OUT OF SIGHT, OUT OF MIND

The Politics and Culture of Waste

Edited by
Christof Mauch

Transformations in Environment and Society

2016 / 1

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Christof Mauch

Introduction

When we consider how much trash is being produced each and every day, one wonders why trash is almost invisible in our everyday environment. According to a study by the Wuppertal Institute for Climate, Environment and Energy, Europeans use approximately 50 tons of resources each year for food, goods, and services; the United States uses considerably more. Emerging economies, on the other hand, use only about half that much. The use of raw materials is in direct correlation with trash, since everything we consume will end up as trash. Some of our consumer items—fast food containers, for example—have a life span of only a few minutes; others, like furniture, may be around for a couple of decades. Either way, they add up to billions of tons of trash that need to be disposed of each year on our planet. They are moved around, loaded, and shipped, and dumped, burned, and buried. Once waste is no longer visible, it is easily forgotten and dismissed: out of sight, out of mind. Or at least, that is the theory.

What would happen if our waste was dumped or burned within view of our housing developments? There are reasons why we place our waste plants, disposal facilities, and garbage dumps out of sight; reasons for putting trash in bins and cans, and for hiding them behind fences and walls. Trash is considered unsightly. And so we are quick to conceal our trash mountains: terracing them, topping them with plastic and seed mixtures, and transforming them into appealing landscapes or parks that allow us to forget what is beneath the green.

Once waste disappears, it is not meant to reappear. It therefore tells stories that are not meant to be remembered. Uncovering these stories can be detective work that reveals our dirty secrets in more ways than one. In a famous incident in the late 1970s, law enforcement officers in Tucson, Arizona, secretly collected the garbage of Mafia boss Joe Bonanno, who must have assumed that what he put in his roadside bin would be gone and forgotten forever. However, thousands of thrown-out paper slips written in Sicilian revealed Bonanno's involvement in drug deals and organized crime. Bonanno's household garbage landed him in jail.

After garbage ends up in a dump it becomes anonymous, but for those who know how to read it, it is no less revealing. In the 1980s, anthropologist William Rathje, together

with a team of scientists, began to recover and analyze strata of waste in various landfills across the United States. In the airless depths of the dump, much of the garbage—even hot dogs, guacamole, and lawn waste—was mummified and preserved. With the help of special equipment workers scooped out core samples of garbage and brought to light time capsules containing everything people had thrown away, from newspapers to condoms to baby diapers. It provided the "garbologists" (a term coined by William Rathje) with clues about consumption patterns, social habits, and cultural values. Garbage, the researchers found, reveals that the information people tell about themselves is often different than their actual behaviors. Like archaeology, it tells stories that would otherwise be forgotten.

The essays in this volume consider a wide variety of materials, objects, and substances that we are eager to get rid of, and they trace what happens to them once they are "out of sight." Drawing on different disciplines—history and art history, urban geography, environmental studies and anthropology—the contributors follow the travels of this waste and visit the landscapes that it has created. Waste, these scholars show us, never disappears completely. What matters is how and where it reappears, and the transformations that it undergoes during its journeys.

In a stimulating essay, Simone M. Müller reminds us that the open sea has long served as a repository for waste. Unwanted things—whether people or objects—could simply be loaded onto a ship and sent away. Müller tells parallel stories of waste and human waste, of toxic industrial remnants and people with diseases such as leprosy. As a space where terrestrial jurisdiction did not apply, the ocean has often seemed to present a convenient solution to messy problems that nobody wanted. And yet, as Müller shows, the fate of these eternally sailing ships was often far from straightforward.

Electronic goods are one form of waste that often ends up overseas, far from the location where it was used. Turning from the travels of waste to what happens to it when it lands on some far shore, Richard Grant looks at urban mining in Accra, Ghana. He shows us that waste, while it may disappear in one site in the developed world, often reappears in another site in the developing world, where it is no longer just waste, but a resource as well. Agbogbloshie, a slum in Accra and central processing site for e-waste, is one such place. Reclaiming or mining elements from discarded electronic devices has become an informal economic activity that is conducted in Accra's "livelihoods of risk" (Amankwaa 2013).

Because e-waste travels in complex international circuits and the recovery of precious materials carries health hazards for those who process it, Grant suggests that producers should think about redesigning electronics in an eco-friendly way and with an eye to urban mining sites such as the one in Accra.

Closer to home, as well, waste that was once hidden in landfills is reappearing, transformed into a new kind of resource. Waste-to-energy plants in places like Britain, Catherine Alexander explains, were designed to help reduce waste and carbon emissions, but they have had unintended side-effects. In one sense, waste-to-energy plants seem to solve the problem posed by the need to dispose of waste: it no longer needs to be sent away, out of sight, because the incinerators of the energy plants can make it "disappear" much more permanently. And yet, as Alexander's essay shows, turning waste into energy does not liberate us from waste itself. On the contrary, the very energy plants that recast waste as a resource have, paradoxically, led to an increase of waste: in order to operate a new generation of large energy plants, demand for waste has risen and a tendency to ship waste to fewer and ever larger plants has set in.

In a sense, then, waste-to-energy plants are merely perpetuating a long-existing dependency between energy production and waste production. Nearly all energy sources involve some form of waste, whether that be in the form of pollution (coal smoke, CO_2 emissions), or radioactive material that remains toxic for tens of thousands of years. In her essay about Ozersk, a small town that was the home to Russia's first plutonium plant, Kate Brown reminds us that nuclear waste products cannot simply be shipped off, buried, or incinerated. Radioactivity often travels whether we want it to or not, and it does so invisibly: it is both unseen and frequently unacknowledged, a problem that governments would prefer to ignore. Brown discusses the effect of nuclear substances not only on rivers and ground water, soils and plants, but on the human body. The last stop of nuclear waste, she argues, is often the bodies of animals and humans. Nuclear waste is causing pain and it has changed bodies. Historians, she concludes, ought to study the transformations through waste not only of landscapes and ecosystems but of the human body, which she describes vividly as the "final radioactive storage site."

While the mark left by radioactivity on the landscape of the human body is, initially at least, intangible and invisible, in most cases the physical materiality of waste is much more difficult to conceal. Waste endures, turning the sites of dumps and landfills and

sewage systems into wastescapes that continue to shape their surroundings—sometimes in surprising ways—long after the waste itself is no longer visible as such.

It is this physicality of waste that also gives it its transformative potential. Precisely because of its persistence, it can be used as a tool to make us more aware of our effects on the world around us. Amanda Boetzkes shows us how waste can be transformed physically and symbolically as art. She looks at plastics as durable and ubiquitous products that are connected to a culture of waste management, a global oil industry, and an energy economy. Her interest is in the ways in which plastics have permeated our reality and, more specifically, in the ways in which artists have disclosed the aesthetic appeal of plastics, how they have subtly criticized their ecological impact, and how they have revealed the provenance of plastics from oil cultures and economies. Contemporary art and film about plastic waste, Boetzkes argues, expose trash in a variety of forms and help us visualize, acknowledge, and critique larger systems in which plastic waste circulates and operates.

Places, too, can undergo astonishing symbolic transformations, as Martin V. Melosi shows in his essay about the Fresh Kills Landfill on Staten Island, New York, the "largest human-engineered formation in the world." Like Boetzkes, Melosi is interested in the ways in which artists, in his case Mierle Laderman Ukeles, have seen Fresh Kills as a social sculpture and a symbolic site. Moreover, Melosi asks how the massive wastescape, which was transformed from landfill to cemetery and future park, should be preserved. He challenges the ideas of planners who wish to restore the original marshland habitat and suggests that the human dimension that is reflected in the history of the landfill may be just as worthy of preservation as the natural environment.

Like Melosi, who reminds us that wastescapes are transient and "exist in a broad historical stream," Sarah Hill invites us to explore the ever-changing history of a marshland in Kalamazoo, Michigan: although today Kleinstuck Marsh is a nature reserve, Hill shows us how this seemingly nearly pristine piece of land was once considered useless wasteland. Through a series of ironies, a peat bog—itself a sort of garbage dump of nature in which organic matter collected and rotted—was drained and transformed from a unique ecosystem full of rare plants into an unwanted, valueless piece of property. In the late 1920s huge sewage pipes were imbedded in the area in order to run wastewater down the hill and into a sewage treatment plant. Today, in another ironic transformation, the

area has become a nature reserve, but one full of nonnative plants that little resembles the bog it once was, and one which bears permanent, if mostly hidden, traces of human activity.

Digging around in the mud and investigating hazardous wastes, refuse, and runoff may be a dirty business. It often takes the meticulous work, shrewdness, and intuition of a detective to follow substances and objects that people have discarded. But tracing how waste moves around and weaves itself into our environments gives us deep insights into social and cultural norms, human habits, and material wants. Moreover, it reveals a hidden side of our culture and past practices, as well as future risks to nature, culture, and life on our planet.

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Most of the essays in this volume stem from a workshop organized by the Center for Advanced Studies (CAS) at LMU Munich in collaboration with the Rachel Carson Center for Environment and Society in October 2014. It brought together scholars from four continents and from many disciplines as part of a CAS research program entitled "Waste in Environment and Society." This volume, together with a forthcoming *Perspectives* volume, *Is There a Future without Waste? Zero Waste in Theory and Practice* and a German-language publication, *Inwastement: Abfall in Umwelt und Gesellschaft*, edited by Jens Kersten, documents the outcome of our two-year research project. I am grateful to my colleagues at the Center for Advanced Studies, especially Dr. Annette Meyer, Dr. Sonja Asal, and Prof. Christof Rapp for their ongoing support and to the visiting scholars and board members of our research focus. My biggest thank you goes to the editors at the RCC, in particular Marielle Dado and Brenda Black, who dedicated time and energy to this project and have significantly improved the individual essays of this volume and helped to see it through production.

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Someone Else's Problem?

Simone M. Müller

The "Flying Dutchmen": Ships' Tales of Toxic Waste in a Globalized World

Ships materialize the flows of globalization. Traversing the world's oceans, they carry the containers filled with goods and people within global networks that sustain our global economy. Not on every voyage, though, is the cargo meant for global circulation, for exchange, or for re-entering social and economic networks at its node of destination. Social, political, or economic considerations at the sending or receiving port—or both—can send these ships on voyages of no return and so end the material flows of globalization.

Maritime space, covering 70 percent of our planet, offers great locations where objects—including goods as well as people—can be disposed of or put outside of the territorial jurisdiction more generally. At sea, unwanted shipments as well as the problems attached to them can easily be brought out of sight, at least temporarily. In the early modern era, for instance, the leper ships were one solution to a community's epidemic health problems. As ghost ships, like the famous *Flying Dutchman* from seventeenth-century nautical folklore, these ships were destined to roam the world's oceans and to never return to port again. In 1633, the Japanese emperor sent a ship full of lepers to Spanish missionaries in the Philippines with strict instructions for the captain to let them drown rather than allowing them to return (Wheeler 1913). Indeed, for centuries, the world's oceans have been the ultimate receptacle for things unwanted by society: objects were dumped at sea, burned at sea, or simply set on a voyage of no return.

Starting in the post-World War II era, the world saw a resurgence of these "Flying Dutchmen" on the oceans in vast numbers. This time, however, these ghost and leper ships were not carrying the externalities of a social community ridding itself of outcasts scarred by a lethal disease, but the externalities of an economic system ridding itself of the non-recyclables of production: toxic waste. The ships' tales were one of the industrial world's most toxic by-products, such as PCBs or outdated chemical weapons from the wars in Korea and Vietnam, which were first dumped and later on burned at sea. In the end, these ghost ships transported toxic remnants of industrial production in the Global North along former colonial shipping routes to "disposal" sites in countries of the Global South. With increasing territorialization of ocean space by means of environmen-

tal regulation, however, the "Flying Dutchmen," whose toxic cargo was doomed to sail forever without a proper destination, returned into sight ever more persistently. It was no longer possible for toxic waste to be out of sight as the "Dutchmen" loomed fiercely on the horizon. By the 1980s, the world had arrived at a global toxic waste crisis.

One of the twentieth century's first "ghost ships" was a US military freighter loaded with outdated chemical weapons from the war in Vietnam. The *LeBaron Russell Briggs* last set sail on a voyage of no return into the Atlantic in the summer of 1969, just prior to the environmental turn of the 1970s. It was already late afternoon when the *LeBaron Russell Briggs* finally sank. For almost six hours the men aboard *USS Hartley* had watched the aging Liberty ship and its 418 coffins of lethal nerve gas slowly making its way nearly 5 kilometers deep into a watery grave. Their mission, CHASE 13, was the last of a series of ocean disposal programs by the US Army between 1964 and 1970. With these missions, the US military got rid of unwanted material, primarily outdated chemical munitions, on old ships which it then scuttled at sea. Its acronym CHASE stood for "Cut Holes and Sink 'Em" (Ross and Amter 2010).

While previous missions had remained relatively under the radar, CHASE 13 received enormous political and media attention in the summer of 1969. It spurred wild protests among conservationist and radical student groups in the US that were engaged in anti-Vietnam activities more generally. For US environmentalism, operation CHASE 13 represented an important landmark. The military operation marked the end of a period in US environmental history that had seen the shift from conservationism to environmentalism, the growth of grassroots activism, and a general rising awareness of topics on pollution and environmental protection. Spurred on by Rachel Carson's best-selling publication *Silent Spring* in 1962 and framed by the Santa Barbara Oil Spill in 1969, Americans increasingly voiced their concerns about their environment (Matthew 2013). After CHASE 13, they also had a term for their discourse on toxic materiality: hazardous waste. A problem that had been "unnamed" beforehand had received its own terminology with operation CHASE 13 (Rome 2003).

Operation CHASE 13 also "environmentalized" maritime space with regards to toxic waste. Succumbing to public and political pressures, the Nixon administration passed the Marine Protection, Research, and Sanctuaries Act, commonly known as the "Ocean Dumping Act," in October 1972. This put an end not only to the military's but also the US

industry's practice of dumping millions of tons of chemical waste. In 1973, the London Ocean Dumping Convention internationalized the American approach. It mandated all contracting parties to "prevent dumping in the ocean which would endanger human health, harm marine life, infringe upon the uses of the oceans for pleasure, or interfere with other legitimate uses thereof." The oceans no longer functioned as the world's ultimate receptacle for toxic waste.

Shortly after the London Convention came another chapter in the story of the modern "Flying Dutchmen." In December 1974 a "strange-looking ship" was tied up at the port of Houston, Texas: the *Vulcanus*. Named after the Roman god of fire, the freighter was painted in "a garish yellow with large black smokestacks aft." With a "good deal of German efficiency," according to the *Philadelphia Inquirer*, the German-designed ship was to solve one of the Gulf of Mexico's most pressing environmental and economic issues: toxic waste disposal. For years, the petrochemical industry that ringed the gulf had indiscriminately, and "with little public attention and only a minimum of government control," dumped million tons of chemical waste into the Gulf (Chriss 1974). With the Ocean Dumping Act, however, this cheap opportunity to bring toxic materiality out of sight had passed. Instead of disposing their externalities from production cheaply in the Atlantic Ocean, the industries of the Gulf now began accumulating their "most noxious wastes" on land, posing a major pollution problem for the Gulf area.

The *Vulcanus* had been re-fitted as a waste incinerator ship in 1972. Although the ship was registered in Singapore, it was operated by the Dutch firm, Ocean Combustion Services, which was a subsidiary of the German shipping company Hansa. In 1972, it contained two incinerators, which according to joint studies by the Environmental Protection Agency (EPA) and Shell could destroy 99.35 percent of the dangerous waste material. The ship took on the waste in liquid form. The liquid was then placed in holding tanks and fed at sea into the incinerators, which burned the waste at 1,400 degrees Celsius (Chriss 1974). At the time, the *Vulcanus* operated primarily in the North Sea out of the Rotterdam ship yard, but it also served chemical waste disposal globally. Aside from its European jobs conducted in the North Sea and Shell's chemical waste in the Gulf of Mexico, the ship also took on jobs in the South Pacific. In 1977, it burned eight million liters of Agent Orange that were "left over" from the Vietnam War (Zeit 1984).

While the *Vulcanus* operated clearly "out of sight" from most land inhabitants, protests surrounding Shell and the EPA's experiments with ocean incineration settled on the fact that the toxic waste ship was still too close to shore. Ocean incineration ships were to operate 170 miles (274 km) from shore; for the concerned US public, this was not far enough away. In the mid-1980s, opposition was fierce against ocean incineration. The attorney generals of the states of Texas, Louisiana, and Alabama threatened to sue the EPA if it were to go ahead with its plans of ocean incineration in the Gulf of Mexico. While American proponents of ocean incineration of toxic waste claimed that it was "environmentally sound," its critics doubted scientific evidence and questioned whether an accident at sea could in fact be cleaned up. "If it's so safe," argued Texas governor Mark White at a US Senate hearing, "why do they want to go 170 miles out to sea to incinerate?" (Mathewson 1985). In the end, ocean incineration did not stand a chance against opposition in the US.

Like Shell and the EPA, the city of Philadelphia also experimented with ocean incineration as an alternative to ocean dumping in the 1980s. But similarly, it failed to establish this as a permanent practice by the city's toxic waste management. Seemingly lacking other options in the face of empty pockets and a "Mount Everest of ash" that had risen behind the gates of its waste treatment facilities, in the summer of 1985 the municipality asked waste traders Paolino and Sons to load another ship named the *Khian Sea* with toxic cargo. The ship left Philadelphia in September 1986 loaded with 14,000 tons of toxic ash from Philadelphia's waste incinerators. Its initial destinations were the Bahamas and then Panama, where the ash was to be used for a road-building project along Panama's fragile wetland areas. In the end, it was a report of the US EPA which caused both governments to have second thoughts. Worried about importing an environmental time bomb, both withdrew their landing rights for the *Khian Sea* (Moyers 1990).

This withdrawal was the starting point of the ship's fateful voyage: for 27 months it roamed the world's oceans in an unsuccessful attempt to find an (il)legal dumping ground for its cargo: traveling from the Bahamas to Panama and finally to Haiti, where the ship dumped 4,000 tons of Philadelphia's toxic ash as "fertilizer." After leaving Haiti, the *Khian Sea* continued its search for a dumping ground for the remaining cargo on to the Dominican Republic, Honduras, Guinea-Bissau, the Netherland Antilles, and Sri

Lanka. After more than two years at sea, the ship reappeared as *Pelicano* in Singapore in November 1988—without its cargo. Its captain stated that the trash had been unloaded, but refused to say where. Greenpeace asserted that the toxic material had been dumped in the Indian Ocean. Moreover, facing a whole fleet of "Flying Dutchmen," environmental action groups and concerned media outlets saw an era of "garbage imperialism" looming large on the horizon, when industrial nations would send their waste to disposal sites in "third-world" countries (Morris 1987).

The public outcry following media reports on the *Khian Sea*, the *Mobro*, the *Karen B* and other toxic waste ships of the time led environmental NGOs and developing countries to rally behind the cause of regulating the export of toxic waste. In early 1994, their alliance was successful in bringing about a ban on the waste trade between industrial and less-industrialized countries within the context of the Basel Convention on the Transboundary Movement of Hazardous Waste and Its Disposal (Clapp 1994). After the ban of ocean dumping and the failure to introduce ocean incineration as a common practice, the Basel Convention added another facet to regulating ocean space environmentally. Ocean space where nations were "free" to dump their toxic externalities had become increasingly limited by the 1990s. Ironically, it was these regulations aimed at "greening" ocean space that made the problem of toxic waste disposal ever more pressing and ever more visible.

In the late 1980s, the *Khian Sea*'s fateful voyage had come to represent many other ships populating the world's oceans on their voyages of no return. But it was the equally hapless voyages of the *LeBaron Russell Briggs* in 1969 and the *Vulcanus* in 1974 which had laid the foundation. All three waste barges symbolized the world's growing crisis with toxic waste after the 1970s. Just like the phantom *Flying Dutchman* signified the shadowy other, reminiscent of death and decay to early modern mariners, those toxic waste ships represented the ephemeral other of an economic system based on growth and profit maximization. And so concerned contemporaries saw the *Khian Sea,* like its mythical predecessor, as a portent of doom: the world was to drown in its toxic waste.

Today, the media relegates a different cargo to the "Flying Dutchmen"—people. Instead of lepers, now they are men and women of African descent attempting to cross the

Mediterranean to find refuge in the safe haven of Europe. But as their captain and crew jumped ship, they are, just like the toxic waste barges of the 1990s, doomed to roam the oceans forever. While the problems require very different solutions, they point out the same human mechanism of dealing with unwelcome objects: out of sight, out of mind. The only difficulty is that some things keep on reappearing.

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Richard Grant

The "Urban Mine" in Accra, Ghana

As societies have recognized the need for sustainability, urban mining has become increasingly important. The phenomenon is derived from the reality that the planetary ecosystem is finite, non-growing, and materially closed, as well as from industrial ecology with its emphasis on materials and energy flows in products, processes, and economies. Urban mining refers to the process of reclaiming compounds and elements from products, buildings, and waste. It concentrates on recovering metals embodied in waste, especially e-waste. The practice of sending our waste elsewhere for processing has enabled urban mining to become a salient urban informal economic activity in e-waste processing sites across the developing world.

The conundrum of waste is that it is regarded as an aesthetic inconvenience in the developed world and a valuable source of income in the developing world. However, the two realms are not discrete but rather linked by an occluded web of flows. Waste can become invisible at a site in the developed world but it never disappears. Rather it is moved out of sight by trucks, containers, and ships only to reappear at informal processing sites in the developing world. There, waste is transformed again through a recovery process of urban mining, metals are recovered and made visible once more, and discarded components are left behind in final resting sites. In further travels, valuable metals are exported from the developing world and re-enter global production circuits where they disappear once again by their incorporation into new products. Importantly, waste is generally understood by imagined static discrete geographies, but its real geography entails a dynamic web of globe flows and complex waste component circuitry (Grant 2015).

We need a new and different perspective to capture these phenomena and the growing urbanization of mining that extends the modes of extraction via the recycling of e-waste, concentrated in particular city locales, and tied to international scrap circuits. Urban mining is, therefore, very different from traditional mining and its "holes in the ground," extraction sites generally located in the interiors of countries away from urban centers (Labban 2014).

Sourcing secondary raw materials as an alternative to primary ones is increasingly important. This has arisen due to urban ores expanding in tandem with consumption. The stock of urban ores is therefore distinct from the stock beneath the ground. Paradoxically, increasing demand for global electronics (and by association the metals incorporated into products) has depleted the primary stock but added to the urban mine.

Scholars such as Labban (2014) now refer to a planetary mine. There is a piling up of metals on the Earth's surface, embedded within the waste of decayed buildings, scrap vehicles, aircrafts, ships, broken infrastructure, and electronic devices. This planetary mine is now extended as well as constituted by burgeoning informal e-waste sites concentrated in specific African cities such as Accra, Lagos, Nairobi, and Johannesburg. Urban minefields extend across metropolitan areas, connecting resources that were once considered waste into a recovery and international reprocessing system. Increasingly, too, mining companies refer to the accumulation of materials containing toxic and valuable metals as the "mines in the city" and "the urban mining field" (Oteng-Ababio et al. 2014). Geopolitically, states (e.g., the US, the UK, and Japan) and regional organizations (e.g., the EU) are leaning toward the promotion of mining of e-waste as a sustainable solution to e-waste dumping abroad, simultaneously enhancing the resource security of the Global North while adding domestic green-technology employment.

E-waste contains high concentrations of valuable metals. UNU (2012) calculates that, on average, deposits of precious metals in e-waste are 40 to 50 times richer than ore deposits currently available from primary mines (see table 1).

Metal	Primary Mining	Urban Mining
Gold (AU)	5 grams/ton in ore	200–250 grams/ton in PC circuit boards
		300–350 grams/ton in cell phones
Platinum (PGMs)	2–6 grams/ton in ore	2000 grams/ton in automotive catalysts
Copper	4,500–9,000 grams/ton in ore	112,5600–131,250 grams/ton in cell phones

Table 1: Amount of metal available from primary and urban mining. Based on statistics in Umicore (2011).

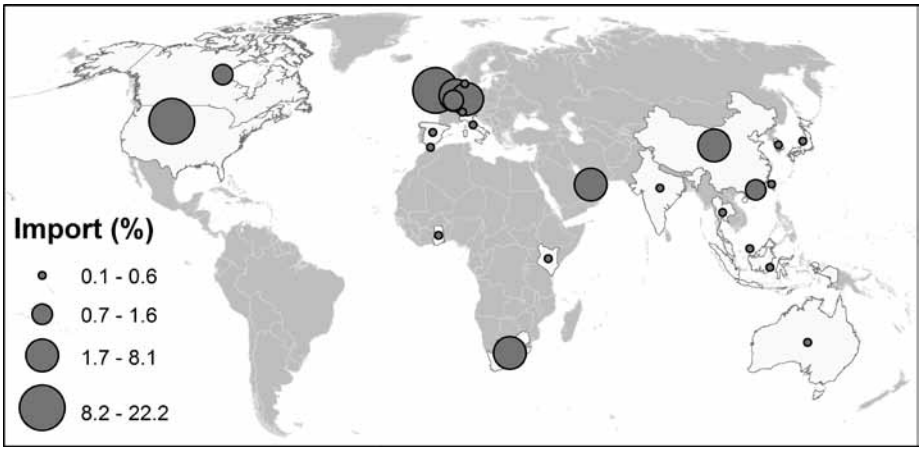
Some scholars (e.g., Schluep et al. 2009) calculate that several billion dollars' worth of metals are incorporated into global electronics. For example the combined sales of mobile phone and personal computers in 2007 accounted for 3% of the world mine supply of gold and silver, 13% of palladium, and 15% of cobalt. Importantly, in theory, this metal accumulation could be reclaimed and harvested at the end-of-life of the devices, potentially making 40 million tons of metals available for reuse.

Geographies of Ghana's E-waste and E-scrap

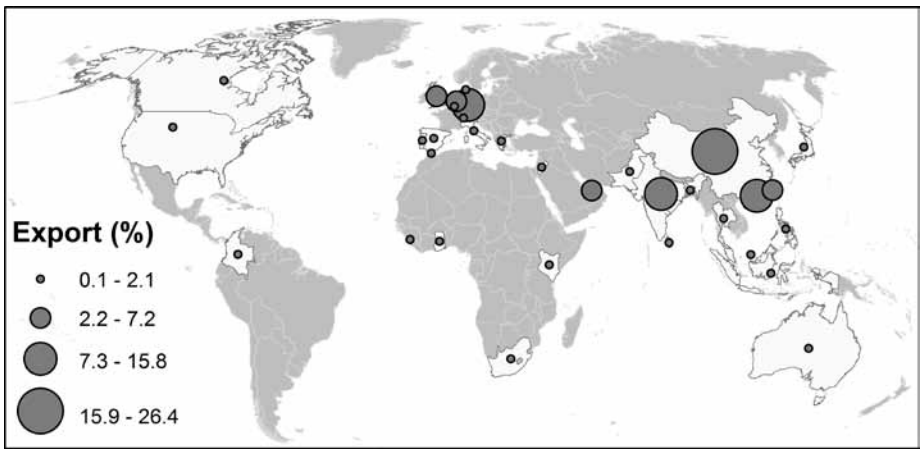
The main feature of the economic geography of e-waste imports versus e-scrap exports is the huge imbalance in global e-waste flows. Shifting our focus to Accra, Ghana enables us to understand waste and revaluing from a very different lens. It also enables us to situate Accra's urban mine within a global system.

On the ground in Accra there is a large and well-organized recycling sector involving rich and diverse practices of reuse, repair, and refurbishment as well as recovery of metals and plastics from electronic discards. Some firms and individuals make enormous profits from the e-waste refurbishing and recycling, but typically informals only eke out a living. Imports into Ghana originate mainly from Europe and the United States. By contrast, outflows from Ghana show a high concentration to Asia with two smaller concentrations to Germany and Belgium. Noticeably absent are outflows to the United States.

Ghana imports used electronic devices from 147 countries. Electrical and electronic equipment importing commenced in 2004, and by 2009 the level of imports had risen to 215,000 metric tons, 70% of which is e-waste. Another 984,000 tons of working electronic devices are in circulation, much of which is comprised of refurbished devices with a shorter life span (Schluep et. al 2012). This domestic stream is quickening: Ghana's participation in the IT revolution is considerable; mobile phone subscriptions in 2012 (per 100 people) surpassed the number in the United States. Scavengers operating at very high collection rates for electronic devices enable the urban mine to function.



Map 1: Imports of used computers into Ghana, 2004–2010 (by source country)



Map 2: Exports of metal scraps from Ghana, 2004–2010 (by destination country)

The main processing site in the country is located in Accra at the Agbogbloshie site, a slum community in the vicinity of the center of the city. However, as the e-waste business has been consolidated it has expanded to secondary sites in Accra as well as to sites in other cities. E-waste scavenging plays a pivotal role in Accra's economy, employing 4,500 to 6,000 individuals directly, and approximately 30,000 within the broader e-waste chain of activities. Oteng-Ababio et al. (2014, 164) calculate that Ghanaian e-waste activities generate US$105 million to US$268 million annually.

Europe is by far the most important exporter of used computers to Ghana, followed by the United States. Much of this trade is considered donations to accord with the Basel Convention (which regulates the transport of hazardous waste), but non-working devices are often included in exports. Flows into Ghana from Asia, the Middle East, and elsewhere in Africa are also rapidly increasing. Some of this regional traffic is European and North American traffic that is concealed by routing container traffic to Ghana via Hong Kong, Durban, Mombasa, and Dubai. Another component is circumvented traffic from China and other countries that have received negative media exposure (Grant and Oteng-Ababio 2012). Moreover, the IT revolution has meant that countries such as China, India, and South Africa have also become both a source as well as destination for e-waste.

At the apex of the e-waste export economy are a handful of formal recyclers, most based at Ghana Free Zones in Tema, but since 2010 a few foreign firms have established operations outside the free zone. The most prominent firms on the Ghanaian e-scrap scene are Success Africa, Gravita, Commodities Processing, and N.N. EST Meta, all registered as Indian companies, and Goldline, which is a Saudi Arabian-registered enterprise. These free zone companies enjoyed exclusivity in e-scrap exports from 2004 until 2010 due to specific national policies that granted these firms sole rights to export scrap metals, virtually permitting a "state-sponsored monopoly." Their dominance was further bolstered by virtue of the Ghanaian scrap sector being largely comprised by survivalist informal operators.

As a direct result, domestic scrap firms had to engage middlemen scrap brokers and/or free zone companies if they wanted to participate in legal export trade. In time Ghanaian firms opted to bypass the middlemen and participate in export scrap trade by circumventing trade policies and outwitting customs officials. Grinding motherboards into fine powder for export became common. As profits rose from this practice, especially compared to profits earned from domestic scrap (e.g., with the exception of steel, local prices for scrap materials are 40%–150% below international market prices [Amankwaa 2013, 563]), non-zone firms began to call for greater freedom to export.

Ghana trade policy on scrap metal exports is murky. A trade ban on export metals was imposed by the Ghanaian government in the 1980s but weakly enforced and relaxed to entice free zone investment and to permit export exclusivity. Considerable flexibility

prevailed until 2009, when a change in government coincided with a reconsideration of the monopoly of free zone companies in scrap exports. The government enacted a legislative instrument, LI 1969, the Exportation of Non-ferrous Scrap Metal Regulations, in 2010, permitting local companies the license to export scrap metals without having to engage free zone companies and/or their agents. Free zone companies responded to the increase competition by pre-financing their "agents" to undercut incentives for local scavengers not directly connected with their operations, and pre-financing was extended to international agents in Burkina Faso, Togo, and Niger to extend the Accra urban mine by developing a secondary material supply hinterland. A stronger law—the Ferrous Scrap Metal (Prohibition of Export) Regulations (LI 2201)—was introduced in March 2013, but this law has not been fully implemented because of opposition from the Scrap Dealers' Association.

Generic scrap is the largest category of scrap exports, accounting for approximately one-third of exports in 2004–2010. The next largest categories are copper, lead, and mixed scrap. Copper is a significant export because of high global prices and no refinery capacity within Ghana; exports serve markets in the Middle East via Dubai and in Asia via Hong Kong. Customs officials in Ghana complain that they lack the resources to check every container. As a result, new subcategories of trade, e.g., mixed scraps, appear, and this generic invention in 2005 circumvented customs officials and provided a pay-off until customs surveillance was improved. There is also a portion of secondhand trade that is illegal. The media regularly report mislabeling and millions of dollars of scrap metals being exported as shea nuts, teak wood, cashews, and other products.

Informal recyclers use rudimentary technology, principally hand tools, and concentrate on the extraction of copper, lead, steel, and aluminum. There is no local capability to extract silver, gold, palladium, and cobalt. Some metal scraps are traded more in the domestic economy: steel scrap is mostly processed in electric arc furnaces (five of which are located in Tema).

Officially, Ghana exports metal scrap to 31 countries amounting to several million dollars of reported trade. Newly emerging economies such as China and India, which are in major need of metal inputs for their rapidly industrializing and urbanizing economies, are key export destinations. China is by far the largest importer of Ghana scrap (see map 2).

Numerous small companies also participate in scrap exports. Some exporters and importers appear to be fictitious enterprises (companies without websites that could not be traced via the Internet), which is hardly surprising given that the waste and recycling businesses are widely reported as attracting criminal networks and companies that circumvent taxes and duties.

A New Beginning for Urban Mining? A Global Sustainable E-scrap System?

Urban mining unsettles notions of bounded informal economies, national resource economies, and the core-periphery dyad, as well as conventional spatial oppositions, e.g., city-mine, consumption-production, and waste-resource. Instead, urban mining illustrates how informal workers are linked to global transformations of digital economy materials.

Urban mining shows that it is essential to keep multiple perspectives on devices and recycling in view simultaneously. This framing illustrates the considerable value in disassembly (in addition to assembly). The global transformation of materials links informal and formal firms in the e-waste and e-scrap circuitry. Positive aspects of urban mining include the conservation of global resources (saving the environment, reincorporating materials already enmeshed in the global material system, and turning residuals into resources) and providing local livelihood opportunities (although in its present form, scavenging and informal processing are far from decent work).

Moving the conceptualization of non-value electrical and electronic equipment waste toward a sustainable waste management centered around urban and planetary mining allows for the possible engagement of distant and hitherto separated economic actors—manufacturers, recyclers, users, waste re-claimers, scrap metal traders, and especially the communities where waste recovery is done.

The key challenge is to situate urban mining within a global sustainable network. Critical challenges for African interchanges include: 1) the establishment of a more sustainable collection and recycling system that ensures that high volumes of valuable and non-valuable waste fractions are collected equally and that the respective fractions are channeled to appropriate treatment and disposable facilities; 2) harnessing finan-

cial support from the global players in order to ensure that the valuable pays for the non-valuable; 3) implementing formal collection depots for discarded devices where trained e-waste workers operate in safe and more efficient environments for processing waste so that metal fractions can be improved; this formal collection system must at the same time integrate informal scavengers; and 4) situating informal urban mining within respective national development frameworks, which requires state, private sector, and civil society support for informals so that metal scraps are prioritized for domestic industries and exported only under fairer and transparent conditions.

The creation of a global sustainable system will require profound changes at various sites—the ore mines, the producer sites, the urban mines—as well an appreciation of the circulation of material transformations among spatially separated sites. One pathway to explore in production might be an eco-friendly design that would reconfigure electronics with an eye to their eventual transformation in faraway urban mining sites. Financial support for technical shredders and creating green jobs in metal extraction are badly needed to ensure that African incorporation into the global material transformation is enabled on improved terms. At present, the difference between informal and formal disassembly capacity could not be greater. For example, compare an Accra informal worker operating with a chisel and hammer versus a mechanical 9,000-horsepower shredder in the USA that can shred a car in one minute so that other technologies can be deployed to separate the ferrous from non-ferrous material.

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Catherine Alexander

When Waste Disappears, or More Waste Please!

This paper considers the unintended consequences of well-intentioned environmental propositions or principles that on closer examination turn out to be partial views and/or isolated from broader structural constraints. In particular, I examine what happens if we take three core environmental propositions, which have almost become truisms or principles of our time, and consider them in conjunction. Baldly stated, these are the propositions: First, the world produces too much waste; we therefore need to reduce waste. Second, primary resources are being extracted beyond the point of sustainability or replenishment; we therefore need to reduce resource extraction, particularly carbon-based fuels. Third, energy demands are increasing, particularly in developing economies; we need to expand energy production, but we also need to reduce carbon emissions.

These are, of course, closely related. Energy is required to treat waste and extract resources; it can also be generated from both. Recycling, which again uses energy, replaces or delays primary resource extraction.

There is a fourth proposition, which we might call a secondary or recursive proposition, since it both addresses how we deal with these problems and is derived from all three principles. This is commonly known as the proximity principle. Enshrined in EU guidance (EU 2008, Article 16), the proximity principle suggests that material operations should minimize distance traveled. Thus if waste is to be disposed of, treated, or recycled, the proximity principle promotes these activities happening as close to the point of waste generation as possible. The rationale is formed by principles two and three outlined above: local recycling means less energy and fewer resources (fuel) are consumed in transportation.

An ideal, virtuous scenario might therefore be imagined as a closed loop, where materials circle through different stages of assembly, consumption, and post-consumption disassembly before the circle starts again. Since some of these stages can release and others consume energy, the closed loop requires no energy input.

Whether or not any system can be fully closed is a moot point.

This article is, in part, a provocation: carefully adhering to all these excellent principles produces unexpected results, one of which is that the apparent reduction or indeed elimination of waste in fact requires *more* waste. One might say therefore that this provocation is a *reductio ad absurdum*, but one that is regularly promoted and enacted, if in not so many terms. What this paper is therefore exploring is why ideas of closed loops are inevitably tripped up in their translation to practice (Alexander and Reno 2012).

The context is contemporary Britain and attempts to respond to the 1999 EU Landfill Directive (EU 1999) to reduce biodegradable waste going to landfill. Vast amounts of public money have been directed towards new technologies to treat waste and then treat the inevitable by-products, large-scale commercial contracts to manage municipal waste streams, and massive media communications to the public to recycle and segregate their rubbish at home. These new social, political, engineering, and financial technologies invariably do not stand alone, despite often being presented as such, but require some kind of pre- or post-activity process, or indeed something as simple, and problematic, as a physical connection to the National Electricity Grid or local housing in order to realize technological and financial promises (Alexander and Reno 2014).

Tracing the logic of how less produces more, we need to think about three key factors that immediately complicate the abstraction of a closed loop. In the first instance, *uneven geographies* underlie each of the three main propositions. The production, consumption, and disposal of waste, resources, and energy occur at different rates and at different scales whether within cities or regions, or globally (Moore 2012; Bakker and Bridge 2006). Arguably, keeping material operations local in a globalized material economy demands active disconnection and can be as hard to sustain as many local exchange trading schemes (Aldridge and Patterson 2003). Second, *technical constraints* on most waste treatment technologies affect what goes in and out of them. Not all technologies can cope with all materials, and often choices have to be made as to which element is to be maximized: energy generated or waste treated. Third, *sociotechnical constraints* are central to this provocation in terms of how materials and processes are classified and what those classifications enable or inhibit. Similarly, the financial devices that frame and drive these processes often determine how they operate: economies of scale and shareholder imperatives undermining a moral/environmentally-framed pre-

script of reduction and local operations. These three considerations are often occluded when considering resource and energy management. The remainder of this paper discusses these technical and sociotechnical constraints within a context of uneven material, social, and financial geographies.

Energy, Waste, Resources—and Proximity

Technical Constraints

There are roughly three modes of waste treatment and disposal, some of which are only appropriate for organic waste. These are: rotting (composting or anaerobic digestion [AD] for organic waste); burying (landfill); and burning (incineration and more sophisticated forms such as pyrolysis and gasification that partly char material and produce a synthetic gas called syngas). We could add here "containing" or "storing" as a subcategory of burying where decisions about what to do with waste—typically toxic waste such as nuclear waste—are postponed or temporally displaced. This has not always been a successful strategy; containment technologies do not necessarily weather well and can leak into the present (Gille 2007; Brown 2013).

All technologies (other than postponement) take waste in and produce some form of energy: biogas from AD, methane from landfill, and heat or syngas from incineration. All of them, except landfill, require some kind of technological treatment for the waste *before* the technology and sometimes *afterwards* if by-products are to be usable; for example, autoclaving digestate to be spread on fields to ensure persistent organic pollutants and heavy metals have been eradicated. Most treatments produce one or more by-products, which in turn require "treatment" to render them safe, compact, saleable, recyclable, etc. As materials process through this efflorescence of treatments, their capacity for value extraction, in the broadest sense, is steadily reduced until finally the landfill receives the compressed husks of char, ash, and fiber. After nine recycling iterations, for example, the best quality wool is nothing but dust.

Shifting the emphasis from waste treatment and disposal to energy changes the picture. Incineration produces heat directly through combustion. Other waste-to-energy technologies produce heat and combustible fuel (methane) that can be converted to electricity or heat. Technologies are being improved all the time. However, most operate better with a

constant volume of inflowing material. The need for steady flows is accentuated in non-mechanical treatments where microorganisms require the right substrate conditions to multiply and digest waste. Starting up an AD plant requires a degree of care. Sudden shifts in volume or shutting down and starting up again is not easy to do.

The extent and quality of the gas produced depends on the volume and composition of the waste feedstock technology. Quality refers to first, how clean it is—hydrogen sulfide, siloxanes, and carbon dioxide have to be removed in order to upgrade the biogas—and second, how much energy it contains. The greater the calorific content going in, the better quality gas produced. Optimum feedstock is organic in origin (e.g., paper, wood, food, crops) and preferably has not been through any processes that have already extracted some energy. Slurry, therefore, while the most common reason for farms having AD plants on site, releases relatively little and poor quality biogas, as the organic matter that went into the cow has already had much of the energy removed by the cow's own digestive processes. Arguably, a cow is a living anaerobic digester.

Farmers therefore have to consider whether their AD plant's primary purpose is to contain and treat on-site slurry for intensive farming, or to generate energy. If the latter, the output is improved by the addition or co-digestion of other organic material such as maize or crops rejected by supermarkets as aesthetically imperfect. At the other extreme, of course, high-calorific crops are grown exclusively to produce energy, raising questions about trade-offs between food and energy security.

Energy via biogas is not the only output. AD also produces digestate, which is akin to a fertilizer and a fibrous matter for which many ideas have been suggested but none as yet commercially implemented. This is therefore a residual by-product currently landfilled.

Research is underway to team pyrolysis with anaerobic digestion, to "disappear" that last bit of waste and, it is claimed, produce more energy, but the syngas produced by feeding fibrous residue from AD plants into pyrolysis plants is negligible in terms of energy quality. This means that if incinerators or indeed syngas technologies are only fed residual waste, after extensive recycling of paper products and diversion of organic wastes to AD and composting plants, then the energy they produce is of lower calorific content. A further nuance is that "burning" technologies operate more efficiently and effectively with dry feedstock.

If waste treatment technologies are to produce energy, they therefore need high calorific inputs. Arguably, this works against recycling paper and reducing organic waste *tout court*. One way forward here is to develop the technologies that use these fuels so they require less energy for their own operation, thus releasing more surplus energy. Or to recast those principles of reducing waste and increasing energy production as a balancing act or a question of choice, rather than an unproblematic, beneficial solution, where one is elided with the other.

However, there are other kinds of technologies that are locking in place particular approaches to those opening propositions: legal restrictions and penalties on the one hand and financing mechanisms on the other. It is these sociotechnical obstacles that, added to the technological requirements for high calorific composition and volume, start to alter the picture of energy from waste as a straightforward win-win response to those opening axioms.

Sociotechnical Constraints (1): Classification

Considerable work is required to transform byproducts of waste treatment technologies to "goods": they have to shift categories from "waste" to "commodity." Waste is typically hedged about with restrictions on handling, movement, and transferability. Commodities are mobile; they can be moved, sold, and bought. Classifications do things. In order for this to happen with new by-products, as AD was getting off the ground in Britain for example, there had to be quality protocols and certificates and then effectively the manufacture of a green energy market via government subsidies, "renewable offset certificates" (Reno 2011b). Still, the British government's resistance to underwriting these ventures and the cost of connecting to the grid, rather than simply establishing a plant, has slowed progress in developing AD plants—unlike Germany where state support is stronger (Weiland 2000).

Sociotechnical Constraints (2): Financing

The British government's response to the 1999 EU Landfill Directive (EU 1999) was first to pass to local authorities both the responsibility for responding to the directive and potential penalties for failure to meet targets. Having said it was up to local authorities to find ways of reducing biodegradable waste going to landfill, the government's second move was to make billions of pounds available for them to spend on private finance initiatives (PFIs) for municipal waste management.

PFIs began in the UK as "public-private partnerships" in 1992. They are a way of creating large public projects with private capital, effectively outsourcing risk to the private sector and enabling a cash-strapped government to continue investing in infrastructure (Froud 2003). They are grounded on the assumption, not always correct, that the private sector is *ipso facto* more efficient and effective at delivering and running assets and services. They have also been described as a public accounting trick, simply hiding public debt "off balance sheets." They have created considerable controversy as services have not only not improved but have sometimes had to return in-house after massive failures or costs have mounted to keep profit margins steady. Nevertheless, they continue and have indeed expanded (Campbell et al. 2012). PFI contracts are long-term; waste management contracts, in particular, are often at least 25 years in duration to enable huge capital investment in infrastructure to be recouped. This encourages inflexible technological lock-in.

Waste management contracts are typically premised on the following income streams: energy produced and waste diverted from landfill and treated, including recycling or selling collected materials for recycling elsewhere. The central block of many such contracts is a large-volume energy-from-waste incineration plant. Indeed the word "waste" has all but disappeared. Instead, a common sight are lorries emblazoned with "green energy" trundling through cities and "Green Energy Plant" or "Renewable Energy Plant" signing the way to landscaped gardens and ponds surrounding architect-designed, low environmental/aesthetic impact buildings where energy is produced, usually by incineration, sometimes by biomass conversion. Waste, it might seem, has all but disappeared. It has become a feedstock to create low-carbon energy, thus reducing reliance on carbon resources. Certainly, from the promotional literature of much energy-from-waste companies, it would seem that the challenges outlined in the opening propositions have been happily met.

Looking more closely at the contracts themselves complicates this assumption. These contracts are usually based on certain minimum quantities of waste being treated. Effectively then, the municipality is contracted to produce a given amount of waste. A second key income stream is from energy generated. Noting that volume and quality of energy outputs depends on feedstock composition, there is little or no incentive here to reduce organic waste. Indeed, interviews with one city council generated some confusion when they were asked about their strategy for increasing recycling rates: their answer had

been to land a large PFI contract, financed by the government, centered on an incinerator that was in turn linked to a local heating system.

Indeed, to be sure of making the investment pay off, the catchment area has grown in some cases. Waste has been brought in from much further afield to keep levels up, and slowly contracts are being modified to include merchant or commercial waste alongside municipal, typically household waste (Alexander and Reno 2014). This is not only the case with incineration: organic waste can be brought in to anaerobic digestion plants (ibid.; Reno 2011a) and it is not only the case in Britain. Municipal waste is increasingly being shipped to Denmark and Germany to provide profitable waste disposal and energy feedstock. "Recycling" often translates into selling source-segregated materials on the open market for further disassembly and reassembly elsewhere (Alexander 2012). Thus the proximity principle goes out of the window in order to allow these investments to be profitable for the operator.

Conclusion

What then happens to those opening four principles? By recasting waste as a feedstock for energy plants and emphasizing energy outputs, waste is both "disappeared" and becomes essential. Indeed, as energy-from-waste plants grow in size and capacity (larger and larger incineration plants are being built in Britain) and more waste is brought in to feed the hungry plants, we might indeed say that we are on track towards an energy economy that demands more waste to be produced.

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Kate Brown

The Last Sink: The Human Body as the Ultimate Radioactive Storage Site

Living in Chelyabinsk, Russia, while researching a closed nuclear city, I got distracted by the supposedly hidden secrets of the security zone. It took an old woman and her scarred body to get me to see the real secrets. She taught me that a bigger story was right before me, on the bodies of the people I met. These were secrets so close I could reach out and touch them.

I was in Chelyabinsk to find out more about Ozersk, a pretty little city in a northern birch and pine forest surrounded by lakes. Ozersk, home to Russia's first plutonium plant, is a closed town surrounded by a tall cyclone fence topped with barbed wire and patrolled by guards at gateposts. I wasn't able to enter Ozersk, or even get close to it. In the summer of 2010, I took up residence in nearby Kyshtym, a small city of heavy log houses on an isthmus between two lakes. An Ozersk-based human rights lawyer connected me to several dozen pensioners of the plutonium plant who were willing to come to Kyshtym and tell me their story.

Most of the people who came to talk to me were elderly women. I wanted to hear from them about the security arrangements of the early nuclear security state. But to my chagrin, their business was not state secrets, but secret body parts: their genetic legacies, reproductive histories, and physical maladies. They kept pressing on me dog-eared sheets of paper—medical reports and legal petitions—but I was not interested in their records. Instead I wanted them to tell me what it felt like to be locked up in a zone, cut off from the larger world. I asked questions along those lines.

Luibov Kuzminova started talking. Kuzminova began work as an agronomist in Metlino in 1946, the year the Soviet construction enterprise broke ground on the Mayak plutonium plant, seven kilometers distant. In 1949, having run out of underground storage containers, plant engineers began to dump all the plant's waste, including a highly radioactive slurry, into the Techa River. If ingested in micro-quantities, the radioactive waste was fatal. The Techa pooled into ponds, lakes, and swamps along its soggy course.

Parts of this essay were published in my book *Dispatches of Dystopia: Histories of Places Not Yet Forgotten* (Chicago: University of Chicago Press, 2015).

Metlino was the first hydrological way station downstream from the plant. “We didn’t know.” Kuzminova recalled, “We drank and washed. We didn’t know it was all dirty.”

Kuzminova narrated her biography like a medical and reproductive record: “I was married in 1956. We had trouble conceiving. Finally I managed to get pregnant but had first a miscarriage, then a stillborn. Eventually I gave birth to three children in 1959, 1960, and 1963. The first child died of leukemia at a year and a half. The other two survived. They are sick a lot. My husband worked in the lab at the plant. He died in his fifties. I have female problems, and I have had a lot of operations.”

From 1949 to 1951, Soviet engineers dumped 3.2 million curies of high-level waste into the Techa. After several years of drinking and washing with contaminated water, villagers fell ill. Plant doctors examined 7,900 people in the downstream communities and clandestinely diagnosed over 900 cases of what they called chronic radiation syndrome (CRS). The symptoms of CRS include chronic fatigue, loss of appetite, severe anemia, premature aging, aching joints, brittle teeth and bones, immune disorders, and heart and digestive track diseases. Many of the 28,000 people who had also been exposed but not tested might also have had CRS (Thompson 2012; Degteva 2012).

Kuzminova also held tattered medical records, which she pushed toward me to examine. I had little interest in the documents. I did not know how to read the numbers in her records. I had no training in medicine. Seeing my indifference, Kuzminova put her papers aside, stood up, and before I could stop her, unbuttoned her shirt to show me the scars on her belly. Unlike the medical records, these markings finally drew my attention. She lifted her shirt to reveal thick chalk lines of the surgeon’s knife scrawling a crosshatch, left and right, up and down, on her abdomen. The marks looked as if they were graphically attempting to void her torso. I did not know if the cause for those many surgeries was the isotopes from the plant, but her pain, recorded in those bodily etchings, was simply, exhaustingly there. I could no longer doubt it, but confronted with this rendering of a body in pain, I wished it would go away.

Kuzminova wanted me to see her body in order to grant her a diagnosis of CRS so that she could claim compensation as a victim, but the CRS diagnosis was a moving target. In the 1990s, after a release of information about the Techa River disaster, a furious debate flared up around the bodies of people who claimed they were sick from the plant’s

radioactive waste. In those same years, US agencies started to fund and direct many post-Soviet research projects in nuclear installations, and US researchers did not have a medical equivalent of CRS. To them it was a doubtful diagnosis. Instead, US scientists were focused on a few cancers and thyroid disease as effects of exposure to radioactive isotopes. In the US tradition of toxicology, from which radiation biology or "health physics" emerged, only a link between a quantifiable exposure (i.e., a certain dose of radioactive iodine) with a known physiological effect (thyroid cancer or disease) constituted an occupational illness. US researchers correspondingly focused on "dose"—how much a person was probably exposed. If they had a dose over a "threshold" and a corresponding illness, then they were likely sick from plant exposure. As a consequence, US researchers monitored local landscapes and work places, focusing health physics on environments rather than bodies (Nash 2003; Sellers 1994).

CRS never became a diagnosis in the US medical tradition in part because it would never hold up in court.[1] There was no way, in the US medical-juridical understanding of occupational illness, to separate the complex of symptoms describing CRS from other illnesses with similar symptoms, such as heart disease, hepatitis, rheumatism, and tuberculosis. US research was focused on notions of stand-alone diseases from singular entities, like germs producing tuberculosis or singular toxins or radioactive isotopes causing cancer. Except for a few geneticists working in the late 1940s, I have found no evidence that US researchers thought in terms of radioactive isotopes assaulting and weakening multiple organs and immune systems, causing a multiplex of debilitating symptoms. Most researchers just didn't think that way. Their focus was on exposures, not on bodies and their symptoms, as researchers recorded long lists of estimated doses and depositions in isolated organs. To an amazing degree, in the studies that emerged from US nuclear installations, bodies of patients and certainly bodies in pain are wholly invisible.

Historian Christopher Sellers situates a form of this "body blindness" in the early US environmental movement of the 1960s. The first activists, failing in court to draw a line between the assemblage of vague human health effects associated with a chemical sensitiv-

1 The National Academy of Sciences's Biological Effects of Ionizing Radiation (BEIR) VII Committee concluded in 2005 that "there is no threshold of exposure below which low levels of ionizing radiation can be demonstrated to be harmless," and that in addition to cancer "other degenerative health effects have been demonstrated" from low dose exposure. Yet these insights have not been incorporated into regulation or lawsuits.

ity to DDT, turned instead to proving in court damages to animals and birds as "property" and natural resources. Winning these early court cases over contaminated environments, activists established the Environmental Defense Fund, but in so doing, Sellers argues, they turned their back on the humans threatened by environmental disasters.

In the early 1990s, the US Department of Energy declassified thousands of documents detailing the colossal volume of radioactive waste dumped into the interior American West during the Cold War. When Americans in eastern Washington State claimed that they had acquired a range of illnesses from living near the Hanford plutonium plant, the Department of Energy's response is revealing: the researchers whom they funded to conduct large-scale health studies used "dose estimates" from environmental monitoring, rather than examining actual human bodies. These figures, calibrated from decades of ambient readings of radioactive isotopes, estimated the doses residents received, then they compared those numbers against estimated exposures of Japanese survivors of the Hiroshima and Nagasaki bombings to come up with the probability of the cancers and thyroid disease reported by the "downwinders" (Richardson, Wing, and Stewart 1999).

Studies by the Atomic Bomb Casualty Commission (ABCC) remain the gold standard for US juridical panels in determining probable causalities of illness from radiation exposure (Greenland 2012). Of course, the one-off explosions in damp and coastal Japan differed greatly from the slow drip of exposures of a different cocktail of radioactive isotopes on the volcanic soils of the arid and continental Columbia basin. Yet researchers made models estimating doses across landscapes and their effects on bodies that considered the contexts of Japan and the United States as interchangeable.[2] This is remarkable considering all that had been discovered in four decades of research by hydrologists, ichthyologists, meteorologists, and soil scientists about the locally contingent pathways of radioactive isotopes. Using the ABCC studies, US government officials eventually determined that the Hanford Nuclear Reservation required a multi-billion dollar cleanup; at the same time, however, they decided that people exposed nearby were largely unaffected.

2 In the Hanford Environmental Dose Reconstruction (HEDR) case, researchers set out to reconstruct the doses that people living downwind from the plant might have received over the decades. The study focused on environmental monitoring as a way to estimate dose exposure. Using HEDR's estimates and computer programs, scientists of the Hanford Thyroid Disease Study (HTDS) examined 3,440 people from the seven exposed counties. The study found cases of thyroid cancer and thyroid disease among the participants, but determined based on HEDR dose estimates that the risk was about the same regardless of radiation doses (Center for Disease Control 2002).

These rulings indicate the moment when the bodies of exposed people disappeared, dissolved into the heavy physical and mental labor of making sense of the isotopes. That is what had long puzzled me as I read through the medical studies of long-term, low-dose exposure. The people—how they felt, their complaints, what they experienced as pain or illness—were nowhere to be found in these records. Just counts of differing isotopes, dose estimates, and various probabilities of the emergence of cancer in numerous organs extracted from a statistically configured composite body.

Invisibility takes a lot of work. The medical studies of the 1990s in the United States and then later in Russia did just that, ignoring or rendering invisible the bodies exposed to the Soviet and American plutonium plants' radioactive waste. This is not just a problem in the nuclear industry. Employers and insurers worldwide are notoriously reluctant to consider human bodies as evidence. In the early 2000s, Zhang Haichao, a migrant worker in China, was exposed to silica dust at the Zhendon Abrasion Proof Material Company in the Henan Province. He contracted silicosis, but the occupational disease hospital repeatedly refused to certify him, diagnosing Zhang instead with tuberculosis, which called for no compensation. To prove his case, Zhang had to go to extremes, persuading a doctor to perform a live lung biopsy to confirm his silicosis, although a simple x-ray had already shown the disease clearly (Pandita 2014). A failure to see bodies and to use them as archival maps of exposure helps explain the emphasis on cures rather than the environmental causes of a growing number of debilitating and deadly diseases. As I had pushed Kuzminova's medical records away, I too exhibited this same body blindness. Unable to judge, I did not know what to do with her and others' vague complaints. When Kuzminova raised her shirt to show me her scars, I wanted nothing more than to make her body go away.

There ought to be a new frontier of scholarly inquiry, one that learns to read bodies as historical texts so as to re-create historically voided bodies living on contaminated landscapes in a way that does not dismiss bodies in pain.[3] For the landscape most overlooked on the panorama of nuclear sacrifice zones is the landscape of the body. Human bodies—porous, renewing, and transforming—are as much a repository, a dump of man-made waste products, as are rivers, ground water, soils, plants, and

3 A new field of narrative medicine is emerging to incorporate biography and narrative in healing processes (Klosterman 2009). The field of medical anthropology has been exploring the question of the relationships between landscapes, health, and bodies for some time (See Biehl 2005; Johnston and Barker 2008; Iversen 2012).

animals. The last stop of the tour of nuclear sacrifice zones should be reflective: a tour of human bodies, for they are the long-haul truckers of the vast transformations of human history on geology, ecology, and biology. Human history, in other words, is changing human bodies. Yet this bodily archive has scarcely been accessed. In the search for nuclear secrets, the mysteries are right here with us.

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Sighting and Siting

Amanda Boetzkes

Plastic, Oil Culture, and the Ethics of Waste

A new geological entity has begun to wash up on the shores of Hawaii. The "plastiglomerate" is the term coined by Patricia Corcoran for these amalgams of plastic, volcanic rock, seashells, and coral (figure 1). The plastiglomerate is a symptom of the Anthropocene, the designation given to a proposed geological era beginning with the Industrial Revolution and measured in terms of irrevocable and distinctly human-produced transformations to the Earth, evidenced by the extinction of species, the sedimentation of nuclear waste, and sharp increases in carbon dioxide. The fusion of plastic with earthly substance signals the intertwinement of the global oil economy with our current ecological condition, and the extension of this entanglement into the geological future.

Figure 1: An example of a plastiglomerate found in Hawaii. Photo by Kelly Jazvac. Used with permission.

Plastic weaves itself into every facet of our contemporary reality: commodities, cosmetics, technologies, medical products. It has integrated itself into or even replaced many other substances, too: textiles, clothing, paper, lumber, cork, rubber. It has also come to signal a distinct regime of visual representation. We might think of Gayle Chong Kwan's *Wastescape* (2012) at the Hayward Gallery in London, made from thousands of plastic bottles taken from a wastewater facility in Moravia, Colombia (figure 2). Melanie Smith's

Figure 2: Gayle Chong Kwan, "Wastescape," 2012. Used with permission.

series of installations *Orange Lush* present an archaeological perspective of the plastic objects that are part of everyday life in Mexico City. Seoul-based artist Choi Jeong-Hwa experiments with the affective qualities of plastic in his stunning constructions such as *Happy Happy* (2010), *In the Mood for Love* (2010), or *Kabbala* (2013). These are but a few among hundreds of contemporary works that have become preoccupied with the spatial and visual phenomenon of plastic waste.

For all the spectacular appeal of plastics in the visual field, at the same time plastics disclose the procedure by which oil obscures itself from visibility and from any capacity to interpret their ecological meaning. How do we grapple with the ubiquity of plastics, and the fact that they are not a localized, but rather a global waste belonging to everyone and no one? Plastics make visible a stratigraphy of oil capital and oil cultures. Any significant critique of the visuality of the oil regime would not simply be to expose it, but rather to leverage a view of oil beyond its economic primacy. From this perspective, it becomes clear that the tactic of contemporary artists to reposition plastic objects through the lens of archaeology permits a different and specifically ecological perspective of their material status. We see it as what Tim Morton terms a

hyperobject, an entity massively distributed in time and space which transcends localization and which is constitutive of an ecological condition.

The Archaeology of Plastic

Figure 3: Melanie Smith, "Orange Lush I," 1995. Used with permission.

Oil is not simply a political terrain limited to land claims, environmental management, and economy. It is a cultural and aesthetic mesh that mediates the sensorial field. The general tenor of these works shifts the visual field away from the efforts to objectively expose the dirty truth of the oil industry, to works characterized by a sensorial fullness, robustness, and flexibility. Consider Melanie Smith's series of installations called *Orange Lush*, which is comprised of bright orange plastic objects, among them life-preservers, extension cords, buoys, cheerleader's pom-poms, water-wings, flip-flops, light bulbs, balloons, and water rafts. For all their ordinariness, however, the layout of the objects is not arbitrary: the subtle distinction between full and rounded objects and deflated, pendulous ones thematizes a broader stalemate between sensorial plenitude and economic exhaustion. Smith chose orange in particular because it was the color that marked the invasion of Mexico City with cheap commodities in the 1990s, after inflation and bailouts from the US and the Bank for International Settlements caused a devaluation of the peso. At the conjunction of Mexico's preindustrial economy and global capitalism, orange was the color of superadded value and fake excitement on otherwise worthless merchandise, or what the artist calls "chemically-induced enthusiasm."

Plastic is clearly connected to an industry and economy, but how does it articulate our attitudes toward waste as such? We might look to the dominant model of waste man-

agement, the "sanitary landfill." The archaeologist William Rathje, who spearheaded the Tucson Garbage Project in 1973, the first archaeological dig of a North American landfill, examines the relationship between our beliefs about our own waste production and the reality of what we waste and how we deal with it. The sanitary landfill is currently the most common approach to garbage dumping in North America. Usually built into a thick clay foundation or a base layer that is lined with heavy plastic, it is effective in terms of neutralizing toxicity. However, Rathje points out, the sanitary landfill encumbers biodegradation. Contrary to what many believe, Rathje argues, the landfill is not a composter, but a mummifier. Once a relatively small amount of methane gas has been harvested from the mounds of trash, and a degree of settling takes place, the garbage remains preserved indefinitely.

Rathje points out that plastics are merely a tiny fraction of our waste production. So why are they so troubling? The answer, perhaps, lies in their durable materiality and prolonged lifespan. In this respect, plastics act as a synecdoche of the sanitary landfill. More than this, though, they are the link between our culture of waste management and the global energy economy. We find ourselves in a curious dilemma of garbage as such being profitable (that is, cities accept garbage for profit, and thus garbage is circulated in a sub-economy), but wasting as a behavior is derided—it is an environmental heresy that must be curtailed through sustainable living. The need for decomposition, energy expenditure, more fundamental forms of wasting persist despite their prohibition under the directive for energy preservation.

Plastic and the Prohibition against Waste

The phrasing of this dilemma in terms of waste as the transgression of a perceived moral prohibition signals a detour into the work of the French theorist Georges Bataille. Bataille waged an ambitious transhistorical theory of economy read through the notion of energy expenditure in his book *The Accursed Share*. Bataille speculated that all societies are inherently driven towards acts of "glorious expenditure" in order to burn off their surplus energy. He cites the ecstatic rituals of sacrifice in the Aztec civilization or the potlatch of the Northwest Coast Native tribes as case studies of sacrificial rituals that unleash excess energy, or what he calls "heterogeneous" energy: a wholly chaotic force that cannot be directed or harnessed. For the duration of the ritual, the release of

energy acts like a burst of air after opening a pressure valve, precipitating an orgiastic destabilization of social hierarchies and even a radical undoing of the subject.

In comparison to the "general economy" of solar societies who periodically burn surplus energy, Bataille argues that the economic system of mid-twentieth-century bourgeois capitalism is entirely restricted. So while it still produces surplus energy, the rule of profit prohibits all true forms of expenditure. Though there is still a profound need to "burn off" excess, instead energy is re-routed back into the economy. Surplus energy is suppressed, but inevitably discharges in unexpected and highly destructive ways. The pressures of this "restricted economy" had, he believed, resulted in the explosion of energies that took the form of two world wars and the nuclear bomb. We could make the connection to the restrictions of global oil, whether they be the conscious act of squandering oil as a stripping of profit, as in the case of the Kuwaiti oil fires, or accidentally, as in the case of oil spills due to pipeline explosions or offshore drilling projects like the *Deepwater Horizon* explosion. All result from the competitive grab for this singular energy source.

At the heart of a Bataillean critique of this economic predicament is a distinction between consumption as simply the act of using energy—burning gas when driving a car, going shopping, watching a movie, for example; forms that ultimately reroute energy back into the stockpiling of profit—and expenditure, which Bataille associates with an absolute release of heterogeneous energy that transgresses all limits and meaning. Expenditure in this expansive sense simply cannot be reclaimed into a system, or recovered as profit in an economy. The appearance of accumulations of plastic objects in art encapsulates a system dogged by the perpetual "re-ingestion" of energy. In this way plastics become the figuration of the pleasures of energy consumption, while at the same time being the symptom of the prohibition of true waste.

Whose Waste?

The appearance of plastic waste in art is an appeal to a different kind of audience and marks the rise of a different kind of subject. Rather than "representing" to an art world, it seeks to break out into a global visual condition and, equally, a global ecological condition. It cuts across our categorizations and signifies new scales, times, and

places. How, then, can we imagine new forms of ecological responsiveness? A compelling case study comes from Agnes Varda's documentary *The Gleaners and I* (2000), which connects the historic figure of the gleaner to a contemporary context in which many live off waste, sometimes by choice and sometimes for survival. She locates an ethics of gleaning at the intersection of a more familiar tradition of French agricultural practice and its more contemporary forms, which are now illegal and punishable, such as garbage-picking, dumpster-diving, freegan lifestyles, and more.

The film begins with interviews that reveal a treasured collective memory of seasonal gleaning, an activity that was often carried out by families as an effort to make good use of the remainders of local farms. The interviews are accompanied by a sensitive representation of the remainders: potatoes that are oversized, undersized, or too misshapen to be sold; grapes that exceed the quota limits that would set the price and value of a vintage; forgotten and overgrown crops; food that has passed its official best-before date; day-old bread. The ethic of the gleaner is precisely to welcome this, to find waste extraordinary, to discover redemption in the particularity and beauty of this process.

Cultural theorist Gay Hawkins addresses precisely the way in which such an ethic stems from the affective and sensible dimensions of handling waste. She insists on a distinction between the moral obligation to deal with rubbish produced by legal, technical, and governmental institutions, and the physical sensations and attachments that emerge from everyday confrontations with it. In previous eras, garbage was handled through practices of elimination and expulsion, and could thus be understood as spatial acts of passing from one side of a boundary to another, in ways that produce and perpetuate cleanliness and order. The elimination model reached its apex in the postwar era with the rise of disposability culture, when commodities were produced precisely with a view to quick and easy discard. However, Hawkins argues that disposability as such is a technical and spatial fantasy: not only is the prospect of waste departing out of sight and out of mind a logical impossibility, but waste is increasingly visible, "a landscape in its own right." Moreover, with the politicization of environmental responsibility, waste is charged with a new moral valence as well, whereby waste is never simply eliminated but rather has entered into a reorganized set of relations in connection with the subject.

Hawkins's deeper question is, can an ethics of waste be discovered even from within the moral discourse of garbage management? While it is surely true that our new

rituals of waste carry the full moral weight of environmental responsibility in an era of impossible challenges, we might consider how new sensibilities that are woven through obligatory behaviors are constitutive of an ecological subject. Herein lies the connection to a new ecological subject whose becoming is enfolded with the forces, intensities, and effects of other bodies, objects, and planetary conditions.

It is here that Varda's formulation of the melancholy, tragedy, and sensuousness of waste finds the junction between the ethical and the aesthetic in ways that connect to a more complex global economic apparatus of waste. She shifts from the rural tradition to contemporary urban gleaners who scale fences and large disposal bins, sort through elaborate packaging, evade surveillance, navigate between the exposure of public sites of waste and finding shelter out of public view. A striking leap of associations takes place in an interview with one man who lives entirely off of salvaged food and goods and has done so for over a decade. Though he has a job and a salary, the man has a somewhat odd and distinctive appearance, wearing a large pair of rubber boots and oversized raincoat, presumably necessary garb for the task of rummaging through trash. The man's rationale for the freegan lifestyle at first appears sound: he finds the amount of waste an appalling symptom of a society that overconsumes, and therefore made a decision to compensate for this, albeit at a small scale, by living off of garbage. Here, though, he makes a curious jump from the decision to salvage food from trash, to the problem of waste in general, to an environmental disaster, and very pointedly, an oil spill. The amount of waste, he states, "proves that we're heading for disasters like the *Erika* oil spill [off the coast of France in 1999]…Sea birds, guillemots, razorbill penguins, all those who were smashed up real good by Total Fina Oil, those who will get smashed up real good by this over-consuming society…If they are cleaned, the birds might still get caught in nets, it's for them that I'm an activist. All the rest can die in their apartments in their trash. I don't care. Birds first."

This movement from recovering wasted food to animal protection—a life lived "for the birds"—gathers together an individual ethic with a deeper stance toward the global economy and planetary condition, though perhaps this activism bears no direct relationship between cause and effect. Though there is no logical continuity to his string of associations, Varda hones in on this character as a way to articulate the collision of forces that takes place in and through the contemporary gleaner. Or, we might say this is a collision that is constitutive of an ethics.

Varda's portrait of the gleaner encapsulates an entry into a vast global wastescape, one which spirals anarchically into the realm of the oil economy. This threshold is captured by the suspension of time, a deep consideration of the physical process of choosing (stooping, selecting, the hand that grasps), and the affective dimension of accepting trash (a sense of fulfillment, plenitude, nourishment, and visual pleasure in the forgotten). The film as a vision of global wastescape, then, insists on a bodily measure. Yet as a threshold, it also opens the body far beyond human scale, so much so that the gleaner becomes uncanny, deviant, animal, technological, and ultimately of a piece with the trash that she or he relies on. To characterize the film as a "scape" however, is to insist on its intermediary status as a junction to an imagined "beyond" of waste. Thus, we see trash in a variety of forms: its accumulation (for example, heaps of discarded produce), its dispersal (in thousands of bins across cities), its recovery (as food, objet d'art, and of course, as image), and we catch the sensorial inferences of larger systems in which waste operates: the law, habits of consumption in the developed world, the oil economy, global warming and other ecological disasters, and time itself.

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Martin V. Melosi

Fresh Kills: The Making and Unmaking of a Wastescape

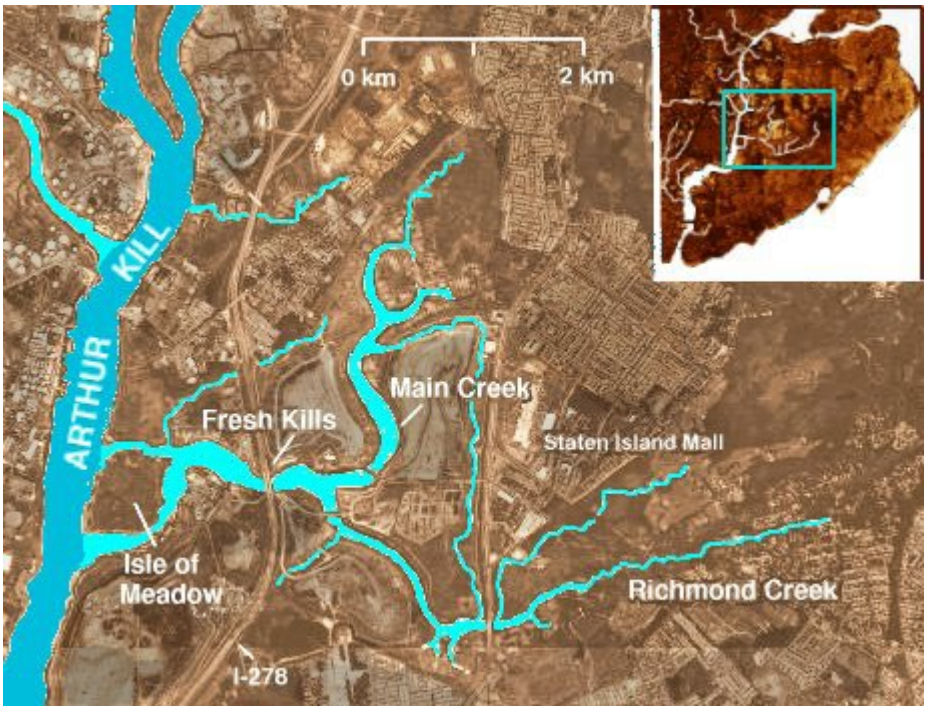

Figure 1: Fresh Kills Landfill is on the western edge of Staten Island. Photo by Matthew Trump, via Wikimedia Commons. CC BY-SA 3.0.

At a session on "Urban 'Wastelands'" held at the European Association for Urban History Conference in Lisbon in September 2014, a presenter stated that the presence of a wasteland can be a *narrative trigger* which is neither rational nor foreseeable, but useful. In this sense, a wasteland develops an identity that clearly sets it apart from other land uses. Fresh Kills Landfill on Staten Island, New York, is that sort of space. It is the largest human-engineered formation in the world. Located along the Fresh Kills estuary in the northwestern part of Staten Island, it blankets approximately 2,200 acres (890 hectares) on what had once been salt marsh. Over the course of several decades (beginning in 1948 and ending in 2001) it served as the primary disposal facility for New York City's solid waste. Fresh Kills reopened briefly in late 2001 through June 2002 to provide a receiving point for human remains and building rubble from the destroyed Twin Towers

of September 11. Today it is the focus of a mammoth reclamation project to turn New York's major waste site into expansive parkland.

Fresh Kill's history is marked by transience: from salt marsh, to landfill, to cemetery, and finally to future park. It also is a narrative trigger that beckons us to look back on the site's long pre-landfill history as well as its future. The history of Fresh Kills is most immediately bound to Staten Island and New York City, but also to the larger world of consumption and waste. Some observers regard the massive refuse sink as a curiosity, a dreary eyesore, or even an environmental menace. To New Yorkers in general, if they think about it at all, Fresh Kills was a necessary evil. For the people of Staten Island, it has been a humiliation: resource and receptacle.

Stepping back from its long and truly remarkable history, artist Mierle Laderman Ukeles looked upon Fresh Kills as "a social sculpture," a reflection of our material culture, our consumerism, our acquisitiveness, and our sense of value and worthlessness. This larger view takes Fresh Kills out of the realm of the tangible into a world of ideas and perceptions. Indeed, Fresh Kills, like so many wastescapes, is both *site* and *symbol*. To focus only on the site's history as a landfill misses the larger questions associated with how landscapes become wastescapes, and in this case, cease being wastescapes.

Staten Island before the Landfill

In earlier times Staten Island was called "a little piece of the country in the city." For many years, it functioned as a retreat for the wealthy, as an essentially rural community and then as a suburb. In the early twentieth century, industrial growth on Staten Island became more pronounced, especially along its north side across from New Jersey. Richmond Borough, as it was called after the New York City consolidation in 1898, has always been the outlier in Greater New York. The southernmost borough, Staten Island is third largest in area at 60 square miles (155 square km), but the least populous and the least dense. The western shore is marshy and is bisected by the tidal entrance of Fresh Kills, which drains the borough's northwestern hills and central greenbelt. It is the most geographically separate of the boroughs, economically different, and politically conservative. Before 1713 there was no public ferry, and until the opening of Verrazano-Narrows Bridge (1964) Staten Island was not connected to the other boroughs by land.

While many contemporaries were prone to think of Fresh Kills as uninhabited or wasted space, it had a long history of use. Before European colonists, the Lenape Indians were among the first settlers in the estuary. They hunted, traded, and eventually farmed in the vast marshland. From colonial times onward, white farmers harvested "salt hay" as a source of food for horses. In the largest sense, Staten Islanders came to believe that outsiders treated their home as the "forgotten borough," so rural and undeveloped that its primary value was to utilize its land only for the greater good of the City of New York.

The most dramatic clash in the nineteenth century over Staten Island's property was the so-called "Quarantine War." In 1799, the New York Marine Hospital, known as the Quarantine, opened in the village of Tompkinsville, close to the modern-day disembarkation dock for the Staten Island Ferry. The siting of the New York Marine Hospital grounds in their backyard made no sense to Staten Islanders. Overall, the compound posed a health danger to the community; it threatened real estate values and curbed opportunities for other economic growth. A yellow fever outbreak in 1848 prompted the first major effort to purge the island of the Quarantine. Local citizens burned the Quarantine to the ground and forced the city to move it off Staten Island.

Beginning in 1916 an effort was underway to build a large waste reduction plant on Staten Island to replace a similar facility on Barren Island. The site selected for this facility was Lake's Island along the Fresh Kills estuary. Thirty-two years later, Fresh Kills Landfill was located in the exact location. Staten Islanders again were up in arms, fighting the siting of the plant all the way to the state capital. The residents even threatened to secede from the city if their demands were not met. The plant nevertheless was constructed in 1916, but closed in 1918 because of pollution violations and economic woes. Neither the Quarantine nor the reduction plant constituted a major wastescape, but they set precedents for the gigantic landfill that was to come.

Fresh Kills Landfill

New York City returned to ocean dumping as a consequence of the closure of the reduction plant in 1918, exposing the failure of the city to develop an effective alternative disposal plan. Ocean dumping generated its own controversy, and after it was curtailed in 1934, the city considered an ambitious incineration plan. Landfilling, however, was

cheaper and more available. The various islands in the New York archipelago had long served a variety of purposes for a city strapped for space. However, an alternative was to create more land along the edges of existing shorelines. Such was a widely practiced enterprise for cities across the country and around the world—creating wanted space out of unwanted land (or water). Filling marshes and swamps to make "usable" land had a singular purpose: to eliminate a noisome or "worthless" site in exchange for solid—and taxable—ground to build upon.

Marsh-rich Staten Island provided a great opportunity to address the city's waste disposal problem created by the curtailment of ocean dumping. In 1938 Great Kills, also on Staten Island, was used as a short-term location for a landfill. A new dispute broke out and the plan was aborted. The sustained isolation, the extensive marshland, and economic downturn of Staten Island opened up new opportunities to exploit the island for the benefit of the city. In 1946 Robert Moses, the "master builder" of New York, was looking for a site to use for highways and parkland (and also for waste disposal). He recommended that refuse be dumped in the marshes in Fresh Kills. Moses assured the locals that his plan was a temporary measure, but opened the way for a permanent solution to the city's disposal crisis. In 1948 the filling began and lasted until 2001.

Landfill Extraordinaire and Closure

Fresh Kills underwent many changes through its long history. In the early 1970s, for example, the site was receiving half of New York City's garbage. By the mid-1980s, Fresh Kills became the city's sole landfill. While some expected it to reach its maximum capacity by the late 1960s, scows continued to cross the harbor incessantly with no alternatives under serious review. The solid-waste infrastructure developed and managed by the New York Department of Sanitation expanded *in situ* alongside the mounds of the landfill itself.

By the 1990s, the convergence of suburban-style population growth on Staten Island with New York City's even greater dependence on the landfill created a new dynamic. Staten Island's physical isolation was over, its population growth gave it a political potency it never had before, and restive citizens tired of bearing the burden of the waste load for all of the boroughs (leading once again to a vociferous threat of secession). The

effort to close Fresh Kills Landfill was simply a political decision, not motivated by a necessity to find another refuse sink. The election of Republican Rudolph Giuliani as mayor of New York City calmed the protests on Staten Island. An appeal to close Fresh Kills was heard loud and clear by the new mayor and by local politicians dependent on Staten Island's conservative votes. Supported by Governor George Pataki (also a Republican), Giuliani, and the borough president, an agreement was reached in May 1996 to close Fresh Kills by 2002. In March 2001, with great fanfare, Fresh Kills was closed.

The decision, however, left the city without an adequate plan for its future disposal needs. This was least important to residents of Staten Island, who believed that they had suffered the humiliation and the environmental risks of the landfill long enough.

9/11: Hallowed Ground

The al-Qaida attack on the Twin Towers on 11 September 2001 turned the issue of the closure of Fresh Kills in an entirely new direction. The landfill was reopened soon thereafter and remained open until June 2002 in order to receive human remains and debris from the site in Lower Manhattan. In making this decision, political leaders might not have realized that a new set of issues arose for Fresh Kills. What had been a garbage dump was now hallowed ground—a cemetery, a resting place. While the remains and rubble from the Twin Towers only occupied a small portion of the landfill site, the space's identity was altered. Added to the tedious process of capping the landfill, mitigating its effluent, and reclaiming land, a different kind of responsibility fell upon the city—how best to honor those lost in the disaster. This was not so much a logistical and technical question but an issue of the heart and a respect for memory. The event also requires introspection about the severe contrast between Fresh Kills as a site where discards of society are hidden and forgotten and a burial place that could not, and should not, be forgotten.

Regeneration: Freshkills Park

The long-term fate of Fresh Kills was not bound by the events of 9/11. In 2003 a plan for a world-class park constructed on the site moved the story of transformation in yet another dramatic direction. Plans would call for the world's largest reclamation project to consist of reclaimed wetlands, recreational facilities, and landscaped public parkland—

and a 9/11 memorial. Between 2001 and 2006 the City of New York conducted a master planning process to turn Fresh Kills into the newly envisioned parkland. The master plan was meant to guide the evolution of the site over a 30-year period. The task of carrying out the plan was given to the Department of Parks and Recreation in 2006.

The decision to build a park brought to a fine point the practical, the abstract, and the aesthetic qualities of Fresh Kills over time. It confronted what going forward with the remaking of the site—yet again—said about that history, and it unearthed the practical problems to be faced by the City of New York by rejecting one role for Fresh Kills and replacing it with another. A change in use bred a change in identity.

Final Thoughts

Transience of space is at the core of the history of this massive wastescape at Fresh Kills, and wastescapes in general. Two big questions come to mind (and there are more):

To what extent is Fresh Kills a story about the dilemma of consumption manifest in a wastescape? The dilemma of consumption is how to be productive, how to manage growth, and how to handle the unwanted. This predicament has dogged New York City throughout its modern history. For Staten Island, mass consumption was a curse, leaving its citizens to wonder why they alone were sacrificed in an era of relentless acquisitiveness. Fresh Kills is a reminder of human habits and societal behaviors caught between material wants and valueless remnants.

Is the regenerated space of Freshkills Park more worthy of preservation as a human or natural artifact? The final stage in the evolution of the wastescape under discussion is touted as "ecological restoration," resurrecting the site from its sordid past. If this were a project of historic preservation there would be a debate over what to preserve, what point in the site's history needed to be the central focus. Instead, momentum has moved toward restoration largely in a pre-landfill context. But is the landfill itself—a massive human artifact—unworthy of historic remembrance? This is related to Mierle Ukeles's concept of places as social structures, not just material geographies. Accommodation has been made for the site as cemetery, since human remains carry a different meaning than material discards. In this instance, a large context for exploring site as symbol should become important.

The landfill, strictly in terms of its materiality, reflects a history of quite a different sort than environmental restoration. The "stuff" in the landfill is inextricably linked to humans and human activity in much the same ways as middens provide insight into the life of ancient civilizations. Is there a way to reconcile the human and the natural in this restored landscape?

With respect to both queries, the landfill is not simply an abstraction, any more than the salt marsh before it or the park after it. Such a mundane thing as a landfill can inspire a broad-ranging narrative trigger, which is truly remarkable and worthy of further discussion. It is equally important to remember that such a wastescape exists within a broad historical stream, and is bound and defined temporally.

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Sarah Hill

Forget About It: Purposeful Ignorance (of Waste) in a City Nature Preserve

Nature Now

In September 2014, I sent three dozen college students to explore the Kleinstuck nature preserve, a 48-acre urban wilderness owned by Western Michigan University, one mile from the main campus. Traveling in pairs and trios, they entered the preserve at the edge of a grassy field. There they walked by a welcome sign planted atop a wide, graded slide of crushed stone that links to a narrow, wooded trail. This trail descends about 30 yards to a sandy path 0.7 of a mile long, completely encircling the marsh. A ring of uniform tree stump stools is artfully arranged at the intersection of the entry path and circle paths, 90 feet (in altitude) below the top of the basin.

For their short writing assignment I asked my students to describe what they saw as "nature" and "culture" in the preserve. Unsurprisingly, most found the entry sign, the paths, and the ring of tree stumps to be "culture." Some students also observed a sewer-line access at the center of the tree stump ring, with its distinctive iron standpipe about 30 inches in diameter, covered by a heavy lid—an iconic feature of the urban landscape. Those students who made note of the sewer standpipe found it troubling. They asked: Why put a gathering place next to such an undeniably unpleasant reminder of urban culture? Some also wondered why there was a sewer line in the nature preserve in the first place.

According to my instructions, students turned right at the junction of the descending and circle paths and next came to a short spur on the inside of the trail. This took them 15 yards into the bottom of the preserve, to the watery edge of a wetland. Here they encountered a concrete bench positioned for bird-watching. Observant students could note a number of thin posts submerged in the shallow water, topped with pink plastic ribbons and marked with numbers to indicate depth. Only one student recognized the predominate species of late-season flower as the very attractive but highly invasive purple loosestrife.

Figure 1: Sewer access in Kleinstuck Preserve, summer 2014. Courtesy of the author.

Recalling their journeys later, many students marveled at "nature's beauty" on this part of their short journey. They relished this variegated sanctuary in the midst of a city, with tall trees and thick underbrush and a wetland teeming with sights, scents, and sounds. Several praised a particularly handsome, stately tree with stringy, auburn bark: a southern bald cypress (though no one identified the species nor recognized its improbable appearance in a northern marsh). Some also observed a change in tree cover—from broadleaf hardwoods to a stand of uniform conifers—about a tenth of a mile beyond the concrete bench.

What they next encountered provoked a near universal reaction (as I had anticipated). Leaving the pine stand students expressed shock, dismay, and sometimes outrage when they confronted a brand new, massive public works project: a gravel roadbed several inches deep and wide enough to support enormous utility vehicles, studded with freshly cut tree stumps—still oozing sap—and splashed with fluorescent paint, a kind of hieroglyph for utility work, mapping a subterranean scene that ran below what had been, until recently, a narrow path carved by foot traffic.

Figure 2: Sewer crews in Kleinstuck Preserve, summer 2014. Courtesy of the author.

In their short essays, many students noted the signs, posted by the City of Kalamazoo, which explained this disruption of nature as necessary to repair a badly degraded sewer line that flows underneath the nature preserve. They sniffed with indignation: Who decided to "ruin" nature with this bit of culture? Here are some samples of their reactions:

> "They had created this network of human waste and centered it in the preserve. They had used no restraint in cutting down trees and moving anything they deemed as problematic to their cause."

> "Human intrusions no longer surprise me. They are an expectation since man must leave his mark to show just how much he controls."

> "As we head back home, I can't help but wonder why people couldn't leave even that small part of nature alone. Whose brilliant idea was it to put a sewer under a forest and to make a path out of stone that will never go away (at least in our lifetimes)?"

> "While it is great that the City of Kalamazoo has taken initiative in attempting to prevent sewage leaks into the wetlands, the city should not have had reason to build something potentially hazardous in a protected area in the first place. Western Michigan University considers Kleinstuck protected for a reason, and the city should honor it as such."

Culture in the Past

A week later, I invited Steve Keto, the preserve's manager, to tell my students Kleinstuck's history. He quickly set the record straight for them: "This area is by no means pristine. Most of what you see there is the result of change wrought by human hands."

Indeed. Though the site that became the preserve began in geology, what we have today as "nature" in Kleinstuck derives its character from culture. In fact, *natural* Kleinstuck has been entangled with multiple challenges of both purposefully and somewhat accidentally forgotten waste since its inception as a *cultural* artifact of the industrial age in the late nineteenth century. Since then its problems both *as* waste and *with* waste have shaped its every era of exploitation, abandonment, reverence, and preservation.

Let's start with the geological history. Some 12,000 years ago, retreating glaciers left a chunk of ice buried by layers of outwash (sand and gravel) that accumulated atop it during subsequent cycles of freezing and thawing. This bubble of trapped, solid water melted slowly amidst the mineral mix that would become upland areas around it. (Picture a road pocked with ice-filled potholes: that was the landscape of the upper American Midwest at the end of the last glaciation.)

In the area now known as Kleinstuck, remnant ice made a void in the sandy landscape. Once melted it left a roundish depression that became a kettle pond—a small body of standing surface water. Sealed off from groundwater that flowed beneath a clay layer, this pond received only rainwater. Over time, it largely—but not completely—evaporated. Left in its place was a bog: spongy wet after a rain and brittle dry in seasonal droughts. Its surface mat of highly acidic, partially decayed organic material was short on useable nutrients (nitrogen and oxygen) and thickly covered with carnivorous plants that extracted their nourishment from captive insects rather than the muck beneath

them. Bogs, in the array of North American wetland types, support very limited and specialized plant communities in large part because previous generations of flora and fauna in them have not fully decomposed.

We know little about what the indigenous human population in the area made of the bog, though presumably they had sussed out its prospective utility. Somewhere near Kleinstuck, according to early European and Euro-American settlers' accounts, these native peoples forged iron. Did they power their metal craft by burning carbon-rich peat extracted from Kleinstuck? Was the spot to them a resource?

It certainly was to the landscape's third recorded white landowner, an immigrant from Saxony named Carl Kleinstuck, who set out to drain it in 1885 so that he could rescue it from what he regarded as its otherwise unusable condition. To Kleinstuck, this land in its natural state promised nothing more than a wasted opportunity (a view echoing Enlightenment philosopher John Locke's assertion that men must mix their labor with the land in order to prevent prospective property from wastage).

So Kleinstuck, good German innovator that he was, built a small cog railway from his farmyard on higher ground down to the bog, where his workers sliced wet bricks of peat, to both sell and use for fuel in his varied enterprises (a nursery, a farm, and a wild animal collection among them). And he also began fulfilling his vision of the bog's future: a botanical garden. The concept seems silly now (aren't all gardens botanical?). But in accordance with the fashion at the time, Kleinstuck imagined in the wastes of his mine a living display of the world's prized plant varieties—a kind of zoo for flora. Kleinstuck's plan amounted to landscape recycling: once denuded of bottomland muck and upland tree cover, he would replant the resulting blank slate with an array of imported exotics.

In 1916, the bog, now scraped clean of peat and populated with at least one of Kleinstuck's imported trees (the bald cypress), passed to his widow, Caroline Kleinstuck. Six years later, she gave it to the State of Michigan for "educational purposes." Much has been made, over time, of the good widow Kleinstuck's intentions to protect the land for education. When the beleaguered, underfunded preserve faced vandals and ruin in subsequent decades, its champions would recall Caroline Kleinstuck's bequest that the property be used for education and the advancement of science.

But consider her alternatives at the time: the land that is now the nature preserve may well have looked rather burdensome to Caroline Kleinstuck. At the time it was a sealed bowl: too small, too sloped, and too wet (or dry) for either horticulture or home building. And it probably had already begun yielding an unsightly cover of opportunistic plants unleashed by European immigration (including the very aggressive garlic mustard, Asian bittersweet, and common buckthorn). Even if, as local lore holds, Caroline Kleinstuck saw the excavated bog as beautiful and wanted to honor her dead husband's vision of its transformation, she also no doubt recognized that that fanciful dream would entail both effort and resources. Neither of these would come cheaply to the elderly widow on her own.

In fact, Caroline Kleinstuck might well have needed to off-load the parcel in order to secure the real-estate potential of the rest of her holdings—upland farmland that she and her children had begun selling for residential subdivisions in the previous decade. Maybe no developer wanted to buy a mined-out, cut-over, and possibly smelly crater. Maybe she had no choice but to give it away. Whether she meant to preserve a fragile landscape or jettison a wasteland, in 1922 she gifted it to the state Board of Education, headquartered in distant Lansing, which appears to have put little effort into its due diligence of the maintenance of the property. Instead, it quickly turned the property over, with no budget, to the recently opened local teachers college (Western State Normal School), relieving itself of the burden of management from afar.

In 1927, the college embraced the passionate arborist fervor of the decade, canceling classes in early spring to send all its students on a planting adventure. That day, the school covered a portion of the basin's hillsides with more than 12,000 pine seedlings (none of them varieties native to this corner of Michigan). What prompted this considerable outlay of time and resources? What did the college see in the treeless bowl—an ugly scar? An empty vessel? An opportunity? Whatever it saw, it undertook the pine plantation to purposefully change the preserve's nature, guarding against a new fear of how it might indeed go to waste.

Then two years later this remote, bald depression, now stippled with an incipient forest, found itself the happy resolution to a new waste problem: where to put the sewer line for a recently built subdivision that the widow Kleinstuck had initiated when she sold off the rest of her deceased husband's estate to a developer. Here we encounter another

Figure 3: Arbor Day tree planting, Western Normal School, 1927. Courtesy of Western Michigan University Archives and Regional History Collections.

turn in the larger American cultural practices of which this preserve is a part. When the Kleinstuck family negotiated the sale of its land for residential development, sewer infrastructure neither existed nor was warranted for the future homes that would soon appear there (the first houses of this subdivision had cisterns and water closets). But a decade later, the city required sewerage, both of its residents as well as of itself.

The city's new sewage treatment plant lay miles to the north, downhill, on the Kalamazoo River. To make efficient use of gravity (and to avoid the need for a sewage pumping station) the city appealed to the college for a collector easement around the bog—the low point near what would eventually become neighborhoods of more than 20,000 residents. This the college granted because it got, in return, help in maintaining the property, or so it seemed. Construction soon began on 8-inch and a 15-inch clay pipeline. These now drain 1.8 million gallons of wastewater a day. That's enough, preserve manager Steve Keto calculated recently, to fill the bottom of the preserve one foot deep in sewage within 24 hours, were the pipes to fail.

In time the pine forests took root and the preserve's other slopes became covered with non-native bushes and trees. Some were purposely planted by the college's biology faculty, while others had escaped from neighbors' yards: Norway maples, mulberry, apple

and black cherry trees, Asian bittersweet, and English ivy vines, among others. The scrubby preserve also filled in with trash, reported by the volunteer group of preserve supporters who appealed, year after year, for funds to properly manage the "derelict," neglected property. They lobbied as well for a fence to keep vandals out (which would obstruct the movement of wildlife, of course, although this did not seem to concern the nature preserve's advocates). The college made clear by its routine denial of these requests that it regarded such expenditures a waste of its educational resources.

Nonetheless, in the early 1960s, the college, now a university, did reveal its concern for the preserve. Worried about the bog's lack of drainage (which is, of course, the nature of a bog), it brought in heavy equipment, paid for by a neighbor, to trench a circular moat, which it set off by a hummocky berm made from mounded soil unearthed in the process. This was meant to restore what was imagined to have once been a year-round pond (it did not).

Instead, now, for the first time in millennia, seasonal surface water drained into subsurface groundwater, previously sealed from the bog by thick layers of peat, dense silt, and marl. This dramatic man-made hydrological change prompted unintended man-made water chemistry changes: the acidic bog gave way to more a pH-neutral fen (though most people call the wetland a marsh). When the bog disappeared, so too did whatever was left of its unique communities of plants. In their place grew vegetation common to marshes.

Waste Forgotten, Waste Remembered, On Purpose

In less than a century, a bog became a marsh, treeless hillsides became thickly forested, and city residents forgot the whereabouts of sanitary infrastructure. In reading the landscape of Kleinstuck Preserve, my students (along with everyone else I know, including myself) got the relationship between the waste management service of the preserve and its "natural" service wrong.

One of the key features of the "civilizing process" as Norbert Elias so eloquently put it, is the way we separate ourselves from our own bodily effluent. In doing so, of course, we strive to forget how that waste travels away from us. The Kleinstuck nature preserve will probably never return to what it was in 2014: a tangle of feral urban forest and wetland,

accessible only by foot trails. But it will also never return to the bog that preceded the marsh, nor will the old-growth oak savannah ever encircle its top again.

Instead, for the foreseeable future it will bear a highway of sorts in its center, in order to preserve the City of Kalamazoo's increasingly frail liquid waste management infrastructure and provide access to vital monitoring and maintenance. Hopefully this change will extend the life of nature in the preserve by preventing a ruinous catastrophe: the explosion of a sewer line in the man-made marsh, wasting forever a culturally prized piece of accidental nature.

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