Waste’s translations: Estuaries, marine life, and the chemistry of Mumbai’s dumping grounds

ABSTRACT
Mumbai’s dumping grounds, located on the city’s estuarine edge, are sites where garbage and marsh are turned into salable land. This process of translating waste into land depends on keeping matter, beings, and landscapes separate and on limiting their interactions. Yet waste and the marsh interact and transform in ways that escape managerial discourse, revealing a haze of category and control errors that complicate knowledge, agency, and responsibility. While developers translate waste to land in relation to developmental goals, fishing communities, scientists, and activists translate it differently: scientists translate it in relation to chemical properties, interactions, and timelines; marine-life activists draw attention to its coastal ecologies; and fisher communities look for productive possibilities on a polluted shore. These translations attend to the inseparability of waste substances from the coast and its futures. They articulate a politics that acknowledges waste’s sociopolitics, material agency, temporalities, and multispecies ethics.

Waste undergoes a process through which it appears as or becomes a different thing. This process, which I call translation, occurs within a field of possibilities that depends on timelines, discourses, and frameworks. The principles and practices of solid-waste management translate substances and spaces, which are classified as waste, into commodities of higher value, a process that intensifies entrenched social hierarchies (Doron and Jeffrey 2018; Gidwani 2015). Such translation depends on keeping matter, beings, and landscapes separate and limiting their interactions (Reno 2016). It involves both physical separations (like thick barriers of rubble and plastic that separate garbage from marsh) and conceptual separations based on material categories (such as organic, inorganic, toxic, and inert).

In dumping grounds, chemical reactions take place among the many components that make up the complex amalgam that is waste. Then, after a certain time, the components are deemed inert, remaining in the ground as benign, self-contained objects. But, as was the case with Mumbai’s Malad dumping ground, things and landscapes rarely remain within neat boundaries or act in set time frames: cracks, pores, and the slow work of attrition allow for slippages and unanticipated reactions. The toxic sludge trapped under layers of sediment and the steady degradation of materials like plastic and metal hold the menacing promise of future action. The marsh is not a passive container; it reacts with and carries waste beyond the dumping grounds and beyond the horizons of development projects.

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IN THE EARLY 2000S, A TECHNOLOGY PARK CALLED MINDSPACE OPENED IN MALAD, A SUBURB OF MUMBAI. SOON AFTERWARD, HOWEVER, THE COMPUTERS AND ELECTRONIC SYSTEMS AT MINDSPACE BEGAN GOING ON THE Fritz. AFTER SEVERAL MONTHS OF FAILURE, REPAIR, AND REPLACEMENT, AN ENVIRONMENTAL CONSULTANCY FIRM DETERMINED THAT THE DELICATE MACHINERY WAS CORRODING AS IT CAME INTO CONTACT WITH SULFUROUS COMPOUNDS EMANATING FROM THE GROUND (NAIR 2007; Sahu 2007). MINDSPACE WAS BUILT ON WHAT USED TO BE A LARGE MUNICIPAL DUMPING GROUND IN MALAD CREEK’S ESTUARINE MARSHLAND.

CREATED IN 1968, THE DUMPING GROUND RECEIVED OVER 1,000 METRIC TONS OF GARBAGE FOR MORE THAN THREE DECADES (ATTARWALA 1994).

A survey drawing published in 1994 showed that the Malad dumping ground extended well into the creek and was covered with 25-to-30-meter-high mounds of garbage (Attarwala 1994).

Illustrations by V. Chitra
The filled-up marsh was bought by the K. Raheja Group, which had developed Mindspace as a brand of commercial and industrial parks. Mindspace typifies the emerging architectural style and design vocabulary replicated across Indian cities (Sze and Gambirrazzo 2015). On top of what used to be towering mounds of garbage, there now stand office complexes, manicured gardens, and one of the country’s largest malls.
Waste is a liminal substance that lies between use and disuse. It exists between the human (rejected after use as trash) and the natural (turning into landscape). It is dumped into estuarine marshes that are themselves liminal sites where solid and liquid, salt and fresh water, mix (Leysison 2018). These redoubled liminalities of waste meddle frameworks for governing and managing it. They work against managerial orders that compel human-nonhuman relationships and restrict their multiple possibilities and configurations (Bavington 2011). While developers choose to ignore histories of dumping and are partial to translations that turn waste into salable land, there are others, such as scientists, fisher communities, and marine-life advocates, who notice waste’s other translations. Waste-management experts attend to translations that work along the chemical timelines of different substances. Near-shore fishers inhabit translations that reconfigure communities over generations, even as they skillfully translate between polluted coastlines and their productive possibilities. Environmental activists pay heed to translations that rearrange the lives of marine creatures at the shore.

Paying attention to these other translations creates possibilities for a waste politics that acknowledges the material agency of waste, as well as its temporaliy, class and caste dynamics, and multispecies ethics. A fundamental aspect of this waste politics is that it does not separate waste from the shore. It melds waste’s translations with the coast and coastal futures—futures that reach beyond the discourses and timeframes of urban development and of environmental management.

In 2011, I began my fieldwork in Malvani, a koliwada (fishing village) in the western suburbs of Mumbai, just up the creek from the Malad dumping ground. That same year the Indian government revised its Coastal Regulatory Zone (CRZ) policy, which divided the coast into varying areas of ecological senitivity with corresponding potential for development and conservation (Menon et al. 2015). I became interested in how technical images such as maps and plans for the coast changed human-nonhuman relationships and shaped the city’s political and material landscape. The 2011 CRZ policy paved the way for large-scale infrastructural interventions, such as managing solid waste through landfills and waste-to-energy programs. Its provisions protected the coast from polluting substances through managerial practices that took account of waste’s potential for harm but articulated that harm in ways that understood the coastal environment as a natural resource.

For Malvani’s near-shore Koli fishers, waste is inextricable from social and material life. It is most immediately visible as the litter that fishing nets bring up along with the catch, the open sewers that drain into the mangroves, and the soggy garbage that piles up at the entrance of the village, waiting for the weekly municipal truck. Then there is waste at work, two, three, or several steps removed: garbage and sewage react to produce algae and jellyfish blooms, which sometimes cover the catch. Waste exists as industrial pollution and in the chemical load inside the fish that is sold and makes its way into bodies as food. Waste reorganizes and creates ecologies (Hoag, Bertoni, and Bubandt 2018)—at this shore where waste abounds, it cannot be considered separate in any sense.

In 2017, I expanded my project to think beyond coastal policy and more broadly about coastal transformations, climate change, images, and infrastructure. Solid-waste management—especially the question of where to put it—was an important one, given that the city’s existing dumping grounds were well past their capacity. The new ground too was in estuarine marshland, which links it to long histories of dumping and reclamaiton in Mumbai. To think about this tension between mixing and separation, I began talking to waste-management scientists. Scientists who work on waste curate the chemical life of dumping grounds by carefully separating and controlling the interactions between different substances. These controlled interactions link waste to global economies of energy and carbon reduction, but they obscure the continuities among garbage, marshes, and people. How scientists engage the chemistry of substances reveals the multiple temporalities in which waste acts. Their understanding of waste opens the possibility of thinking with waste’s latencies—that is, the time lag between when waste is dumped and when it reacts with other substances or its surroundings (Murphy 2013).

Around the same time, a new marine-life advocacy group was conducting shore walks to raise public awareness about the plethora of nonhumans at risk from coastal megaprojects. During these walks, the advocates would point to creatures that persist despite coastal pollution. They would encourage residents to walk along the shore, take pictures of marine creatures, and upload them to a digital database where the creatures are meticulously labeled and sorted. While this archive reproduces modern scientific sensibilities of crafting an anthropocentric coastal order, it works beyond scientific categorization—the images not only provide data about each particular creature, its habits, and where it was found, but they also create a multispecies relationship, one in which city dwellers recognize marine beings as coresidents that exist despite, or because of, the chemistry of the city’s shoreline. These walks make visible waste’s continuities, which reorganize the ecologies of a coastal city.

Waste is translated not just as a commodity but as a part of the shore, thanks to how it is engaged with, encountered, and seen by the near-shore fishing community, waste-management scientists, and marine advocates. These translations are openings to think beyond large-scale technological solutions and managerial discourses of controlling and commodifying nature. They also break with nature-culture dichotomies and turn instead toward...
the sociomaterial entanglements among matter, beings, and landscape (Bennett 2010; Haraway 2016; Tsing 2015). Waste’s entanglements impinge on and alter other entities and beings, including humans (Hird 2013). This profusion of potential confounds the received categories into which infrastructural projects place materials and beings. Far from inert, waste matter acts and reacts, sometimes in imperceptible ways, such as the small, innocuous-looking plastic grains that mix into the sediment and masquerade as sand. A geological agent produced by humans, waste has already insinuated itself into the environment, where it will remain far beyond human timelines (Chakrabarty 2009). Its physical presence and interactions, which are often unpredictable, imperceptible, or slow, are creating the coast and its possible futures.

**Slow cooking**

Mumbai has two working dumping grounds, Deonar and Kanjurmarg, located on the city’s estuarine edge. The Municipal Corporation of Greater Mumbai (MCGM), the city’s governing body, keeps filing for extensions to keep Deonar, the larger of the two, open. The MCGM is also locked in a legal battle over its plans to expand the facilities at Kanjurmarg. The courts ordered a stay on this expansion since it could harm the tidal ecosystem (B. Chatterjee 2019b). The MCGM has long cited the lack of space as a reason to build dumping grounds in the estuarine marshes on the city’s edge. It promises to minimize damage by centralizing waste processing and by introducing new technologies while turning a profit through waste-to-energy programs and biomining (using microbes to eat away at organic waste and recover metals in the dumping ground).

Depending on the technology involved, centralized and mechanized waste regimes introduce new physical and conceptual separations and categories. For example, incineration technology recategorizes the complex mix of garbage into simplified objects for energy production (Kornberg 2019). The resulting economic and political shifts efface communities of waste workers (Gidwani 2015) and existing ecologies created by years of dumping waste in marshland. Despite these concerns, the refrains of a city swallowed by garbage have created widespread public support for centralization and waste-to-energy projects. They offer to neatly square away the excesses of consumption before overrunning the landscape (Ahmann 2019). Such interventions fit neatly within bourgeois sensibilities of greenness (Reddy 2015) and within the spectacular landscapes built on the slippery promise of modernity and urban renewal (Anjaria 2009; Parikh 2020; Searle 2016).

In the summer of 2017, I approached Urmila Mala, a waste-management scientist, to understand the technologies and practices applied in dumping grounds. Mala specializes in solid-waste management and is an expert on the physical and chemical processes that go on inside these grounds. She started off by explaining “capping,” which is a popular, modern waste-management technique for sealing off trash from its surroundings and preventing any human contact with it. Typically, before garbage is dumped in an area, the ground underneath is prepared with liners and channels for capturing the toxic leachate that the garbage exudes. This creates an impregnable cell, which prevents garbage from leaching into the ground below. When the ground reaches the end of its life, the piles of garbage are once again capped with layers of gravel, silt, and high-density plastic. The mounds are then steam-rolled and compacted, becoming salable land. As Mala explained, most dumping grounds in India did not begin as engineered sites (also called landfills), which means that there are no liners that separate the garbage from the ground below. Yet, as was the case in Malad, these older dumping grounds are routinely capped off, which only hides the garbage. “It gives the illusion of separation,” Mala said when we first spoke on the phone, “but there is a lot happening underneath.”

A scientifically managed dumping ground, as Mala described it, is an active site, meaning it must be continuously monitored even if it is engineered to be cut off from its surroundings. The physical separation, monitoring, and maintenance practices are crucial for reproducing modern sensibilities according to which contamination and risk are managed by separating waste from society (Douglas 2002; Reno 2016). Depending on the architecture and layout, the ground is filled in parts, where matter is segregated based on its composition to minimize damage to the environment and to maximize gains from composting and recycling. Piles must be carefully engineered so as not to slide; they have to be stratified, and the ground’s boundaries have to be scrutinized from time to time to ensure that the garbage stays within. Like a slow-cooking pot, Mala said, dumping grounds must be carefully attended to, and the conditions in which things meet and mix must be meticulously controlled to derive energy from waste.

One of the key aspects of generating energy from waste is to determine its composition, that is, how much of it consists of biodegradable materials, paper, plastic, metals, glass, and inert matter. Waste has caloric value, Mala explained, using one of several food metaphors common to waste management. Knowing the broad composition of the garbage allows experts like her to calculate the energy that the dumping ground will likely generate during its lifetime. Given that Mumbai’s trash largely comprises wet, organic waste, it has a low caloric value for waste-to-energy programs that incinerate waste. Waste’s composition in these terms—wet, dry, organic, metal—also divulges how it degrades. In the dumping grounds, this mostly wet garbage lies in large anaerobic mounds, meaning the garbage is not
exposed to air and undergoes a host of chemical reactions that are, in theory, predictable (Sahu 2007):

\[
\text{anaerobic environment} \rightarrow \text{organic matter + water + bacteria + temperature} \rightarrow \text{new cells + resistant organic matter + carbon dioxide + methane + ammonia + hydrogen sulfide}
\]

As this formula indicates, bacteria inside the mounds digest organic matter and release carbon dioxide, methane, ammonia, and hydrogen sulfide, as well as other nitrogenous and sulfurous compounds. Most of the emitted gas is carbon dioxide and methane, both of which can be used as biofuel or burned for carbon credits. But some amount of toxic gas is always released, and there are reactions that can happen outside the parameters of this template. As Mala emphasized, the template is akin to a diagram: it simplifies the varied and complex reactions that unfold over different phases in the lifetime of a dumping ground. But none of the dumping grounds in the city were engineered, and unsegregated trash (including hazardous waste) was directly deposited into marshland, where waste matter reacts with its surroundings. Moreover, most of the separation and transformation happens through informal networks of waste workers who are on-site. Thus, each dumping ground has its own unique set of conditions. As Mala said,

Each case is different. Each dumping ground has its own complications and its own composition. So we can control in the sense that we can have a general idea ... and only if everything has been scientifically managed from the start. But very few dumping grounds are like that. Each dumping ground has a unique chemical, physical, and ecological makeup.

The chemical reactions at the Malad dumping ground, which started as an open landfill in marshland, happened in a particular context (Sahu 2007). Since the dumping ground wasn’t on an engineered site, a whole host of other interactions were involved, such as those between organic matter and the marsh, between chemicals in the garbage, and between the sewage and the creek water. These interactions were affected by topography and the fill’s height and composition. Because the garbage was dumped directly on-site, the leachate oozed into the marshy ground and trickled into cracks in the rock bed. The mound was capped with layers of plastic, which cut off oxygen, and the construction above added further pressure. While taking me through the chemical reactions, Mala remarked,

There is no zero-harm dumping ground. There are always gases released and leachate that needs to be managed. The question is, How much harm? Even in a well-managed dumping ground, till the reactions settle, people should not remain in the area for long periods of time. In places like Malad, the office-going and residential population could suffer long-term effects of continuous exposure to toxic gas.

Mala’s response articulates the complexities of solid-waste management in megacities like Mumbai, of turning dumping grounds to land, and of ecologies that are engineered in human terms. In each phase of the ground’s life, its emissions are measured, and over time they are supposed to come down to safe levels that are set according to an adult human with a healthy immune system. Remaining outside these considerations are measures of harm and possible outcomes for nonhumans that share the coast. Waste infrastructures hold aspirational futures, promising the possibility of renewal through destroying trash (Ahmann 2019). Such a utopian imagination, however, relies on the controlled conversion of garbage that is much like a template reaction, albeit along a developmental timeline:

marshland → dumping ground + waste-to-energy programs → capped and turned into parks and real estate

The problem, as Mala pointed out, is that the convergence of the two transformations—the chemical conversion of waste and the transformation of dumping grounds into salable land—is far from smooth or complete. The pressure and timeline of creating salable land from marsh often does not match up with the time taken for reactions to finish, for gases to dissipate, and for matter to decompose. For Malad, these plans failed because they overlooked the nature of substances. As she said, everything erodes over long periods, and these erosions too are a part of the dumping ground’s chemical life. They remain outside the template reaction of development projects, which attend only to the short term.

The sleight of hand that turns garbage into fuel into land must also be understood in relation to the global carbon assemblage (Whittington 2016), in which one credit represents the reduction of one ton of any greenhouse gas reduced from the atmosphere. In 2007 the Asian Development Fund (ADF) began financing the closure of one of Mumbai’s former dumping grounds against the future carbon credits that it was estimated to generate. The Gorai Landfill and Gas Capture project entails capping the dumping ground and burning the trapped gases. The project burns methane to release carbon dioxide, which is considered a less potent greenhouse gas. In the process, it earns tradable certificates that can be sold or used to offset domestic emissions. The project was declared a failure because the garbage generated only a fraction of the estimated carbon credits. The MCGM was eventually forced to buy carbon credits from the global market to pay back the US$3 million advance it received from the ADF (Indian Express 2012).
Despite failures such as Gorai, in 2016, when the Indian government revised its rules governing solid-waste management (MoEF 2016), it continued to rely on the classificatory and regulatory orders of urban planning and waste-to-energy programs (Mirza 2019). The government’s aggressive promotion of new technologies overlooks the physical and chemical characteristics of the existing waste. As trash becomes big business, it also cuts off communities of informal waste pickers, scrap dealers, and traders from the revenue stream, and these precarities multiply with the emergence of private companies that specialize in waste-to-energy programs or in recycling specialized goods like electronics (Gidwani and Corwin 2017; Reddy 2015).

The idea that waste presents both a crisis and a resource is tied to long histories of waste experiments in Mumbai. The successes and failures of these technological experiments reveal the sociopolitical frameworks that scaffold infrastructure—each new experiment holds the promise of modernity and a functioning state, while failures signify apathy or neglect (Schwenkel 2015). For example, in the late 1800s, as germ theory displaced the idea of miasmic transmission, new concepts of contagion reshaped cities (Gandy 2014). In 1890 a civil engineer named C. C. James, who was commissioned to oversee the sanitation infrastructure of the Acworth Leper Asylum, designed Mumbai’s first waste-to-energy plant (Doron and Jeffrey 2018). James’s system treated waste from latrines; the waste was then used to fertilize fields of grass that was harvested and sold to the city. Later, excrement was directed into a sealed chamber to produce biogas that generated electricity. James’s (1906) account of the project is a careful production of human and nonhuman continuities: calibrating the volume of water used by the residents, investigating the composition of the waste, using different materials and technologies, and studying the variety and quality of the resulting crops.

Around the same time, in 1885, when the Health and Sanitation Departments were struggling to manage the growing quantity of solid waste, city officials toyed with the idea of using incinerators to manage the problem. When these experimental incinerators were found to be inefficient (because the waste was too wet), it was decided that the garbage would be transported north for use as fill material in reclamation projects (Attarwala 1994). This established a pattern of dumping garbage (including construction debris) in marshlands allotted for reclamation (S. Chatterjee 2019). Waste—its changing compositions, technologies, and associated public health concerns—has not only shaped Mumbai’s socioeconomics, but it also shares a long, physical continuity with the city. The very spaces that are described as estuarine are also wasteland ecologies. In the city’s dumping grounds today, under the rubble, substances that have accumulated over decades continue to transform and work in unknown ways and chronologies.

Creek, fish, guts

The village where I did my fieldwork, Malvani, is near Manori Creek, one of Mumbai’s major estuarine systems. In 2011, when the coastal policy was released, the MCGM announced that it would begin revising Mumbai’s Development Plan, a document that is used for planning the city’s development in 20-year cycles. The fishing villages, or koliwadas, became sites of intense real estate speculation (Chouhan, Parthasarathy, and Pattanaik 2017). Because the fishing villages were located on prime real estate (Warhaft 2001), the public meetings in the villages tended to focus on the immediate threats to homes and livelihoods. But issues of climate change and pollution would erupt from time to time in the everyday work of near-shore fishing.

Traditionally, the fishing season begins at the end of the monsoon with a prayer asking the sea to calm its waters and requesting a bountiful fishing season. The creeks offer a safe space to park and launch boats, and the smaller two-man vessels use it as fishing grounds, where they easily move in and out of shallow creeklets. Life and work in the fishing village are inextricably linked to the creek, garbage, and fish. I worked with the women who sort and sell fish on the beach. Speed was of the essence because we had to catch the wholesale dealers at the beach before they finished buying their lots for the day and because we had to beat the water, which would be fast creeping up our backsides as we squatted on the beach. This work was how I came to have a very tactile, visceral relationship with garbage.

Sorting fish involves a combination of activities. After cleaning the fish in the creek, you arrange them in containers (the best ones on top). This was performed without any protective gear; bare hands dig into the mounds and separate the fish from the nonfish, the edible from the inedible, and a small pile of edible-but-ugly would invariably form on the corner of the sorting mat. Unlike trawlers, where much of the processing happens onboard, artisanal fishers find their catch in near-shore waters. They are not peripatetic; they have fixed spots allotted for each boat, where they secure their “bag nets,” so called because they take the shape of bags as they are held open by the current. The same tidal currents that trap the fish in the floating nets also carry the garbage that floats out of the city. Once in a while, I would spot boats where the entire catch was covered in garbage and black goo. Other times, our catch and that of others would be covered with jellyfish blooms that result from pollution—the purple slime stung our hands and made our skin peel.

If the catch was covered with dead jellyfish, I and some of the others would be spared the task of cleaning it. That task would mostly fall on the two daily wage laborers, Mary Bai and Jenny Bai, who worked with a few boats. Gauri Bai, who was the boat owner’s wife and our boss on the beach, would yell at me, “Aye bai! Tula zombel! Teela karu de. Uska
Mumbai is one of India’s biggest waste generators. In 2016, about 1,000 metric tons of waste made its way to Mumbai’s landfills (CPCB 2016). This does not account for the several tons of garbage that are dumped into the creeks. The city’s sewage treatment plants are also inefficient, failing to remove the toxicity from the 2,092 billion liters of sewage that they treat daily (MPCB 2019).

Waste is melded into the coast, a reality that surfaces dramatically from time to time when the sea spits back hundreds of tons of trash back onto the shore.
WHEN RESEARCHERS MEASURED HOW MUCH PLASTIC THERE IS ON MUMBAI'S SHORE, THEY FOUND THAT ON ANY GIVEN DAY ACROSS ANY OF THE CITY'S FOUR MAJOR BEACHES, A RANDOMLY SELECTED AREA OF ONE SQUARE METER WILL HAVE, ON AVERAGE, 84 PIECES OF PLASTIC (JAYASIRI, PURUSHOTHAMAN, AND VENNILA 2013).

OF THESE, 42% (39 PIECES) WOULD BE MICROPLASTICS (< 1.5 MM) — 98% (32 PIECES), MESOPLASTICS (6-20 MM) — 9% (16 PIECES), MACROPLASTICS (21-100 MM), AND — 1% (1 PIECE), MEGAPLASTIC (> 100 MM).

THE RESEARCHERS NOTED THAT THERE IS A LOT OF VARIATION; DEPENDING ON THE TIME OF YEAR, THE AMOUNT OF PLASTIC CAN VARY FROM TWO TO 720 PIECES. THEY ALSO SPECIFIED THAT THE SAMPLES WERE TAKEN ONLY FROM THE SURFACE AND DO NOT ACCOUNT FOR THE PLASTIC THAT IS INSIDE THE SAND.
kaam karke chamdi hardi ho gaya hai” (Aye, woman! It will burn you! Let her do it. Her skin is tough from years of work). Then, turning to the two women, she would yell, “Chal bai! Baghates kai? Richav! Richav!” (What are you staring at? Sort! Sort!) 10

Mary and Jenny would quickly sort the catch while the rest of us worked around them, cleaning the bigger fish, hauling tubs, and running to woo the dealers. After they had finished sorting the catch, Mary and Jenny would regularly comb the beach for trash. The inedible or bad fish would be put away in plastic bags; these would be sold to middlemen, who sold it to fish-waste processors that produce fertilizers. Plastic and metal would be sorted and sold to the bhangarwala (scrap dealer); aluminum and copper items were harder to find, but they fetched a higher price. Mary would comb the beach, scavenging for anything salable in waste bins and under food stalls.

Our relationships were organized by the infrastructural inequalities and continuities that make Mumbai (Anand 2017; Björkman 2015). This took place in intricate ways that extended beyond the beach, owing especially to waste. In Mumbai’s informal settlements, access to toilets and water is vital to everyday life across scales; access affects intimate relationships, alliances, associations, bodily comfort, contagion, and ideas of community belonging (Khanolkar 2021). Malvani village was surrounded by apartment blocks with private toilets. My upper-caste status afforded me many social and economic privileges. At the end of the day, I could go to a home, just down the road, with a private bath and bathroom. My visits to the common public toilet in the village were carefully mediated. I was warned against going to the ruined bungalow where a colonial officer had once lived; its half-broken walls were now the designated women’s toilet. Few houses had a private toilet—most just had a mori (a shallow sink with a water trap in the floor, usually connected to a gutter), where people bathed and washed their clothes and dishes. Infants and toddlers also used the mori as a toilet. All the drains—including the outlets from the few houses that had a private toilet—led to open, unlined gutters that emptied out into the grounds behind the village, where some families cultivated patches of greens, which were sold in the local market. Wastewater of all sorts—sewage, kitchen waste, rainwater—was always mixing because the infrastructures that conducted these flows were porous, unsegregated, or entirely lacking, which led to higher health risks, especially for those without access to private toilets.

The lack of proper water supply exacerbated the effects of the fickle arrangement of drains and toilets—the village received one hour of water every evening. The hodgepodge of crumbling water tanks, plastic bins, metal and concrete, provisional gutters, and septic tanks had human, vegetal, animal, and microbial outcomes. While there is no systematic study on the spread of infectious diseases in Malvani, diarrhea, parasitic infections, and infectious fevers were common.

The disease burdens and risks caused by the lack of sanitation infrastructure were not uniformly felt. Malvani’s infrastructural ecology entangled its residents and those who worked in the fishing industry in different ways. For example, the fishing industry employed migrant workers from North India who could not afford housing and had to live on the boats. This had direct consequences for their health: their only access to fresh water was the rundown public toilet at the beach. A big part of their daily diet was leftover fish, often consumed hours after they finished work at the market. Structural violence marked daily wage laborers like Mary and Jenny Bai, who were exposed to greater risk because they did the hard and dangerous work. Any resulting harm and distress they felt was naturalized as a result of perceived bodily differences that are often used to separate Dalit and migrant workers’ bodies from others’. Their skin, stomachs, and hands were deemed tougher. Or they were viewed as “habituated,” as they would often say themselves when they pulled away the heavier tubs from my hands or washed their jelly-covered limbs in the creek. This perceived sensorial resilience sets workers like Mary and Jenny apart and threads them deeper into harmful continuities with waste (Gidwani 2015). In the process, it turns them into dispensable subjects in an extractive regime (Prasse-Freeman 2021). For instance, dumping grounds destroy biodiversity and pull animals and humans into new zones of contact that are rife with the possibility of zoonosis (Doron 2021). Research on waste pickers in India finds that they lack protective gear and have disproportionately high rates of injuries, eye and stomach infections, psychiatric disorders, and substance abuse, and that their poor health leads to additional economic burdens (Ananthakrishnan and Patil 2013; Chokhandre, Singh, and Kashyap 2017).

Across different informal communities, waste has asymmetric socioeconomic risks and material-corporeal outcomes (Gandy 2014; McFarlane 2008). People’s encounters with waste are not chance meetings between individual bodies and toxic substances. Rather, they reflect how toxic materials coconstitute environments and communities across different registers of time. The outcome of waste’s adherences are evident in informal settlements close to the city’s largest dumping ground in Deonar, which has been operational since 1927 (S. Chatterjee 2019). The dumping ground is located in a Mumbai ward called M (East), which was described as “on the edge” in a baseline survey of its socioeconomic conditions (TISS 2015, 2). This was meant both literally (since it is located along the city’s eastern edge, on the delicate estuarine landscape by the Thane Creek) and figuratively (since it has the lowest human development index compared to the rest of the city). The average life expectancy in the ward is 39 years, compared to
When I first started sorting, I would scribble down the occasional pieces of garbage I saw at the beach.

My list was mostly a monotony of plastic—lots of small and large bags, mostly torn. There was the occasional bottle, tube, or fragment from a mysterious object once, when I pulled out a torn bag from the catch, the unfurling tentacle of an octopus greeted me. Another time, I saw a crab scuttling away with a bottle cap.
the national average of 68.5 years. The ward also performs poorly in terms of literacy, household income, and access to public amenities and infrastructure, and it has extremely high rates of respiratory diseases such as tuberculosis and whooping cough, as well as other infectious diseases. None of these conditions can be separated from the dumping ground’s presence. Even when residents of informal settlements are moved into mass housing blocks, the risks follow them there, assuming different forms (Doshi 2013). Recent studies show an increase in drug-resistant strains of tuberculosis in apartments where people are stacked cheek by jowl and where trash lies uncollected and festering in the alleys (Pardeshi et al. 2020). These studies lay bare how harmful substances operate—they not only work on the body but also rearrange social relationships and operate across generations (Lamoreaux 2016).

These differentiated continuities of waste also reveal the more-than-human socialities of the coastal landscape. They show that the coast is not simply the outcome of human design but is, rather, an active landscape created in part by waste’s interactions with other matter, plants, and animals. It is very hard to anticipate how different discarded substances will interact or transform over time, especially over very long periods in which inorganic matter degrades. Research on the city’s changing coast, however, confirms that different waste substances are hard at work remaking Mumbai’s edge. For example, in the 1980s, flocks of greater and lesser flamingos started flying in to gorge on blooms of blue-green algae in the city’s polluted marshy wetlands. The industrial waste, garbage, and sewage dumped into the creeks resulted in algal blooms, which nourish the birds but harm other creatures (Mohta 2019).

Among the handful of bird species that visit Mumbai each year, the flamingos now number in the thousands—the result of birds, effluents, and algae coming together. This confluence led some species to die and others to flourish. Humans too were pulled into these flamingo worlds: the birds support a booming flamingo-tour and bird-watching industry. In 2015 the Thane Creek, one of the sites where the flocks congregate, was turned into a wildlife reserve. In the distance, I could see on the group’s social media page to build a collection of photographs, to go on walks by themselves, and to share what they saw on the group’s social media page. As he skipped over rocks and squatted over shallow pools, Sagar—one of the organizers—stuck his hand in the water and lifted rocks to show us the crabs and shrimp underneath. Meanwhile, Dilip, another organizer, who was better at identifying species, would tell us the creatures’ names, where they lived, and what they did on the coast. The organizers would urge participants to take photographs, to go on walks by themselves, and to share what they saw on the group’s social media page to build a collective archive of life along the shore. In the distance, I could

As waste streams into the landscape, escaping its planned life, it creates spaces where humans and animals are pulled into configurations that have violent effects (Doherty 2019). Things get murkier over time, as revealed by research on nanoplastics in the environment—plastic permeates the air, the water, and our bodies (Costa et al. 2016). Scientists researching plastic as sediment find that its effects vary across near and far geological futures as plastic mixed in sand changes the nature of sandy soil (Gabbot et al. 2020). Substances in the marsh, mud, and creek are slowly unraveling existing relationships that sustain particular life-forms even as they create new landscapes and ecologies (van Dooren 2014).

Archives and encounters

Often called a dead zone, Mumbai’s coast has some of the world’s highest concentrations of marine litter and pollution. Since 2011 the amount of garbage the city produces has more than doubled. In a very short span of time, the addition of these chemical and material agents has radically altered coastal conditions. The coastal landscape consists of various plastics of different varieties, sizes, and densities that press on plant and animal life (Jayasiri, Prurushothaman, and Vennila 2013). The outcomes of these encounters are not singular events but protracted, transformative processes that unravel the threads of entanglement among trash, marine creatures, and humans.

In 2017, I heard about a volunteer-run group called the Marine Life of Mumbai (MLOM), which was organizing public walks along Mumbai’s shoreline. It was led by a small team with varied expertise in different industries and areas of research, including zoology and marine biology. Apart from conducting shore walks, the group promoted coastal conservation and raised awareness about the environmental impact of developmental projects. The walks were a way for Mumbai’s human residents to encounter marine life and thus establish a multispecies relationship and acknowledge nonhumans as their coresidents. The activists facilitate encounters that translate waste as a substance that is not external but integral to the coast, a substance that creates altered conditions for life.

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Waste's continuities go far beyond the city's marshes and dumping grounds. In the winter of 2016, the waves glowed blue along Mumbai's shore, bringing many of the city's residents out to the beach at night to see the spectacle.

The bioluminescence was later attributed to blooms of Noctiluca algae, which produce dead zones, or low-oxygen areas of the sea that cannot sustain marine life.

The patch of sea between the Gulf of Oman and Mumbai is often described as a dead zone created by the sewage, garbage, and industrial and agricultural runoff that urban agglomerations like Karachi and Mumbai release into the sea.

Aye ghochu! Flash nahi chalega! (Hey idiot! The flash won't work!)
see the wastewater pipes emptying into the mudflats, and I was terribly conscious of my sandaled feet. I asked Sagar, a bit tentatively, whether he was worried about being in the water, and in response, he quickly plunged his arm elbow deep into a puddle and pulled out a rock partially covered with coral and sponges. Pointing to a part of the coral that was bleached white, he said, “Look, this part is dead. But this other part—and the sponge—they are alive! What does that say, then?”

This question stayed with me long after the walk was over. I wondered whether pronouncing the sponge alive made the pollution seem acceptable or under control. During the next walk, I learned that some of the group members were going to a meeting to discuss the environmental impact of the Maharashtra government’s plan to build a statue of Shivaji, a 17th-century ruler who is considered the founder of the Maratha Empire and whose mythological status is fundamental to regional politics (Hansen 2001). The proposed statue would be the tallest in the world and would be built on an artificial island off the Mumbai coast. As one of the organizers, Gaurav, talked about the project’s ecological impact, I gathered that, in many ways, the MLOM was formed as a response to unchecked coastal development. Understood in this context, walking the coast to see signs of aquatic life takes on new meaning. Far from accepting coastal conditions, or glossing over pollution, the MLOM articulates a different understanding of the coast—one that is not predicated on human needs and developmental desires and one that does not downplay the effects of pollution.

As he was describing the upcoming meeting, Gaurav repeated what Sagar had said before: that the campaign had to show how the coast was not a dead zone that could be exploited for development—that there was life that needed to be conserved. He went on to explain that several development projects had been green-lighted according to the argument that Mumbai is an already developed urban area and is therefore unworthy of conserving, since there is nothing natural about its landscape. “We need them to see that there are thriving ecosystems that support marine creatures here,” he said. Walking the coast to see marine life, taking pictures, building an archive, and browsing and seeing the diversity of creatures in the archives—these were ways of seeing the coast as not a dead zone, and of crafting a multispecies ethics.

Today, the MLOM has become a much bigger movement. The shore walks are almost always fully booked as soon as they open. The visual archive consists of hundreds of meticulously labeled and captioned images that identify species that spring up on the coast. This archive is crucial to the group’s manifesto: that the coast has life that must be seen, and that it is so much more than a site that serves urban functions. It brings into view a possible posthuman politics (Alaimo 2010). Instead of thinking of the creatures as occupying space designed for human needs, these ambulatory visual encounters recast the coast as an outcome of waste’s transformations and interactions. In the process, they suspend the viewer’s anthropocentric view; they make it possible to think about loss beyond the language of complete destruction and to think about coastal futures as crafted by the actions of waste.

**Waste/coast**

In late 2011, Mumbai passed an ordinance banning the use of thin plastic bags, citing coastal pollution. While this was met quite favorably, it all but halted beachside retail business because patrons refused to buy fish unless it was wrapped in a plastic bag. For boats like the one I worked with, retail business was a small part of the income earned from fishing, but it was not insubstantial. This meant scrambling to clean bags salvaged from the beach or hiding plastic bags under the tubs to escape fines. I could, however, find a plastic bag by walking a few meters along the beach, and this pressed against how policy initiatives attended to the shore as a site that can be separated from waste.

Plastic is an interesting material to think with, given that the availability of cheap packaging is fast changing the composition of urban waste in India. As plastic proliferates, it introduces new ideas of contagion, separation, and pollution (Pathak 2020). At the beach, the ubiquitous plastic bag was a sign of how discarded things were mixing with the landscape. After the short spans of development projects and policies, waste would exist as a substance that makes up the beach, waters, fish, and coastal communities and economies—organizing life across scales toward uncertain ends.

More often than not, waste-management logics are oriented toward solutions—they aim, for example, to cope with excess waste or to find ways to derive profit from waste. They are tied up with ideas of functionality, speed, and efficient resource distribution as benchmarks and metanarratives of modern urban life. The certainty of finding solutions to urban problems—problems that are articulated in relation to the task of keeping cities running and growing—often does not take into account infrastructure’s volatile attachments with humans, animals, plants, and the landscape (Kim 2016). By this, I do not mean to imply that it is futile to ban plastic or adopt technologies like sewage treatment plants. Nor do I wish to repeat the refrain that dysfunctional infrastructure characterizes cities like Mumbai (Anand 2017) or turn away from important questions about land rights or the right to work and to a clean and healthy environment. Rather, the encounters I describe point toward different imaginative grounds for infrastructure (Jasanoff 2015) and different waste politics (Liboiron, Tironi, and Calvillo 2018). Such grounds are
WE SAW SPONGES AND CORALS HOLDING TIGHTLY ONTO ROCKS. EACH SHALLOW TIDE POOL WAS THE SETTING OF A STORY. TWO CRABS UNDER A ROCK, AND LOOK THERE'S AN EEL. DO YOU SEE THAT SNAIL NEXT TO IT? THOSE ARE BARNACLES, YES, THEY ARE ALIVE...

THE FIRST TIME I WENT ON A WALK WITH MLOM, I WAS LATE. THE SMALL GROUP WAS ALREADY OUT ON THE SHORE NEAR HAJI ALI. WHEN I CLIMBED DOWN TO THE ROCKY SHORE, A PACK OF DOGS SURROUNDED ME. SABAR SHOUTED, "THEY WON'T DO ANYTHING! JUST WALK OVER." WHEN I REACHED HIM, HE REMARKED, "WELL, YOU WERE IN THEIR SPACE, AFTER ALL."

I SAW A BLUE BUTTON JELLYFISH. A DELICATE THING SUSPENDED IN THE WATER WITH A WHITE CENTER AND BRIGHT BLUE TENDRILS REACHING OUT. AGAINST THE GRAY, BROWN, BLACK, AND WHITE OF THE ROCKS, IT HUNG, A SHOCK OF COLOR.
Waste’s translations • American Ethnologist

These encounters make it hard not to see how plants, animals, insects, and microbes abound in the urban landscape. They make it hard to deny the multispecies intimacies that make the city and its shore.
offered by how fishing communities, scientists, and marine activists translate waste. Waste rearranges near-shore fishing worlds and economies in ways that are asymmetric across caste, communities, gender, and even species of marine beings. The physical and chemical qualities of its components provide an opening to think in relation to materials and their properties rather than developmental needs—waste forms a connecting line that weaves humans into geological timelines. Waste alters the conditions of existence for plants, animals, and microbes, and it creates new ecologies. These are not the sum possibilities of waste’s outcomes; they are examples that convey the need to attend to waste’s multiple translations.

Waste’s translations—those that exceed managerial discourses—immerse it in landscapes made of other materials and beings. They alert us to the varying effects of substances, especially their harmful ones; to how humans, animals, and plants form open ecosystems; and to the capacity of things to penetrate and cohere with bodies, even if in unwelcome ways. They attend to toxic continuities that braid into human lives at different timescales: there is the quick encounter with a caustic agent or the sudden harmful accumulation of poisons, such as oil spills. Then there are the continuities that produce effects over a long period (Nixon 2011), such as layers of plastic, which make it harder to mitigate harm or to point to discrete causes. The translations that scientists, marine-life activists, and fishing communities articulate may not tell us what could happen to dumping grounds and the estuarine landscape, but they do offer hints and points of entry to think about how waste—once dumped—becomes the shore. As a part of the shore, it transforms coastal lives and landscapes across scales. Such translations recognize how the coast comes alive (and dies) through small and large interactions of materials. Such interactions take place at different timescales in which humans, plants, and animals are profoundly enmeshed.

with the understanding that it refers to different kinds of complex mixes, and I have tried to specify where possible.

2. The 2011 CBZ policy is the outcome of a long history of reengineering landscapes through policy regimes. It was replaced by subsequent notifications (the latest one was released in 2019), each of which rolled back environmental protections further than the last.

3. I follow Ajantha Subramanian’s (2009) use of the term fisher because it avoids the gender generalization of the term fisherman and the primitivism inherent in the term fisherfolk. In their study of women fish vendors, Shuddhawati Peke (2013) writes that in western India, the term Koli names a caste group that traditionally fishes; it is also a general term for those who work in the fishing industry. In the state of Maharashtra, “Kolis” are officially categorized as “Other Backward Castes.” There are, however, many different Koli subcastes and communities, some of which are included on the “Scheduled Tribes” list. These lists are used to implement affirmative action policies (Peke 2013). The Koli community’s identity as Mumbai’s “aboriginal” community is central to their claims to land and housing rights (Ghlibharia 2018).

4. All personal names are pseudonyms.

5. Unplanned sites are called dumping grounds (I have also heard them described as open landfills), whereas the term landfill is typically used for sites engineered for storing waste. There is, however, much slippage between these terms.

6. There are many ways of generating energy, such as by creating biogas or through incineration.

7. This is, however, a trend that could change as packaged food becomes cheaper and more easily available. It is the reason why waste-to-energy programs are inefficient and often fail (Luthra 2017).

8. This is not to obfuscate the fact that ooze and emanations from dumping grounds are barely controlled and have disastrous consequences for waste workers and the residents of informal communities who live near them (Tiss 2015). It is only to explain the anthropocentrism that underlies these planned transformations, which often do not unfold as planned. See, for example, Hugh Raffles’s (2010, chap. 3) discussion of Cornelia Hesse-Hongeger’s art, which shows how thresholds of exposure to radioactivity were only ever calculated in relation to human bodies.

9. The literal translation of the term bai is “woman,” and it is often used when addressing older women.

10. My translation. The speech combines Hindi and Marathi.


V. Chitra
Department of Sociology
National University of Singapore
11 Arts Link, #03-06 AS1
Singapore, 117573
soccv@nus.edu.sg