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The Ongoing Effects of Apartheid on Waste Management in South Africa

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Abstract

This paper explores the negative imprint that apartheid has left on the waste management sector in South Africa and the strategies being put in place to decolonize and restructure the current system. Chapter 1 includes quantitative research to introduce this topic as well as a discussion of the history of colonization in South Africa, with data on how indigenous groups interacted with the environment in pre-colonial history. Chapter 1 will also examine how, after the arrival of the European colonizers, the creation of townships and informal settlements and their inaccessible, unsustainable infrastructure has led to the current ways in which people interact with the environment. Chapter 2 uses the perspective of environmental economics to discuss the implementation of capitalism in South Africa, which has sparked consumerism (the cause of single-use, unrecyclable products being purchased) and corruption in the government, which prevents money from entering resourceful waste cleanup programs. Chapter 3 uses environmental psychology to analyze how issues within the waste management sector have damaged emotional health. Chapter 4 uses a case study on waste management in Mamelodi Township as well as the lens of public health to explain the phenomena of burning garbage in townships and related informal settlements, and how these have negative physical-health effects on the people living in the area. Chapter 5 uses the preceding chapters to develop concrete policy recommendations for how to create e a regenerative South African economy, which will in turn benefit the physical and psychological health of those who call South Africa home. These recommendations involve urban planning and redesign, land and wealth reparations, and environmental education. This paper uses a 2019 research internship in South Africa as a source for qualitative data on the Mamelodi Township case study in chapter 4, as well as current interviews and quantitative data on the township.

Keywords: South Africa, environmental justice, waste management, colonization, environmental economics, public health, environmental psychology, sustainable development.

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Fig. 1. *Litter in Mamelodi*. Feb. 2019. Author's personal collection.

Introduction

In 2019 I was accepted to Fordham University's Ubuntu Program and spent the second semester of my sophomore year in South Africa. The Ubuntu Program had three parts to it: an educational component (studying abroad at the University of Pretoria), a cultural component (going on cultural excursions and travelling around the country with the group), and a volunteer program (volunteering consistently at a location at least once a week to accomplish a project that we designed ourselves). The volunteering was also considered a means to an end, with the end being the writing of a 15 page paper and a presentation given to fellow students, supervisors, professors, and higher-ups involved with the program. My volunteer experience has led me to writing my senior thesis on the same topic.

In order to be paired with a volunteer program that best fit us, we spent one of our first days in South Africa touring through various townships and meeting with volunteer coordinators at each stop. In all of these places, I was amazed at how much litter covered the ground (see *Figure 1* above). There was also garbage burning in open air pits that created an immense stench throughout the area, and dirtied the nearby streams as well. I wanted to direct my volunteer project towards cleaning that up, and after addressing this to my supervisors, was assigned to work with a science teacher at Funanani Christian School (a grade school in Mamelodi Township). The school was located next to a river, with one of the largest informal incineration sites adjacent to the two. The smoke from the burning garbage blew directly into the schoolyard, causing a permanent stench and leaving asthmatic students and teachers vulnerable. If I could accomplish anything within my six months in south Africa, I wanted that pile of garbage to be cleaned up permanently.

It didn't seem like too big of a task at first. Initially I was even prepared to just go into the township each week and pick up the litter myself. But I would have no plan of where to put the garbage once I had it—anyone who's read up even just a bit about waste management understands that there really is no such thing as 'away.' I could have redirected the issue to government officials, and I discussed this with my supervisors, but they emphasized that working with the government would be a waste of time. They had tried countless times to get the government involved in eradicating the dumpsite, but to no avail, and an American college student visiting the country for a few months would not have any more power. At the same time, the people dumping the garbage were their neighbors, not criminals, and they wouldn't know where to put their waste otherwise. My supervisors recommended I find a more substantial project that I could easily write about for my final project.

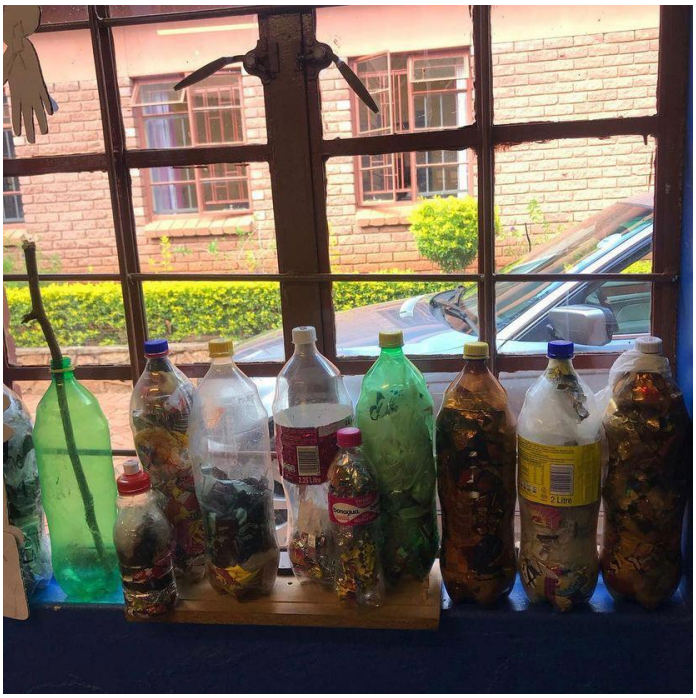

Fig. 2. *Ecobricks in Progress*. April 2019. Author's personal collection.

My project ended up being a mix of giving presentations to the students on environmental issues and assisting with other school tasks, but for the most part it was based around an organization called *ecobricks*. I first learned of ecobricks at the grocery store I would go to each week—the store had a big bin outside of the check-out aisles that was labelled as an ecobrick drop-off site. I did more research when I got home one day and was feeling very inspired by the concept. Ecobricks are plastic bottles filled with clean, unrecyclable litter (such as candy wrappers, chip bags, balloons, cling wrap, etc.) until they hit a certain mass and feel firm. The bricks can then be pieced together with silicone or inner-tube bands as a short-term attachment method, or with an earth-based adhesive material such as adobe or cob to create more permanent structures. The bricks can be used as a sturdy building material, and when made properly, are fireproof, thermal-retentive, resilient, water resistant, and can float. People have made all kinds of structures with ecobricks, from boats and furniture to houses and schools. Ecobricks

emphasize cradle-to-cradle design, as their deconstruction does not negatively impact the environment, and they can be used and reused for years ("Ecobricks" 2020).

I envisioned my project resulting in a garden being built with planters and beds made from the ecobricks, but we hardly got close. The making of the ecobricks was fun, and I enjoyed having plenty of time to converse with the students about ecological matters as well as answer their questions about the United States. One of the problems was that, ironically, many times the students did not have enough litter to fill their ecobricks; other times the litter was not thoroughly cleaned, and the bricks began to stink. One student, Linda, told me her mom had her go door-to-door to her neighbors' houses to ask if they had litter, which made her feel embarrassed. At the end of my time working with Funanani, there was still litter covering the ground, and students unable to attend school because their asthma could turn deadly with the informal incineration practices, and mental health issues that I couldn't help but wonder if they had to do with the children growing up in a literal garbage dump.

The volunteer project was a great experience, but as it goes with international volunteering, I swear I learned more from the students than I could have ever taught them. I am not getting my college degree to use band-aid tactics to solve issues that are deeply rooted; I want to find the root, pull it out, and cover up the hole with something more nourishing. I'm writing this paper because I am not satisfied with how I attempted resolving a problem that I saw—and I know that this paper will not resolve the problem either, but it will provide some knowledge on how to start.

Before we get into the paper, I also want to acknowledge the Lenape people, whose land Fordham University rests on, and the Ndebele, Xhosa, Zulu, and Northern Sotho peoples whose land the University of Pretoria rests on. Before colonizers stole your land, waste management

and the health issues associated with it were not an issue. I hope that in the future what was lost can be restored and we can achieve balance.

I also cannot feel confident allowing you to read this paper without you understanding that the year that I wrote this thesis was during the COVID-19 pandemic. I really struggled to concentrate, and I hope that in the future I can revisit this topic again and give my full time and attention to it. This paper is not nearly my best work, but it is the best I have been able to do given the circumstances I've been in.

Acknowledgements

The biggest thank you's go to my parents and family for their support and encouragement, as well as to my professors. Prof Themeli, this paper is quantity, *not* quality, and I am genuinely sorry it turned out this way, but I hope in the future I can continue to show my love for South Africa in a style that does not involve writing fifty pages of research.

Chapter 1: A Separation of Humans from Nature

Waste Introduction

Waste is an umbrella term for a variety of concepts, categorized in numerous ways by numerous entities. Within the subject of anthropology, ethnographers seek out what specific requirements constitute the meaning of waste, who manages it and decides its significance, and how waste circulates within local and global forces (Reno 2019). Within economics, waste is understood by its transition from commodity to an object without worth or necessity, still accounting for its existence on the planet and humans' dependency on labor and material (Marx). Within the health sector, connections are made between waste and its ability to hurt, whether physically or mentally. It falls under the category of politics within local and global disputes regarding who is responsible for it. Waste is a consequence of human existence.

Waste management is an element of human's desire for order, and is vitally important with regards to a society's ability to govern. In areas where proper waste management is lacking (as we will see further in discussing townships in South Africa), people and waste mix in ways that threaten human life and dignity. It relates collectively to an individual's decision to transition the commodity into waste. Acts of rejection, remaking, and reuse change both peoples reactions toward the waste as well as their relations with each other. Collectively, it relates to how one ought to rid oneself of things and where they ought to go, following laws and norms to make the most ethical decision. In some circumstances, such as with ecobricks, items destined for waste can be repurposed back into a commodity. As is with compost, food waste can be repurposed back into nutrients in a different form. Waste is biopolitical in that it involves the wellbeing of populations (Reno 2019).

This paper will focus on municipal solid waste (MSW). MSW is a multifaceted phenomenon, generally conceptualized as the waste inside a big plastic garbage bag set out to the curb. It can be categorized by its location of origin, whether that be a household or a commercial area. generally thought of as the waste found from households in big plastic garbage bags. It comprises paper, plastic, glass, metal, food scraps, and other biological materials (such as garden scraps or hair clippings). Industrial and biomedical waste can be contained within MSW, adding an element of toxicity to the waste. Other materials within MSW can be categorized as either dry or wet, with dry waste being paper, plastics, metal, and glass, and wet waste including more natural materials such as yard and food waste. Dry waste can be further categorized into combustible and non-combustible materials (Gumbo 2020).

As compared to developed countries, underdeveloped countries generate more wet materials that are biodegradable. This is a positive note, as organic matter can be more productive when buried (especially with regard to composting) and can be essential when generating renewable energy. Separating the dry and wet materials is important, as the dry materials can be much more easily recycled when not in contact with wet materials. A community's cleanliness is dependent mainly on MSW management and the fulfillment of its various stages. These include collection, transfer, treatment, recycling, resource recovery, and disposal.

Municipal solid waste management systems serve the purpose of cleaning up this waste so that it gets properly 'thrown away' or dumped, either in waterways, geological depressions, or open land. Unfortunately, 'away' globally tends to refer to impoverished areas where people of color live (Miller and Spoolman 2011). When waste is dumped, it suggests that eliminating it is the primary goal—it is viewed as an impediment to life wherein through its absence, life and

growth is possible. Once the waste is ‘away,’ it is for the most part erased from the consciousness of those who tossed the material, and becomes a point of concern for those in the communities in close physical proximity to the site where it had been dumped. These communities often exist in areas where political resistance is less effective, and thus become equivalent to the waste itself. The communities nearest to dumpsites are viewed as disposable, powerless subjects in the eyes of the more powerful communities that are capable of distancing themselves from the dumpsites through their power and wealth.

The internationally accepted means of MSWM is the implementation of an integrated MSW management model, based on the MSWM hierarchy consisting of prevention, minimization (reduce, reuse, recycling) treatment and disposal. MSWM involves activities associated with generation, storage, collection, transfer and transport, processing and disposal of solid waste. It requires proper infrastructure, and maintenance for all activities. The landfill disposal is regarded as the last resort in waste management. The typical municipal solid waste management system implemented in most municipalities in SA comprises of collection of waste from point of generation, transportation of waste to the treatment point or landfill site, treatment of waste including sorting and separation of waste at disposal site, disposal, and recycling.

Waste generation occurs at the source of waste where it encompasses activities in which materials are identified as no longer being of value and are either thrown away or gathered together for disposal. The 3 Rs (reduce, reuse and recycle) strategy should start at the point of generation to minimize the volume of waste that will be taken to the landfill site and to protect the environment. The activities associated with the management of waste encompass handling, sorting, storage, and processing of waste at the source until they are placed in storage containers for collection. The best place to separate waste is at the source.

The storage of MSW at the source is substantially lacking in most of the urban areas and it has a significant effect on the collection system. The bins are common for both decomposable and non-decomposable waste (no separation of waste is performed). It is important to plan and decide on the appropriate means of on-site storage in conjunction with transport options before implementing any system. There are different methods of on-site storage for domestic waste generated which include 85 litre black or clear plastic bags, 85 litre rubber/galvanised steel bins, 120/ 240 litre mobile bins and $11m^3$ bulk containers for communal collections. The collected waste is then transported to the transfer station or the landfill site for treatment and final disposal.

South Africa Introduction: Pre-Colonial Encounter: Hunter-Gatherer Waste Practices

Africa is the one continent that has never been devoid of human genealogy. About seven million years ago, pre-human lineage split from that of chimpanzees and over time evolved. *Homo sapiens* developed on the African savannahs, and then branched onto different continents.

From *homo sapiens* emerged unique groups. In the most southern part of the African continent, there were the *San* as primarily hunter-gatherers and the *Khoikhoi* as primarily herders; collectively these groups have become known as the *Khoisan*. These groups have lived egalitarian lifestyles in small communities. Over thousands of years, farmers and herders from different parts of Africa migrated south, with many coming from regions where the Bantu languages were spoken. Groups merged and kingdoms were formed. ("Before" 2020). As populations grew and civilizations were formed, the disposal of waste remained a non-issue, as most waste was food waste and therefore biodegradable. Material items [give examples?] were used to their maximum, and even the toughest were biodegradable to an extent as well.

Fire was most likely first used about 1.6 million years ago by *homo erectus,* the predecessor of *homo sapiens,* for cooking food. Eventually fire became used to clear brush for

agricultural practices. Unintentionally preserved waste left behind at fire sites—including burned bone or stone chips—are actually what archaeologists use to analyze when a fire may have been lit (Dance 2017). Pre-historically, there was no fear of leaving waste behind. Over time, fire was used to speed up the discarding of this waste. Still, this waste was biodegradable, and ecosystem services cleaned up anything that was not. Waste was compost; it was fertilizer for the earth. These practices of disposing of waste remained until Europeans began to infiltrate the area.

Settlement Waste Practices

The first Dutch ship arrived at the Cape of Good Hope in 1652. Discourse on the Dutch settling in a human-less area in the 1500s, or coinciding their arrival with Bantu-speakers, is simply not true, and there is plentiful archaeological research to prove this (Marks 1980).
By the 1700s, the rich soil left from the hunger-gatherers was mostly used for settled farming. The waste collection services were first implemented in the Cape Colony in 1786, and by the 1820s a regular waste collection service on specific days of the week, using animal-drawn carts was established. The purpose of waste collection services is to separate the generated waste from the community for health reasons and for the protection of the environment.

Currently the waste removal service can be done by the local authority, a conventional contractor or an emerging entrepreneur, although the responsibility lies with the local authority/ municipality. There are two methods of household waste collection implemented in South Africa by most municipalities: firstly, the door-to-door collection system which is more prominently implemented in formal settlements, and secondly, communal collection which is generally implemented in poorly developed areas like informal settlements where the households are required to place their waste in the centrally provided containers for collection by large motorized refuse vehicles.

The most preferred frequency of collection services to households is once a week. Due to variations in community structures and geographical distribution, the same type of waste collection services is not appropriate and sustainable across all areas/ municipalities. Factors that can influence waste collection services include affordability, accessibility (particularly road infrastructure and condition), level of education of both community and authorities, availability and suitability of on-site storage containers, composition and volume of waste, appropriate vehicles and available expertise, distance to disposal site and collection systems like communal collection and door to door collection. The waste collection route map is critical as it provides a guide on the starting point and final point of collection and plays a role in minimizing the travelling costs. The collection should also be at a regular time for the convenience of the residents. It was only in the 1920s, that waste collection was done using motor vehicles in South Africa. There are several options for transportation of waste including the hand cart, animal-drawn cart, tractor and trailer, flat-bed truck, tip truck, rear-end loader, econo-loader, lugger/ skip loader, roll on- roll off truck, and rail. The type of transport selected will depend on the composition of waste, the type of storage container and funds available.

Presently, economic growth, urbanization, and population growth in South Africa have caused an influx of waste production. As in most developing and developed countries, sustainable waste management practices have not kept up with this growth. Issues of waste management in the present day as listed by the government include ineffective data collection systems and lack of compliance and enforcement capacity, lack of education and awareness amongst stakeholders within the waste sector, operational costs for management of waste, support for waste reduction at local government level, availability of suitable land for waste disposal, lack of structural incentives for reduction, and recycling and/or reuse of waste (DEA

and UNEP 2013). In 2009, a hierarchical approach to waste management was implemented, with waste avoidance and reduction at the top and treatment and disposal at the bottom.

Treatment and disposal are the last resorts, yet eleven years later, 90% of all waste is sent to landfills (Godfrey *et al*. 2017). Laura Godfrey and Suzan Oelofse list out four different phases in South African waste management from 1989 to the present day. The stages relate to landfilling, recycling, regulations, and a mandatory Extended Producer Responsibility scheme. Landfilling became popular because landfill gate fees were much cheaper than recycling, leading municipalities and waste generators to be unwilling to find alternative solutions. There also was an assumed vast amount of space in the country. Recycling began in the 1970s, though it was quite limited. With the National Waste Management Summit and the publication of the Polokwane Declaration in 2001, goals to make recycling more prominent, to avoid the generation of waste in its production, and to guide South Africa to becoming zero-waste were ratified by the government, though they were not legislated.

Voluntary Extended Producer Responsibility groups to encourage recycling also became popularized during this time, though not without struggles. Although economic incentives had been provided to support these initiatives, these incentives appeared to be more about raising money for the national fiscus rather than driving a secondary resources economy in South Africa. (Godfrey *et al*. 2017). It was only following the creation of the NEM: Waste Act (Act 56 of 2008) that provided the legal framework necessary to move the EPR schemes from voluntary to mandatory, with the Waste Tyre Plan (2012) marking the beginning of the shift. Collect-A-Can (explain these orgs). Beverage can collection rates increased from 18% in 1993 to 72% in 2015.

Informal waste pickers have also become popularized, making up 0.6% of the urban population, or approximately 215,000 waste pickers. (Linzer *et al.* 2013). These numbers are on

the rise, correlating with South Africa's rise in unemployment and therefore the rise in workers in the informal sector (Godfrey *et al.* 2017). Co-operatives have been encouraged by the government to help formalize the informal sector, yet these have had a very high failure rate (91.8%) (DTI). Most often these co-operatives fail because of a lack of infrastructure: little to no access to the transport, equipment, or premises at which to sort and store recyclables. Operational challenges also make it difficult, including difficulty in accessing markets, and miseducation on how to operate a business.

Regulations have been discussed in government since the publication of the White Paper on IP&WM, though it wasn't until eight years later when the first legislation was published. This legislation, the NEM:WA (Act 59 of 2008) enabled the regulation of every aspect of the waste management and secondary resources value chain in South Africa. Following this was a series of regulations aiming to control human and environmental health impacts associated with poor waste management as well as shifting the patterns of waste disposal to fitting within the cyclical framework or reusing, recycling, and recovering. This influx of regulations has actually damaged the implementation of recycling as the sector has become so controlled that extensive legislative requirements must be issued in order for any growth of a recycling economy to occur.

Urban centers in underdeveloped parts of the country tend to face serious challenges in the disposal, transportation, treatment, and collection of waste, leading to indiscriminate dumping at uncontrolled sites. Volumes of waste increase with population increases and standards of living, as economic development leads to more consumption of goods, and therefore more waste. Some of the reasons for these difficulties with waste harm-reduction include the lack of access to adequate recycling and waste disposal facilities, the inconvenience of collecting and sorting waste (both by individual households and greater organizations), discrepancies

between intention and action as defined by government policies, and a general lack of trust between civilians and the government in underdeveloped areas. Research by Gumbo (2020) shows that factors influencing recycling behaviors of individual households include that it is inconvenient, takes up too much time and too much physical space, and it is hard to form the new habit of incorporating sorting and recycling into everyday life. There is also a lack of information on what items can properly be recycled, why they should be putting the effort in in the first place, and whether or not their items actually get recycled.

Chapter 2

Hunter-Gatherer Economics

As discussed previously, waste management requires the movement of waste in order for it to be covered up or seemingly to disappear. This movement is necessary through labor. Dumping the waste may be the easiest form of removal, but is certainly not the most efficient with regards to the long-term quality of the planet. Waste can be recovered and remade at all stages of the dumping process—from household disposal, to cleaning, collection, and sorting. Part of what makes the recovery and reinvention of waste tricky is that there are still risks involved, particularly that the waste can be a form of contamination. Contamination can occur in two ways, with the first being of waste's commonly toxic physical nature, which will be discussed further in chapter 4. Secondly, though, MSW in particular can possess traces of its former owner, whose identity could be stolen or privacy violated (think: old cards, photographs, documents). These objects could also have indeterminate value, whether as an actual object or as part of its material substance.

Implementation of Capitalism

Population growth, urbanization and economic development have resulted in changing resource consumption patterns and led to a rapid increase in waste volumes and types of waste. As a result of these trends, existing waste management systems are often overburdened with increasing quantities and changing composition of the waste. This results in a need to periodically evaluate and improve the solid waste management systems.

Informal Waste Collection

The informal economy relates to economic activities that are not covered by formal arrangements (ILO, 2003). The informal economy has an important role in the overall economy

of a country, and in South Africa, the informal sector makes up 37.2% of employment (ILO, 2012). The informal economy is particularly important to women, children, and the poor. Waste picking is one aspect of the informal economy that also significantly helps with creating more environmentally sustainable practices. Still, research by Dawa and Kinyanjui (2012) shows that the green economy in general disregards, belittles, and overlooks the informal economy as an asset.

Globally, informal waste collection is the most common form of reuse when dealing with trash. Informal waste collection refers to the process by which people gather rubbish, sort through it, and . The *formal* aspects of this work lie in the waste management sector, and are supported by the government, and laws supporting wages and benefits. The *informal* aspects of this work include that the pickers are not supported by regulations that sustain their business; they work for the most part under the radar, gathering and cleaning items on their own to be resold to suppliers or to other individuals.

The informal sector does not necessarily only refer to impoverished people living amongst dumpsites—it can include middle class sanitation workers that take objects of value out of their garbage collection, or thrifty dumpster-divers and stoopers (people who collect rubbish off of street curbs and household stoops). The difference between these informal pickers and their counterparts is twofold. First, they are not necessarily picking due to desperation; they have much more access to formal paying jobs than those who use picking as their form of subsistence. Secondly, they live removed from the dumpsites. Informal waste collection tends to be gendered and infantilized (Reno 2019).

A linear economy cannot sustain itself when the resources being consumed are finite. A close-looped, circular economy is necessary for progress to continue on without risking

demolition; balance is necessary and desired. The main source of the problem lies within the hands of the bourgeoise. Their desire to hold onto power and inability to redistribute their wealth slows the means of production for anyone but themselves. A shift towards socialism would allow production to be for use, not profit, so that no one person would exploit another (Nkrumah 1968). Development would still occur, but only to benefit the welfare of all. Education and enhancement of the community would be of the utmost importance. Thus, the waste management sector needs to be decolonized, as the root of the problems within this sector are results of wealth inequalities and lack of welfare for communities.

Consumerism

Humankind is not wasteful by design, as discussed in Chapter 1. Abundant waste is not inevitable. Consumerism is one of the main culprits of this. A study by Addai-Poku shows that shoppers were more likely to buy cheaper conventional products over expensive green products. Price was considered the most important deciding factor in the shoppers' experience (Addai-Poku, 1997).

One of the biggest problems facing South Africa's environment is pollution and the consumption of non-renewable natural resources. Ever-increasing population and industrial development mean that more and more natural resources are consumed each year with the result that more waste products are produced, such as plastics, tins, papers, and glass and greenhouse gases. In order to address the problem of increasing waste production, South Africa has formulated policies that will firstly ensure the protection of the environment, its biodiversity and people. Secondly, the policy aims to enable the structures that are mandated with waste disposal services such as municipalities and the communities to manage their waste appropriately. The legislation such as the National Environmental Management Waste Act (NEMWA), and the

Environmental Conservation Act (ECA) provide a framework within which the country can respond to this problem. South Africa generates 42 million m^3 of solid waste every year, which translates to 0.7 kg per person per day. The figures are said to be comparable to developed countries such as UK (0.73 kg and Singapore (0.8 kg). South Africa's capacity to treat, store and dispose of high volumes of waste are limited and this will lead to a shortage of land for landfill sites. Rapid urbanization has created many informal and congested settlements on peripheries of towns and cities. This has provided authorities responsible for waste management in South Africa with new challenges (DEA and UNEP 2013). There is a need for a more systematic approach to managing waste in the rural and urban areas through integrated waste management practices.

Chapter 3: When Trash Replaces Nature: Psychology

There are a number of emotional impacts that come with an ill-equipped waste management system. Environmental psychology is the science of humans interacting with their physical setting. It became popularized when psychologists began analyzing humans' interactions within the natural and built environment to understand psychological diagnoses (Miller and Spoolman 2011). Richard Louv's book *Last Child in the Woods* explains connections between children's lack of interactions with nature and the rise of childhood health issues such as obesity, attention disorders, depression, and other behavioral problems. Louv's research shows that direct exposure to nature is vital for children to develop emotional strength and physical health. If children develop without establishing a connection to nature, they could fall victim to this nature-deficient disorder (Louv 2008). While *Last Child in the Woods* is renowned, nature-deficit disorder is not technically recognized by any medical manuals, though numerous other researchers have agreed that for children to grow up without nature is to harm them mentally.

Getting children to spend more time outdoors in nature is the main way to eliminate the consequences of nature-deficit disorder. Advocating for children to spend more time in nature in Mamelodi, though, is more of a difficult task, for a number of reasons based around the problems surrounding waste mismanagement. Townships are high-density, semi-urban areas, and were not designed with green spaces in mind, both in public settings and private. Research by McConnachie and Shackleton shows that locations of green space are also influenced by its location relative to the commercial core and what ethnicity, education, and relative wealth the nearby residents have. In particular, their research amongst that of others shows that white people in South Africa lived in areas with the lowest density of housing and

highest area of green space per capita. For children to leave the township and have access to one of the nearby parks, they would need transportation, funding to pay for entrance fees, and adults to take off from work to chaperone. The parks in South Africa were designed for the wealthy, certainly not for the people of the townships (McConnachie and Shackleton 2010).

Maintenance of green spaces in urban settings is also vital for economic improvement in the area. Similar to the broken windows theory, when a significant amount of litter is on the ground, it leads to people littering more (Huffman *et al.* 1995). This dismantles the aesthetic capabilities of an area. Public areas coated in litter can deter new businesses from arising as they are less visually pleasing, diminishing the value of the property. Capitalism's cycle of poverty makes this difficult to escape from: in order for people to have access to waste removal services, they need an income to pay taxes off of. On the other hand, though, local economic opportunities are so scarce that the wealth remains in the hands of the oppressors. Finding work inside townships is difficult enough with high levels of business degradation and abandonment. Working outside of townships requires transportation and can take up a significant amount of time. With abandoned buildings and a general sense of dismay and hopelessness amongst the people living in townships, domestic violence and crime prevails. The system of oppression under apartheid is working as it was designed, and it continues on this way. Without safe public green spaces, there are few places for people to find peace (Ruane 2010).

It has also been evidenced that in many traditional cultures in South Africa, mental health services are taboo. Through processes of colonization and actions of underdevelopment by European nations (Rodney 2018), modern-day mental health treatment and trust in psychiatrists and other psychological medical practitioners has been diminished. It is not that mental health

concerns were obsolete pre-colonization, but there were different ways of treatment for them. Mental health concerns were not necessarily a problem, but an element of a person that made them unique. Money has likely become one of the reasons mental health has become a taboo topic in this region. Treatment for mental health costs money, and it can take many trials of treatment practices before the proper diagnoses is discovered. Therapists, psychiatrists, and medications to change behavioral problems can rack up a large sum. Westernized treatment plans had been designed to treat problems that flowed with modernization, whereas traditional treatment plans treat traditional issues better. The problem is when people try to incorporate traditional treatment plans onto non-traditional problems. For example, a study by Roberts *et al.* shows that children exposed to NO2 and PM2.5, two chemicals released with the burning of toxic waste, have a high chance of being diagnosed with depression by the time they turn eighteen years old (Roberts *et al.* 2019). This type of depression was spurred by environmental factors, therefore the treatment would be different, as the root of the problem is chemical-based. The problems surrounding mental health are cyclical. Stigma surrounds mental health problems as well as the treatments for them, leading to persuasion from elders not to partake (Ruane 2010).

Improper waste management causes significant problems in variety of areas relating to mental health, ranging from those involved with economic instability, to causing disease directly in children spurred by the intake of chemicals. In the following chapter, I will be unpacking the various physical ailments that come with improper waste management.

Chapter 4: Burning Garbage, Burning Lungs

During my time in South Africa, I learned that many of the students at Funanani suffered from asthma. On warm, dry days when the incineration pile was burning, many of these students would stay home from school or return home after a short amount of time at school because the air quality was too harsh for them. On these days, the other students made sure to keep the windows and doors of the classrooms shut tight, which seemed to help keep the smoky air out but did nothing to help the stifling heat indoors. Gym class and recess would be held outdoors except on these days, transforming into a study hall instead, leaving the kids jumpy with energy and unable to sit still and focus. Limiting the children's access to the toxic air was well worth the short-term consequences of obnoxious students. Informal incineration can cause severe problems to physical health. The most obvious one is asthma.

In one study, Njoku shows a number of correlations to diseases and landfill proximity, including that one in four people under eighteen years old living near a landfill will develop asthma. The same research shows that 78% of participants living close to landfill sites have experienced health issues related to gaseous pollutants coming from the landfill. Also, 30% of participants living close to the landfill and 56% living far from the landfill agreed that garbage and litter in the streets and in public areas were considered a serious problem. This research is related to formal landfill sites, where laws—as adequate or inadequate as they may be—are followed (Njoku 2019). In informal sites, the severe effects of the improper waste management are likely higher, considering that no rules are followed.

Even when garbage is not burnt, it can still cause negative consequences on physical health. Litter can attract rodents, flies, mosquitoes, and cockroaches, all of which can also spread their

own forms of disease (Nkosi 2014). For example, malaria is prominent in southern Africa. Plastic bags and other similar forms of garbage can collect groundwater and offer great breeding grounds for mosquitos that carry malaria (Miller and Spoolman 2011). Garbage in landfills does not disintegrate or decompose within months—in fact, it can take centuries, as it is compact and protected from sunlight, water, air, and microorganisms that would otherwise break down these wastes.

Additionally, there are issues that correspond with leachate. Leachate is the mixture of waste, toxic liquids, and rainwater that occurs inevitably with all outdoor dumpsites. Formal dumpsites have proper protocols to keep the leachate separate from the groundwater, so as to not contaminate nearby water systems. Sheets of synthetic material layer together to contain any leachate (Taylor 2014). Without leachate protection, chemicals and bacteria can easily contaminate drinking water.

Mercury is one of the toxic chemicals that is found in leachate. Mercury is found in many household appliances, including thermometers, light bulbs, batteries, pesticides, and cosmetics. When these items get thrown out without first being separated as toxic waste away from regular MSW, the mercury in these items can seep out and combine with leachate in the dumpsite. The degradation of plastics is one of the most serious consequences of MSW (Reno 2019). MSW that has been landfilled degrades anaerobically productive methane gas, which has on average twenty-one times the potential of polluting the global atmosphere than carbon dioxide (Gumbo 2020).

Chapter 5: Regenerative Reform

"Growing up in Limpopo, I noticed littering and garbage everywhere, and it's still a problem today. Twenty-eight years of democracy and it's still there." – *Booi Themeli, South African citizen*

As I saw when I was working as a teacher's assistant at Funanani, the youth of South Africa are ready for change. They believe that they deserve more, and that their existence carries beyond their current circumstances.

The only way for substantial, drastic change with regards to the waste management sector will be to change the economy and the way that products are manufactured and valued. Unregulated capitalism does not fit into the vision for the future. A strong economy that supports green growth, sustainability, and social economics can be made possible through redistribution of income, wealth, and power. There must be a significant decrease in consumption and population growth, as well as a shift from viewing nature as a means to an end to understanding the value of nature for its own sake. Green growth can be made possible within the social worldview through green jobs, social protection for vulnerable groups, equality of opportunity amongst people, and consultation with stakeholders (McConnachie and Shackleton 2010).

The informal economy will expand as does modern industrial growth—it is not merely the traditional economy being overtaken. In South Africa, it contributes a significant share of the GDP. Members of the informal economy work closely with the formal economy, as they produce for, trade with, distribute for, and provide services to the formal economy. More of an incorporation of the formal and informal economy could benefit workers in that it would welcome efforts to reduce barriers to registration and increase benefits to workers, including

giving them more stable jobs and workers' rights. Environmental justice and a shift towards localization can also assist with making all sectors more environmentally sustainable (Sze 2020).

Effective municipal solid waste management systems (MSWM) can contribute to improving public health outcomes through reducing opportunities for disease spreading vermin to thrive, such as occurs at unregulated local dumpsites. It also contributes to enhancing environmental quality by protecting watercourses, ground water and preventing illegal dumping and littering. A well-designed MSWM system supports higher levels of economic activity and can contribute directly to poverty alleviation through job creation. Conversely, a failure to provide effective MSWM system is felt most severely by poor households. Waste issue took root as a social issue, but stems as an economics issue. We must abandon the linear economy model in favor of circular, close-looped, regenerative models.

With that, humans must also manufacture products that follow circular design. As McDonough and Braungart detail in *Cradle to Cradle*, products can be designed so that their parts are reused either as part of the technical cycle or biological cycle. Biomimicry can be used to create these designs so that they can be properly recycled. Toxic substances can be taken out of products altogether and replaced with a safer substance. A different strategy altogether could be to sell services rather than products—for example, a dishwasher may be 'lent out' for some years to assist the customer in cleaning dishes, and be checked upon every so often for parts to be fixed and taken back to the main supplier and recycled if need be. There becomes less of an emphasis on owning property and more on a communal understanding of creating a continual flow of reusing and recycling (Braungart and McDonough, 2009).

The South African government does have some sector- and time-specific policies and government initiatives and plans that support the green economy framework (Montmasson-

Claire 2012), (NDP), (Sustainlabour 2013), (DEA & UNEP 2013). These policies are designed to support steady employment growth and development along with a transition to full environmental sustainability. While these plans seem promising, they have not made much of a dent since their initial implementation.

The National Development Plan (NDP) is South Africa's take on the United Nation's Sustainable Development Goals. The goal of the NDP is to uncover where South Africa lies as a country (in terms of poverty, economics, well-being, education, etc.) and to find a path to solve those issues bringing the country down. The NDP stresses the intersectionality between the damaging effects on impoverished peoples that climate change and abuse of the environment has. Although the NDP is a positive, productive effort to diminish the problems that South Africa as a nation is facing, the development strategies involved are not direct enough to heal the country by 2030. The NDP "aims to eliminate poverty and reduce inequality by 2030" and for "absolute reductions in the total column of waste disposed to landfill each year" (Commission, 57). Unfortunately, in one lengthy article published recently by the South African Broadcasting Corporation, the NDP has caused hardly any change in the goals set out back in 2013 (Sibanyoni). "Looking at the pace of things since 2013, they haven't even made a dent…and the problem is going to be compounded by the impact covid-19, because now it means the government priorities are going to change to secure the vaccines and rebuild the communities." (Themeli)

The general consensus of South Africans is dismay with this plan, and distrust that it will accomplish anything. Part of the issue as of recently is also that of the COVID-19 pandemic. Due to the pandemic, funding that was once budgeted to environmental concerns has been transferred

to easing pandemic sufferings. That being said, its positive affirmations and ideas are still important to have in a legal document and to be acknowledged.

Education is the most important factor in improving society. For those attending school, education contains the building blocks needed for a job, for basic understanding of rights, and for independence. But it doesn't end there— lifelong learning is vastly important in the continuation and expansion of those building blocks that have been learned in a variety of ways. The history of apartheid still has South African education at a split of inequality at all levels and is particularly acute in schools with significant populations of people of color, which is recognized by the National Development Plan as well as researchers in various sectors (Commission 2013), (Zeleza 2017).

Public demands for more recycling and a reduction of greenhouse gas have led to emerging technologies focusing on waste regulation. Some of these technologies include thermal waste treatments (such as gasification and pyrolysis), in-vessel composting, anaerobic digestion, and "eco-enzyme" devices (Reno 2019). Public education on the importance of green consumerism will be important in encouraging shoppers to buy the more environmentally friendly versions of products. As these products tend to be more expensive, lower taxes or subsidies should also be required to promote green consumerism (Addai-Poku, 1997).

Conclusion

My answer for how to resolve the problem of waste management in South Africa has yet to be resolved in a clear manner. Ecobricks can certainly be a part of the vision, but much grander scale transformations have to take place in the economy and social spheres as well. Community building remains key in the assessment. There are many ways to strengthen

communities: landfills can be formalized and regulated by local governmental sectors; waste mismanagement should not disproportionately affect people of color; informal waste pickers should feel secure in their field of work; mental and physical health should be prioritized over economic gain. The government will have to work for the people rather than for corporations, and make certain to not fall into corruption. If capitalism remains dominant in the future, it will have to change so fundamentally that it no longer works to exploit workers, but provides unity and true equity. Through the spirit of *ubuntu*—"I am who I am because of who we all are"—we can recognize the importance of everyone's humanity, and transform waste management systems to support this dream.

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