Spring 2018

Legacies of War: How the Commercialization of Plastics in the United States Contribute to Cycles of Violence

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Abstract

Plastic manufacturing practices developed and justified during World War II transitioned into the commercial space, entered our homes, and became part of everyday life. This proliferation was due in large part to the consolidation of manufacturing processes organized and subsidized by government contracts and the plastics industry leaders' marketing dynamism. Plastics are in the cars we drive, the way we package our food, and are invaluable throughout the medical field. Moreover, the use of plastics has tangible environmental and health ramifications. The plastics industry and consumption patterns in the United States contribute significantly to hydrocarbon emissions, ecological violence, and the perpetuation of global structural violence through production and waste management flows. Methods like recycling, single use plastics bans, United Nations Sustainability Goals, informed consumers, and the nonprofit sector are all working to restore ecological peace. While this is a necessary step for the planet's wellbeing, we must also transform the underlying notions and cultural methods which perpetuate industry standards and consumption patterns. This study will focus on how the direct violence of WWII, supported the commercialization of the plastics industry through structural and cultural violence, eventually leading to environmental degradation. While post-war reconstruction, reconciliation, and resolution are often reserved for geographies experiencing high levels of direct violence, I propose we integrate environmental justice into peacebuilding by analyzing the industries created during war time, through the "3Rs" (Reconstruction, Reconciliation, and Resolution) in efforts to detract from cycles of violence and promote shifts toward positive peace.

Introduction

The United States economy continues to be formed by conflict, which informs the United States' present and future economic and international landscape. This is being written at a time where the President of the United States, decided to take the United States out of the Paris Agreement, making this research of particular importance. The manner in which products are developed, subsidized, and justified during war time and transition into the commercial space, enter our homes, and become part of everyday is said to be left to market influences, but are often rooted deeper in our history.

An example of how quickly and pervasively technology can influence our global environment and violence is the use of plastics. The plastics industry was in its infancy until it was subsidized by the United States government during World War II. The war effort benefited from this innovative substance. Jobs were created, more and more uses were discovered and engineered as the use of molds were developed, skyrocketing production levels. After World War II, the factories created to incorporate plastic into equipment manufacturing turned toward consumer bases in the United States and began marketing plastic as a panacea for anything from food storage to telephone cases (Knight, 2014). By 1975, plastics began to be marketed as "disposable" with the introduction of the polyethylene terephthalate (PET) soda bottle (Rogers, 2005). Once it was introduced and marketed to the American public, manufacturing and consumption of plastics proliferated. The consequences of these consumption patterns do not stay within the US.

Currently, around 19 billion pounds of trash ends up in the world's oceans each year, 81% of which is plastics (Mosbergen, 2017). The United States ranks number eleven in per capita CO^2 emissions (Smith, 2017), plastic production being a large contributor. Within four

generations, the use of plastic products went from something being used as a casing for war radios to single-use products like straws and lids, which are only used for as long as it takes us to consume a cup of iced coffee (Altman, 2017). As of 2013, the US' largest export is waste (Humes, 2013). Through globalization, post-war technologies ripple into other economies through trade relationships as well as by creating global norms of production and consumption. The United States is not only exporting waste abroad to be processed, but also its post-war commercial and development practices. Problems associated with climate change, such as increases in the likelihood of natural disasters and food insecurity, disproportionately impact developing countries (Center for Global Development, n.d.) and often lead to propagation or exacerbation of direct violence.

The solution lies not only in assisting those countries which will be most affected by these policies, but in understanding how these systems came to be and formulating best practices to prevent future environmental violence. Plastics are not inherently destined to be a destructive force. It has many uses, within the medical industry for instance, innovative treatments and devices could not have been accomplished without their development. However, we could adopt measures to mitigate negative aspects of a technology and highlight its useful attributes as it enters the commercial sphere. A reprioritization needs to occur, from short term war economies to long term effects of consumption and investment.

The United States utilizes large portions of GDP on the military, as an investment toward economic growth. However, this investment creates a larger ecological footprint than any other country, the effects of which are only partially calculated. To better understand these relationships, I will explore how plastics production entered the American economy through World War II subsidies and how their proliferation contributes to ecological violence. I will then

explore possibilities for mitigating this cycle. This includes looking at what actors and methods are best suited for this task, as well as looking into what types of programs are working to reverse this dependence on plastics.

Literature Review

Before plastics was an industry, it was a budding technology. The word "technology" can include a particular item or an industry. However, when it is separated from the social contexts in which it functions technology becomes an artifact. A toothbrush is only a toothbrush in relation to teeth. It is in this way, that technology cannot be entirely separated from the social aspect or intent which dictated its inception (Kurtz, 2008). When technology is understood within the social systems in which it was designed, this is referred to as the "technological ensemble" (Kurtz, 2008, p. 6). These ensembles have been the topic of debate for many decades within the US.

Historically, technology has often been created in order to aid in the destruction of others, the groups with the most destructive forms of technology win. Past examples include gunpowder, rifles, and nuclear technology (Kurtz, 2008). Some of the most prolific technologies of our time have been researched, developed, and designed by the US Department of Defense (DOD), plastics is no exception. Many technologies that are part of our everyday like plastics, the internet, or public roads have been constructed through military funding (Martin, 2008).

President Dwight D. Eisenhower warned of the potential ramifications which military research and development could have for American democracy. In a speech in 1961, Eisenhower addressed what is known as The Military Industrial Complex, "Until the latest of our world conflicts, the United States had no armaments industry. American makers of ploughshares could, with time and as required, make swords as well. But we can no longer risk emergency

improvisation of national defense; we have been compelled to create a permanent armaments industry of vast proportions" (Swanson, 2011, p. 36) His concerns spoke to the integration of war and private interests into the US economy (Sullivan, 2011). The military industrial complex does not remain exclusive to tanks, missiles, and the like. It also extends to industries proliferated during war time. "We must guard against public policy being co-opted by 'scientific technological elite" (Swanson, 2011, p. 37). These relationships among science, industry, and the government and their effects have been a topic of debate in full effect for over fifty years (Swanson, 2011). Despite this body of work, a policy of the US has been to utilize military funding in the promotion of "dual-use" technology to drive economic development and growth (Stowsky, 1996).

"Dual-Use" technology funding is utilized not only as a method of growth, but also a way of creating an industrial and technological base should the DOD be in need or at war (Stowsky, 1996). Instead of research and development being funded solely by the DOD or by private investment only, the defense budget is shifted into private firms which share in the R&D cost, providing production and innovation capacity for the Defense Department (Perani, 1997). This inextricably links both entities with the technology being created, contributing to a "technological ensemble." Dual-use technology is sold as a way of refocusing post-war efforts by jump starting small to mid-sized businesses. These investments from the DOD are focused on pre-determined initiatives. For instance, the development of new aircraft materials or information technology are a product of dual-use policies. Dual-Use technologies are utilized by the government during and post-war to drive economic development by creating jobs and items for commercial consumption. Those who are concerned with the military industrial complex view dual-use technologies as problematic, stating that the interplay between public and private

sectors can lead to a lack of governmental oversight or create a higher propensity for technology to either have violent uses or incentivize the continuation of war.

Even though there is overlap between the government, science, and private industry, the costs associated with industries often fall outside of those participating in these business relationships. This concept of cost being associated with members outside of corporations is known in economics as externalities. “An externality is positive or negative consequence (of an economic activity) experienced by unrelated third party” (Investopedia, 2018). This can include monetary cost, but also social cost. Negative examples of this may include: water contamination, air pollution, or costs to recycle or dispose of waste. There are also positive externalities, like the research and design taken on by private firms which have positive ripple effects by contributing to a knowledge base or providing a more efficient way of implementing social services. Within economic systems like the United States, profit remains in hands of private firms. Even though these private firms pay taxes, often taxation is avoided by moving manufacturing abroad, where externalities can be passed to not only consumers but also third-party producers. Also, monetary taxation can be inefficient to offset the long-term financial and social costs experienced by those outside of these business relationships.

One cannot examine cycles of violence without referencing Johan Galtung, who posits, violence manifests itself on a community or global scale through different forms of violence. In 1969, Johan Galtung began a conversation around the delineation of several types of violence manifested in society: direct violence and structural violence. Direct violence is an effect one can physically see and experience. For instance, a person being anatomically harmed; this is the form of violence we are accustomed to discussing as interpersonal or interstate violence. It often occurs under the guise of perceived threats or land and resource shortages.

Structural violence is less immediately visible. Often referred to as social injustice, structural violence may be built into political institutions, education practices, religious institutions, or anywhere "unequal power leads to unequal life chances" (Galtung, 1969, p. 171). Structural violence implements discriminatory practices which may include: unjust laws around but not limited to land ownership, lack of access in the political and decision-making sphere, as well as nepotism and corruption in government. These practices may result in lack of economic opportunity for some, while advancing others. Through these societal channels, structural violence results in negative consequences for the health and peace of a society. Structural violence exists even before the first outbreak of direct violence, and is built into governments through laws, public policies, and preferential subsidies.

In 1990, Galtung introduced a more subtle, nuanced form of violence, cultural violence. Cultural violence is "any aspect of a culture that can be used to legitimize violence in its direct or structural form (Galtung, 1990, p. 167)." This even includes preventing communities from reaching their potential (Galtung, 1990). Cultural violence refers to those aspects of culture, which inform our behavior, whether consciously or subconsciously. Often, cultural violence is passed down from generation to generation through cultural carriers like chosen glories or chosen traumas, where we cling to aspects of our past and act out of our cultural understandings of what transpired. Chosen glories and chosen traumas are often embedded in cultures leading up to wars by granting permission to take control of a people or resources because of perceived religious, racial, or technological "advancement," or by granting cultural permission to seek vengeance. Chosen traumas and glories create meaning around loss and sacrifice following violence, becoming part of a culture's identity. Cultural violence can manifest in many forms through; media, storytelling, marketing, music, among other forms. In other words, cultural

violence is the means by which we "justify and legitimize direct or structural violence" (Galtung, 1990, p. 291).

On a macro scale, these different types of violence extend beyond an individual society to include our ecosystems. As the environmental movement gained momentum in the 1970s, peace studies began to incorporate ecological concerns by including environmental violence. Environmental violence harms the earth and its inhabitants including soil, animals, fish, plants, etc., through pollution, global warming, or other negative impacts to the biosphere. As climate change impacts our ecosystems, it results in higher numbers of floods and food shortages throughout the global south (UNDP, 2016). When evaluating and addressing environmental violence, a long-term approach must be adopted to understand the world prior to economic development and extend to multiple centuries into the future.

Peace studies currently includes four types of violence: direct, structural, cultural, and environmental. Each classification of violence relates to, is informed by, and perpetuates the others. Arai notes an important overlap between structural and environmental violence advocating for the awareness of eco-structural violence and its negative impacts on countries and peoples subjected to natural disasters due to climate change (Arai, 2017). Direct violence can lead to structural wartime policies being implemented to secure power for one group over another or promote dual-use industries which may contribute to environmental violence. Conversely, structural violence may act as a precursor to direct violence. This may present on an individual level through substance abuse, suicide, internalized oppression; on a community level through crime, interpersonal violence, and rape; or on a state level through rebel movements, terrorism, revolutions, and civil wars (Schirch, 2015, p. 24). Civil wars are more likely in contexts with structural violence such as weak democratic structures, low-income levels, and

stagnant or low economic growth, (Fearon and Laitin, 2003; Hegre & Sambanis, 2006). Once violence (direct) has broken out, it exacerbates or contributes to a cycle of violence and underdevelopment (Tadjbakhsh & Chenoy, 2007). During and leading up to direct conflict, leaders utilize cultural violence through identity politics, chosen glories, chosen traumas, and scarcity, to justify mobilization.

Just as Galtung delineates among direct, structural, and cultural violence, he uses the terms 'negative' peace to describe the absence of direct violence and the term 'positive' peace to denote the absence of both direct and structural violence (1969, p. 183). This study will operate under the notion that positive peace includes the absence of cultural and environmental violence. This is a useful way of approaching peace studies, as it shows a continuum between the types of violence and peace. We are not merely in peacetime or at war. Societies and the world at large is consistently engaged in violence to varying degrees; positive peace is on one end of the spectrum, negative peace in the middle, and direct violence at the other end of the spectrum. Each rung on this violence and peace continuum operates in between and around a dynamic interplay of policies, governmental structures, externalities, culture, psychological drivers, media, historical past, and future potential. These linkages among industry, government, military, technology and society contribute to this continuum, manifesting dynamic balances of violence and peace.

Methodology

To explore how the development of the plastics industry in the United States rippled throughout American culture, economic structures, and ecology, I will begin by utilizing skills gleaned from Theory and Practice of Peacebuilding course at the School for International Training. I will inquire into how the direct, structural, cultural, and environmental aspects of

plastics consumption interrelate by applying plastics development and consumption to Johan Galtung's violence typologies, with the addition of environmental violence. After outlining the nature of the issue, I will utilize the topics covered in my Post-War Development course to understand how we as consumers and citizens can help shape our economies in a more sustainable, violence-free way. This will involve analyzing the US through "the three R's" (reconstruction, reconciliation, and resolution). I will also examine mechanisms and actors which shape the commercial landscape. This may include, among others, feedback mechanisms which link consumers and producers, and what policies other societies are taking into consideration when adopting technologies.

The Origins of the Plastics Industry

Plastic is, "a type of synthetic or man-made polymer; similar in many ways to natural resins found in trees and other plants" (American Chemistry Council, 2018). The first prominent type of plastic, Bakelite, was invented in 1907. Bakelite was used first as a replacement for shellac and covering for electrical wiring (Meikle, 1997). Originally the term "plastic" referred to any substance which was malleable when soft and hardened upon cooling. Bakelite was an exception; once hardened Bakelite stayed hard despite being heated (Meikle, 1997). By 1911 Bakelite production was at 100,000 pounds per year, but remained somewhat volatile during production, making mass production difficult.

Early production of plastics focused on producing products as less expensive alternatives to save cost and natural resources. For instance, a comb company would utilize plastic to emulate the ivory or wood combs they originally made (Meikle, 1997). Production was decentralized, imperfect and somewhat dangerous. Throughout the 1930s the chemical company Du Pont,

among others, entered into serious production with its products being used in cars and airplanes, as well as photography and cinematography.

Investment in the advancements in plastics started to rise. Different forms of plastics begin to enter production: polystyrene, polymethyl methacrylate, cellulose acetate, and polyvinyl chloride. Soon, injection molding is developed, allowing for a more streamlined and precise manufacturing process. Injection molding merely required plastic pellets be melted into pre-made molds which were able to be used again and again. Notably in 1935, the hydraulic injection press, produced in the US by Index Machinery Corporation, began to be used in the manufacture of buttons, desk sets, and screwdriver handles. Uses, methods of production, and types of plastics continued to diversify.

Prior to the United States entering World War II in 1941, an estimated nine thousand decentralized presses were active and working across industries. After the war, by 1946, the Plastics Industry had been consolidated into 370 companies total (Meikle, 1997, Chapter 4, Section 2, para. 5). Plastic production utilized raw materials, locally available in the United States: ethylene, coal, natural gas, or petroleum. This proved extremely useful during WWII when the military was unable to source rubber, aluminum, or brass. Instead, the US could rely on the byproduct of energy sources that were already being processed. At the behest of the military, the industry developed new technology to produce more and more items for the war effort (Meikle, 1997). The industry experienced great success after the war, converting their efforts to focus on US consumers. Several heavy hitters, some of which are still in existence, are: the Dow Chemical Company, General Electric, Du Pont, Bakelite, Monsanto, Phillips Petroleum, Eastman Kodak, and Boonton Molding Company (Meikle, 1997, and Smith, 1998).

Violence Analysis

Direct Violence

World War II began abroad in 1939. The United States officially entered the war following Pearl Harbor in 1941. Between 1940 and 1945 production of plastics almost tripled. This span expanded the use of plastics to include: aircraft cockpit covers, mortar fuses, bayonet scabbards, helmet liners, and even the atom bomb, just to name a few (Meikle, 1997, Introduction, para. 2). The close of the second World War gave the plastics industry a surplus of manufacturing capacities. Partnerships between the government and the plastics industry during mobilization developed new uses, new resins, and further streamlined processing and distribution techniques.

While contracts between the US Department of Defense and plastic manufacturing companies were widespread, for the sake of brevity I will highlight the case of Du Pont, which at that time was purely a chemical company. Prior to WWII, Du Pont was charged with war profiteering when company sales went from 5 million USD to 60 million USD from 1915-1918 for the sale of explosives (Meikle, 1997, Chapter 5, Section 3, para. 1). Still the company received government contracts throughout WWII. In 1941 alone, Du Pont shipped 7.7 million pounds of nylon for use during the war (Meikle, 1997, Chapter 5, Section 5, para. 12). This soon expanded into cargo parachute, tire cord, towing ropes, mosquito nets, shoelaces, parts of machine guns, and clothing (Meikle, 1997, Chapter 5, Section 5, para. 13).

Du Pont was not the only company receiving capital investment to expand. Before the war in 1939, plastic production in 1939 was 213 million pounds per year (Meikle, 1997, Chapter 5, Section 1, para. 2). With the help of government investment and uses, by 1945 the industry was manufacturing 818 million pounds per year (Meikle, 1997, Chapter 5, Section 1, para. 3).

The expansion of the industry did not stop with the amount of plastics being produced, but the sectors working along plastics did as well. Those companies and employees working in the packaging, transportation, and design businesses benefited as well. By 1951 the amount of plastics being produced jumped from the millions to 2.4 billion pounds of plastic being produced a year.

It is hard to know how big and to what extent the plastics industry would be today without the onset of World War II. However, it is safe to say the plastics industry in the US greatly increased due to the direct violence being experienced around the globe and the US's response to that violence with the war effort. Direct violence spurred the funding of manufacturing techniques and processes, encouraged research and design of different types of plastic and products, and built a large physical and economic infrastructure which would be used later commercially.

Structural Violence

Because the components of plastics manufacturing were vast, utilizing different ratios, components, and manufacturing processes led the federal government to help standardize the production and oversight of the industry by creating of The National Bureau of Standards (NBOS). The NBOS is part of the US department of commerce and is charged with promoting innovation. Starting with only two people, the bureau expanded to over forty during the war. The industry responded by creating The Society of Plastics Engineers (SPI) to organize and liaise with the National Bureau of Standards. This created what became known as the "SPI Triangle," a bond among government, industry, and Department of Defense. Throughout the war up until the 1990s, members of the plastics industry took government jobs in the Bureau. The first to leverage this role was an industry executive, Gordon M. Kline who become technical editor of

Modern Plastics while working for the government in the National Bureau of Standards. This connection lent the bureau to take care of and protect the needs of the plastics industry cataloging techniques, processes, and products (Meikle, 1997, lo 1673). Directly following the war, there may have not been immediate knowledge of the long-term effects of plastic. However, in the decades following, there were resources and ample intellectual capital to conduct testing. They conducted exhaustive testing on the manufacturing processes and chemical properties of plastics. However, the long-term life cycle effects of plastics and their uses were left unexplored.

The SPI triangle not only built steadfast relationships and employment overlaps among these entities, but also built Plastics into the economy. Once Plastics had been established, it was used as a way of driving post-war economic development (Meikle, 1995). “Dual-use” subsidies were put in place among the Department of Defense and the Society of Plastics Engineers overseen by the National Bureau of Standards. “A plastic a day keeps Depression Away” (Meikle, 1997, Chapter 4, Section 4, para. 4) was a phrase used by contractors and government officials to note the use of plastic production to stave off development stagnation and generate economic growth. However, this dual-use approach to economic growth differed from traditional dual-use policies which focus on small to medium sized businesses.

The Plastics Industry was not many different companies whose relationship was based solely on competition. Instead, it was united through yearly retreats, strategy meetings, and representatives with the National Bureau of Standards. Also, many chemical firms, Monsanto and Du Pont for instance, were well established. These firms were holding factories, businesses, and employees relying on the industry to continue. With a surplus of plastic material, and no war effort in need of it, the industry turned to the US consumer base. Plastics were being fueled by the supply side of the equation as opposed to consumer demand. To create outlets for this ever

growing surplus, the industry employed a heavy marketing strategy and began to transition into the commercial sphere. By 1960, annual production of plastics had exceeded six billion pounds. By 2015, the grand total of all plastic made after the 1950s amounts to 8.3 billion metric tons (Dengler, 2017).

Cultural Violence

The marketing strategies crafted and adopted by the plastics industry captured the beat of the American public brilliantly. Because the industry was so united and had governmental support, a broad view of plastics in the American eye was able to be articulated, captured, and capitalized on. Plastic manufacturers successfully capitalized on the sentiment of success of the war as a marketing strategy. When the "smoke of the conflict cleared, both warriors and workers would 'return to find quite a different world' where old, familiar things will have been made more beautiful, more useful, more durable and far, far, more desirable because of Plastics" (Meikle, 1997, Chapter 6, Section 3, para. 6). This is a quote from an article published in *Modern Plastics Magazine,* a Plastics trade journal (Meikle, 1997). The United States viewed itself as a savior against the Axis powers, relying on its "superior innovation" to conduct and end the war. As plastics transitioned from the war effort to the commercial sphere, the industry knew that after a period of grit, Americans would want to make their surroundings smooth, clean, and malleable.

Technological advancement and victory represented the "chosen glory" associated with the heavy sacrifices experienced by soldiers abroad and families domestically during the war. World War II left the American population longing for more control over the elements and their surroundings. "Whether used to imitate traditional materials or to create seamless artificial surfaces, plastic established unprecedented control over the material environment" (Meikle,

1997, Introduction, Section 3, para. 7). Plastics represented control over nature, and citizens' immediate environment. What couldn't be controlled during the war was now able to be molded to fit their needs more readily, at less cost, all due to technological advancement.

The plastic industry went beyond marketing plastic as merely useful and inexpensive to be the product of the future. Companies took on marketing campaigns like Du Pont's Wonder World of Chemistry, a Du Pont exhibit which was used to show people how they "enhance" nature's capacity by expanding on it, changing it, using it in a more effective way (Meikle, 1997, Chapter 5, Section 4, para. 3). During the 1950s, "the Monsanto House" was built entirely out of plastic for The Land of Tomorrow at Disneyland. Products like Du Pont's Tupperware and its infamous parties helped solidify plastics as a household staple, making plastics the champion of women's convenience and food storage. Plastics aligned with the cultural sentiment of Americans at the time, innovation saved us and the world, and we deserve this convenience.

The industry's marketing initiatives had a far reach into American culture. The industry was known for promoting and paying designers to use plastic as a medium for furniture design, home design, and even fashion. A large marketing opportunity arrived with the onset of space exploration which relied on synthetics like Mylar, foams, nylon, Teflon, and heat resistant synthetics. Plastic was integrated into TV specials like "Plastic Man" and Disney programs where Donald Duck creates objects using plastic. The industry touted it was the dawning of a new era, the likes of the bronze, gunpowder, or steel, "The Plastics Age" (Meikle, 1997, Chapter 3, Section 2, para. 1).

In the 1970s, as the environmental movement began to recognize potential harm plastics could be having on the environment, plastics employed marketing strategies stating that plastics were a "natural synthetic" and man was utilizing what nature had already made. This kept plastic

production from any major disruptions. The modern day version of this is “bioplastics.” Made from plant material but are only compostable in specific areas with the appropriate facilities. It is common for those who recycle to feel they are doing their part to counter the negative impacts of plastics. However, recycling carries little coordination and regulation ensuring the plastic recycled is completed in a sustainable way (Johnson, 2016). Also, marketing campaigns promoting recycling and biodegradable plastics are inaccurately presented as viable counterbalancing strategies. Currently, plastics are experiencing higher consumption levels than ever before.

“Cultural violence makes direct and structural violence look, even feel, right - or at least not wrong” (Galtung, 1990, p. 29). While Galtung did not specifically mention environmental violence in this quote, the sentiment applies. The consumption of plastics in the US is rooted in an overarching chosen “right” to convenience and access to technological “advance.” Plastic has been built into the culture and day to day life of citizens, making us more and more psychologically removed from the effects we are having on the environment. This distance is a function of US exceptionalism manufactured or deepened during World War II, relying on the denial of the collective self as a potential source of violence (Galtung, 1996), and leaving the public susceptible to marketing strategies.

Environmental Violence

It was not until the 1970s, with the publishing of *Silent Spring* by Rachel Carson, that the environmental effects of chemical companies came into question. Still both the uses and types of plastics being crafted by “Big Science” boomed. As the uses of plastics rose, the lifespan of plastic products decreased dramatically (Altman, 2017). Originally, plastics like Bakelite were hard and could be used for decades, now the lifespan of plastics has been shortened to the time it

takes to finish a meal, becoming “disposable” with single use plastic products. Plastics are a valuable resource, one that is sent to landfills causing environmental damage and leading to the production of more plastics.

Examples of plastics we use every day are Acrylonitrile-Butadiene-Styrene (ABS), Nylon, Acrylic, Polycarbonate, Polyester, Teflon, Silicone, Tetron, recyclable Thermosets, Polyurethane. PET most commonly used for packaging and beverage bottles is one of the most expansively used plastics. PET can cause harmful health effects with exposure to the sun, washing, or hot liquid cause chemical leaching. Polystyrene, better known by its marketing name Styrofoam, used in takeout boxes and disposable cutlery is highly carcinogenic (Sivaramanan, 2016). High density polyethylene (HDPE) is used commonly in buckets, toys, grocery bags, and is a large emitter of ozone depleting hydrocarbons as well as chemicals which cause groundwater pollution and coal ash during production (Sivaramanan, 2016). PVC is a softer more malleable plastic like we see in cling film, pipes, shower curtains, and is the most toxic of all plastics causing cancer, disrupting hormones, and is one of the most difficult to recycle. Low density polyethylene (LDPE), the type of plastic used in milk cartons is durable but still able to be recycled readily. Polypropylene is used for baby bottles, microwave covers, inside of cans and may be recycle. Polycarbonate is used in medical supplies and can stand vast temperature differentials (Sivaramanan, 2016). The reason I chose to highlight these classifications is to note that not all plastics are created equal: some plastics cause cancer, some do not, some are recyclable, some are not, some products are used in the medical field, and some are not. However, the policies surrounding plastics do not speak to the vast array of their uses and the processes necessary to recycle or ban these prospective types.

Similarly, all recycling methods are not created equal. While recycling may reduce the amount of plastic being created, different recycling methods can be more harmful than others. These efforts can be categorized by primary recycling, secondary recycling which converts used plastics into sheets or threads to be reused, tertiary recycling which uses chemicals to break down the plastics to be reformed or burned to be used as fuel is gaseous form, and quaternary recycling which uses the plastics to produce steam and then energy. While each recycling method replaces the need to create new plastics, it still carries its own pollution concerns. For instance, one quaternary recycling method utilized to recycle plastic is to add oxidizing minerals to plastics to break them down into small pieces. These small pieces of plastic often end up polluting water and accumulating in the bodies of sea animals. Often, marketers will promote bags as being made from composted plastics when, in reality, these quaternary recycling methods have been used (Sivaramanan, 2016).

When not recycled, plastic often ends up in landfills or at sea. The most utilized method of processing plastics is the use of landfills. Landfills discharge chemical waste into waterways and the earth (Meikle, 1997, Chapter 6, Section 6, para. 8), affecting surrounding communities and wildlife. Oftentimes plastics do not make it to landfills. Currently there are five gyres composed entirely of plastic litter floating in the oceans. These gyres amount to 5.25 trillion pounds, approximately 270,000 tons (Sivaramanan, 2016, Chapter 6, Section 7, para. 1). There is a plastic gyre between Hawaii and California the size of Europe (Five Gyres, 2018). Gyres like this one are devastating to marine life, where they live within plastic filled waters, often ingesting plastic. These plastics take up to 450 years to break down. Eighty percent of this plastic trash comes from Canada, the United States, and Asia (Sivaramanan, 2016, Chapter 6, Section 7, para. 2).

Many plastics can cause harm to individuals, not just the environment. Chemicals are released from plastics during production, use, and breakdown. Not only can it poison drinking water, it can lead to skin conditions like dermatitis, affect immunity, cause cancer, increase developmental issues in babies, neurotoxicity, organ damage (notably liver, thyroid, and kidney), sterility problems with reproduction in both males and females, and even produce tumors (Johnson, 2016, Cohen, 2010). It has even been linked to endocrine disruption, type two diabetes, and miscarriages (Sivaramanan, 2016, Section 2, Harmful Effects, para. 3).

The Linkages

Direct, structural, cultural, and environmental violence interact with, influence, and reinforce one another. During the direct violence encountered globally during World War II, technology and science began to interact in the US in a greater way, having large and long-term impacts on manufacturing and consumption patterns of citizens (Kurtz, 2008). Military spending throughout times of and after direct violence promoted structural, cultural, and environmental violence. Historically, there is an inverse relationship between military spending and environmental noncompliance, the more a state spends on its military, the less environmental compliance there will be (Carbonell, 2015). This is true in the United States which has the highest per capita footprint in the world (Jorgenson, 2003), and spends more than any other country on its military (Carbonell, 2015). Not only is there a link between military spending and environmental noncompliance or environmental violence, but this link also applies to gross domestic product. The higher the GDP and military spending of a country, the higher the ecological footprint (Jorgenson and Clark, 2009, p. 642). This rings true of the US as well, where high military spending, development, and environmental harm are linked.

Ecological footprints from development and military practices are symptoms of underlying structural issues and should both be considered when combating emissions and environmental degradation (Jorgenson and Clark, 2009). The structures set in place through dual-use policies, and the proliferation of plastics industrialization led to a cultural mindset of convenience and the human right to control and consume plastics. This need for cheaper products, drove higher consumption levels, and further entrenchment of plastics into the US economy.

The environmental impact is not only caused by military operations, but also through the industrialization processes developed during war. “Massive industrialization following the Second World War has implied a profound restructuring of ecosystems and human life in them, starting from the workplace itself and expanding to the industrial site, the local community and the larger environment” (Barca, 2014, p. 6). This quote speaks not only to the reformulation of the US economy during and after direct violence had taken place, but also to the levels of which these shape us, our communities and our environments globally.

The globalization of plastic manufacturing, consumption, and the generation of waste which accompanies it, is a form of global structural violence: the west consumes more for less, leaving others vulnerable to the overall global environmental damage created through global warming, but also in creating precedent for others to compete in the global economies the US has “developed.” Setting large scale plastic consumption as a precedent, led to larger amounts of industrialization, consumption, and the environmental violence associated with both.

Climate change and direct violence are directly linked by their relationship to scarcity (Zimmerer, 2014). The death of coral reefs, due to CO^2 emissions, will result in the loss of habitat to many species of fish and sea life which will impact not only our ecosystems, but also

the human communities which rely on the seas as sources of food. Environmental damage leads to environmental insecurity and can exacerbate other precursors to violence like weak democratic institutions or high levels of inequality (Barnett, 2007). Also, marine life forms a large basis for other Life on Earth, without which could cause great scarcity.

To seek security, the economies utilized to encourage peace, alongside structures and cultures, have led to far reaching levels of environmental violence. In order to fight for security during World War II, the US government enacted structural development initiatives to increase plastics production. While this may have helped stave off invasion and helped the Allied forces win the war, the negative effects of this investment have been far reaching, irreversibly harmful to the environment on which we rely. Lloyd states this interconnectedness perfectly, "Militarization orients political economies and institutions to military projects and discursively shapes social relations, values, and geographic understandings in ways that prioritize military goals, promote martial values, and legitimate the use of force to solve social problems" (Lloyd, 2009, p. 864). Just as it is impossible to take the social context out of technology, it is difficult to separate these different forms of violence. The structures and mindsets surrounding the plastics industry are pervasive, reaching into many facets of society. It makes you question; What can be done to reverse these cycles of violence and what approaches can we learn in order to not recreate other harmful industries? Luckily this expansive landscape also offers many avenues to address these cycles of violence and begin restorative practices.

Towards Positive Peace

It is often inapparent how history and procedures adopted during times of struggle splinter into other facets of our lives. However, with the plastics industry after World War II, we have had decades to understand how economic development measures enacted during wartime, if

left unmitigated, can have adverse effects and entrench negative peace. Using plastics as a cautionary tale, we can work towards best practices to develop transitions to just societies post-war. Working towards positive peace requires post-war acknowledgement of the need to reconstruct our economies, reconcile environmental violence to the best of our ability, and resolve the underlying violent structures and cultural norms.

Reconstruction

Reconstruction is "a range of holistic activities in an integrated process designed not only to reactivate economic and social development but at the same time, to create a peaceful environment that will prevent a relapse into violence. In this sense, reconstruction can be distinguished for its corrective dimension in righting wrongs and addressing vulnerabilities, while maintaining the focus on the future." (Barakat, 2005, p. 11). Reconstruction is a long term, multi-dimensional and dynamic process.

Post-war time horizons need to expand by combating the narrative that peace and war are dichotomous in nature (Galtung, 1996). Our timelines become shorter in times of violence because the needs are most pressing. During transition from wartime to positive peace, when people are trying to settle in, back to "normal," a renegotiation of the economy and societal values should be safeguarded. "The false localization and temporization of "war" obscures the broader geographies and histories of militarization (Geyer 1989, p. 79, cited in Lutz 2002, p. 723). Realistically, we are continuously functioning within different forms of violence in different measures, existing outside of the formal declarations war. Conflicts can be decades in the making and peacebuilding equally long (Lederach, 2005). Expanding this timeline allows a clearer view of the issues needing to be addressed in the hopes of stopping cyclical violence.

While disarmament traditionally refers to the giving up of stockpiles of guns and other weapons, it may also refer to the giving up of all instruments of war. In the case of plastics, disarmament is inherently linked with demobilization, where organizations employed by the military are disbanded and deemed no longer necessary. As an instrument of war, the factories used during the WWII to proliferate plastics, should have been shut down or transitioned into more sustainable industries. As this applies to the current plastics industry, the factories utilized to produce plastic should be converted into recycling plants or used to develop alternatives to plastic packaging. This way, economic development could be made more sustainable. In the future, we could utilize the advice of Deepak Chopra who requested Obama transition to a peace economy by including peace time projects in defense contracts and paying for war time companies to transition into uses for the general public through tax incentives or funding these transitions directly (Sullivan, 2011, p. 278). This highlights three things. Firstly, the importance of planning and considering the effects war will have on the structures of the economy, expanding our timelines. Secondly, he is providing a loose structure that may change according to the needs of the moment to exit a war economy. Thirdly, it reminds us that all spending should be working toward the social good.

Reconciliation

Efforts to reconcile the damage which has been caused are of the utmost importance. "Reconciliation involves re-establishing harmony and co-operation between antagonists who have inflicted harm in either a one-sided or reciprocal manner" (Fisher, 1999, p.83). The production of harmful substances often reinforced structural violence by being placed in low income communities (Santa Barbara, Dubee, & Galtung, 2009, p. 95). As such, there should be an expansion of Federal funds to clean up polluted sites. These waste sites should be removed, or

at the very least heavy compensation should be granted to these communities. The compensation should come from either the federal government or plastics companies.

Attempts to rectify the misuse of plastics are well underway within civil society through treaties, agreements, and organizations like the International Convention for Prevention of Pollution from Ships (MARPOL), the UNEP Global Programme of Action for Protection of the Marine Environment from Land-based activities, the EU Marine Strategy Framework Directive (MSFD), Fairtrade, Greenpeace, and many others. Examples of adopted policies are the Paris Agreement, The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, UN Sustainable Development Goals, Global Partnership on Waste Management, and the European Union's attempt to manage the coasts collaboratively and sustainably (Sivaramanan, 2016, Chapter 6, Section 7, para. 5). Unfortunately, still, the US Federal Government is not engaged with these organizations or policies to a level befitting our per capita contribution to CO^2 emissions.

True reconciliation, however, can only occur after the oceans, rivers, animals, and humans alike have been restored to their potential. "The slow, inexorable pace of ecological and climatic cycles and lag times bear no relation to the hasty cycles and lag times of human attention, decision, and action. We can't slow down all of human behavior, and shouldn't, but we might slow down parts" (Brand, 2011, Reframing the Problems). As Brand references, humans have historically innovated faster than nature can respond. Within the next ten years, the global consumption of plastic is projected to be the same amount of plastic than was produced in the whole of the twentieth century (Cohen, 2010). This unfortunately dictates, complete restoration of our ecosystem is unlikely. However, the transgenerational effects of environmental violence can be mitigated.

We must work to overcome the chosen glories and chosen traumas which underlie our decision making and actions. The United States still exhibits signs of regression. Regression is when the same fear responses are triggered and cause a person or people to revert to what they know as a function to identify threats and is “an inevitable and necessary response to certain levels of trauma, threat or stress” (Volkan, 2014, p. 56). Often these perceived or actual threats facilitate and reinforce the reliance on chosen glories or chosen traumas. Chosen glories are, “the collective mental representation of an event “passed from generation to generation through caretaker-child interactions and by participation in ceremonies that recall the past success to saturated with self-esteem enhancing feelings” (Volkan, 2014, p. 47). This type of chosen glory can affect a society's ability to see the consequences of their actions by framing the measures taken during and post war as necessary for survival or later even as a deserved luxury, leaving outside communities to wonder about the sanity of the traumatized state (Volkan, 2014).

In the case of the United States, after World War II, citizens were intergenerationally taught to rely on the perception of the US as a global savior throughout and beyond the Second World War. The generation who suffered through the Great Depression and went on to “defeat Hitler” during World War II, proclaimed as “the Greatest Generation,” were subjected to food rationing, mandatory work, bodily harm and personal loss during the war effort. They subsequently felt that the technology they had a hand in creating would provide a well-earned level of convenience and luxury. Plastics being just one piece of this earned convenience. Another deep-rooted pathology the US exhibits is the Judeo-Christian mindset that man has been granted stewardship over the Earth (Galtung, 1996). This translates into having ownership or dominion of its resources or people outside of this group. By acknowledging and transforming

destructive attitudes we are able to change our behavior and construct sustainable peace (Brouneus, 2007).

Another, more subtle, assumption the US intergenerationally adopts is that economic growth is the only way to wealth and happiness. Growth in GDP should not be the only indicator of success for an economy. Consistent economic growth that is to the detriment of the environment cannot be viewed as contributing to growth. Rather, the long-term social and monetary costs associated with diminishing nonrenewable resources and long term expensive cleanup projects (Sumaila and Walters, 2005) should be considered. Also, growth and development measures should include equality as a main indicator (Santa Barbara, Dubee, & Galtung, 2009).

To truly reverse the underlying notions of the general public, we must understand the effects consumption patterns are having on the environment, transparency of data on how and what to recycle is a must. While the US government does take actions to keep track and report on what resources are being used within the country, the standardization of information on impacts to the population, the environment, and on the economy have yet to be incorporated into best practices. For instance, businesses should be able to easily provide access to where and how to manage their waste (Matos and Wagner, 1998). It should be as simple as glancing at the box of a product to understand the means by which it was created and how it will be disposed of. Recycling processes and information should be accessible, easier to understand, and incorporated into education systems. The international community, as well as local NGOs, are doing work toward environmental justice, but should receive greater support from the US government. This support should be driven by individuals relieving themselves of the notion that the US is superior in any way or that convenience at the expense of the environment can be earned or justified.

Resolution

Resolution is addressing the root causes of violent conflict constructively (Arai, 2017) to ensure "Intergenerational Equity" (Sumaila and Walters, 2005, p. 137). This requires new approaches to our current and future actions. As we attempt to reconstruct and reconcile the structures and behaviors which led to the current state of pollution, we must replace these practices with sustainable processes which have undergone social consideration and scientific testing. Life cycle analysis is a process in which a stock is taken of environmental impacts from resource extraction through the entire life cycle of a product through, including disposal. Before products are introduced on a large scale, they should undergo these levels of testing.

Many arguments for industrialization and mass manufacturing relies on the notion of cost and efficiency. Cost being defined in strictly financial cost-benefit analysis, not the actual social or environmental cost. This is a western notion of cost, one that focuses on the immediacy of the issue at hand, separate from the intergenerational, environmental, moral strands which create a cohesive and resilient ecosystem. This separation or exceptionalism, allows for a disconnection between local consumption patterns and their environmental ramifications.

Consumers and governments should focus on the re localization of our economies. As of 1994, on average, over 80% of the materials used to make products becomes waste (Santa Barbara, Dubee, and Galtung, 2009, p. 45). The use of plastics should be removed from luxury items and focus solely on meeting the basic human needs of a society (Galtung, 2009). Single use plastics, which are a luxury item, should be banned immediately. Adopting greater regulations on known harmful plastics should be enacted.

Under current regulations, cost of waste remains external from the companies creating environmental harm through plastic. Long term costs would need to no longer be externalities,

but instead be placed back onto the producers and consumers which create this large level of waste. If companies, as they are in the Netherlands, are left with the burden of waste management, or if governments taxed companies according to their plastics waste or emissions, best practices would shift toward more sustainable measures making firms internalize these costs. This way, the growth and profit experienced by environmental exploitation would become untenable and spur technology focused on renewability (Santa Barbara, Dubee, & Galtung, 2009, p. 43-45). Recycling should also remain localized, without the option to ship it abroad to inflict environmental health problems for citizens of other countries. Household recycling machines are just now becoming available for purchase. Recycling could also be done on a community level.

When adopting new technology or creating space for commercial businesses, we should work toward creating businesses' devoid of violence. Santa Barbara, Dubee, and Galtung (2009) refer to business devoid of violence as "peace business." Peace business "puts the well-being of all human beings, their peaceful relations, and the environment first" (Santa Barbara, Dubee, & Galtung, 2009, p. 17). A key component to peace business is understanding what scale consumption and production levels can be reach before the ecosystems we rely on are unable to bounce back. Keeping within scalable bounds and allowing others access to the resources equally is important for the balance needed in the sustainable development.

Amish communities in the US have a method of selecting which technologies to integrate into their communities. Instead of viewing all technology based on immediate efficiency, each local Amish community is different and makes decisions based on their experiences with each new technology. Consensus must be given before technological adoption and only after a trial period (Kelly, 2018). Perhaps this could provide an insight into alternative methods of

technology adoption at a grassroots, localized level rather than relying on rational consumers or government sanctioning.

There are also new alternatives coming into prominence. Plastic alternatives like bamboo and hemp are currently more expensive than plastic but are beginning to be used commercially with similar functionality. Bioplastics, made from plant material instead of petroleum are entering the market as well. However, bioplastics are not compostable as their name implies (Song, Murphy, Narayan, & Davies, 2009). There is even a grocery store in the Netherlands named EcoPlaza which has begun using either alternatives to plastic like cardboard and glass or compostable bioplastics for food packaging, accomplishing all that traditional packages can with fewer of the long-term repercussions.

Yes, recycling projects and smarter consumers are pieces to the puzzle. Yes, business and the way costs are seen is a way toward prevention of environmental issues. However, in order to prevent the direct and environmental violence present in plastics and other technologies, we need to deal with and accept a balance between economic pragmatics as to cost and utility with environmental responsibility and the inherent vulnerability of the ecosystems in which we are a part.

Conclusion

The plastics industry and consumption patterns in the United States following World War II have contributed significantly to hydrocarbon emissions, ecological violence, and the perpetuation of global structural violence through production and waste management flows. Methods like recycling, certain plastic classification bans, United Nations Sustainability Goals, informed consumers, and the nonprofit sector are all working to restore ecological peace. While this is a necessary step for the planet's wellbeing, we must also transform the underlying notions

and methods which contributed to the issue. As companies and organizations transition from the sphere of war to the commercial markets, special care must be given to take the war out of these industries to break cycles of violence. To conduct analysis of technologies before domestic consumption, I propose we utilize methods identified in peace research: reconstruction, reconciliation, and resolution to work towards positive peace. We must reconstruct the dual-use policies adopted during and after war as a form of economic development. The plastic factories which proliferated after World War II, should be transitioned into recycling plants and hubs for sustainable innovation. We must also attempt to reconcile the harm plastics have caused to the environment by subsidizing cleanup efforts, participating in international agreements on climate change, and choosing to change our mindsets associated with convenience and overconsumption. The externalities of our patterns have implications for the likelihood of violence. To truly resolve these issues, we must rid ourselves of the notion that convenience is earned, that the knowledge of science trumps the wisdom of our ecosystems, and expand our timeframes to include intergenerational justice. This demands individuals, communities, and society at large shift our understanding of economic development as profit and growth toward equality, social capital, and relocalization. Only when these shifts occur may we be sure to be at peace.

The ideas and discourses mentioned in this study, while specific to plastics, can contribute to a larger body studying the intersections of technology, war, violence, and economic development. One technology currently at this intersection is use of military drone technology entering into commercial transportation markets. This is but an introduction into the study of the subtlety drawn, yet pervasive linkages which shape our economies and therefore us, and an attempt to reconcile these structures with global citizenry. At the very least these discussions could act as a deterrent to violence by expanding the way we see how war time decisions have

long term, implications for cycles of violence. Better yet, these discourses could pave the way for budgetary provisions for post war transitions toward social innovation, the establishment of best practices being considered prior to technological research and implementation, and development with peace at its center.

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