. April 25, 2017. Accessed May 05, 2017. <https://twitter.com/search?q=defunding%2Bnoaa%2B&src=typd&lang=en>.

<sup>33</sup> "Microplastic - Twitter Search." *Twitter*. May 02, 2017. Accessed May 05, 2017. <https://twitter.com/search?q=microplastic&src=typd&lang=en>.

<sup>34</sup> "Facebook." *Search*. Accessed May 05, 2017. <https://www.facebook.com/search/videos/?q=microplastics>.

<sup>35</sup> *A Plastic Ocean*. Produced by Jo Ruxton and Adam Leipzig. Directed by Craig Leeson. 2016. Accessed May 5, 2017. <https://www.plasticoceans.org/film/>.

<sup>36</sup> *Plastic Paradise: The Great Pacific Garbage Patch*. Directed by Angela Sun. Performed by Lewis Goldsmith and Angela Sun. 2013. <http://plasticparadisemovie.com/>.

<sup>37</sup> "A+plastic+ocean - Twitter Search." *Twitter*. Accessed May 05, 2017. <https://twitter.com/search?q=a%2Bplastic%2Bocean&src=typd&lang=en>.

<sup>38</sup> Paradise, Plastic. "Plastic Paradise (@plasticpdise)." *Twitter*. May 03, 2017. Accessed May 05, 2017. <https://twitter.com/plasticpdise?lang=en>.

waste. This progressive accumulation of waste is effectively making the environment more hostile, consequently shortening the amount of time that we have on this earth as a species. Roy Scranton in his book, *Learning to Die in Anthropocene: Reflections on the End of a Civilization* starkly reminds us:

Across the world today, our actions testify to our belief that we can go on like this forever, burning oil, poisoning the seas, killing off other species, pumping carbon into the air, ignoring the ominous silence of our coal mine canaries in favor of the unending robotic tweets of our new digital imaginarium. Yet the reality of global climate change is going to keep intruding on our fantasies of perpetual growth, permanent innovation and endless energy, just as the reality of mortality shocks our casual faith in permanence.<sup>39</sup>

Today we are facing incredible consequences due to our current ways of life such as global warming, ocean pollution and more. Yet, we continue onto the next new development in technology as if there were no environmental consequences. While the development of micro plastics is an issue, it is relatively minor in comparison to the greater issue of the persistent production of plastic and its corresponding waste and pollution in the environment. Responses have varied to this reality, some scientists have given up and announced “we’re totally fucked”<sup>40</sup> while some members of the public choose to ignore it.<sup>41</sup> An incredibly influential world leader has even publicly announced his belief that climate change is a myth propagated by China.<sup>42</sup>

The issue of the presence of micro plastics in our water and food chain is purely an effect of our way of life on the earth. This means that to truly solve the issue of micro plastics in our water our current way of life need to change and we need to be capable of comprehending the consequences of our actions. This capability of looking and comprehending this cumulative reality requires a new way of thinking. One of the changes we need to make is that we need to make the environment a priority, or, as Timothy Morton says in his book *The Ecological Thought*, we need to “think ecologically”. “Ecology shows us that all beings are connected. The ecological thought is the thinking of interconnectedness. The ecological thought is a thought about ecology, but it's also a thinking that is ecological. Thinking the ecological thought is part of an ecological project”.<sup>43</sup> We need to incorporate ecological thinking into a new way of living, transcending social, political and cultural boundaries.

To address a multifaceted issue such as this, taking an interdisciplinary approach is necessary. This means that to understand an issue such as micro plastics and its implications, it must be understood not only scientifically, but also historically and socially. Pope Francis addresses this in his book *Laudito Si: On Care for our Common Home*: “Today, however, we have to realize that a true ecological approach always becomes a social approach; it must

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<sup>39</sup> Scranton, Roy. *Learning to Die in the Anthropocene: Reflections on the End of a Civilization*. City Lights Publishers, 2015.

<sup>40</sup> Zolfagharifard, Ellie. "We're F\*\*\*\*\*: Climate Change Will Be Catastrophic for Mankind after Study Reveals Methane Leaking from the Arctic Ocean, Scientist Warns." Daily Mail Online. August 08, 2014. Accessed May 05, 2017. <http://www.dailymail.co.uk/sciencetech/article-2719727/Were-f-ked-Climate-change-catastrophe-mankind-study-shows-methane-leaking-Arctic-Ocean-scientist-warns.html>.

<sup>41</sup> Marshall, George. *Don't Even Think about It: Why Our Brains Are Wired to Ignore Climate Change*. London: Bloomsbury, 2015.

<sup>42</sup> Trump, Donald J. Twitter. November 06, 2012. Accessed May 05, 2017. <https://twitter.com/realdonaldtrump/status/265895292191248385?lang=en>.

<sup>43</sup> Morton, Timothy. *The Ecological Thought*. Harvard University Press, 2015. Print.

integrate questions of justice in debates on the environment, so as to hear both the cry of the earth and the cry of the poor".<sup>44</sup> In changing our approach to living on the earth, understand the implications of changing for everyone is necessary.

To truly solve the issue of micro plastics in waterways we must discontinue the production and use of plastic. Sure, we can suspend the production of micro plastics themselves; however, there are larger pieces of plastic in waterways that will degrade and disintegrate into micro plastics just as rocks become sand. This is the reason why, if plastic use is not discontinued almost all efforts to resolve the issue of micro plastics in our waterways will be relatively insignificant. Critical thinking, ecological thinking and interdisciplinary approaches are all equally necessary in addressing the issue of plastics and micro plastics in the environment.

## Diversity Awareness and Cultural Competence

It is apparent that the repercussions of micro plastics in the environment effect everyone globally; however, these implications could affect some more than others. This is where diversity awareness and cultural competence is necessary in the consideration and discussion of micro plastics in the environment and their impact on human life. Within the United States poor communities suffer a disproportionate amount of pollution compared to that of wealthier communities.<sup>45</sup> This is also true globally.<sup>46</sup> One of the reasons low income communities suffer a disproportionate amount of pollution is because they are more likely located closer to hazardous waste sites, landfills and industrial areas in comparison to wealthier communities.<sup>47</sup> In addition to this, low income communities are more likely to be targeted for waste dumping sites.<sup>48</sup>

A notable factor among low income communities within the United States is that they are primarily composed of a majority minority group.<sup>49</sup> Some highly publicized examples of pollution adversely effecting low income minority communities in the United States are the Flint, Michigan water crisis in 2014 and the Warren County, North Carolina PCB landfill in 1973 among others. Briefly consider Flint, Michigan's water crisis. Flint, Michigan is mainly composed of a low income minority group.<sup>50</sup> In 2014, the water source for the town was changed leading to toxic levels of lead within the water. This led to adverse health effects for the residents of Flint, and, once the issue was recognized, many could not afford to leave.<sup>51</sup>

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<sup>44</sup> Francis. *Laudato Si': On Care for Our Common Home*. Frederick, MD: Word Among Us, 2015. Print.

<sup>45</sup> Collins, Mary B., Ian Munoz, and Joseph Jaja. "Linking 'toxic Outliers' to Environmental Justice Communities." *Environmental Research Letters* 11, no. 1 (January 26, 2016). Accessed May 5, 2017.

<sup>46</sup> *Global Alliance on Health and Pollution Annual Report*. Report. New York, Ny: Global Alliance on Health and Pollution, 2015. [http://74.220.18.60/wp-content/uploads/2017/01/GAHP\\_AnnualReport15Sm-1.pdf](http://74.220.18.60/wp-content/uploads/2017/01/GAHP_AnnualReport15Sm-1.pdf)

<sup>47</sup> Bullard, Robert Doyle. *Dumping in Dixie race, class, and environmental quality*. Boulder, Colo: Westview Press, 2000.

<sup>48</sup> *ibid*

<sup>49</sup> Proctor, Bernadette D., Jessica L. Semega, and Melissa A. Kollar. "Income and Poverty in the United States: 2015." *United States Census Bureau*, September 2016. Accessed May 5, 2017. <https://www.census.gov/content/dam/Census/library/publications/2016/demo/p60-256.pdf>.

<sup>50</sup> "Flint, Michigan (MI) Poverty Rate Data Information about poor and low income residents." Flint, Michigan (MI) poverty rate data - information about poor and low income residents living in this city. Accessed May 05, 2017. <http://www.city-data.com/poverty/poverty-Flint-Michigan.html>.

<sup>51</sup> Kennedy, Merrit. "Lead-Laced Water In Flint: A Step-By-Step Look At The Makings Of A Crisis." NPR. April 20, 2016. Accessed May 05, 2017. <http://www.npr.org/sections/thetwo-way/2016/04/20/465545378/lead-laced-water-in-flint-a-step-by-step-look-at-the-makings-of-a-crisis>.

The fight between residents and the Flint administration was highly publicized and their water crisis sparked a national debate on environmental racism with the ongoing question being: would their water crisis have happened if they were composed of a rich, majority white community?<sup>52</sup> This question also arose with the dumping of PCB in Warren County, North Carolina, one of the poorest and most minority counties in North Carolina in 1973. The events that took place within the county led to the birth of the environmental justice movement and sparked a national discussion on environmental racism.<sup>53</sup>

Occurrences such as these must be considered when the implications of micro plastics on human health are discussed. Based on the above facts, it is highly possible that low income communities could also suffer more from the adverse effects of micro plastic in comparison to that of wealthier communities due to the unequal societal structures already in place. Some questions to consider are: What would the implications of micro plastics polluting the food chain mean for low income and minority communities? What happens when humans, on a global scale, realize that micro plastics are being consumed via seafood every day? Will our global unequal social structure remain among food and water quality?

### **Ethical Reasoning and Direct Action**

The mission of Salve Regina University:

As a community that welcomes people of all beliefs, Salve Regina University, a Catholic institution founded by the Sisters of Mercy, seeks wisdom and promotes universal justice. The University through teaching and research prepares men and women for responsible lives by imparting and expanding knowledge, developing skills, and cultivating enduring values. Through liberal arts and professional programs, students develop their abilities for thinking clearly and creatively, enhance their capacity for sound judgment, and prepare for the challenge of learning throughout their lives. In keeping with the tradition of the Sisters of Mercy, and recognizing that people are stewards of God's creation, the university encourages students to work for a world that is harmonious, just and merciful.<sup>54</sup>

Currently many communities are suffering from environmental justice issues such as environmental racism, people are consuming micro plastics daily without the knowledge of doing so or the knowledge of what it could do to them and we are effectively choking our oceans. What is merciful about environmental racism? What is harmonious about people consuming micro plastic without any knowledge of it? Does the reality that we, as a species, are choking our oceans sound just? For issues such as this, giving the issue the justice of recognition is pertinent. The justice of "recognition is typically concerned with respecting identities and cultural difference, it is about the extent to which different agents, ideas and cultures are respected and valued in interpersonal encounters and in public discourse and

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<sup>52</sup> Eligon, John. "A Question of Environmental Racism in Flint." The New York Times. January 21, 2016. Accessed May 05, 2017. [https://www.nytimes.com/2016/01/22/us/a-question-of-environmental-racism-in-flint.html?\\_r=0](https://www.nytimes.com/2016/01/22/us/a-question-of-environmental-racism-in-flint.html?_r=0).

<sup>53</sup> "History: Warren County, NC." Environmental Injustice. Accessed May 05, 2017. [https://sites.duke.edu/docst110s\\_01\\_s2011\\_sb211/what-is-environmental-justice/history/](https://sites.duke.edu/docst110s_01_s2011_sb211/what-is-environmental-justice/history/).

<sup>54</sup> "Mission Statement." Mission Statement | Salve Regina University. Accessed May 05, 2017. <http://www.salve.edu/about/mission-statement>.

practice”<sup>55</sup>. To truly address the issue of micro plastics we must treat it as a global issue instead of something that only one class, culture or country must deal with. Unequal societal structures can hinder the efforts to solve an issue such as micro plastics. In addition, public knowledge, discussion and recognition of the issue can lead to increased efforts and expand knowledge of global pollution and its effects on the environment and daily life.

## Conclusion

The current manufacture, use and disposal of plastics has various negative implications on the global environment and our way of life. The adverse effects of micro plastics on us and the environment are becoming increasingly clear. Scientific research and study on the issue highlight the fact that every piece of plastic produced today is just another piece of plastic that eventually ends up in the environment. This reality is due to the fact that plastic takes a very long time to decompose. Although scientific research and studies show that the issue of plastics is expanding and their implications are proving to affect our life and environment globally, we continue to produce plastic and ignore the problems that our production of plastic are causing. Each piece of plastic produced today will eventually add to the growing pile of plastics in the environment. We can minimize this by recycling the plastic we use, but, this merely turns one piece of plastic into another with a different purpose. Eventually, it will either end up back in the recycling plant, or, in the environment. While we can recycle plastic and clean up the plastic that is already in the environment, these are short term solutions that merely delay the fact that we cannot successfully clean plastic pollution if millions of tons of plastic continue to be produced every year. The reality is: to effectively clean up and discontinue plastic pollution we need to terminate global plastic production. If this does not happen almost any effort to clean plastic or solve the problem of micro plastic will be ineffective which leads to the question I asked earlier: can you imagine a life without plastic?

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