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Mopping Up or Turning Off the Tap? Environmental Injustice and the Ethics of Plastic Pollution

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THE PROBLEM WITH PLASTICS

Decades of scientific research confirm that plastic pollution poses a threat to many species, to water resources, and to economies around the world (Laist, 1997; Barnes et al., 2009; Gregory, 2009; Teuten et al., 2009; Chen, 2015; Newman et al., 2015; Rochman, 2015). Experts demonstrate that oceanic plastic pollution is increasing at astounding rates (Eriksen et al., 2014; Geyer et al., 2017). Research indicates harmful levels of toxicity in everyday plastic items (SCP/RAC, 2020). Scientists find this issue so important that they have recommended plastics be classified as a pollutant on par with hazardous waste (Mouat et al., 2010; Rochman et al., 2013) or that single use plastics should be banned (Telesetsky, 2019). For many years, experts have noted that increasing plastic manufacturing and use will worsen the condition in the marine environment (Carpenter and Smith, 1972; Azzarello and Van Vleet, 1987; Gregory, 2009) and yet the global plastic industry continues to increase production, cumulatively producing 368 million tons in 2019 (PlasticsEurope, 2020). If current growth trajectories continue, by 2050 plastic could account for 20% of global oil production (Giacovelli, 2018) and the world could have four times the amount of plastic waste that we generate today (Geyer et al., 2017). Plastic debris contributes to a comprehensive global environmental problem that –if current trends continue— will worsen significantly (Borrelle et al., 2020; Silva et al., 2020). The COVID-19 crisis only exacerbates the problem, as it has led to an increase in the use of single use plastics in the form of personal protection equipment, which researchers have already begun to see in the environment at high levels (Ammendolia et al., 2021; Mejjad et al., 2021).

The majority of the plastic pollution problem falls disproportionately on the global south, especially in south and southeast Asia (Jambeck et al., 2015; Lebreton et al., 2017), creating an issue of slow violence (Homer-Dixon, 2000) and environmental injustice. While plastic pollution is universal, some consequences such as clogged drainage systems, increases in vector-borne diseases, and reduction in tourism are particularly felt in poorer communities, where solid waste management systems are not in place (Barnett, 1997; Coe and Rogers, 1997; Liffmann and Boogaerts, 1997; Jambeck et al., 2015; The Ocean Conservancy, 2015; Lebreton et al., 2017; Giacovelli, 2018; Godfrey, 2019). Plastics may be exported from the developed world to the developing world for legal or illegal disposal (Blettler and Wantzen, 2019; McCormick et al., 2019). In poorer communities, plastics may be burned as fuel (heat or cooking) or in disposal (Giacovelli, 2018). Poorer communities may also be selected as sites for plastic manufacturing (Ramirez, 2021).

Responsibility for managing plastic waste often falls on the people and places least responsible for producing said waste (Conlon, 2020).

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“MISMANAGED WASTE” IN THE GLOBAL SOUTH

Critically, the way we frame the story of plastic pollution has consequences for the proposed solutions. The framing of the plastic problem typically focuses on a handful of south and southeast Asian countries where the problems of waste are most visible (Lebreton et al., 2012, 2017; Jambeck et al., 2015; Schmidt et al., 2017). This is not surprising, as these countries often represent the nexus of high population, communities clustered near river and coastal areas, extreme poverty, and a lack of waste infrastructure. Such framing fails to recognize the way issues of privilege and justice influence the distribution of debris around the world. This framing ignores the complex relationships between the industries that sell plastics, the people who use them, and how waste is handled and exported globally (Heinrich Böll Foundation., 2019). Such framing does not hold manufacturers in the developed world accountable for marketing materials in the developing world that they know will be “mismanaged.” It does not account for the economic factors that drive individuals to purchase goods, often wrapped in plastic, in small quantities. It also clouds the reality that people in all countries use single-use plastics and few are immune from contributing to this global problem.

It is true that waste infrastructure is limited or non-existent in many countries and that a lack of waste infrastructure contributes to debris accumulation (Kaza et al., 2018). Yet, when researchers frame the problem of plastic pollution as “mismanaged waste” it gives the impression that if developing countries can simply “manage” their waste, then the problem will be solved. In this way, plastic pollution may be less visible but is no less pervasive in western communities with adequate solid waste management. Most developed countries serve as models of waste infrastructure, and yet still suffer from, and are a source of, marine litter (Law et al., 2020). In these more affluent communities, plastics are collected and then incinerated or buried, dispersing their chemical loads into the air and soil (Yang et al., 2015; Aryan et al., 2019; Blettler and Wantzen, 2019). In fact, a great deal of debris accumulates in freshwater and ocean and coastal systems in developed countries each year (Moore et al., 2005; Williams et al., 2011; Rosevelt et al., 2013; Lee and Sanders, 2015; Baldwin et al., 2016; Cable et al., 2017; Hardesty et al., 2017; Castro-Jiménez et al., 2019). In this way, framing the problem as mismanaged waste leads to a “solution” of more waste management. While increasing waste management may lessen the impacts of the problem, it cannot solve it.

What does “management” of plastic waste look like? Current packaging material flows indicate linear paths wherein about 14% of plastic is incinerated; 40% is landfilled; and 32% leaks out into the environment as litter or debris (World Economic Forum, 2016). Of the 14% of plastic collected for recycling, only 2% has been recycled in a closed loop (a 1:1 ratio); 8% is down-cycled; and 4% is lost in the recycling process (World Economic Forum, 2016). After decades of recycling narratives, the dysfunction of recycling systems reveal plastic recycling was not *designed* to solve the plastic waste problem, but to be a distraction to continue production

(Sullivan and Gonzales, 2020). The issue of design should not be underestimated. Without conscientious design, communities will necessarily continue to grapple with voluminous waste. In other management scenarios, when plastic waste is landfilled as a part of municipal solid waste, local government and taxpayers pay for the land on which waste will be placed and the long-term health costs as this waste slowly degrades over decades and centuries releasing ethylene and methane (Royer et al., 2018), as well as poisoning soils and groundwater. When burned, municipal solid waste yields “emissions to air and chemical waste residuals” (Dijkgraaf and Vollebergh, 2003:2), which are also costs borne by the local community. Some researchers believe waste to energy incineration models have low externality costs, when they include “state-of-the-art air pollution control technology” and when “pre-sorting minimizes the potential for air toxics release” (Miranda and Hale, 1997:599). Yet, a study by Dijkgraaf and Vollebergh (2003) found “much higher gross environmental cost for a [waste to energy] plant than for a modern landfill” even when considering the constraints of available land for this purpose. According to the World Economic Forum (2016), incineration infrastructure may lock out “higher-value mechanisms” like recycling, carry a risk of “negative health effects,” and yield by-products that also must be “disposed of” (26). This report names three primary externalities associated with plastics and plastic packaging: “leakage, especially in the ocean; the greenhouse gas emissions ... from production and after-use incineration; and health and environmental impacts from substances of concern” (World Economic Forum, 2016:28). As a long-term solution for the problem of plastic waste, managing the increasing waste through infrastructure is limited, and too often a case of distancing waste to areas and populations with less power to regulate it (Clapp, 2002). To illustrate how different approaches can emphasize up-stream or down-stream solutions, we share examples of two organizations seeking to address plastic pollution: the Alliance to End Plastic Waste and Common Seas.

THE ALLIANCE TO END PLASTIC WASTE

The Alliance to End Plastic Waste (AEPW) is a group of multinational and international companies “working to make the dream of a world without plastic waste a reality” [(AEPW, 2019):1]. The organization’s mission is to: “develop, accelerate, and deploy solutions; engage communities; catalyze investments” (AEPW, 2020:5). Their proposed outcomes are: “demonstrated and scaled plastic waste-free cities in priority regions; enabled local ownership of waste management; demonstrated investable models, and partnerships that unlock even more capital to end plastic waste” (AEPW, 2020: 5). Initially in 2019, the AEPW membership pledged 1.5 billion dollars over 5 years in an “effort to end plastic waste in the environment” (AEPW, 2019:1). A contribution of 1.5 billion dollars represents <2% of their annual net profits (Owens, 2019). Moreover, the 28 founding members of the AEPW are a part of plastics and related industries, including plastics packaging, petrochemicals, chemicals, fossil fuels (oil and gas), personal health/care products, and water- and waste-

management. The *Plastic Waste Makers Index* (Charles et al., 2021) reveals that eight of the AEPW members fall within the top 100 plastics producers that account for 90% of plastic globally, including the top two producers¹. While it is admirable that these industries recognize the problem their products cause, their stated goal to “make the dream of a world without plastic waste a reality” in some ways conflicts with their role in producing this waste.

The AEPW writes in their 2020 progress report, they will address plastic waste by:

- Developing and accelerating technologies;
- Partnering with the extended global community; and
- Catalyzing capital.

To guide their work, they propose to “think globally and act locally; to collaborate; to change behavior; to recover and extract value from waste plastic; and to shift from short-term actions to long-lasting waste management solutions that help communities and society achieve circular economies” (AEPW, 2020: 4). Finally, the report emphasizes their four strategies: “infrastructure, innovation, education and engagement, and cleanup” (AEPW, 2020: 5).

The progress report shares several case studies that on the surface sound effective. Yet, their framing of plastic waste challenges emphasizes the end user, not the producers of the plastics. Responsibility of plastics generation is deflected from the members of the AEPW and other producers. For instance, one, from “Project Stop” Jembrana in Indonesia, emphasizes “waste segregation at the household level” and recycling. The project description highlights “local responsibility” (AEPW, 2020: 10). Framing pollution as the responsibility of the end user rather than the manufacturer is not novel. This was also the case with the American “crying Indian” anti-litter campaign from the 1970s, funded by “bottled beverage and packaging industries” through the Ad Council, whose commercials “reinforce the propensity that readily exists in our society to reduce social problems to personal challenges” (Melillo, 2013). The print campaign included a charge to the public: *People start pollution. People can stop it.* while failing to recognize the interplay of design, manufacturing, use, and options for disposal. Campaigns that shift responsibility directly conflict with the concept that polluters should be responsible for the end of life of the products they manufacture and sell (i.e., a Producers Pay Principle or Polluters Pay Principle).

The report also details the Plug and Play accelerator project created “to foster start-ups that can impact the plastic value chain” (AEPW, 2020:11). Small teams work for 12 weeks to co-develop innovations with expert advice from Alliance members. The 10 solutions described in the report include using robots to more cheaply sort recycling; using biotech to “convert[] under-used carbon into high-value industrial

products;” creating materials of 100% plastic waste; using crowdsourcing to enable citizens to clean the planet; envisioning “recycling the unrecyclable;” better technology to enable curbside recycling of plastic film; using AI and robotics to sort trash from recyclables in bins; “connecting recycled plastics with trusted suppliers from around the world;” creating roof “cover boards” from plastic and paper that would otherwise enter landfills; and recycling plastics into “environmentally friendly fuels” (AEPW, 2020: 13). These are overwhelmingly end-of-pipe clean-up solutions that do not address upstream production. The report shares information on two other Indonesian projects, which are briefly described as converting “plastic waste into a petrochemical feedstock” (AEPW, 2020: 15). Continuing, in collaboration with the Grameen Creative Lab, the Alliance is developing additional projects in Puducherry, India and Tan An, Vietnam that emphasize recycling (AEPW, 2020). The ASASE Foundation project in Accra Ghana trains women to collect and recycle waste (AEPW, 2020). In another collaboration, the Aviral Project seeks to engage the local community in “recovery and recycling” to protect religiously important sites along the Ganga river and to reduce waste from religious festivals (AEPW, 2020:19). AEPW describes the Renew Oceans project in Varanasi, Indian as “the engagement of the area’s student population to develop waste management concepts that cover three areas: plastic waste collection, plastic waste conversion and community education” (AEPW, 2020:22). However, as of 2021 the project has been halted, as “the organization has come to the conclusion that it simply does not have the capacity to work at the scale this problem deserves” (Brock et al., 2021: 1).

Collaborating with The Incubation Network in south and southeast Asia has yielded four projects: the Ocean Plastic Prevention Accelerator (OPPA), which focuses on waste management and recycling in Surabaya, Indonesia; the Circular Innovation Jam which asks local communities to “design solutions to advance circular economies” in India, Indonesia, Thailand, the Philippines and Vietnam; the Surabaya Access Pad, which innovates, “plastic pollution prevention products” in Indonesia; and the Plastics Data Challenge which seeks to collect data on “plastic leakage” in south and southeast Asia (AEPW, 2020:23). Of the 21 projects or innovations described in the report, 16 emphasize recycling; one citizen cleanups; one data collection; and for three projects, it is unclear what mechanism they will use to reduce plastic waste (Circular Innovation Jam, Surabaya Access Pad, Kiverdi). Overall, the report mentions reducing plastic leakage, but not reducing plastic production, considering the relative value of different kinds of plastic usage, or the exploration of reasonable alternatives to single use plastics.

It should also be noted that the AEPW, 2020 report mentions “front end design” to “boost recycling rates, support[] materials innovation, and contribute[] to reduction and reuse (AEPW, 2020: 6). In addition, it states the Alliance is “working toward a circular economy, where all people thrive” (AEPW, 2020: 2) and yet most of the projects described in the report focus on end-of-pipe solutions. While their report does not provide the full context necessary to deeply evaluate the work of the Alliance, we find it important to note that on the whole, these projects

¹AEPW members on the Plastic Wastemakers Index: Exxon (1st), Dow (2nd), Lyondell Basell (7th); Braskem (9th); Mitsubishi Chemical (31st); Sasol (38th); Mitsui Chemicals (37th) and Shell (51st) (Charles et al., 2021). The top 20 producers account for 50% of global plastic waste; and the top 100 account for 90% (ibid.).

and initiatives focus on the symptoms of plastic pollution, not the sources. These kinds of projects may be a part of a long-term comprehensive sustainable plan to reduce global plastic waste and likely provide important opportunities to local NGOs. That said, the AEPW framing ignores the resources that must be used to remake plastics in one form into another, the pollution caused by doing so, and the abysmal rate of global recycling. In summary, the AEPW envisions a future where they continue to produce plastic but address the problem by creating technology that better deals with waste, not its generation. A more comprehensive program to eliminate plastic waste would emphasize front end design rather than pay lip service to circular economy approaches.

COMMON SEAS: PLASTIC DRAWDOWN

Common Seas is a non-profit based in the UK founded by Jo Royle with some portion of major funding coming from the Lemos family's Avra foundation. In comparison to the Alliance to End Plastic Waste, we analyze the Common Seas' Plastic Drawdown toolkit which more heavily emphasizes the sources rather than the symptoms of plastic waste. Common Seas is "a social enterprise tackling the plastic pollution crisis by driving new policy, investing in the circular economy and catalyzing a cultural shift in how we make, use and dispose of plastic" (Common Seas, 2020a).

The organization promotes a country-level analysis, a sharp decline in single use plastics, and collaborative decision making by stakeholders to "turn off the tap." Their four-phase approach:

- "Models a country's plastic waste mass and composition including future projections to 2030
- Map[s] the waste pathways and leakages,
- Analyzes the impact of key policies, and
- Enable[es] governments to convene key actors and chart a policy pathway toward dramatically reduced ocean plastics" (Common Seas, 2019:3).

Drawdown uses a wedge approach akin to that described by Pacala and Socolow (2004) to combat climate change. Through this approach it seeks to address the *sources* of plastic waste and leakage. At times, it also uses technological advances, but importantly, moves beyond downstream collection and recycling, instead working collaboratively with communities to develop a pragmatic plan. The 18 potential policy interventions proposed by Common Seas include:

1. Banning some plastics,
2. Taxing to discourage use,
3. Deposit return schemes for beverage containers,
4. Improving access to clean potable water,
5. Water refill schemes,
6. Improving regulation on and handling of plastic pellets,
7. Improved standards and labeling for textiles to reduce microfiber pollution,
8. Better regulation and labeling of tires,
9. Deposit schemes and extended producer reliability concerning fishing gear,

10. Zoning controls in fishing areas
11. Developing waste management collection potentially coupled with a "bring back" scheme that holds producers responsible for the end products they manufacture and sell
12. Better standards for storing and managing waste
13. Creating street-level waste collection to prevent littering
14. Creating systems to deter or penalize littering and unlawful dumping
15. Improving wastewater treatment infrastructure to filter water of plastics
16. Developing sewage and stormwater treatment
17. Tagging fishing gear to prevent illegal abandonment, and
18. Instituting flat rates for port-based waste disposal (Common Seas, 2020b).

Rather than emphasizing downstream options, Common Seas' policy framework includes reduction (2), re-use (1), holding producers accountable (4), addressing underlying problems like clean water access, sewage and water treatment (4), better waste management (4), and measures to reduce waste in the fishing and port industries (3).

Our analysis recognizes that publicly available documents may present an incomplete picture of the work of either of these organizations. It is important to note there are some similarities in the approaches taken by the Alliance to End Plastic Waste and Common Seas. Common Seas also take part in some monitoring and measurement of the plastic problem, while the Alliance to End Plastic Waste also works with local communities and co-creates actions. This is also not meant to condemn the work of the Alliance –which can be a part of a comprehensive effort to reduce plastic pollution— but instead to inform it to better address plastic pollution at the source.

AN ISSUE OF JUSTICE

Sze and London (2008) define environmental racism as the "unequal distribution of environmental benefits and pollution burdens based on race" while they describe environmental inequality as a broader term that includes, "class, gender, immigration status," and the interactions of these factors as a source of disproportionate environmental impacts (1332-1333). Scenarios of environmental injustice often include disadvantaged—whether by class, income, status, or race—communities experiencing higher pollution levels, while not being responsible for high production of said pollution (Pearce et al., 2006). Global environmental justice is not new (Pellow and Brulle, 2005). Pellow and Brulle noted in 2005 that we can expect further environmental injustice from a North-South perspective as, "global North nations continue dumping waste in both domestic and global "pollution havens" where the cost of doing business is much cheaper, regulation is virtually non-existent, and residents do not hold much formal political power" (11).

Bullard (1996) positions environmental injustice as "(1) unequal enforcement of environmental, civil rights, and public health laws, (2) differential exposure of some populations to harmful chemicals...in the home, school, neighborhood, and workplace (3) faulty assumptions in calculating and assessing

risks, (4) discriminatory zoning and land-use practices, and (5) exclusionary policies and practices that limit some individuals and groups from participation in decision making” (493). The waste burden of plastics on the global south takes on all of these characteristics. In addition, plastic pollution takes on the characteristics of “slow violence” which is the “slow erosion[] of environmental justice” (Nixon, 2011: 8), and the slow onslaught of the social and ecological impacts wrought by plastic waste and plastic pollution. Moreover, the concept of “adaptive injustice” is also applicable to the global plastic environmental justice crisis, where those who have to adapt to increasing plastic waste streams are not the ones responsible for generating the waste (Conlon, 2020).

Experts weigh in on what they believe will be the best approach to the plastic pollution problem. While the Basel Convention (which deals with hazardous and toxic waste), the Stockholm Convention (which deals with Persistent Organic Pollutants or POPs) and the Rotterdam Convention (which focuses on hazardous materials and pesticides) may provide a framework for hazardous waste imports and exports, none were created in response to global plastic pollution reduction (Basel Convention, 2021; Rotterdam Convention, 2021; Stockholm Convention, 2021). The Basel Convention on waste, which added plastic waste amendments in 2019, does not include many common plastics (e.g., polyethylene, polypropylene, and polyethylene terephthalate) if “destined for recycling in an environmentally sound manner” (Basel Convention, 2019). As the implementation of the amendments began in January of 2021, it is still unknown how enforcement might proceed or how effective the Convention may be in reducing the impact of plastic waste. The World Economic Forum (2016) recommend a “systemic approach” ...that moves... “beyond incremental improvements” (3). Haward (2018) calls for an international agreement on par with the Montreal Protocol. Worm et al. (2017) propose “a Global Convention on Plastic Pollution that incentivizes collaboration between governments, producers, scientists, and citizens” (1). Dauvergne (2018) notes that plastics governance, which “reflects industry efforts to resist government regulation, deflect accountability, and thwart critics,” fails to “rein in marine plastic pollution” (22). The author recommends “hard hitting domestic regulation” coupled with an international plastics treaty (Dauvergne, 2018: 22). In their 2021 report, the United Nations Environmental Program emphasizes the inherent problem of single use materials, making the distinction that the problem is more about single-use than plastic itself (United Nations Environment Programme, 2021). Their recommendation is for a “systemic transformation of the plastics economy” through a “comprehensive policy response” including designing all products for multiple use, no matter the material, taking local conditions into account, and “addressing the needs” of affected sectors (United Nations Environment Programme, 2021:4). In a collaborative report from the Ellen MacArthur Foundation and United Nations Environment Programme (2020) they strongly prioritize “elimination of problematic or unnecessary plastic packaging through redesign, innovation, and new delivery models” (19).

Watterson and Dinan (2020) in their piece describing the lag of policy behind science in regulating air pollution in England, warn that the dominance of fossil fuel industries in policymaking is detrimental to “ethical and environmental justice decision making with significant consequences for public health (1). The same could be said of plastics regulation. Examples from cigarette manufacturers and petrochemical companies indicate that rather than incorporating scientific data, businesses may take on a strategy to actively thwart accountability (Michaels, 2005; Michaels and Monforton, 2005; Cook et al., 2019).

To combat environmental injustice, Bullard (1994) shares a framework of environmental justice, which includes:

- **The right to protection** for all people from environmental degradation conceived as a civil right
- **Prevention**, or “the elimination of the threat before harm occurs” (17).
- **Shifting the burden of proof** “to the polluters who do harm, discriminate, or do not give equal protection to minorities and other overburdened classes” (39).
- **Obviating proof of intent**, allowing instead for “disparate impact and statistical weight... to infer discrimination” (40).
- **Redressing inequities** from the impacts of pollution, through “targeting action and resources... where environmental and health problems are greatest” (41-42).

Overwhelmingly, the AEPW proposals to date emphasize ‘better management’ through recycling, and frame responsibility around end users in the global south; while the Common Seas approach de-emphasizes recycling and encourages reduction, re-use, and better regulation that holds producers responsible on a global scale. It also addresses some of the problems that make single use plastics a necessity at times, such as lack of access to clean water. The recommendation for an environmentally just response emphasizes that it is the onus of the upstream producers to prevent harm caused by environmental pollutants, not the downstream work of the civic sector and local governments impacted by the pollution.

CONCLUSION

If you walked into your bathroom to find your tub overflowing with water, would you first begin mopping up the water on the ground, or would you turn off the tap? When manufacturers promote solutions that address the symptoms of plastic pollution but not the source, they leave the tub overflowing while ineffectively mopping up the resulting water. Plastic waste as it is currently understood by industry is an externality that demands a technological solution. Most plastics (over 90%) originate from virgin fossil fuel stock and most are not recycled (World Economic Forum, 2016). When the problem of plastic waste is ignored, the costs are pushed to marginalized communities around the world, to future generations, citizens, governments, and taxpayers. In some cases, distribution companies take the lead in reducing plastic packaging when manufacturers and governments fail, as can be seen in initiatives taken by the supermarkets Sainsbury, Aldi, Co-Op, and Trader Joe’s (Chhabra,

2019; Goncalves, 2021). For decades, peer-reviewed scientific literature has decried the threats to wildlife; the degradation of ecosystems; the instances of entanglement and ingestion; the accumulation of debris in the gyres and coastal areas; the costs to industries as varied as shipping, tourism, and agriculture; as well as the immense cost to global society to clean up beaches, waterways, and the open ocean. Waste management cannot operate in a vacuum oblivious to the social and environmental harms it causes. Not all plastics are equally useful and many single-use plastics have less environmentally harmful but comparable substitutions available. Some plastics are inexpensive and useful: they can also support important goals in the global south. That said, framing the problem of plastic waste as that of end users, particularly those in developing countries, fails to recognize the complex nature of global plastic markets. Rather than leave the problem-solving to the problem-creators, scientists, policymakers, and governments are advised to frame plastic waste narratives like that of Common Seas: with an emphasis on reduction, redesign, re-use, and

collaborative decision-making for plastic reduction rather than downstream management.

AUTHOR'S NOTE

Neither of the authors is affiliated with the Alliance to End Plastic Waste or Common Seas in any way.

AUTHOR CONTRIBUTIONS

KO and KC contributed equally to the conceptualization, the writing, and the editing of this manuscript. All authors contributed to the article and approved the submitted version.

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