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From Waste to Resource: The Trade in Wastes and Global Recycling Economies

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Abstract

We outline the frameworks that shape and hold apart waste debates in and about the Global North and Global South and that hinder analysis of flows between them. Typically, waste is addressed as municipal waste, resulting in a focus on domestic consumption and urban governance and an emphasis on cities and the national scale. The prevailing ways of addressing the increasingly global flows of wastes between the North and South are those of global environmental justice and are underpinned by the geographical imagination encoded in the Basel Convention. New research on the trades in used goods and recycling in lower income countries challenges these accounts. It shows that arguments about dumping on the South need revision. Wastes are secondary resources for lower income countries, harvesting them is a significant economic activity, and consequent resource recovery is a key part of the global economy. Four areas for future research are identified: (*a*) changing patterns of global harvesting, (*b*) attempts to rescale resource recovery and the challenges faced, (*c*) the geopolitics of resource recovery, and (*d*) changes in resource recovery in lower income countries.

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1. INTRODUCTION

In this review, we provide an overview of the prevailing paradigms that shape the burgeoning social science literature on waste in and across the Global North and Global South. This field is distinct from other longstanding approaches to waste from an environmental science or management perspective. For social science research on waste, environmental justice positions have long been important in framing the connections of the Global North and Global South through waste [see Mohai et al. (1) and Schlosberg (2) for important reviews]. A variety of alternative framings characterize the recent social science literature on waste. All these framings have points of commonality. They tend to see waste as municipal waste and result in an emphasis on either domestic consumption at the household scale or urban governance at the municipal scale. They are, for the most part, nationally bounded and hold apart the Global North from the Global South. Wastes in social science research on the Global North are almost exclusively postconsumer, or municipal, and have been understood through the diverse perspectives of environmental psychology (e.g., 3–6) and environmental governance (e.g., 7–9), or as a dynamic social and cultural category linked to social practices (e.g., 10–13) (Section 2.1). In contrast, although they still concentrate on municipal waste, for the Global South, studies are primarily framed in terms of development and urban governance failures in the cities of the South (e.g., 14). The focus is often on informal waste scavengers, or waste pickers, and their relationship to changing forms of urban politics (e.g., 15–17; see also Section 2.2). This review concentrates on these large social science literatures rather than related work on waste's connection to public health and epidemiology (18) and to climate change (19).

New social science research on waste is beginning to move beyond nationally bounded studies to connect the Global North and Global South in ways that differ from environmental justice accounts (Section 3; see also, e.g., 20–22). This research emphasizes global flows of ideas, capital, and wastes (Section 2.3), particularly the global trade in wastes and their subsequent transformation into secondary resources through recycling (Section 4; e.g., 23–26). The past two decades have been characterized by a large, and growing, international trade in used goods

and discarded materials, or stuff that is often categorized as waste—although this classification is frequently disputed. UN COMTRADE data show that in the 2001–2011 decade, the value of global trade (in US dollars) in the major categories of used and scrap goods (recovered paper; used textiles; ferrous, copper, and aluminum scrap; and plastic scrap) grew between 4 and 10 times. Furthermore, the value of this trade is far from insignificant. Although it does not bear comparison with global trade in high-value finished goods and commodities (e.g., cars, oil), the value of global trade in scrap ferrous ($57 billion in 2011) exceeds that for diamonds. Global trade in scrap copper ($32 billion in 2011) is comparable with that for coffee or refrigerators, and global trade in recovered paper ($12.5 billion in 2011) exceeds the value of global trade in tea and is equivalent to global trade in raw tobacco. High income countries comprise the major exporters of used and scrap goods, whereas lower income countries are the major importers. For example, in 2011 80% of the value of the United Kingdom's paper product exports to China were scrap; additionally, 66% of the metals (mostly copper) and 20% of all plastics exported were also scrap. Much of this is associated with industrial products and by-products of processing, not domestic consumers.

Debates on trade in waste framed by the environmental justice paradigm perceive the wastes of profligate western consumers and of the throwaway consumer societies of the Global North as a form of neocolonialism, as they are dumped on the peoples and environments of the Global South. In economic terms, the environmental justice paradigm sees the environmental costs of the consumer societies of the Global North as being externalized through the use of nature in the Global South as an uncosted sink. This is perceived as an ecological subsidy across the globe. Recent research on global recycling has challenged such accounts, contending they obscure a complex global trade in secondary resources and their recovery for further rounds of manufacturing. Although high profile instances of toxic waste dumping continue to grab media headlines, these are the exceptions rather than the rule. In Section 4.1, we describe how wastes are instead harvested in the Global North by networks of buyers and traders from the Global South. In Section 4.2, we describe how they are then shipped to the Global South, where they are processed and recycled into even more manufactured goods, many of which find their way back to the Global North—either as new consumer goods or as packaging for those goods. In this way, new waste research in the social sciences has highlighted the importance of the global scale for understanding waste and has positioned waste as an important part of the global economy. It has shown the importance of the materiality of wastes in anticipating how, where, and why wastes are transformed into resources. It has also complicated, and even upturned, prevailing understandings of the relationship between the Global North and Global South in the social sciences. As Alexander & Reno (27, p. 4) state, "[f]amiliar economic geographies and understandings of how the global economy works are upturned as the developed North becomes a source for scrap/raw materials; marginal regions add value before (re)finished goods are sold, sometimes back to where they came from."

2. THE GLOBAL NORTH AND GLOBAL SOUTH IN WASTE DEBATES

2.1. Waste in the Global North

In this section, we summarize the primary areas of social science literature on waste in the Global North. They focus mainly on the management of municipal waste and its relation to consumption, but conceptualize this in very different ways.

2.1.1. Postconsumer municipal waste, environmental psychology and environmental governance. There is a large literature that, starting with Vance Packard's *The Waste Makers* (28; see also 29–31), has positioned waste as the effect of overconsumption, resulting from profligate

consumers in the Global North and a built-in product obsolescence. Mountains of waste, both literally and metaphorically, are used as evidence of a waste crisis in the Global North and as the material testimony that throwaway consumer societies are rapidly depleting global resources. When placed in landfills, discarded wastes contribute to greenhouse gas emissions, and so the issue of waste is linked to that of climate change (19). Environmental policy in the Global North has sought to intervene in ways that connect these two policy domains, by diverting materials from landfill (a major generator of methane), through the promotion of recycling. As such, household-based collections of dry recyclables (paper, card, glass, aluminum cans, and certain plastics) have become commonplace across the Global North. Recently, at least in some nation states, there have been moves to ban organic materials, which include food waste, from landfill.

As environmental policy (in the Global North) has promoted recycling, waste research in the social sciences has examined attitudes toward recycling and recycling behaviors. Several studies since the 1990s have identified social, economic, and demographic predictors of (non)participation in recycling schemes, typically using national case studies, and within that, intracity or intercity comparisons (e.g., 3–5, 32–38). This body of work argues that differing attitudes (or values) determine the behaviors that individuals adopt, in this case toward recycling.

Research in this tradition has gone beyond the early association of pro-recycling behaviors with certain types of households [e.g., older, higher income, those living in houses rather than flats or apartments (5)] to examine perceived "problem groups" of transient populations such as students (39), and to examine recycling beyond the home in commercial institutions (40). It has also identified sustainable lifestyle groups by connecting everyday reported recycling practices to other sustainable behaviors, including energy saving, water consumption, and green consumption (6, 41, 42).

Work in the environmental psychology paradigm has been highly influential in environmental policy circles, where Elizabeth Shove (43) has shown ABC (or attitude, behavior, choice) thinking prevails. She argues that UK climate change policy frames environmental issues as "a problem of human behaviour," and that this "marginalises and in many ways excludes serious engagement with other possible analyses" (43, p. 1274; see also Section 2.1.2). This argument also applies to waste policy. ABC framing focuses attention on strategies of intervention, seeking to modify individual behavior by resolving a value-action gap in terms of better information and/or knowledge (e.g., 44). Research has evaluated the effectiveness of different forms of information or incentives for improved public participation in recycling schemes (45–47). Furthermore, just as the emphasis in waste policy has shifted up the waste hierarchy to focus on minimization and prevention (48, 49) alongside recycling, work on attitudes and behaviors has begun to examine these factors, and to highlight the differences between attitudes and behaviors with respect to reuse and prevention on the one hand, and recycling on the other (50–53).

If environmental psychology is one of the dominant paradigms framing social science research on municipal waste, the other is environmental governance, which has been argued to be the primary organizing concept and priority area for much environmental research in human geography (54) and the allied disciplines of planning and urban studies. Early work on waste in these fields focused on policymaking, rather than implementation, and highlighted "barriers to" as the means for analyzing the problems faced by waste policy (55, 56). More recent research has continued to focus on policymaking but has positioned this within broader debates about the configuration of the state (57). It has turned to the meta-concepts of governance, modes of governing, and governmentality to frame its analyses (8, 9). These perspectives focus on the range of actors shaping waste management within given nation states, including nongovernmental organizations (NGOs) alongside municipalities, the private sector, and government (7, 58); they emphasize the importance of multiple, simultaneously interacting scales; and they highlight distinctive modes

of governing waste: disposal, diversion, eco-efficiency, and resource. They also have a wider interpretation of the policy process than that which is featured in early environmental research, extending this from a narrow concern with policy as defined [or what Bulkeley et al. (57, p. 9) label a "linear, technical-economic model of the policy process"] to encompass the social, cultural, and political practices of policy implementation.

Notwithstanding their differences, there are two points of connection between waste debates framed through the environmental psychology and environmental governance paradigms. The first is the close attention paid to the shifting contours and content of environmental policy in relation to waste management, mostly at the national and sometimes supranational levels in the case of the European Union (EU) (59). The second is the focus on households as the key target of policy implementation for local authorities or municipalities. Given the prevalence of ABC thinking, the success, or otherwise, of municipal-scale intervention is often understood by municipal actors as shaped by household attitudes and behaviors. However, research informed by environmental governance argues that attitudes and behaviors relate to the materialization of policy in particular configurations of infrastructure (such as bins and collection rounds) at the municipal scale (60, 61). In the terminology of Steve Woolgar and Daniel Neyland (62), waste bins become a form of "mundane governance," or governance through ordinary objects. Furthermore, the household scale is seen to be but one aspect in the multiscalar governance of waste.

In this way, waste research framed through environmental governance has distanced itself from the environmental psychology paradigm. It has looked to bring in political science to strengthen understanding of the ways in which environmental governance relates to the state and has made connections to wider bodies of literature in the social sciences on sociotechnical systems and the importance of social practices (see Section 2.1.2). It also emphasizes the scaling of waste governance. The work of Simin Davoudi (63) on the United Kingdom has been particularly significant here. Davoudi emphasizes the role of the region in rescaling the United Kingdom's environmental governance. She argues that the regionalization of waste demonstrates the resilience of spatial Keynesianism and illustrates how redistribution relates not just to goods but also to "bads." This, she argues, is "best conceptualised as the state's ongoing struggle to secure new 'spatial fixes' to manage the interlocal tensions over the redistribution of environmental bads within an EU policy framework" (63, pp. 152–53). As such, her work makes connections to another body of work that has been highly influential in shaping debates on waste in the social sciences: environmental justice, in which appropriate technologies of waste management are framed as a key means of reducing the harms associated with waste as an environmental "bad." These include the deleterious effects on human health of exposure to inappropriately managed wastes (see Section 3).

In both the environmental psychology and environmental governance literatures, waste is self-evidently waste. These paradigms define what is managed as waste as self-evidently waste and see waste as stuff that must be managed (64). In contrast, a growing subliterature of waste studies in sociology, human geography, and cultural studies has problematized this definition of waste by locating it within the social, and particularly within the study of consumption. In these works, waste is an effect, or consequence, of how something is disposed of, not an innate property of particular materials nor is it automatically assumed to be harmful stuff that has to be tamed through waste management. In short, here waste is not; rather, it becomes.

2.1.2. Waste as the fallout of consumer practices and the connection to political waste regimes. In this body of research, waste is an unstable social category. This means that it is understood in terms of the contexts that generate it and the relations and relationships in which it is embedded. It also means that waste is seen as needing to be understood in relation to consumption.

Although most consumption research emphasizes the acquisition, appropriation, and appreciation of consumer goods, research in this tradition maintains that just as much can be learned about consumption through the devaluation, divestment, and disposal of goods (10, 12, 13). It is here that the connection to waste is made.

Research in this paradigm builds on earlier waste scholarship (65–68) to show how waste is intimately related to key social identities but also embedded in, and consequent upon, the routines and practices of ordinary, everyday social life, for example, shopping, parenting, cooking, cleaning, doing the laundry, and patterns of work (10, 11, 69–72). Gregson and coworkers (10, 11, 69), Hetherington (12), and Evans (70–72), all of whom have worked in the UK context, argue that to understand how waste comes to be generated involves understanding the consumption practices that generate it. Their research also focuses attention on the conduits by which devalued things, and stuff, can be divested, or "moved along," be that through bins that define such things or stuff as waste, by moving them toward landfill, energy recovery or recycling, or through second-hand exchanges that are assumed to rekindle and revalue discarded things by connecting them to new social lives. These exchange fora include online and face-to-face market mechanisms (e.g., eBay, Gumtree, car boot sales, or garage sales), the hand-me-down/around economy of social networks, and the gift economy often associated with the unknown, but assumed to be deserving, poor [e.g., charity shops, thrift shops, swap shops, and reuse outlets (73–75)]. Taking its inspiration from anthropological, cultural, and sociological theory, research in this tradition distinguishes between surplus and excess, and draws attention to the importance of what Gregson (69) terms "the gap in accommodation." The importance of this for work on waste management is that it is the category of the excess that connects things most easily to the conduits that in turn connect to the waste stream: bins. In contrast, surplus things are either held on to, as household stocks (which may be useful sometime), or gotten rid of through conduits that are imagined to revalue them.

The combined work of researchers in this paradigm shows how much of the waste generated in the United Kingdom is an effect of social life. Some of this is an effect of the big life events of separation, death, moving homes, and family formation; however, ordinary life is as important. Research has shown how home renovation and redecoration work to generate waste, as does the humble fridge, where an effect of the entwining of materiality and the social allows food to quietly decay, become "risky," and then, as discourses of safety trump those of caring for the environment, be legitimately placed in the bin, as food waste (72, 76). This research frequently positions itself as a counter to the ABC thinking that shapes much current waste policy (see Section 2.1.1). Instead of emphasizing interventions that concentrate on individuals and choices, work in this paradigm argues that waste policy needs to design interventions to address the social and material conditions that generate it. Rather than blaming individuals for their behavior or castigating the consumer, this research maintains that as policy necessarily moves up the waste hierarchy to focus on waste reduction through minimization and prevention it needs to "cross the threshold" into the household (77) and engage with consumer cultures and the sociotemporal practices that constitute consumption (78). The primacy of environmental psychology perspectives in informing and framing current policy thinking in the United Kingdom, however, is such that waste policy has been relatively impervious to work that emphasizes the importance of social practices.

Research in this tradition highlights that in the material transfer of waste from private households to waste management infrastructure, its legal and economic status is also transferred (79). In placing their discards in a range of bins, households are, effectively, transferring ownership of their discards to whoever has the collection rights to their bins. This point is recognized by Martin O'Brien (80) in his work on food waste, which shows how, on being discarded, food waste is no longer food waste but rather has been transformed into feedstock for the generation of new commodities, in this case renewably generated electricity and biofertilizer (81).

The same argument provides the starting point for much of the research produced under the auspices of the 2006–2011 Waste of the World program, funded by the Economic and Social Research Council in the United Kingdom (see Section 4). Both sets of research argue that, although household practices undoubtedly matter to understanding municipal waste generation, they can only go so far. Rather than tracing discard back into the households that generate it, following the conduits that connect households to waste management infrastructure allows research to recognize that what appears, from the perspective of households, to be their discard is actually the raw materials for cycles of further commodity production. Through its placement in certain bins, discard is transformed: What was waste has become resource. The question is: Whose resource is this?

O'Brien's (80) work uses the example of food waste in supermarket bins and the legal cases brought in the EU against so-called freegans or dumpster divers to show the transformation of waste from a property of the commons to private property. This approach shows the collision in values between political activists, who appropriate waste for redistributive purposes and/or as a critique of the profligacy of contemporary consumption (82–84), and the alliance of interests that constitute waste as private property (85). It argues that waste policy is not best conceptualized as a reaction to the problem of capitalist surplus but rather contributes to constituting that surplus, by transforming waste from nonaccumulating to accumulating capital (80, p. 206). In making that argument, O'Brien illustrates that discarding things moves them into a regime that governs who profits and what happens to them. In that regard, his argument has affinities with Zsuzsa Gille's (86) concept of waste regimes in relation to Hungary and is subsequently applied by other researchers (87) to other contexts.

Gille's idea of waste regimes is a dynamic, macrolevel concept that analyses the production, circulation, and transformation of waste as materials with differing specific properties that render them amenable to different operations (88). Her argument is that wastes are similar to resources: Certain wastes will be considered valuable by particular societies and others not. Societies will constitute principles of valuation, and they will identify mechanisms for resolving value conflicts. Which wastes are considered valuable, then, varies according to those different regimes that come to treat all waste as the one that is valued. In these terms, the transformation that O'Brien describes is a transformation in a (municipal) waste regime in which certain waste (food in this instance) has become resource and in which the social relations associated with waste's production have shifted from a public service provided by municipalities to one in which households generate raw materials for further capital accumulation—and provide the unpaid labor to sort them.

As with so much waste research in the social sciences, the focus of work on waste regimes has to date been nationally bounded. The tendency is to equate regimes with nation states—something that is as much an effect of the sociological imaginary as it is of the institutions that govern waste. Gille (88, p. 1062) acknowledges this when she states, "we need a more nuanced understanding of how local and national waste actors and practices deflect or use global ones"; we turn to this in Section 2.3. First, however, we establish how waste has been researched outside the Global North.

2.2. Waste Beyond the Global North: Waste Pickers and the Crisis in Urban Waste Governance

Research on waste in the Global South has had little to do with consumers and households. Indeed, studies of household segregation and recycling behaviors are only just beginning to appear in the literature (89–93). Instead, research on waste has focused much attention on waste pickers, or scavengers. Most studies from the late 1970s to mid-1990s were positioned in the paradigms of development studies. This work began from the visibility of waste pickers in public spaces in the

cities of the South. It characterized and classified waste pickers; it explained their presence in terms of rural–urban migration, and it positioned waste picking within analyses of the informal economy and within ethnically, racially, and gender-segregated labor markets (e.g., 94–97). A wave of research post-2000 coincides with growing concerns about a waste crisis in the Global South consequent on both urban expansion and increasing scales of consumption and new types of materials in consumer discards. Solid waste management (or municipal waste) is widely acknowledged to be one of the biggest challenges facing Southern cities (14). The inability of municipalities to handle the waste being generated is seen not only as a crisis in waste governance but also as deeply symbolic. Mountains of rubbish are here taken as emblematic of the crisis facing so-called developing cities and as evidence of their inability to be modern (98). They also challenge the legitimacy of the state, which is predicated upon its capacity to create order; the presence of waste and rubbish has been mobilized by citizens, through strikes and public acts of dumping (99).

Current research on waste pickers can be characterized as follows. There is a large volume of literature describing and classifying waste pickers in specific Southern cities. Typically, this work surveys waste pickers working at city dumps and on city streets and focuses on the single city case study (e.g., 100–104). Another large body of work focuses on the importance of waste pickers in systems of urban waste governance in the South. It argues that waste pickers play a valuable role in Southern recycling and, as such, should be integrated into formal municipal waste management systems, but that to do so they need to be upgraded (17, 105). The means to this is argued to be establishing waste picker cooperatives in partnership arrangements, directly with municipalities or as collaborations with NGOs and international aid agencies (106–109). A growing literature has examined these cooperatives in a range of cities (see 15, 16 for surveys), producing mixed evaluations of waste picker co-ops in contemporary urban waste governance. Positive accounts frame waste picker co-ops as both a poverty-reduction strategy and a waste management strategy; they relate this to arguments of social justice, and they tend toward a celebratory account of the creative opportunities afforded by working with waste (110–112). More negative accounts go back to the insights of Mary Douglas with respect to dirt and social order (65) to highlight the ambiguities between waste work and development (113, 114). Alternatively, accounts position informal waste pickers as exemplars of and/or challenges to neoliberal urban governance. The latter accounts point to the so-called globalization of garbage in the municipalities of the South, as contracts are won by multinational waste management companies, often from the Global North. They emphasize the casualization of subcontracted cooperative labor, and point to the sanitization, as well as displacement and resettlement, of urban waste workers, and they highlight the deleterious effects of these changes on the livelihoods of well-established groups of waste pickers such as Cairo's Zabaleen (115–122).

The overwhelming majority of research conducted on waste pickers in the South confines attention to acts of picking and who is doing the picking and in which social relations, and positions this in the frame of urban governance. As a consequence, it analyzes waste management as symptomatic of urban governance trends. The privileged scale of analysis here is the city. In contrast, very few studies either take explicitly, or begin to recognize the importance of, a political economy approach to waste picking in the South. The most significant is the work of Kaveri Gill (123, 124) on Delhi (see also 125). Her work highlights the significance of the recycling value chain. Correspondingly, she focuses on the connections, as exchange relations, between waste pickers and dealers and traders in recovered materials, and the further exchange relations between those dealers/traders and domestic manufacturing industries, which are the means for reprocessing recovered materials. Gill's work points to how value is made in recycling—not just through collection, but also through sorting, separation, preparation, and treatment, and then through compaction, packaging, and storage. Key here are the grades and typologies, or the classification

systems, that order sorting and separation activities. These are closely guarded commercially, as they are key to competitive advantage, but by paying attention to exchange relations between pickers and dealers and traders, Gill shows that what is presented in the urban governance literature as a casualized labor relation is actually long term, and embedded—at least in the case of Delhi's waste pickers. She shows that waste picking needs to be understood through the relations of economy to society.

2.3. Connecting the Global North and Global South in Waste: North–South Flows of Ideas, Capital, and Materials

Research on waste in the social sciences differs substantially in its focus, depending on its contextual domain. In the Global North it is framed as a problem of consumption; in the Global South it is understood in terms of poverty, labor, and a crisis in urban governance. These framings are indicative of the pervasiveness of highly simplified meta-level understandings of the global economy in the social sciences, in which production, particularly low-value manufacturing, occurs outside the Global North, which is the primary site for the consumption of goods. A smaller body of literature has begun to challenge this separation in waste research, pointing to the intricacies of the connections between Global North and Global South to the North–South travel of ideas, capital and materials, and in so doing troubling the North–South geographical imagination which continues to underpin much social scientific work.

2.3.1. Flows of ideas. The travel of waste management ideas connects to the crisis in waste governance in the Global South. As partnerships between NGOs and international agencies have been established with cooperatives and municipalities in the South, a notion of "good garbage governance," which sees such partnerships as normative, has taken hold (120). At the same time, particular understandings of what constitutes appropriate, and efficient, arrangements and configurations of waste management infrastructure have also taken root. An example is the waste transfer station. Zapata-Campos & Zapata (126) highlight how the idea of the waste transfer station (where collected materials are taken for consolidation and/or sorting for onward transportation, either to disposal sites or recovery operations) has become increasingly prominent in waste governance policies for the South. This idea traveled through key international agencies (e.g., UN Habitat) and consultants' models, and has been applied successively in China, Vietnam, Egypt, and Nicaragua, to date. Waste transfer stations are integral to highly mechanized, capital-intensive waste management infrastructures and are commonplace in the Global North, where they handle large volumes of waste materials on a daily basis. They also rely on a dense truck-based collection network to transport materials to and from the transfer station. An open question, however, is to what extent such arrangements are appropriate in the cities of the South. Not only is there the problem of a dense urban fabric and road network unsuited to large trucks but there is also the question of how an arrangement geared toward volume in materials flow relates to more labor-intensive waste picker cooperatives and microenterprises. Furthermore, the introduction of waste transfer stations—typically on the edge of informal settlements—brings with it another level of siting controversy, as people see these facilities as likely to result in the proliferation of dumps rather than as materials recovery facilities.

2.3.2. Flows of capital. Allied to the Global North–Global South traffic of ideas about appropriate waste management infrastructure is the North–South flow of capital. Research on the privatization of waste management by municipalities in the South points in passing to the awarding of waste collection contracts to multinationals from the Global North. It does not go on to make

the obvious connection, which is that these contracts are important emerging new markets for globalizing, rather than national, waste management businesses. These firms are looking to expand beyond the municipalities of the Global North, and even become global waste management multinationals (e.g., Veolia), whose scale and size of operations is on a par with global firms in the manufacturing sector. Waste management is now a global business and is often allied with parallel interests in the utilities sector, particularly water, where the financial underpinnings to the business are similar to those of waste. Headquartered in the Global North, and with an understanding of waste management that comes from these cities, these firms offer the promise of upgrading and modernizing municipal waste facilities in the cities of the Global South, including closing old dumps and replacing them with sanitary landfills and incinerators. What tends to transpire, however, is a familiar story of transferring technology from the North to the South that then struggles in new and unfamiliar contexts. In this case, the material composition of municipal wastes (more organic matter content and higher humidity) compromises technology's performance. Often it is also a story of contradictory logics, in this case between regulated waste management, which favors capital-intensive arrangements, and poverty-reduction programs, which see waste and allied recovery activities as livelihoods and survival strategies for poor people. Additional considerations should be the constitution of the people and cities of the South as a guaranteed, long-term source of revenue for multinationals based in the North. Through long-term municipal waste collection contracts, waste generated in the Global South becomes the means to large financial flows from South to North and the means by which value in global municipal waste is becoming increasingly concentrated in large utilities transnational corporations (TNCs).

2.3.3. Flows of wastes. A final Global North to Global South connection that is obscured by the literature's focus on the distinctiveness of waste in the North and South is the material flows of wastes from the Global North to the Global South. These flows have expanded dramatically since the late 1990s, so much so that they comprise the largest exports, by volume, from the major economies of the Global North.

Linear conceptualizations of economies see these exports as the dumping of wastes on the countries and peoples of the Global South, where waste management facilities are seen to be inadequate for their own wastes, let alone those generated by the Global North. Such understandings are the basis for environmental justice accounts of how wastes connect North and South. These global environmental justice accounts are the prevailing paradigm shaping global waste debates in the social sciences. We turn to these in the following section.

3. TRASHING THE GLOBAL SOUTH? GLOBAL ENVIRONMENTAL JUSTICE AND ITS CRITIQUE

Reviews of the considerable literature on environmental justice show that waste has long been a key concern (1, 20, 127). One of the founding disputes in the environmental justice movement was the protest in 1982 over the hazardous waste dump in Warren County, North Carolina (128). Early work highlighted the polluting wastes of manufacturing industries and their effects on human and environmental health, as well as controversies over waste management infrastructures, where anti-incineration campaigns have been a backbone of studies linked to NIMBYism and locally unwanted land uses (129). These concerns continue in the current literature (130–133).

Waste's prominence in environmental justice research reflects its identification as an environmental "bad" and an approach to waste that sees it primarily as potentially harmful to public health (c.f. Section 2.1.1). The geographical distribution of wastes, and particularly waste management facilities, has been key to demonstrating the greater environmental burden carried by lower income

groups and people of color, and hence has been key to demonstrating environmental injustices (134). It has also underpinned the development of the concept of environmental racism (135). There have been hundreds of studies on wastes as environmental injustice, the vast majority of which focus on waste management sites or waste as pollution. Most take cities in the Global North as their case study sites, with the majority being US based. They can be characterized as taking one of two approaches. The first is concerned with distributional equity and uses quantitative, and increasingly geographic-information-systems-based, approaches to map environmental risk alongside which population groups are subject to it. The second follows a procedural approach to equity, and uses largely qualitative approaches to examine the social movements that have opposed environmental injustices.

Research in the environmental justice tradition has also encompassed global environmental justice and environmental justice in the Global South, although the volume of research here is significantly smaller. A growing set of still largely qualitative case studies of environmental justice in the cities of the South has used the siting of waste management infrastructure as the basis for examining injustices (136, 137). It has highlighted how the different social and political fabrics of Southern cities disrupt understandings of injustice that are grounded in US cities. Another strand of work, particularly in Latin America, is firmly embedded in social movement analysis, locating this within the strong activist and participatory traditions of social justice research that prevail there (138). The vast majority of this work, however, is focused at the national scale, be that single-state or cross-country comparisons. There are two exceptions to this. First there is a set of work on transborder environmental justice, in which the US–Mexico border has been the paradigm case (139–144). It focuses on the Mexican maquiladoras and interprets the location of US TNCs as a shift of the environmental burden of production and waste disposal from the US to the Mexican side of the border. Grineski & Collins (144) argue that this results in a very different, and highly unequal, cross-border environmental risk profile. Second, there is research that has examined the global export of wastes from the Global North to the Global South. The key work here is that of Jennifer Clapp (20) and David Pellow (21, 145). Their research has examined the work of NGOs in formulating the Basel Convention and later Basel Ban, which are the major international instruments for regulating the global flows of hazardous wastes. It has also focused on the role of social movements in resisting these flows, seeing this as part of a global movement against environmental injustice.

In environmental justice research on the global export of wastes, wastes are always hazardous and toxic, and they are invariably portrayed as being dumped on the Global South. The terms toxic colonialism and toxic imperialism are frequently used, whereas pollution haven is reserved for those countries engaging in the race-to-the-bottom of environmental standards to handle the wastes of the world's dirtiest industries. The effect is understood as the trashing of the South, through environmental degradation and the exposure of poor people in the South to enhanced environmental risk. Although not denying that there is a correlation between lower environmental standards and the volume of imported wastes (146), there are at least two criticisms that can be made of this research. The first is the lack of convincing evidence; the second is the close connection between work on global environmental justice and NGO campaigning.

Many researchers, including global environmental justice researchers, point out that data on global waste flows, including UN-COMTRADE data, are poor and/or inadequate at best, due to problematic categorizations of used and discarded goods which, in turn, are often utilized by traders to allow high levels of misdeclaration in traded wastes. This makes quantitative assessments often inaccurate, albeit suggestive and dramatic (see the Related Resources below). As a consequence, there has been a tendency to shy away from quantitative data and to rely on high profile cases to make the general argument about dumping (see sidebar Trafigura; *Probo Koala*; and Abidjan, Ivory

TRAFIGURA; *PROBO KOALA*; AND ABIDJAN, IVORY COAST

The Trafigura case of 2006 is at one level a classic case of global environmental injustice (147). The vessel *Probo Koala*, chartered by oil company Trafigura, arrived at Abidjan Port. Wastes from the hold, classified as slops, were taken to local dumps. The so-called slops turned out to be a cocktail of hazardous wastes, which Trafigura was quoted €500,000 to dispose of in Amsterdam. Instead, the company negotiated a deal with an Ivory Coast subcontractor, for €18,500. Public deaths from exposure to the wastes, which were placed in uncontained municipal dumps, led to an international outcry and investigation. Less commonly publicized is the backstory. These slops were from coker gasoline produced by Pemex, who sold it to Trafigura. The coker gasoline was trucked to Brownsville, Texas (the site of the US ship breaking industry), where it was loaded onto the *Probo Koala*. The vessel anchored off of Gibraltar, where Trafigura experimented in stripping sulfurous products from the coker gasoline. The resultant naphtha was sold, but this left a residue of 500 tons of extremely hazardous wastes to dispose of. This residue is what ended up in Abidjan. The wider case demonstrates how wastes are never just wastes, but rather open to further processing; how seaborne chemical experimentation with wastes can evade land-based, or territorial, environmental regulations; and how dumping is not a straight North–South exchange. In 2011, the *Probo Koala* in turn was at the heart of a political storm, in this case related to its sale for breaking in India.

Coast. Furthermore, a commonplace argument that appears in the environmental justice literature is that the second-hand goods label is a proxy for toxic waste. As new research is beginning to show, this generalization is a questionable inference.

A 2004 paper by Alastair Iles (23) points to the complexity of transnational recycling chains, comprising networks of traders and dealers, as well as small-scale recycling entrepreneurs in China and India. It flags the intricacies of patterns of trade, and particularly the export of wastes from the major global manufacturing centers, including Asia, to poorer Asian neighbors making lower-end electronics. Other work using proxies and quantitative data has since begun to systematically challenge the North–South flow assumed by global environmental justice research. Particularly important here has been the work of Josh Lepawsky and colleagues (148, 149). Lepawsky's work on e-waste, based on UN-COMTRADE data, joins with other work on e-waste to show that the flows of e-waste from "rich" to "poor" countries were relatively modest, even in 1996, and negligible by 2012, and that interregional trade is of greater significance (149). It shows that there is no pollution-haven dynamic at work and throws into serious question the geographical imaginary that frames the Basel Convention (150). This research suggests not just that Basel is regulating a trade that is no longer relevant, but also that trade is going in more directions than those that Basel regulates.

Issues over evidence point to the second critique that can be made of global environmental justice research. This is the close connection between work on global environmental justice and NGO campaigning. NGO campaigners have stated publicly that their tactic for perpetuating the idea of waste as the "dark side" of globalization was to focus on iconic wastes, specifically the e-waste of the digital revolution and merchant ships that are the workhorses of globalization (151). In both cases, graphic, highly visual campaigns featured child labor and toxic wastes leaking uncontrolled into the wider environment. The campaigns proved extremely effective as political devices, ensuring that international debate on exported wastes remained firmly grounded in toxicity and the dumping of wastes by "rich" countries on "poor" countries, and these representations continue to shape the current debate. However, in relying on NGO evidence rather than reported trade data, global environmental justice research reproduces as evidence the most egregious cases,

which NGOs had selected to make their political arguments. Research led by environmental justice agendas therefore has tended to look to prohibit flows of wastes, a prohibition that is welcomed by an unlikely alliance of environmental campaigners and those who seek to realize profits from the premiums prohibition creates (152). In so doing, global environmental justice research has missed the complexities of reuse, refurbishment, remanufacturing, repair, recycling, and recovery that accompanies the export of second-hand, or used, goods, and which has been the focus for a further area of new research. It rightly points out that claiming a particular good will be reused is sometimes a cover-up for the export of harmful wastes; however, it is silent on the issue of it actually being an important component of the global waste trade that is not entirely harmful.

4. WASTES TO RESOURCES: GLOBAL RECYCLING ECONOMIES AND GLOBAL RECYCLING NETWORKS

Research that highlights the transformation of wastes to resources in lower income countries provides a corrective to another line of work that has explained the global shift in manufacturing from the countries of the Global North to Asia in terms of the flight of capital in search of cheaper labor. It has shown this to be only half the story, for manufacturing activity outside the Global North also has an insatiable demand for resources. High levels of economic growth, based on manufacturing for both the export market of northern consumers and a rapidly expanding domestic market of middle class consumers, have required scouring the planet for new, and cheaper, resources. Satisfying that resource demand has required utilizing secondary resources, that is, materials derived from wastes. The prime example is China, which for example consumes 43% of the world's copper, with 50% of that sourced from scrap.

Scouring the world for wastes and harvesting them so that they become secondary resources has become a multimillion dollar global business. Estimates place the turnover of the global recycling industry somewhere in the region of $500 billion per annum, with employment exceeding any other sector other than agriculture (24). The business is made more profitable by the cheap costs of shipping containers on the "back run" (from West to East or North to South) of global shipping routes. Just as containerization has enabled global logistics for production, the ability to ship relatively small consignments of discarded goods back in containers, rather than hiring bulk carrier ships, has enabled many small-scale entrepreneurs to enter the market in the global trade of waste goods (24). Once imported, cheap labor costs plus less stringent environmental regulations allow for further rounds of materials separation, segregation, and sorting. The latter are critical to extracting value from resource recovery, where the degree of purity of the grade, as well as its converse—the degree of contamination—is key to the acceptance of material for onward processing (i.e., recycling) by manufacturers.

4.1. Harvesting in the Global North: Buyers, Traders, and Brokers in Global Recycling Networks

Adam Minter's (24, p. 100) research on the global scrap metal trade describes the United States as "the Saudi Arabia of scrap" (c.f. 153). A conservative estimate of 100 Chinese traders are at any one time driving around the United States, from scrap yard to scrap yard, sourcing scrap metal and wire to fill containers to send back to Chinese importers. These traders are likened to high stakes commodity traders: When the market is right and prices are high, they can buy and sell some 50 containers a month, with a value of somewhere between $10,000 and $100,000 per container. Price connects to demand, and demand for scrap metal—and indeed, for scrap paper and plastic—is high in both China and India. Although cable and wire chopping plants exist in the

United States and Europe, even in vertically integrated operations, they will rarely accept used wire with less than 60% metal content. Correspondingly, wire with less metal content, such as Christmas tree lighting, gets bought up by Chinese traders, shipped to China, and ends up in places like Shijiao in southern China, where some 20 factories process upward of 9,000 tons of such wire per annum. Not only do these factories supply secondary copper to other factories making more wire, power cables, and smartphones but they also shred the insulation for manufacturers to make into slipper soles. In contrast, demand for Christmas tree lighting from manufacturers in places such as the United States is nonexistent. So, without China, this stuff would end up in a landfill.

A similar pattern comprising networks of traders working in the Global North linked to importers in lower income countries characterizes other sectors of the global recycling market. The prevalence of small-scale traders and informal networks has been argued to be caused by needs for knowledge of both specific products and market demand, leading to what Rivoli (25, p. 218) calls a "globalisation for the little guy." The trade in used clothing is a good example (154) (**Figure 1**). Recent research by Olumide Abimbola (155) has shown how family-based networks of Igbo Nigerian traders operate in the European used-clothing market. West African importers are sending their sons to work as apprentices in the sorting factories of UK used-clothing exporters to overcome their lack of knowledge about which garments are selected to go into which bales of used clothing sent for export (156). They provide free labor for the clothing exporters but also a means of quality assurance for importers, who have the advantage of knowing the content of bales in advance of their arrival in West Africa. Once imported, bales are sold to further traders. Some may split the bales, to separate out things of value from items of worn clothing, such as zips, buttons, and designer labels, and then rebale them to be sold to other wholesalers. Others, such as "entry-level" street traders, may only have sufficient working capital to purchase part of one bale of used clothing, which they then sell in street markets (157). Similar family-based networks of buyers and importers move used clothing to India, but this time for the recyclables market. Here, Lucy Norris' (158) research has shown how given importing second-hand clothing for reuse is banned, the garments are slashed and the fibers separated and then rewoven as secondary materials.

Another sector demonstrating the importance of family-based networks of traders is used cars. Here, Andrew Brooks' (159) research on Japanese used-car imports to Mozambique, via South Africa, shows the importance of a small number of Pakistani traders in controlling the trade. In Benin and Nigeria, it is again ethnic and family-based networks that control the used-car trade that flows through Cotonou Free Port in Cotonou, Benin (160). Beuving's (160) research goes further to show how the cultural dynamics of ethnicity and family have business effects, demonstrating how a combination of authority and the pressure to live up to familial expectations leads used-car traders to create a false impression of commercial success, and to continue to direct working capital into activities that are no longer as profitable as they once were. In Cotonou, as with other parts of the world where recycling activities predominate, used goods are widely seen as a means to making money. This reputation works to both attract more so-called fortune seekers and undermine levels of profitability through ruinous competition.

Although most research on global recycling continues to emphasize the importance of small-scale or family-based trader networks in moving the wastes of the Global North to the Global South, other research has begun to position these flows within the explanatory framework of global production networks. Andrew Brooks' (161) research on used clothing in Mozambique is one instance of an attempt to stretch a framework derived in relation to primary production to encompass goods returning to the commodity form. As well as emphasizing the importance of family-based networks of traders and diaspora populations, he links these to the networks of charities and firms who collect and sort used clothing in the United Kingdom and argues for

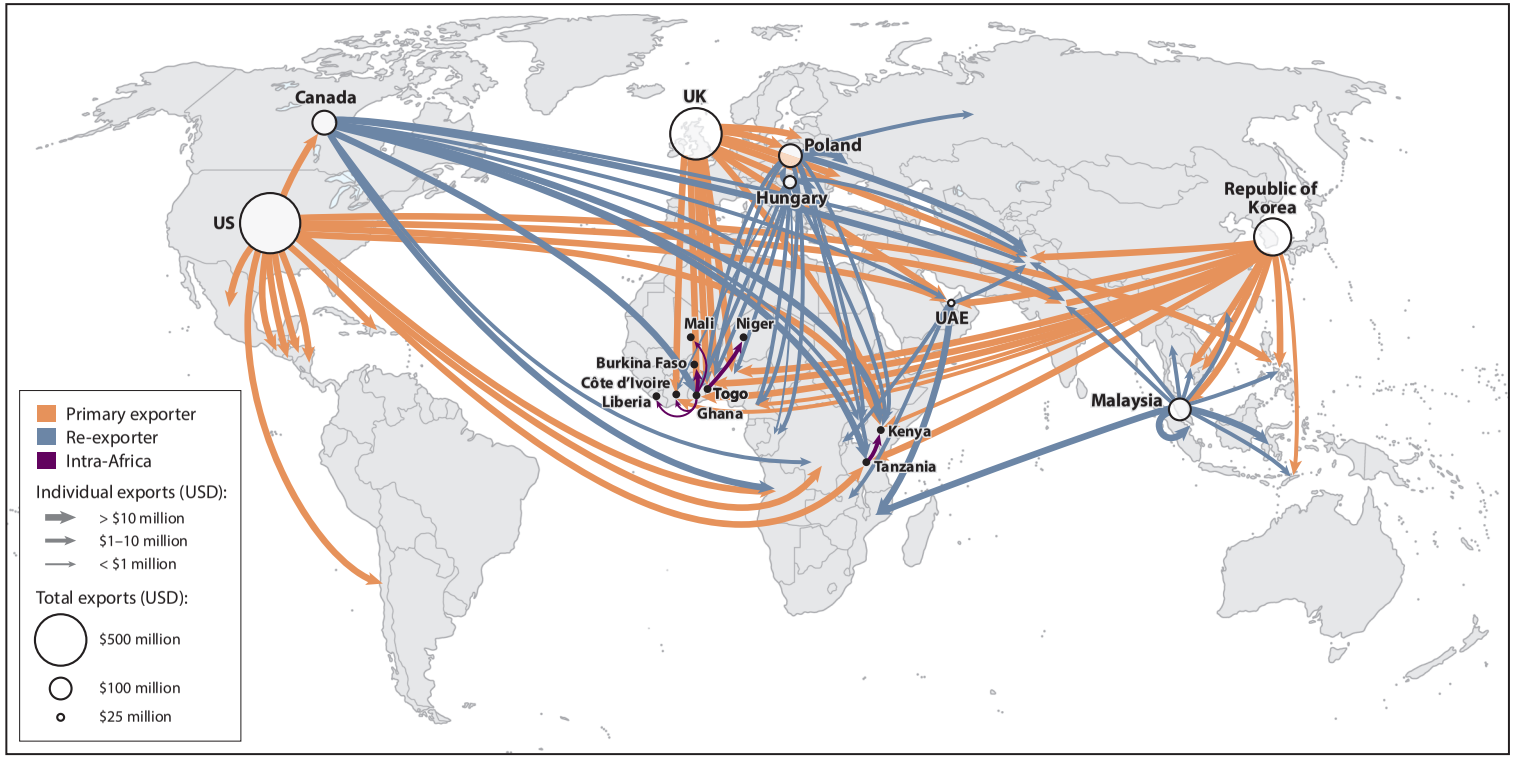

Figure 1

Illustrative global flows of used clothing. The map illustrates the cascade of material through different countries and markets. It selects the largest exporters in each of the Americas, Europe and Asia, and the 15 largest markets for them (above $5 million). It then illustrates the further flows by selecting the next two largest re-exporters for those flows and the ten largest markets for those (above $3 million) and finally illustrates a third level of the cascade of materials in Africa (above $500,000). All flows are denominated in US dollars (USD) and taken from UN official Comtrade data for the last year available (SITC category 6309).

conceptualizing these relationships as either coordinated or nonintegrated chains. Taking as their empirical focus end-of-life merchant ships and used clothing, Crang et al. (162) use the concept of global recycling networks to argue that secondary resource flows from North to South are connected by different regimes of value. They show that these flows are based on highly brokered forms of governance, grounded largely in trust relations—hence the importance of ethnic and familial trader networks—which in turn connect with the practices of valuing heterogeneous materials, through sorting, separation, and segregation. Further confirmation of the importance of trust relations comes from research on e-waste (163), with an emergent strand of work focusing on interventions that use labels and standards to guarantee ethical recycling (164, 165).

The majority of new research on global recycling seeks to position this within global economies. In contrast, a small amount of research in criminology and international law emphasizes the interface between illegality and legality in the trades of toxic wastes, particularly e-waste (166). Research here illustrates how networks of traders, buyers, and also sellers exploit gaps in both environmental regulations and classification systems; how opportunities are "fixed"; and how this often relates to indirect patterns in trade and/or key centers of coordination and brokerage.

A further line of research focuses on economic illegality and seeks to explore the effects of the illegal import of used goods on domestic industry. Brooks & Simon's (167) research on Africa highlights the ineffectiveness of policies that seek to counter trade liberalization by imposing bans on imports of goods such as used clothing. It recognizes the porosity of borders and the importance of transborder exchanges among ethnic and family-based trader networks, the role of rents extracted through corruption at borders in enabling these exchanges, and the significance of cultural transformations in dress to the continued success of the international second-hand clothing trade in Africa.

4.2. Reuse, Recycling, and Resource Reclamation Economies in Lower Income Countries

Research on the waste-to-resource transformation in lower income countries highlights the agglomerative tendencies of these activities. A good example is the Sitakunda-Bhatiary area near Chittagong, Bangladesh, which provides an illustration of the ways in which reuse, remanufacturing, and resource recovery for recycling can exist in a symbiotic relationship (168). Although NGO campaigns focused their attention on the ship breaking activity taking place on the beaches, this research points to ship breaking's vertical integration with a Bangladesh steel industry based on secondary production, and the close connection between that industry's emergence and the closure of primary steel manufacture in post-independence Bangladesh. It highlights how secondary steel production has been critical to supplying reinforcing rods to meet the burgeoning demand of the construction industry in Bangladesh, but also how a myriad of other activities grounded in reuse, remanufacturing, and repair have also grown up in the proximate area based on goods and materials besides steel. Notable here is a furniture remanufacturing sector whose primary customers are some of the Bangladeshi middle classes (26) and the refurbishment of marine engineering goods, which are purchased to power domestically oriented manufacturing activities, particularly in the apparel industry.

Agglomerative complexes such as Sitakunda-Bhatiary exemplify the symbiotic possibilities that accompany the reclamation of resources from complex commodities such as merchant vessels. Nevertheless, it is important not to lose sight of their relation to the environmental conditions that seem to encourage and enable symbiotic activities to occur. Far from the eco-parks favored by environmental policy geared toward industrial symbiosis—but which have had questionable success in the developed world (169)—places such as Sitakunda-Bhatiary are more zones of national

sacrifice. They are places where the pollution from recovering materials from wastes, and their consequences for public health, tends to be overlooked by both the state and regulators. A well-known Chinese example is Guiyu, the major site of e-waste reprocessing in southern China and the focus for the NGO campaign, *Exporting Harm* (22). Guiyu developed in response to local government's concern about the effects of e-waste processing in Guangzhou and Shenzhen, which were the major centers for recycling in China in the 1990s (24). Pressure from local municipalities led to the relocation of activity to a remote, mountainous, and agricultural area of the province: Guiyu. Originally dependent on global imports, Guiyu now processes internally generated scrap, and is widely seen in the trade as a site of national sacrifice, which contrasts markedly with the hi-tech, internationally certified forms of "clean" recycling now found in Chinese eco-parks (170). In addition to reprocessing e-waste to extract metals for Chinese manufacturers, Guiyu firms also export used gold-bearing computer chips to Japan. Guiyu is therefore not just a key hub in China's recycling economy but also part of global supply chains in used computer chips.

The location of these clusters points to a different patterning than either models of cradle-to-cradle circular economies or pollution havens suggest. Agglomerative tendencies signal the dynamism of capital and labor in resource recovery. Resource reclamation often involves trade-offs between labor- and capital-intensive processes. It involves balancing the volume of material processed and the separation and purity of the materials extracted. Hi-tech machinery of the type that characterizes resource recovery operations in the Global North, and which is seen to epitomize clean recycling, needs to process high volumes of material rapidly to amortize its costs, but that speed typically leads to a relatively mixed stream of recovered materials (171). Given the fine separation of materials is what adds value, it often creates materials of the lowest grade, which are frequently exported to other parts of the world for further segregation (81). There, "dirtier," more labor-intensive operations spend more time sorting, separating, and segregating materials to generate highly differentiated grades of materials, and thus supply a much wider range of markets. As such, there are multiple circuits of materials sorting and separation, leading not just to agglomerative tendencies in resource recovery but also, in some instances, to the exhaustion of value, where the physical capacity of materials to be endlessly recovered is reached. This occurs in the case of textile recycling in India where leftover fibers from the manufacture of shoddy blankets are then sent for further processing and mushed together with other materials to produce aid blankets that disintegrate into a handful of dust (158).

5. FUTURE DIRECTIONS

Recent research on the flows of goods and materials declared to be "wastes" in the Global North to the Global South for recycling has brought to prominence patterns of trade and economic activity that have been "business as usual" in the global economy since the 1990s. That it has taken so long to make this visible within academic research is indicative of two tendencies. The first is the pervasive influence of environmental readings of waste—when waste is just waste it remains uneconomized, just stuff that is unjustly dumped. The second is the effect of prevailing framings of economies in heterodox accounts. They still tend to frame manufacturing activity as based on primary resource extraction and as connected inexorably to consumption and then disposal, thereby occluding the extended economic and social lives of things, as well as materials. New research challenges both these understandings. It shows that what might be termed wastes in one part of the world are part of intricate resource supply chains in another, and this research has done much to unravel the workings of the back end of the value chain. That said, major changes are occurring in resource reclamation and recovery, which all require further research. Four are particularly important.

First, as the economies of the lower and middle income countries have grown, so too have the numbers of urban, middle class consumers in these countries. Their discarded goods now form an important, and growing, part of the resource reclamation supply chain. Indeed, the UN-StEP project indicates that the majority of e-waste now comes from non-OECD countries. Harvesting activities, therefore, are no longer confined to the Global North, and there is not only evidence of networks of Chinese traders in Africa (172) but also of African (Nigerian) traders in China. Further research is required to document emergent research on South–South material flows, to establish how enhanced competition affects trader activities, and how firms supplying them respond to increased competition for their scrap.

Second, environmental policy within the EU is intended to constitute sustainable "green," circular economies within the EU (81, 173). It seeks to sequester all wastes within the boundaries of the EU, seeing these as secondary resources that can be recovered for European manufacturing. These visions attempt a relocalization of resource reclamation. To justify this, they draw on global environmental justice accounts, to depict recycling in lower income countries as "dirty" and "dangerous" and contrast this with "high-tech" and "clean" European forms of ecological modernization. New research has begun to challenge these assumptions, by focusing on recycling labor in "rich" countries (174); however, more research on this is required, not least to counter the heavily technical and celebratory emphasis in the literature on ecological modernization. More recent research is also pointing to the difficulties of turning wastes to resources in the Global North and thus to the difficulties of enacting circular economies (81). It has shown how the financial imperative to rapid volume processing tends to the production of low-grade products, which are rejected by European manufacturers, and the difficulties that recycled products can face when in competition with established products. There is a need for more research on the longer term market trajectory of these protoproducts and, at the same time, for research to examine the inter-relations between recovery-for-recycling and the carbon-incentivized energy-from-waste market.

Third, there is the geopolitical challenge of resources in a multipolar world. China, like Taiwan before it (175), has shown how secondary resources can power development, and several other lower income countries are following suit. At the same time, arguments for sequestering wastes for resource recovery in the EU, as well as for the mining of wastes (through, for example, recasting landfills as urban mines), are receiving a considerable boost through political concerns about growing resource scarcity in relation to key metals and minerals (e.g., the rare earths). This adds to further concerns about resource insecurity. Seen through this lens, resource sequestration within the EU is a new form of mercantilism, in which the EU's version of ecological modernization is increasingly pitched against the secondary resource recovery of China and other lower income countries. There is a need for more research to examine resource reclamation as a geopolitical, as well as an environmental, phenomenon.

Fourth, and finally, there are the changes to recycling activities occurring in lower income countries. Two tendencies are worth further investigation. These are, firstly, the increasing concentration of capital in the sector. This includes the following: the rise of global waste management, and waste-to-resource business and its connection with technology transfer, the development of "cleaner" forms of recycling in the Global South, and their effects on recycling labor. Second, there is the effect of attempts to regulate and upgrade recycling labor in lower income countries. Although one effect has been to push the race to the bottom, another has been to threaten livelihoods. Thus, attempts to license e-waste trading in Bengaluru have effectively worked to dispossess what had been a sector dominated by small Muslim-owned firms and replaced them with a few government-approved, large Hindu ones (176). Both tendencies complicate the representation of recycling in developing countries that prevails in the current literature. In charting an ecological

modernization in the South, they also pose a challenge to the North-South dichotomies that underpin the current global politics of resource reclamation and recovery.

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LITERATURE CITED

1. Mohai P, Pellow D, Roberts J. 2009. Environmental justice. *Annu. Rev. Environ. Resour.* 34:405–30
2. Schlosberg D. 2004. Reconceiving environmental justice: global movements and political theory. *Environ. Polit.* 13(3):517–40
3. McDonald S, Oates C. 2003. Reasons for non-participation in a kerbside recycling scheme. *Resour. Conserv. Recycl.* 39(4):369–85
4. Robinson G, Read A. 2005. Recycling behaviour in a London borough: results from large-scale household surveys. *Resour. Conserv. Recycl.* 45(1):70–83
5. Tudor T, Robinson G, Riley M, Guilbert S, Barr S. 2011. Challenges facing the sustainable consumption of waste management: perspectives on UK households. *Local Environ.* 16(1):51–66
6. Barr S, Gilg A. 2006. Sustainable lifestyles: framing environmental action around the home. *Geoforum* 37(6):906–20
7. Davoudi S, Evans N. 2005. The challenge of governance in regional waste planning. *Environ. Plan. C* 24(5):681–700
8. Bulkeley H, Watson M, Hudson R. 2007. Modes of governing municipal waste. *Environ. Plan. A* 41 (11):2733–53
9. Davies A. 2008. *Geographies of Garbage Governance: Interventions, Interactions and Outcomes*. Aldershot, UK: Ashgate
10. Gregson N, Metcalfe A, Crewe L. 2007. Identity, mobility and the throwaway society. *Environ. Plan. D* 25(4):682–700
11. Gregson N, Metcalfe A, Crewe L. 2007. Moving things along: the conduits and practices of divestment in consumption. *Trans. Inst. Br. Geogr.* 32(2):187–200
12. Hetherington K. 2004. Secondhandedness: consumption, disposal, and absent presence. *Environ. Plan. D* 22(1):157–73
13. Evans D. 2012. Beyond the throwaway society: ordinary domestic practice and a sociological approach to household food waste. *Sociology* 46(1):41–58
14. Myers G. 2005. *Disposable Cities: Garbage, Governance and Sustainable Development in Urban Africa*. Aldershot, UK: Ashgate
15. Medina M. 2000. Scavenger cooperatives in Asia and Latin America. *Resour. Conserv. Recycl.* 31:51–69
16. Medina M. 2007. *The World's Scavengers*. Lanham, MD: AltaMira Press
17. Wilson D, Velis C, Cheeseman C. 2006. Role of informal sector recycling in waste management in developing countries. *Habitat Int.* 30(4):797–808
18. Martuzzi M, Mitis F, Forastiere F. 2010. Inequalities, inequities, environmental justice in waste management and health. *Eur. J. Public Health* 20(1):21–26
19. Vergara S, Tchobanoglous G. 2012. Municipal solid waste and the environment: a global perspective. *Annu. Rev. Environ. Resour.* 37:277–309
20. Clapp J. 2001. *Toxic Exports: The Transfer of Hazardous Waste from Rich to Poor Countries*. Ithaca, NY: Cornell Univ. Press
21. Pellow D. 2007. *Resisting Global Toxics: Transnational Movements for Environmental Justice*. Cambridge, MA: MIT Press
22. Basel Action Network (BAN). 2002. *Exporting Harm: The High-Tech Trashing of Asia*. Seattle: BAN
23. Iles A. 2004. Mapping environmental justice in technology flows: computer waste impacts in Asia. *Glob. Environ. Polit.* 4(4):76–107

24. Minter A. 2013. *Junkyard Planet: Travels in the Billion Dollar Trash Trade*. London: Bloomsbury
25. Rivoli P. 2005. *Travels of a T-shirt in the Global Economy*. Oxford: Wiley
26. Gregson N, Crang M, Ahamed F, Akter N, Ferdous R. 2010. Following things of rubbish value: end-of-life ships, "chock-chocky" furniture and the Bangladeshi middle class consumer. *Geoforum* 41(6):846–54
27. Alexander C, Reno J, eds. 2012. *Economies of Recycling: The Global Transformation of Materials, Values and Social Relations*. London: Zed Books
28. Packard V. 2011 (1960). *The Waste Makers*. New York: Ig Publ.
29. Rodgers H. 2005. *Gone Tomorrow: The Hidden Life of Garbage*. New York: New Press
30. Royle E. 2005. *Garbage Land: On the Secret Trail of Trash*. New York: Back Bay Books
31. Humes E. 2012. *Garbology: Our Dirty Love Affair with Trash*. New York: Penguin
32. Do Valle P, Reis E, Menezes J, Rebelo E. 2004. Behavioural determinants of household recycling participation—the Portuguese case. *Environ. Behav.* 36(4):505–40
33. Martin H, Williams I, Clark M. 2006. Social, cultural and structural influences on household waste recycling: a case study. *Resour. Conserv. Recycl.* 48(4):357–95
34. Collins A, O'Doherty R, Snell M. 2006. Household participation in waste recycling: some national survey evidence from Scotland. *J. Environ. Plan. Manag.* 49(1):121–40
35. Nixon H, Saphores J-D. 2009. Information and the decision to recycle: results from a survey of US households. *J. Environ. Plan. Manag.* 52(2):257–77
36. Fiorillo D. 2013. Household waste recycling: national survey evidence from Italy. *J. Environ. Plan. Manag.* 56(8):1125–51
37. Gillespie R, Bennett J. 2013. Willingness to pay for kerbside recycling in Brisbane, Australia. *J. Environ. Plan. Manag.* 56(3):362–77
38. Byrne S, O'Regan B. 2014. Attitudes and actions towards recycling behaviours in the Limerick, Ireland region. *Resour. Conserv. Recycl.* 87:89–96
39. Robertson S, Walkington H. 2009. Recycling and waste minimisation behaviours of the transient student population in Oxford: results from an online survey. *Local Environ.* 14(4):285–96
40. Andrews A, Gregoire M, Rasmussen H, Witowich G. 2013. Comparison of recycling outcomes in three types of recycling collection units. *Waste Manag.* 33:530–35
41. Barr S, Shaw G, Gilg A. 2011. The policy and practice of "sustainable lifestyles." *J. Environ. Plan. Manag.* 54(10):1331–50
42. Thomas C, Sharp V. 2013. Understanding the normalisations of recycling behaviour and its implications for other pro-environmental behaviours. A review of social norms and recycling. *Resour. Conserv. Recycl.* 79:11–20
43. Shove E. 2010. Beyond the ABC: climate change policies and theories of social change. *Environ. Plan. A* 42(6):1273–85
44. Nixon H, Saphores J-D. 2009. Information and the decision to recycle: results from a survey of US households. *J. Environ. Plan. Manag.* 52(2):257–77
45. Evison T, Read A. 2001. Local authority recycling and waste—awareness publicity/promotion. *Resour. Conserv. Recycl.* 32(3/4):275–91
46. Timlett R, Williams I. 2008. Public participation and recycling performance in England: a comparison of tools for behaviour change. *Resour. Conserv. Recycl.* 52(4):622–34
47. Nomura H, John P, Cotterill S. 2011. The use of feedback to enhance environmental outcomes: a randomised control trial of a food waste scheme. *Local Environ.* 16(7):637–53
48. Read M, Gregory K, Phillips S. 2009. An evaluation of four key methods monitoring household waste prevention campaigns in the UK. *Resour. Conserv. Recycl.* 54(1):9–20
49. Zorpas A, Lasaridi K. 2013. Measuring waste prevention. *Waste Manag.* 33:1047–56
50. Tonglet M, Phillips P, Bates M. 2004. Determining the drivers for householder pro-environmental behaviour: waste minimisation compared to recycling. *Resour. Conserv. Recycl.* 42(1):27–48
51. Barr S. 2007. Factors influencing environmental attitudes and behaviours—a UK case study of household management. *Environ. Behav.* 39(4):435–73
52. Bortoleto A, Kurisu K, Hanake K. 2012. Model development for household waste prevention behaviour, *Waste Manag.* 32(12):2195–207

53. Farrelly T, Tucker C. 2014. Action research and residential waste minimisation in Palmerston North, New Zealand. *Resour. Conserv. Recycl.* 91:11–26
54. Himley M. 2008. Geographies of environmental governance: the nexus of nature and neoliberalism. *Geogr. Compass* 2(2):433–51
55. Petts J. 2001. Evaluating the effectiveness of deliberative processes: waste management case studies. *J. Environ. Plan. Manag.* 44(2):207–26
56. Petts J. 2004. Barriers to participation and deliberation in risk decisions: evidence from waste management. *J. Risk Res.* 7:115–33
57. Bulkeley H, Watson M, Hudson R, Weaver P. 2005. Governing municipal waste: towards a new analytical framework. *J. Environ. Policy Plan.* 7(1):1–23
58. Davies A. 2009. "Clean and green"? A governance analysis of waste management in New Zealand. *J. Environ. Plan. Manag.* 52(2):157–76
59. Lasaridi K. 2009. Implementing the Landfill Directive in Greece: problems, perspectives and lessons to be learned. *Geogr. J.* 175(4):261–73
60. Davies A, Fahy F, Taylor D. 2005. Mind the gap! Householder attitudes and actions towards waste in Ireland. *Ir. Geogr.* 38(2):151–68
61. De Feo G. 2014. Sociological survey in a municipality with a high level separate collection programme in an area of historic unpopularity. *Waste Manag.* 34:1369–80
62. Woolgar S, Neyland D. 2013. *Mundane Governance: Ontology and Accountability*. Oxford: Oxford Univ. Press
63. Davoudi S. 2009. Scalar tensions in the governance of waste: the resilience of state spatial Keynesianism. *J. Environ. Plan. Manag.* 52(2):137–56
64. Gregson N, Crang M. 2010. Materiality and waste: inorganic vitality in a networked world. *Environ. Plan. A* 42(5):1026–35
65. Douglas M. 1966. *Purity and Danger*. London: Routledge, Kegan Paul
66. Thompson M. 1979. *Rubbish Theory: The Creation and Destruction of Value*. Oxford: Oxford Univ. Press
67. Rathje W, Murphy C. 1992. *Rubbish: The Archaeology of Garbage*. New York: Harper Collins
68. Strasser S. 1999. *Waste and Want: The Social History of Trash*. London: Metrop. Books
69. Gregson N. 2007. *Living with Things: Accommodation, Ridding, Dwelling*. Oxford: Sean Kingston Publ.
70. Evans D. 2011. Blaming the consumer—once again: the social and material contexts of everyday food waste practices in some English households. *Crit. Public Health* 21(4):429–40
71. Evans D. 2012. Binning, gifting and recovery: the conduits of disposal in household food consumption. *Environ. Plan. D* 30(6):1123–37
72. Evans D. 2014. *Food Waste*. London: Bloomsbury
73. Gregson N, Crewe L. 2003. *Second-Hand Cultures*. Oxford: Berg
74. Lane R, Horne R, Bicknell J. 2009. Routes of reuse of second-hand goods in Melbourne households. *Aust. Geogr.* 40(2):151–68
75. Watson M, Lane R. 2011. Mapping geographies of reuse in Sheffield and Melbourne. In *Material Geographies of Household Sustainability*, ed. R Lane, A Gorman-Murray, pp. 133–56. Farnham, UK: Ashgate
76. Watson M, Meah A. 2012. Food, waste and safety: negotiating conflicting social anxieties into the practices of domestic provisioning. *Sociol. Rev.* 60(S2):102–20
77. Bulkeley H, Gregson N. 2009. Crossing the threshold: municipal waste policy and household waste generation. *Environ. Plan. A* 41(4):921–45
78. Gregson N, Crang M, Laws J, Fleetwood T, Holmes H. 2013. Moving up the waste hierarchy: car boot sales, reuse exchange and the challenges of consumer culture to waste prevention. *Resour. Conserv. Recycl.* 77:97–107
79. Chappells H, Shove E. 1999. The dustbin: a study of domestic waste, household practices and utility services. *Int. Plan. Stud.* 4(2):267–80
80. O'Brien M. 2012. A "lasting transformation" of capitalist surplus: from food stocks to feedstocks. *Sociol. Rev.* 60(S2):192–211
81. Gregson N, Crang M, Fuller S, Holmes H. 2015. Interrogating the circular economy: the moral economy of resource recovery in the EU. *Econ. Soc.* 44(2):218–43

82. Ferrell J. 2006. *Empire of Scrounge*. New York: N.Y. Univ. Press
83. Edwards F, Mercer D. 2007. Gleaning from gluttony: an Australian youth subculture confronts the ethics of waste. *Aust. Geogr.* 38(3):279–96
84. Barnard A. 2011. "Waving the banana" at capitalism: political theatre and social movement strategy among New York's "freegan" dumpster divers. *Ethnography* 12(4):419–44
85. Lane, R. 2011. The waste commons in an emerging resource recovery waste regime: contesting property and value in Melbourne's hard rubbish collections. *Geogr. Res.* 49(4):395–407
86. Gille Z. 2007. *From the Cult of Waste to the Trash Heap of History: The Politics of Waste in Socialist and Post-Socialist Hungary*. Bloomington, IN: Indiana Univ. Press
87. Cooper T. 2010. Burying the "refuse revolution": the rise of controlled tipping in Britain, 1920–1960. *Environ. Plan. A* 42(5):1033–48
88. Gille Z. 2010. Actor networks, modes of production, and waste regimes: reassembling the macro-social. *Environ. Plan. A* 42(5):1049–64
89. Zhuang Y, Wang Y-L, Wu W-X, Chen Y-X. 2008. Source separation of household waste: a case study in China. *Waste Manag.* 28(10):2022–30
90. Afroz R, Tudin R, Hanaki K, Masud M. 2011. Selected socio-economic factors affecting the willingness to minimise solid waste in Dhaka city, Bangladesh. *J. Environ. Plan. Manag.* 54(6):711–31
91. Mbiba M. 2014. Urban solid waste characteristics and household appetite for separation at source in Eastern and Southern Africa. *Habitat Int.* 43:152–62
92. Zen I, Noor Z, Yusuf R. 2014. The profiles of household solid waste recyclers and non-recyclers. *Habitat Int.* 42:83–69
93. Dwivedy, M, Mittal RK. 2013. Willingness of residents to participate in e-waste recycling in India. *Environ. Dev.* 6:48–68
94. Birkbeck C. 1978. Self-employed proletarians in an informal factory: the case of Cali's garbage dump. *World Dev.* 6(9/10):1177–86
95. Furedy C. 1984. Survival strategies of the urban poor—scavenging and recuperation in Calcutta. *GeoJournal* 8(2):129–36
96. Tevere D. 1994. Dump scavenging in Gaborone, Botswana: anachronism or refugee occupation of the poor. *Geografiska Ann.* 76(B):21–32
97. Beall J. 1997. Thoughts on poverty from a South Asian rubbish dump: gender, inequality and household waste. *IDS Bull.* 28(3):73–90
98. Fredericks R. 2013. Disorderly Dakar: the cultural politics of household waste in Senegal's capital city. *J. Mod. Afr. Stud.* 51(3):435–58
99. Moore S. 2008. The politics of garbage in Oxaca, Mexico. *Soc. Nat. Resour.* 21(7):597–610
100. Agunwamba J. 2003. Analysis of scavengers' activities and recycling in some cities in Nigeria. *Environ. Manag.* 32(1):116–27
101. Hayami Y, Dikshit A, Mishra S. 2006. Waste pickers in Delhi. *J. Dev. Stud.* 42(1):41–69
102. Masocha M. 2006. Informal waste harvesting in Victoria Falls town, Zimbabwe: socio-economic benefits. *Habitat Int.* 30:838–48
103. Afon A. 2012. A survey of operational characteristics, socioeconomic and health effects of scavenging activities in Lagos, Nigeria. *Waste Manag. Res.* 30(7):664–71
104. Asim M, Batool S, Chaudry M. 2012. Scavengers and their role in the recycling of waste in SW Lahore. *Resour. Conserv. Recycl.* 58:152–62
105. Agarwal A, Singhmar A, Kulshrestha M, Mittal A. 2005. Municipal solid waste recycling and associated markets in Delhi, India. *Resour. Conserv. Recycl.* 44(1):73–90
106. Fergutz O, Dias S, Mitlin D. 2011. Developing urban waste management in Brazil with waste picker organisations. *Environ. Urban.* 23(2):597–608
107. Paul J, Arce-Jaque J, Ravena N, Villamor S. 2012. Integration of the informal sector into municipal solid waste management in the Philippines—what does it need? *Waste Manag.* 32(11):2018–28
108. Ezeah C, Fazakerley J, Roberts C. 2013. Emerging trends in informal sector recycling in developing and transition countries. *Waste Manag.* 33(11):2509–19
109. Tirado-Soto M, Zamberlan F. 2013. Networks of recyclable material waste-pickers cooperatives: an alternative for the solid waste management in the city of Rio de Janeiro. *Waste Manag.* 33:1004–12

110. Gutberlet J. 2008. Empowering collective recycling initiatives: video documentation and action research with a recycling co-op in Brazil. *Resour. Conserv. Recycl.* 52(4):657–78
111. Nzeadibe T. 2009. Solid waste reforms and informal recycling in Enuga urban area, Nigeria. *Habitat Int.* 33(1):93–99
112. Zapata-Campos M, Zapata P. 2013. Switching Managua on! Connecting informal settlements to the formal city through household waste collection. *Environ. Urban.* 25(1):225–42
113. Beall J. 2006. Dealing with dirt and the disorder of development: managing rubbish in urban Pakistan. *Oxf. Dev. Stud.* 34(1):81–97
114. Whitson R. 2011. Negotiating place and value: geographies of waste and scavenging in Buenos Aires. *Antipode* 43(4):1404–33
115. Miraftab F. 2004. Neoliberalism and casualisation of public sector services: the case of waste collection services in Cape Town, South Africa. *Int. J. Urban Reg. Res.* 28(4):874–92
116. Fahmi W. 2005. The impact of privatisation of solid waste management on the Zabaleen garbage collectors of Cairo. *Environ. Urban.* 17(2):155–70
117. Fahmi W, Sutton K. 2006. Cairo's Zabaleen garbage recyclers: multinationals takeover and state relocation plans. *Habitat Int.* 30(4):809–37
118. Mitchell C. 2008. Altered landscapes, altered livelihoods: the shifting experience of informal waste collecting during Hanoi's urban transition. *Geoforum* 39(6):2019–29
119. Furniss J. 2010. Private sector reform of Egyptian solid waste management. In *Participation for What: Social Change or Social Control?*, ed. GM Gómez, AA Corradi, P Goulart, R Namara, pp. 52–75. The Hague, Neth.: ISS, Hivos
120. Bjerkli C. 2013. Governance on the ground: a study of solid waste management in Addis Ababa, Ethiopia. *Int. J. Urban Reg. Res.* 37(4):1273–87
121. Sternberg C. 2013. From "cartoneros" to "recolectores urbanos": the changing rhetoric and urban waste management policies in Buenos Aires. *Geoforum* 48:187–95
122. Obeng-Odoom F. 2014. Green neoliberalism: recycling and sustainable urban development in Sekondi-Takoradi. *Habitat Int.* 41:129–34
123. Gill K. 2007. Interlinked contracts and social power: patronage and exploitation in Delhi's waste recovery market. *J. Dev. Stud.* 43(8):1448–74
124. Gill K. 2012. *Of Poverty and Plastic: Scavenging and Scrap Trading Entrepreneurs in India's Informal Economy*. New Delhi, India: Oxford Univ. Press
125. Sasaki S, Araki T. 2013. Employer-employee and buyer-seller relationships among waste pickers at final disposal site in informal recycling: the case of Bantar Gebang in Indonesia. *Habitat Int.* 40:51–57
126. Zapata-Campos M, Zapata P. 2014. The travel of global ideas of waste management: the case of Managua and its informal settlements. *Habitat Int.* 41:41–49
127. Walker G. 2009. Globalizing environmental justice: the geography and politics of frame contextualisation and evolution. *Glob. Soc. Policy* 9(3):355–82
128. Bullard R. 1990. *Dumping in Dixie*. Boulder, CO: Westview Press
129. Rootes C. 2009. Environmental movements, waste and waste infrastructure: an introduction. *Environ. Polit.* 18(6):817–34
130. Bullard R. ed. 2005. *The Quest for Environmental Justice: Human rights and the Politics of Pollution*. San Francisco: Sierra Club Books
131. Hipp J, Lakon C. 2010. Social disparities in health: disproportionate toxicity proximity in minority communities over a decade. *Health Place* 16(4):674–83
132. Singer M. 2011. Down Cancer Alley: the lived experience of health and environmental suffering in Louisiana's chemical corridor. *Med. Anthropol. Q.* 25(2):141–63
133. Boone C, Fragkias M, Buckley G, Grove M. 2014. A long view of polluting industry and environmental justice in Baltimore. *Cities* 36(31):41–49
134. United Church Christ's Comm. Racial Justice. 1987. *Toxic Waste and Race in the US*. New York: United Church of Christ
135. Pulido L. 2000. Rethinking environmental racism: white privilege and urban development in Southern California. *Ann. Assoc. Am. Geogr.* 90(1):12–40

136. Baabereyir A, Jewitt S, O'Hara S. 2012. Dumping on the poor: the ecological distribution of Accra's solid waste burden. *Environ. Plan. A* 44(2):297–314
137. Oteng-Agabio M. 2013. Unscripted (in)justice: exposure to ecological hazards in metropolitan Accra. *Environ. Plan. A* 45(5):1199–218
138. Carruthers D, ed. 2008. *Environmental Justice in Latin America: Problems, Promise and Practice*. Cambridge, MA: MIT Press
139. Frey R. 2003. The transfer of core-based hazardous production processes to the export processing zones of the periphery: the maquiladora centres of Northern Mexico. *J. World Syst. Res.* IX:317–54
140. Carruthers D. 2008. The globalization of environmental justice: lessons from the US-Mexico border. *Soc. Nat. Resour.* 21(7):556–68
141. Johnson M, Niemeyer E. 2008. Ambivalent landscapes: environmental justice in the US-Mexico borderlands. *Hum. Ecol.* 36(3):371–82
142. Lara-Valencia F, Harlow S, Lemos M, Denman C. 2009. Early dimensions of hazardous waste generation in rapidly industrialising cities along the US border. *J. Environ. Plan. Manag.* 52(2):195–216
143. Grineski S, Collins T. 2008. Exploring patterns of environmental injustice in the Global South: *maquiladoras* in Ciudad Juárez, Mexico. *Popul. Environ.* 29(6):247–70
144. Grineski S, Collins T. 2010. Environmental injustice in transnational context: urbanisation and industrial hazards in El Paso/Ciudad Juárez. *Environ. Plan. A* 42(6):1308–27
145. Pellow D. 2008. The global waste trade and environmental justice struggles. In *Handbook on Trade and the Environment*, ed. R Gallagher, pp. 225–33. Aldershot, UK: Edward Elgar
146. Kellenberg D. 2012. Trading wastes. *J. Environ. Econ. Manag.* 64(1):68–87
147. Margai F, Barry F. 2011. Global geographies of environmental injustice and health: a case study of illegal hazardous waste dumping in Cote d'Ivoire. In *Geospatial Analysis of Environmental Health*, ed. J Maantay, S McLafferty, pp. 257–81. Amsterdam: Springer
148. Lepawsky J, McNabb C. 2010. Mapping the international trade and traffic of electronic waste. *Can. Geogr.* 54(2):177–95
149. Lepawsky J. 2015. The changing geography of global trade in electronic discards: time to rethink the e-waste problem. *Geogr. J.* 181:147–59
150. Lepawsky J. 2015. Are we living in a post-Basel world? *Area* 47(1):7–15
151. Crang M. 2010. The death of great ships: photography, politics and waste in the global imaginary. *Environ. Plan. A* 42(5):1084–102
152. Kellow A. 1999. Baptists and bootleggers? The Basel Convention and metals recycling trade. *Agenda* 6(1):29–38
153. Lyons D, Rice M, Wachal R. 2009. Circuits of scrap: closed loop industrial ecosystems and the geography of US international recyclable flows, 1995–2005. *Geogr. J.* 175(4):286–300
154. Brooks A. 2015. *Clothing Poverty: The Hidden World of Fast Fashion and Second-Hand Goods*. London: Zed Books
155. Abimbola O. 2012. The international trade in secondhand clothing: managing information asymmetry between West African and British traders. *Textile* 10(2):184–99
156. Botticello J. 2012. Between classification, objectification and perception: processing secondhand clothing for recycling and reuse. *Textile* 10(2):164–83
157. Tranberg-Hansen K. 2000. *Salaula: The World of Secondhand Clothing and Zambia*. Chicago: Univ. Chicago Press
158. Norris L. 2012. Shoddy rags and relief blankets: perceptions of textile recycling in North India. See Ref. 27, pp. 35–58
159. Brooks A. 2012. Networks of power and corruption: the trade of used Japanese cars to Mozambique. *Geogr. J.* 178(1):80–92
160. Beuving J. 2006. Nigerian second-hand car traders in Cotonou: a sociocultural analysis of economic decision-making. *Afr. Aff.* 105(3):353–73
161. Brooks A. 2013. Stretching global production networks: the international second-hand clothing trade. *Geoforum* 44:10–22
162. Crang M, Hughes A, Gregson N, Ahamed F, Norris L. 2013. Rethinking governance and value in commodity chains through global recycling networks. *Trans. Inst. Br. Geogr.* 38(1):12–24

163. Lawhon M. 2012. Power, trust and legitimacy in the governance of South African e-waste transition. *Environ. Plan. A* 44(4):954–71
164. Lepawsky J. 2012. Legal geographies of e-waste legislation in Canada and the US: jurisdiction, responsibility and the taboo of production. *Geoforum* 43:1194–206
165. Pickren G. 2014. Political ecologies of electronic waste: uncertainty and legitimacy in the governance of e-waste geographies. *Environ. Plan. A* 46(1):26–45
166. Bisschop L. 2012. Is it all going to waste? Illegal transports of e-waste in a European trade hub. *Crime Law Soc. Change* 58:221–49
167. Brooks A, Simon D. 2012. Unravelling the relationship between used-clothing imports and the decline of African clothing industries. *Dev. Change* 43(6):1265–90
168. Gregson N, Crang M, Ahamed F, Akter N, Ferdous R, et al. 2012. Territorial agglomeration and industrial symbiosis: Sitakunda-Bhatiary, Bangladesh as a secondary processing complex. *Econ. Geogr.* 88(1):37–58
169. Gibbs D, Deutz P. 2005. Implementing industrial ecology? Planning for eco-industrial parks in the USA. *Geoforum* 36(4):452–64
170. Tong X, Li J, Tao D, Cai Y. 2015. Re-making spaces of conversion: deconstructing discourses of e-waste recycling in China. *Area* 47(1):31–39
171. Gregson N, Watkins H, Calestani M. 2013. Political markets: recycling, economization and marketization. *Econ. Soc.* 42(1):1–25
172. Furniss J. 2015. Alternative framings of transnational waste flows: reflections based on the Egypt-China PET plastic trade. *Area* 47(1):24–30
173. Kama K. 2015. Circling the economy: resource-making and marketization in EU electronic waste policy. *Area* 47(1):16–23
174. Gregson N, Crang M, Botticello J, Calestani M, Krzywozynska A. 2014. Doing the "dirty" work of the green economy: resource recovery and migrant labour in the EU. *Eur. Urban Reg. Stud.* doi: 10.1177/0969776414554489. **http://eur.sagepub.com/content/early/2014/10/29/0969776414554489**
175. Terao T. 2005. The rise and fall of "mixed metal scrap" recovery industry in Taiwan: international trade of scraps and transboundary relocation of the business. In *International Trade of Recyclable Resources in Asia*, ed. M. Kojima, pp. 63–84. Chiba, Jpn.: JETRO
176. Reddy R. 2013. Revitalising economies of disassembly. *Econ. Polit. Wkly.* 48(13):63–71

Erratum

RELATED RESOURCES

1. The *Atlas of Economic Complexity* and the *Observatory of Economic Complexity* databases, based on UN Comtrade data, and hosted on servers at Harvard and MIT, provide numerous visualization tools for international trade data. Examining them for some of the secondary resources discussed in this article can show growth in flows over time and key sources and markets. The following examples are germane to the article:

   - Import origins of recovered paper to China (1995–2012): **http://atlas.media.mit.edu/explore/stacked/hs/import/chn/show/4707/1995.2012/**
   - Products that the United States exports to China (2010): **http://atlas.media.mit.edu/explore/tree_map/hs/export/usa/chn/show/2010/**
   - Countries that export scrap copper (2010): **http://atlas.media.mit.edu/explore/tree_map/hs/export/show/all/7404/2010/**
   - Countries that import scrap copper (2010): **http://atlas.media.mit.edu/explore/tree_map/hs/import/show/all/7404/2010/**
   - Countries that export used clothing (2010): **http://atlas.media.mit.edu/explore/geo_map/hs/export/show/all/6309/2010/**

- Countries that import used clothing (2010):
  http://atlas.media.mit.edu/explore/geo_map/hs/import/show/all/6309/2010/

2. There are numerous online examples of NGO campaigns against the trade in global wastes, such as the short film on the Bangladeshi shipbreaking industry—germane to Section 4.2 of this article—featuring the NGO Shipbreaking Platform: National Geographic. 2014. *Where Ships Go to Die: Workers Risk Everything.* **http://www.youtube.com/watch?v=WOmtFN1bfZ8**.
3. The travels of used clothing have attracted considerable attention amongst investigative journalists and filmmakers, as well as academic researchers. The following are examples of this work:

   - The journey of used clothing to Panipat (India) and the women who work in the textile recycling factories there:
     Gupta M, Berardi G. 2012. *Unravel*. London: Soul Rebel Films. **http://soulrebelfilms.com/project**
   - An investigation of what happens to clothing donated in the Global North, including tracking data:
     Rodger L. 2015. Where do your old clothes go? *BBC News*, Febr. 15. **http://www.bbc.co.uk/news/magazine-30227025**