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Why is rubbish building up in Khayelitsha?

An investigation into the contestation over Khayelitsha's refuse removal service

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Abstract

This paper explores the sources of inefficiency in the door-to-door refuse collection system supposedly provided to Khayelitsha's informal areas, and the behavioural determinants that influence whether residents respond by dumping their rubbish or taking it to the storage containers themselves. Drawing on qualitative research and the Khayelitsha Rodent Study's (KRS) representative survey of Site C, Khayelitsha, the refuse system's breakdown is attributed to unclear cleaner contracts, residents' aversion to leaving out rubbish bags, theft of delivered plastic bags, and insufficient information provided to residents about the service. Over a third of the KRS respondents in informal areas reported dumping their rubbish as their main method of refuse disposal. Using probit regression analysis, believing that one's neighbours do not criticize littering behaviour and a larger household size are associated with the most substantive increases in the average marginal probability that a household will dump its litter. The paper therefore recommends a revision of the current system, and more extensive education campaigns about littering consequences and the refuse removal service.

1. Introduction

Piles of rubbish, rodent infestations and contaminated water sources (and associated health risks) are characteristic of the informal areas of Site C, Khayelitsha. This paper investigates the history of, and contemporary contestation over, refuse removal in Site C in an attempt to understand some of the root causes of these unacceptable litter conditions. It shows that the City of Cape Town's Solid Waste Department, Khayelitsha's refuse removal contractor and Site C residents pass the proverbial buck in taking responsibility for these conditions and argues that a revision of the current door-to-door collection service supposedly provided to informal areas is required. The paper first explores the history of the door-to-door collection system, explains the switch

from skips to containers for storing rubbish in informal settlements, and reviews the available studies of refuse removal conducted internationally and in other informal settlements around South Africa. After highlighting the unsanitary conditions in which many Site C residents are forced to live, the paper draws on survey data and qualitative research to highlight four key reasons behind the breakdown of the door-to-door collection system: (i) unclear employment contracts for cleaners; (ii) resident preferences not to leave rubbish bags outside their homes; (iii) theft of plastic bags when they are delivered while residents are not home; and (iv) a lack of information given to residents about the refuse removal service to which they are entitled.

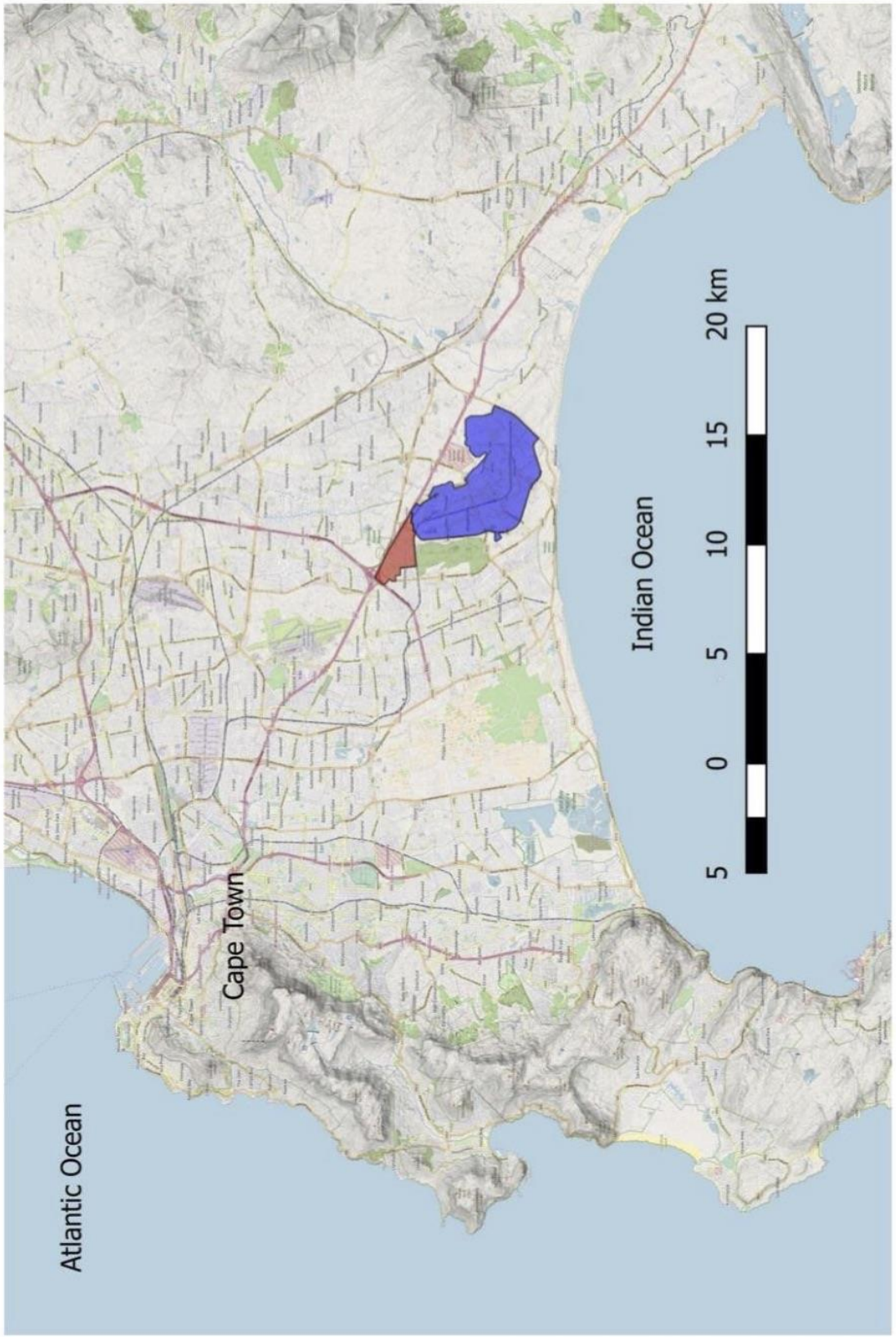
The study shows that the current system of rubbish collection does not function effectively and that as a result, many residents resort to dumping their rubbish or taking it to the large storage containers (provided by the government for use by contractors) themselves. Using probit regression analysis of the Khayelitsha Rodent Study (KRS) data set (CSSR and iCWild, 2018), this paper analyses why residents may choose the option of dumping their rubbish, pointing most significantly to the social attitudes of residents (particularly whether or not they believe their neighbours criticize littering behaviour) and household size. The paper recommends a revision of the door-to-door collection system and the creation of one that is better suited to the fact that many residents are not at home during the collection of rubbish and the delivery of plastic bags. Moreover, residents must be more adequately educated about waste management and the services to which they are entitled.

2. Methodology

This study uses a combination of quantitative and qualitative methods to assess the underlying causes of the failure of the door-to-door refuse collection service in Site C, Khayelitsha and to explore the reasons behind why some residents consequently choose to dump their rubbish instead of taking it to the containers.

In its quantitative approach, this paper uses survey data from the KRS, which was collected by the University of Cape Town's Centre for Social Science Research (CSSR) in 2017 from a representative sample of 222 households in Site C, Khayelitsha (coloured in red in Figure 1).

Figure 1: Map of surveyed Site C (Ikhwezi Park) areas



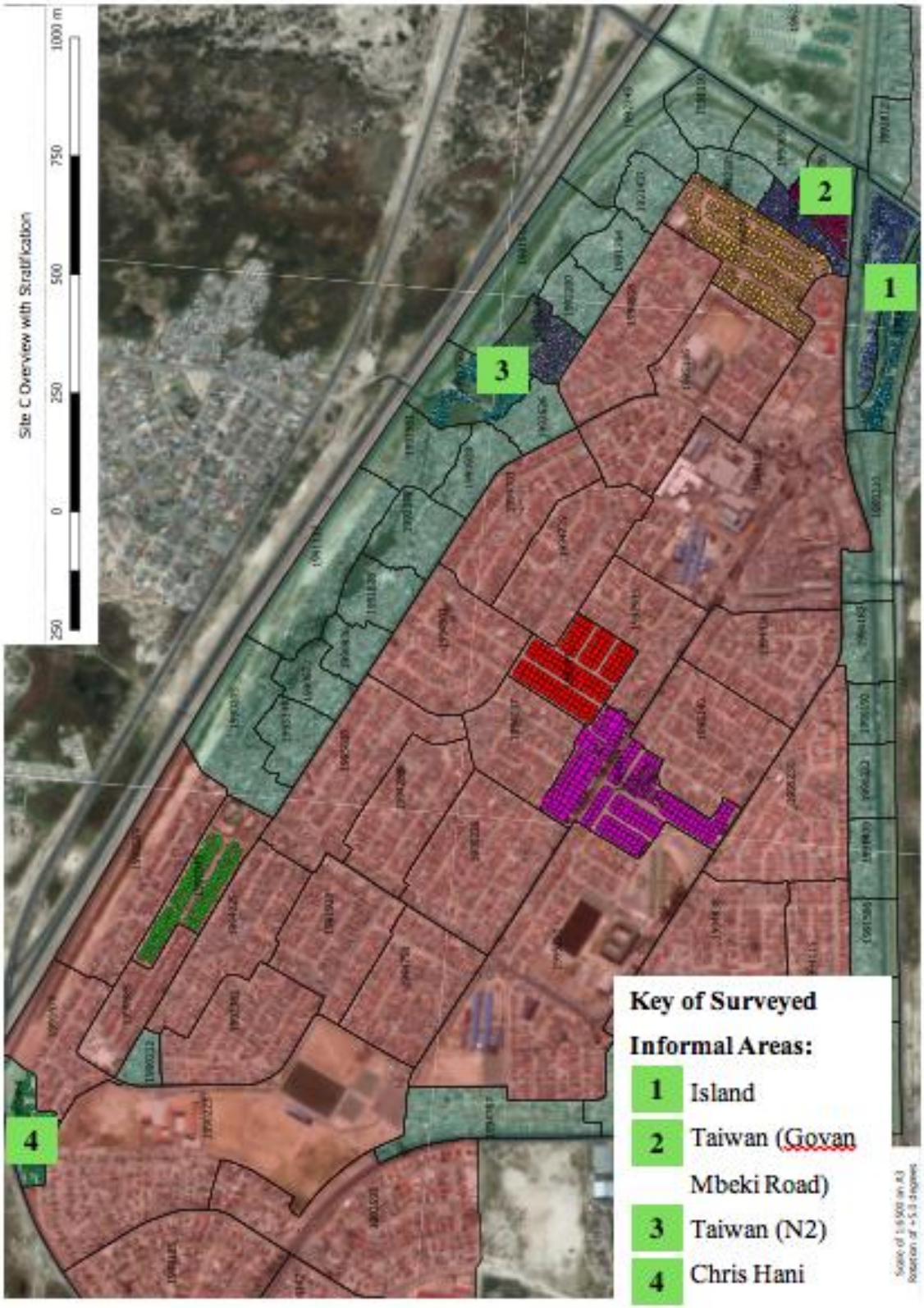
Source: Nattrass, Stephens & Loubser, 2018

The KRS employed two-stage stratified random sampling. After stratifying the 'small areas' (a census classification) of Site C according to whether they contain formal or informal housing, four formal and seven informal areas were randomly selected. Thereafter, approximately 15 to 20 dwellings from each area were randomly selected to be surveyed. This two-stage stratification as well as the names given to each informal area are highlighted in Figure 2. The selection of the respondents was non-random, however, insofar as respondents were chosen simply as the household member who came to the door. Since interviews were conducted during the day, this respondent selection could be biased against employed individuals, for example, who would not have been present to take the interview. This survey aimed to gather information on the experiences and behaviour of households with regard to rodent infestation, public service delivery, and socioeconomic conditions and was, according to Nattrass, Stephens and Loubser (2018:4), the "first representative survey of rodent infestation and control in Cape Town."

This paper also uses qualitative research methods, notably ethnographic observations from two site inspections of Site C, drawing on secondary sources in the form of news reports, tender documents and government policy documents, consultation with the City of Cape Town's Solid Waste Department, and an organised focus group discussion with seven respondents from the KRS survey. Qualitative responses from the survey as well as discussions with residents during the two site inspections also informed the research. Research ethics clearance was obtained from UCT's School of Economics[1].

[1] Research Ethics Clearance number: 005/2018.

Figure 2: Map of surveyed Site C (Ikhwezi Park) areas with stratification



Site C sampled area with red areas representing formal housing and green areas representing informal housing. Households are outlined within each sampled small area. *[Map produced by Jed Stephens].*

3. A brief history of Khayelitsha's contested rubbish removal policy for informal settlements

The informal settlements of Khayelitsha have long been characterized by ineffective refuse removal systems and excessive levels of litter. According to the 2011 census, 55 percent of Khayelitsha households live in informal areas (Statistics South Africa, 2013:2). While households in formal settlements are issued a 240 litre 'wheelie bin' which is emptied for them once per week using garbage compactor vehicles, households in informal settlements, which are typically not accessible by road, are supposedly serviced by a door-to-door black bag collection system. Similar to the delegated management models for water services in the Philippines, Tanzania and Kenya (Castro & Morel, 2008:294), this system for informal settlements in Khayelitsha is governed by contracts between private contractors and the City of Cape Town.

Cape Town's approach was initially adopted as the 'Billy Hattingh Scheme' in the 1990s when Billy Hattingh & Associates, a private company promoting small enterprise development, proposed it to the City Council as a cheaper way of collecting rubbish (Qotole *et al*, 2001:9). At the time, City managers were complaining about a lack of productivity (and discipline) among Council refuse workers. Local residents (supported by the South African National Civics Association (SANCO)) were also aggrieved by poor service delivery and similarly blamed Council workers *(ibid.:*11-12). After various local consultations, the City of Cape Town opted for the Billy Hattingh Scheme, promoting it on the grounds that it would empower local entrepreneurs who would hire local unemployed people (at wages lower than paid to Council workers) to collect refuse (*ibid.:*13-14). The South African Municipal Workers Union challenged the outsourcing decision, but ultimately unsuccessfully (*ibid.:*15).

Initial assessments of the Billy Hattingh Scheme were positive and productivity (in terms of tons of refuse collected from Khayelitsha) increased from seven tons a day (when collected by Council workers) to 42 tons a day under the new scheme (*ibid.:*16). The National Business Initiative found that the incomes of entrepreneurs and the newly employed workers had improved (cited in *ibid.:*16). Khayelitsha's council operations manager, however, complained in 2000 that entrepreneurs had been appointed with inadequate background knowledge in waste management and thus sometimes performed below the expected standard, that the system was unsuitable for all refuse removal functions, such as, in the collection of builder's rubble, and that the sub-contracted entrepreneurs stopped collecting refuse door to door (cited in *ibid.*:16-17). Subsequent interviews with entrepreneurs revealed that this was, indeed, the case, and gave the unlikely

reason that residents sometimes put their clothes in the black refuse bags which were then collected by mistake (Qotole *et al*, 2001:17). Qotole, Xali and Barchiesi (*ibid:*18) concur with the criticism, arguing (from a pro-labour and anti-privatisation perspective) that it would have been preferable to solve the 'management' problems concerning Council workers and not to outsource the service.

The Billy Hattingh scheme came to an end in 2005 and since 2006, Khayelitsha's informal settlements have been managed by six private contractors, each responsible for particular areas of Khayelitsha (Western Cape Government, 2006). Each contractor is responsible for employing cleaners to collect refuse from households and to store it in large shipping containers placed at convenient points in or near informal settlements. Another outsourced refuse collection company then collects the rubbish from the rubbish storage containers by truck.

In 2006/7, the City (assisted by Tedcor) also replaced the skips (used by the Billy Hattingh scheme to store the collected rubbish) with shipping containers. Councillor Xanthea Limberg, the Mayoral Committee Member for Informal Settlements, Water and Waste Services, and Energy, said that skips had become unsuitable since residents were using them to dispose of human bodies and animal carcasses, as well as to burn items for the extraction of different metals, such as copper [Personal Communication, 25/06/2018] [2]. Containers were positioned on the side of the road by City officials to ensure that they are easily accessible to refuse collection trucks, while still being in close enough proximity to informal households to enable cleaners to carry bags of refuse bags from shacks to the containers. The City aimed to provide one six metre container per approximately 400 dwellings, yet there remain areas, such as Site C's 'Taiwan' bordering the N2, that do not have any containers. According to Limberg, these areas do not have sufficient space for the placement of a container and so instead, these areas have designated 'collection points' which are supposed to be serviced three times per week [Personal Communication, 25/06/2018].

Unfortunately, refuse removal services remained unsatisfactory. In 2012, Mayor Patricia de Lille argued that "the quality of the [refuse removal] service [in informal settlements] is dropping because there's no monitoring from the City's side" (Notywala, 2014). The Social Justice Coalition (SJC) subsequently investigated expenditure and monitoring of refuse removal in Khayelitsha's informal settlements. Its report, *Wasteful Expenditure: Report of the Khayelitsha*

[2] This information was attained through email correspondence with the City of Cape Town's Solid Waste Department who attributed their interview responses to Councillor Xanthea Limberg.

Refuse Removal and Area Cleaning Social Audit of 2013, was testament to this "dropping quality." In a week-long social audit, the SJC interviewed 464 residents and 77 cleaners across 23 informal settlements – prompting the SJC to ask the City of Cape Town why it was "paying millions of Rands for a service that is not being delivered" (SJC & Ndifuna Ukwazi, 2014:4). The SJC accused the refuse collection contractors of failing to collect rubbish from dwellings, to provide two free rubbish bags to residents on a weekly basis, to clean and service the rubbish storage containers, to provide workers with adequate cleaning gear, and to inform residents adequately about the refuse services to which they are entitled (*ibid.*:6).

Similar systems have been used in rural areas internationally. In small municipalities of Kolkata, India, for example, residents have their rubbish collected from their door and then stored in "open storage enclosures or dumpers" before being collected by truck (Hazra & Goel, 2009:471). Residents complained, however, about the poor conditions of the containers and their surroundings, and the unsanitary working conditions for rubbish collectors (*ibid.*:471). In Tha Khon Yang, Thailand, residents are required to take their rubbish to stationary, roadside bins which are emptied daily by truck (Yukalang, Clarke & Ross, 2017:2). Having conducted three focus groups and 28 interviews with residents, administrators, organisations and academics in the area, Yukalang *et al.* highlighted the insufficient number of collection points, the infrequency of rubbish collection, the lack of community participation in meetings regarding waste management, and a general lack of information about the system as some of the key barriers preventing effective refuse management (*ibid.*:11-12). Most studies looking at the behaviour of people who litter are not focused in informal areas like these, however. For example, Al-Mosa, Parkinson and Rundle-Thiele (2017) observed 362 people in three parks in Saudi Arabia and found a 48.9 percent litter rate. They found that young adults and individuals in groups of fewer than five people were most likely to litter, that gender had no significant effect on littering behaviour, and that people were more likely to litter if they were further away from the rubbish bins (Al-Mosa *et al.*, 2017:245).

Moreover, there are very few published studies of attitudes and behaviour with regard to refuse disposal in informal settlements in South Africa. Aside from the SJC investigation, these date from the mid-2000s. Nshimirimana (2004) studied 160 respondents from the Lost City in Mitchell's Plain, and attributed the piling up of rubbish to a lack of information about domestic solid waste management, shortages of labour and suitable equipment in the Cleansing Department, and a lack of community and councillor involvement in the refuse management process. Nshimirimana highlighted the discrepancy between residents' attitudes and behaviours: despite 87 percent of the study's respondents reporting that they

felt disturbed seeing people throwing their waste around their residential area, and 98.4 percent declaring that it is very important that the environment is kept clean, many households still dumped their rubbish. Nshimirimana attributed this (vaguely) to poverty: "It is always very difficult to discuss waste with a hungry person" (Nshimirimana, 2004:39).

In 2004, Puling reported that 29 percent of households in the Lwandle township in the Helderberg Municipality of the Cape Metropolitan Area perceived rubbish collection as 'inadequate' due to the irregularity of the collections, the minimal removal of rubbish surrounding the skips, and the unhealthy conditions associated with the use of skips where residents were described as, for example, throwing human faeces into them. Puling (2004:79) argued that poor waste management was a by-product of other problems in the area, including unemployment, housing shortages, low levels of education, squatter camp conditions, and the poor socio-economic circumstances experienced by most households in the area.

A more recent but limited study was conducted by Nkosi (2015) in the City of Tshwane Metropolitan Municipality in the Mamelodi East Township of Gauteng. By interviewing 30 residents, two waste management officers and the waste collection contractor, Nkosi identified poor socio-economic status, rapid urbanization and low levels of education as the key determinants of illegal dumping (Nkosi, 2015:22). The study highlighted that 60 percent of residents believed that the frequency of waste collection was insufficient, and 90 percent reported knowing and frequently observing the people who dump their waste (*ibid.:*41). Finally, during site inspections, Nkosi observed 21 illegal dumps in the area, and identified nine of these as having a high public health risk potential (*ibid.:*31).

To the best of my knowledge, the only other published study of refuse disposal in informal settlements in South Africa was conducted in the Msunduzi Municipality of Pietermaritzburg, KwaZulu-Natal, between 2005 and 2007 using a survey of 622 households to examine household satisfaction with the area's refuse removal service and household's overall perspective on sustainable waste management (Naidoo, 2009). Naidoo found that only 45.5 percent of respondents claimed not to litter, and 18.1 percent of households reported that dumping or burning their rubbish was their main mechanism for refuse disposal (*ibid.:*86).

No research or social audits appear to have been conducted into the state of refuse removal services in Khayelitsha since the SJC's social audit in 2013. This paper aims to fill the gap by presenting an analysis of refuse management and removal services in a section of Khayelitsha (Site C) since the SJC raised its

concerns and called for policy change. The study forms part of the KRS which highlights refuse management as part of the "longer-run, sustainable solution" to the problem of rodent infestation (Nattrass *et al.,* 2018:23). The paper focuses in particular on what motivates some residents in under-serviced informal settlements to take refuse removal into their own hands by taking their rubbish directly to the containers, while others continue to dump their rubbish. The qualitative research focuses particularly on 'Island' (one of the informal small areas) as the issue of control over the rubbish containers has a bearing on whether respondents litter or not.

4. Poor sanitation, rodents and health risks

The litter problem that characterizes Site C's informal areas poses a number of health risks. Resultant rodent infestations can spread diseases such as leptospirosis, flea-borne typhus, salmonellosis and rat bite fever (Nshimirimana, 2004:6). Litter can block drains, resulting in stagnant and contaminated water to attract mosquitos (Puling, 2004:4) and when people resort to burning accumulated rubbish, this can be harmful to the respiratory systems of humans and animals (Smous, 2013). It can also have social ramifications, such as those found by the 2004 Mitchell's Plain survey that highlighted how respondents were worried that outsiders may believe that people living in littered areas are "dirty by nature" (Nshimirimana, 2004:34).

There was a clear consensus among the respondents of the KRS survey that rats and mice come from dirty areas, such as rubbish containers and the river, where food scraps can be found. This can be seen in Figure 3, a word cloud summarizing the most common words used by KRS survey respondents to describe the origins of rodent infestation in their area.

Figure 3: Word cloud of the most common origins of rodent infestations identified by KRS survey respondents

The problem of litter in Khayelitsha's informal areas also has environmental implications. The informal areas covered by the KRS survey include 'Island' (Area 1 in Map 2) and the side of 'Taiwan' (Area 3 on Map 2) adjacent to the N2 (national highway), which have a river and a wetland (the 'Enyhuniwhini' wetland), respectively. According to South Africa's governing party, the African National Congress (ANC), Khayelitsha was built during the apartheid era on land cleared for human settlement "without respect for the prevailing environmental conditions, such as the Kuils River" which is "resurfacing in the form of wetlands", providing sites for illegal dumping and "unsanitary" conditions (ANC, 2018). The results of illegal dumping in the river in 'Island' can be seen in Figure 4 below. Pigs can often be seen foraging amongst the garbage in the river. The river and wetlands are also associated with a toxic smell that is amplified in the heat, mosquitos and flies which pester residents, and floods during heavy rains (which can damage shacks). They are also seen as a dangerous area for night-time crimes.

Figure 4: Litter in the river that runs through 'Island'

Despite irregular, bi-annual clean ups by the City of Cape Town in which the rubbish is cleared and the reeds are cut, rubbish builds up again quickly. As a result, residents refer to the river and wetland with great disdain. For example, one 'Island' resident suggested that the City of Cape Town should "close down" the river to relieve 'Island' from the rats and mice, while a 'Taiwan' resident living near the wetland recalled a time when the City put rat poisons in the wetland, saying, "We were so free back then. We could breathe."[3]

[3] This was a qualitative answer by a respondent to the KRS Survey.

4.1 The breakdown of the door-to-door collection service

Site C is serviced by Masiqhame Trading 729 CC, which offers a wheelie bin service to formal areas (meaning residents place their rubbish in wheelie bins and leave the bin on the street on collection days) and door-to-door collection to informal areas (meaning workers collect bags of rubbish from households). Masiqhame Trading 729 CC was re-appointed by the City of Cape Town on 16 October 2017 for the "removal and disposal of refuse from shipping container storage areas in informal settlements" as part of a R105,000,000 Solid Waste Department deal (City of Cape Town, 2017:3). Outlined in the City of Cape Town's tender document for "community-based refuse collection and area cleaning in informal areas", contractors are required once per week to collect all of the rubbish from every dwelling within their designated area, take it to the refuse storage container (depicted in Figure 5), and issue the household with a minimum of two new plastic bags. Moreover, street litter, public bins and any illegal dumping within the area must also be collected and placed inside, or if too large, next to the containers by the contracted workers (City of Cape Town, 2016:14). Yet there is a significant gulf between these requirements and the reality that residents have reported.

Of the 137 respondents from informal areas that were interviewed in the KRS survey, only ten reported having their rubbish collected by employed cleaners from their door. This shows almost no change from the SJC's social audit in which none of the 464 residents or 77 cleaners interviewed by the SJC said that refuse was directly collected from dwellings (SJC & Ndifuna Ukwazi, 2014:21). While 79 (57.7 percent) of the KRS respondents from informal areas reported taking their own rubbish to a storage container, the remaining 48 (35 percent), together with all of the residents interviewed opportunistically during our site inspections, said that they dumped their litter either in the railway, street, wetlands or river.

The failure of the door-to-door collection service seems to be the result of four key issues. Firstly, workers who are contracted by Masiqhame Trading 729 CC to clean Site C's informal areas are not performing door-to-door collections to all dwellings and seem to be unaware that they are meant to be doing so. The Masiqhame Trading cleaners to whom we spoke during a site inspection in 'Island' told us that their job was to take rubbish from the railway line to the nearest container, while collecting any extra bags that they saw lying in the streets or outside houses. This is despite Masiqhame Trading 729 CC's owner,

Matanzima Mthwa, confirming that his company provides a comprehensive door-to-door-cleaning service in Site C [Personal communication, 24/04/2018][4].

Figure 5: Masiqhame Trading 729 CC cleaners using a wheelie bin to carry rubbish bags collected from a nearby informal area to a storage container sited along the road

The apparent lack of clarity or consistency over job description is consistent with the SJC's earlier finding that most refuse workers did not have formal contracts. Of the workers interviewed by the SJC, only 31 percent had copies of their contracts (SJC & Ndifuna Ukwazi, 2014:27). To make matters more difficult for workers (and the public) to understand, some of the workers involved in refuse removal are hired as part of the government Expanded Public

[4] At the time of calling the owner, Matanzima Mthwa, on 24 April 2018, the only accessible contact number online that successfully dialled was his personal cell phone number. The other two advertised landline numbers for the Masiqhame Trading 729 CC office did not exist, and the company does not have its own website.

Works Programme (EPWP) and this can sometimes generate uncertainty. In 2016, for example, Zameka Mthwa, a former cleaner, reported that she was left unpaid and unemployed without explanation after she had been employed by Masiqhame Trading 729 CC, under a one-month "probation" contract that had not been renewed. Mthwa and some of her co-workers stopped the newly contracted workers from cleaning, refused to leave, and "abducted" and "assaulted" the contractor's supervisors. Masiqhame's spokesperson, however, argued that Mthwa and her co-workers had been hired through the EPWP on one-month contracts that had expired. The Mayoral Committee member for Utility Services (Ernest Sonnenberg) explained that "renewal of their contracts is not possible due to the provisions of the EPWP under which they are employed, which requires new workers to be hired periodically. The rotation of workers is also a requirement set out in the tender to ensure that economic opportunity is shared among communities." After meeting with community members, Sonnenberg said that it was agreed that cleansing workers would not be harmed while carrying out their duties, "although community leaders were divided on the issue" (Washinyira, 2016).

Secondly, some residents reported that they do not want to leave their rubbish bags outside of their houses for collection because it attracts rodents [Personal communication, 19/03/2018][5]. Thus, while the rodent infestation is a consequence of poor rubbish removal, rats and mice are also one of the causes for the failure of the door-to-door collection service, given that many residents do not want to leave their rubbish outside their houses in fear of it attracting rats to their homes or having the bags torn apart by rats or dogs on their doorsteps. Hence, instead of leaving their bags outside for government workers to collect, some residents prefer to take their rubbish to the containers themselves or alternatively dump it away from their houses.

Thirdly, many residents reported that they do not receive the two plastic refuse bags to which they are entitled each week and therefore do not have the means to have their rubbish collected or recognised for collection. Although, on average, residents from the KRS Survey *did* receive two government refuse bags per week, residents reported that they often had to ask council workers for these bags when they visited the containers instead of having them delivered to their doors as legally required. One respondent complained that "if you ask for a plastic bag, [council workers] shout at you saying that they are using those plastic bags", resulting in some respondents having to "end up buying plastic bags from [their] own pockets." This suggests little if any improvement from the SJC social audit where residents reportedly obtained an average of only six instead of eight plastic bags per month. They also received them only if they

[5] This was communicated to us during a site visit of 'Island'.

requested them directly from a cleaner (SJC & Ndifuna Ukwazi, 2014:22). The SJC identified an illicit plastic bags trade in which some cleaners were charging residents 50c to R1 per bag (SJC & Ndifuna Ukwazi, 2014:22). The KRS survey asked respondents if they had ever been asked to pay for a plastic bag, but no one reported that this had happened to them. Rather, focus group respondents alleged that neighbours stole plastic bags that were left outside their doors by council workers and suspected that cleaners were selling bags allocated for them to people in the formal areas.[6]

Finally, residents appear not to be well informed about the door-to-door collection service or who to contact should there be an issue with it. Of the 98 Site C respondents who answered the questions in the KRS survey specific to refuse removal, 93 (94.9 percent) did not know how often their rubbish is supposed to be collected from their doors, and 97 (99 percent) did not know how often the storage containers are meant to be emptied and cleaned. Another 84 (85.7 percent) had never contacted council about refuse removal. Three respondents suggested that this might have been because they did not have any of the relevant contact details. Finally, 44 (95.7 percent) of the 46 respondents who were entitled to receiving free refuse bags by virtue of living in informal areas did not know how many refuse bags they should receive from refuse workers.

Councillor Xanthea Limberg argued that the fault lay with the community, not with the City Council. She maintained that Site C residents had been informed about the refuse removal services offered to them by City officials, local ward councillors and their community leaders, and that concerns or complaints can and should be raised with the contractor's supervisor, their ward councillors or their community leaders. She emphasized that the City had initiated various educational campaigns to prevent littering and dumping in Site C, such as, the oil recycling programme at the Kuwait taxi interchange, education projects with informal traders, mall expos at the Site C Plaza and Thembukwezi Square, and community expos near Nolungile Clinic [Personal Communication, 25/06/2018].

Yet residents lack information about the role of refuse contractors or how they are to be held to account. Signed service delivery agreements, for example, are not available online on all municipalities' websites as required by the Waste Management Act. In its 2013 assessment, the SJC highlighted that at least 95 percent of the 23 settlements received rankings of Level 2 ("minimum"), Level 3 ("unacceptable") or Level 4 ("totally unacceptable") with regard to standards

[6] This was stated by one of the KRS respondents in a focus group discussion held at the CSSR on 23 June 2018.

of cleanliness laid out in the City's tender contracts. Yet the SJC noted that no contractor had been penalized (as outlined by the agreement summarized in Table 1) despite failing to achieve the required Level 1 standard of cleanliness (SJC & Ndifuna Ukwazi, 2014:23-24). This resonates with Mayor de Lille's comments about inadequate monitoring cited earlier. The SJC found that over 80 percent of the residents they interviewed did not know who to approach with refuse-related complaints, and when contractors were invited to attend the public hearing following the social audit, no representatives attended (SJC & Ndifuna Ukwazi, 2014:26). Hence, it is unsurprising that subsequent to the SJC's social audit, complaints continued about refuse removal contractors failing to perform their required duties (Notywala, 2014).

*Table 1: Tender penalties associated with the standards of cleanliness of the informal settlements, refuse storage areas and the periphery**

Level	**Standard of Cleanliness**	**Penalty**
1	Desired	No delay in payment to the contractor
2	Minimum	No delay in payment to the contractor but improvement is suggested
3	Acceptable	A penalty of 20 percent of the total invoice is levied. If level 1 or 2 is not achieved within 24 hours of notice, a further 5 percent is forfeited.
4	Totally Unacceptable	A penalty of 30 percent of the total invoice is levied. If level 1 or 2 is not achieved within 24 hours of notice, a further 5 percent is forfeited.

*These penalties apply when *any* portion of an informal settlement fails to meet the required standard of cleanliness, except when the failure is due to worker or community protest action.

Source: Adapted from City of Cape Town, 2016

There also appear to be different notions of acceptable levels of cleanliness in operation, and uncertainty over which institutional structures are responsible. According to Councillor Xanthea Limberg, no financial penalties were levied because refuse removal services in Site C have always been satisfactory and have met the required cleanliness standards. Limberg explained that the cleanliness of Site C's informal areas is evaluated on a daily basis by City officials, and that the last cleanliness level was deemed satisfactory [Personal Communication, 25/06/2018]. Kagisho Mihi, the Head of Contract Management for the City of Cape Town's Solid Waste Department, explained the disparity between such assessments and the clearly observable litter problem by highlighting that contractors were not responsible for cleaning rivers, wetlands

or trenches [Personal Communication, 25/07/2018][7]. In the contractor's tender agreement, it reads:

> The contractor will also be responsible for the cleaning of canal/river banks within the given area and the removal of any litter from the canal/river water that can be reached with a rake without going into the water and without the use of any special equipment, e.g. dredging machine (City of Cape Town, 2016:20).

Mihi therefore contended that since the cleaning of 'Island's' river, for example, would require going into the water, and particularly since the water is contaminated but the cleaners have not been inoculated or given appropriate protective gear, cleaning of the river falls outside the responsibility of the Solid Waste Department and its contractors. Rather, he argued, it is up to the Transport and Urban Development Authority (TDA) or the City's Roads and Stormwater Department to keep the river clean. Mihi even referred to a case in Langa where the TDA refused to let the Solid Waste Department rake an unacceptably littered river for almost three months [Personal Communication, 25/07/2018].

Another key issue identified by the SJC's social audit as contributing to the reason why cleaners were not adequately performing these jobs (but which was beyond the scope of the KRS survey and this paper) was that of poor labour conditions. Firstly, the private contractors are obligated under their tender documents to supply their workers with safety gear and to replace stolen or worn out gear and tools where necessary (City of Cape Town, 2016:12). On average, only 88.3 percent of the protective gear that should have been distributed was received by workers in the SJC social audit, and some workers reported that they had been told that they were expected to replace lost or broken tools at their own expense, despite contractors receiving contingencies from the City for these expenses (SJC & Ndifuna Ukwazi, 2014:27). This was reiterated by cleaners from QA and PJS Sections (of Khayelitsha) interviewed for *GroundUp* who reported that they worked in their own clothing and torn gloves since they had never received either of the two overalls to which they were entitled (Gontsana, 2014). These same workers also complained that they had to camp outside of their supervisor's office in order to receive their wages of R100 per day. When asked by the SJC about these issues, Fanyana Mfene, the director of the contracted refuse company at the time, Green Guerillas PTY Ltd, said that wage

[7] This was communicated during a meeting arranged by Kagisho Mihi in response to Green's *GroundUp* article, "Why do informal settlements get cluttered with litter?" on 25 July 2018.

payments were delayed since the banks used by the workers were different to the contractor's and so the processing of payments took longer, and thereafter continuously postponed their meetings and redirected queries to the City (Gontsana, 2014).

Whether or not the contracted cleaners are adequately fulfilling their job requirements, the door-to-door collection system as it is currently modelled seems to be unsuitable for the working lifestyles of the households of informal areas in Site C. The successful door-to-door delivery of plastic bags unrealistically requires that a household member is at the dwelling at the time of delivery and that two plastic bags are enough for large households. Moreover, the weekly collection of plastic bags from each dwelling requires unrealistic storage space inside the household on days when it is not collected, and does not account for the risk of rodents or dogs breaking into bags left outside for collection.

4.2 Vigilante refuse removal and vandalized containers

'All I know is that it's us who takes rubbish to the container.'

These were the translated words of a Khayelitsha resident from 'Taiwan' informal settlement in response to being asked by the KRS survey if there had been any change in refuse removal services in his area over the past decade. This is despite the fact that, as confirmed by Councillor Xanthea Limberg, only contracted cleaners are expected to take refuse to the containers for storage. Residents are encouraged to take their rubbish to the containers only if they know that they will not be home on the day of rubbish collection [Personal Communication from Councillor Limberg, 25/06/2018]. With the failure of the door-to-door collection service, however, residents have had to take refuse removal into their own hands, thereby having to choose between two alternatives: taking their own rubbish to the containers or dumping it in or alongside the rivers, wetlands, railway line or roads.

Although 79 (57.7 percent) of the 137 KRS respondents in informal areas adapted to their lack of door-to-door or wheelie bin collection by taking their own rubbish bags to nearby storage containers, some areas, such as the area of 'Taiwan' alongside the N2, do not have any nearby containers, while others, such as 'Island', do not have fully functional containers. Despite 'Island' having three containers, none of these containers get locked as they are supposed to. Hence, some have become used for other purposes. Respondents in a focus

group session explained that taxi washers along Goven Mbeki Road had cut the containers' locks in order to store their cleaning supplies in them. During a site inspection of 'Island', residents complained that containers were taken over at night-time by "those boys who smoke drugs" and who sleep in them [Personal communication, 19/04/2018][8]. Furthermore, only 17 (32.1 percent) of the aforementioned respondents who answered the refuse-related questions said that the containers were actually emptied at least once a week, while 36 (67.9 percent) did not know at all how many times they were emptied.

Highlighted more extensively in news reports, however, are problems associated with the position of the containers and the fact that sometimes they *do* get locked after they are emptied (which makes it difficult for residents to place rubbish inside them, and so residents pile refuse outside the locked containers). Private contractors are responsible for placing the shipping containers in appropriate locations. Should they need to be moved, the contractors are required to consult with the relevant site workers, the residents, the City of Cape Town's designated official, and the transport contractor who must be able to access the container by road (City of Cape Town, 2016:17). Positioning them on sidewalks, however, is often to the detriment of residents or cleaners who have to walk far to get to them or who lack reasonable access to any container at all. Moreover, many containers are also placed nearby to water sources, such as the communal taps in 'Island', thereby posing a health risk.

The containers are supposed to be emptied twice per week after which they are to be swept and then locked overnight by the cleaners to prevent misuse by the community (City of Cape Town, 2016:17). Nosive Steli, a Khayelitsha SST Town II resident interviewed for *GroundUp*, explained that after the container has been emptied and locked, however, people dump their rubbish around the container. Steli reported, "I want this container gone from here…because I have to fight constantly with people that throw dead dogs, sanitary towels, dirty nappies and even rotten meat here that stinks up the whole place" (Matsolo, 2013). Many of the containers also fail to be cleaned or locked. Fifty-eight percent of the containers and surrounding areas evaluated in the SJC's social audit only reached "unacceptable" and "totally unacceptable" standards of cleanliness (SJC & Ndifuna Ukwazi, 2014:25). The containers are also often left unlocked, resulting in young children and stray animals entering them, again causing health risks and a further mess of rubbish. A site inspection of the three containers in 'Island' after they had been emptied on a Thursday morning in April 2018 revealed that they were all unlocked and unclean.

[8] This was communicated to us during a site visit to 'Island'.

Of the 127 KRS respondents from informal areas who did not have their rubbish collected, only 79 (62.2 percent) took their rubbish to the containers, while the remaining 48 (37.8 percent) dumped their rubbish. A focus group of KRS respondents reported that people, especially from larger households, ran out of rubbish bags and so emptied them in the river so that they could be re-used.[9] Some residents blamed the cleaners, arguing that they did a poor job because they did not live in the neighbourhood, that they did not service all houses, refused to collect broken bags (such as those damaged overnight by dogs) and were irregular in their collection times (Green, 2018). One resident even suggested that people dumped their rubbish as an act of protest against the cleaners to "make more work for them" (*ibid*).

Kagisho Mihi responded to complaints about cleaners by explaining that contractors receive the names of potential cleaners from the City's Job Seeker database. These cleaners are chosen randomly based on the section of Khayelitsha in which they live, which is verified with community wardens. Mihi suggested that the reason why residents may feel as if 'outsiders' are employed as cleaners is because cleaners are selected based on the legally recognised section in which they live and not the smaller areas, such as 'Island' or 'Taiwan' with which residents might associate their neighbourhood [Personal Communication, 25/07/2018]. Mihi also asked the cleaners to photograph themselves delivering plastic bags in four different informal settlements. He found that bags were often left under doors or between burglar bars rather than handed directly to residents since most dwellings were unoccupied during the day [Personal Communication, 25/07/2018]. This creates the opportunity for residents to steal each other's allocated bags. Hence, whether or not the cleaners delivered these bags, it seems that many residents are left without them.

Mihi also investigated the reported hijacking of containers by taxi-washers in Govan Mbeki Road (Green, 2018). He acknowledged that the shipping containers were being used for other purposes (such as storage of car wash cleaning materials – see Figure 6) but that they were nevertheless supposedly simultaneously being used for the storage of rubbish. "As long as they do not vandalise the containers", Mihi argued, containers can continue to be used in this (dual purpose) manner. He even referred to it as a "community agreement", but then implied that it was more of an inability to ensure that the containers were used solely as rubbish containers as the City was not be able to "control discipline" [Personal Communication, 25/07/2018].

[9] The information communicated to CSSR researchers that is described in Green's (2018) *GroundUp* article was collected during the focus group discussion held at the CSSR with KRS respondents on 23 June 2018.

Figure 6: An unlocked and unclean storage container on the side of Govan Mbeki Road being used to store the buckets and cleaning equipment of the car washers

This illustrates how city officials can be inconsistent about whose responsibility it is to ensure the proper use of containers. Councillor Xanthea Limberg argued that the broken locks and vandalised containers are to be managed by contractors who should, according to Limberg, use industrial-grade padlocks. Masiqhame Trading, however, contended that the misuse of containers is instead to be dealt with by "community leaders" (Green, 2018). Kagisho Mihi confirmed that the Solid Waste Department is aware of these locks being broken, even when industrial-grade padlocks are used, and reiterated that Masiqhame Trading must replace these each time [Personal Communication, 25/07/2018]. His acknowledgement of the problem of vandalized locks sits uneasily with his other assertions that 'community agreements' allow containers to be used for unorthodox dual purposes. It also sits uneasily with evidence from residents that the container used by reportedly delinquent youth was *de facto* off limits.

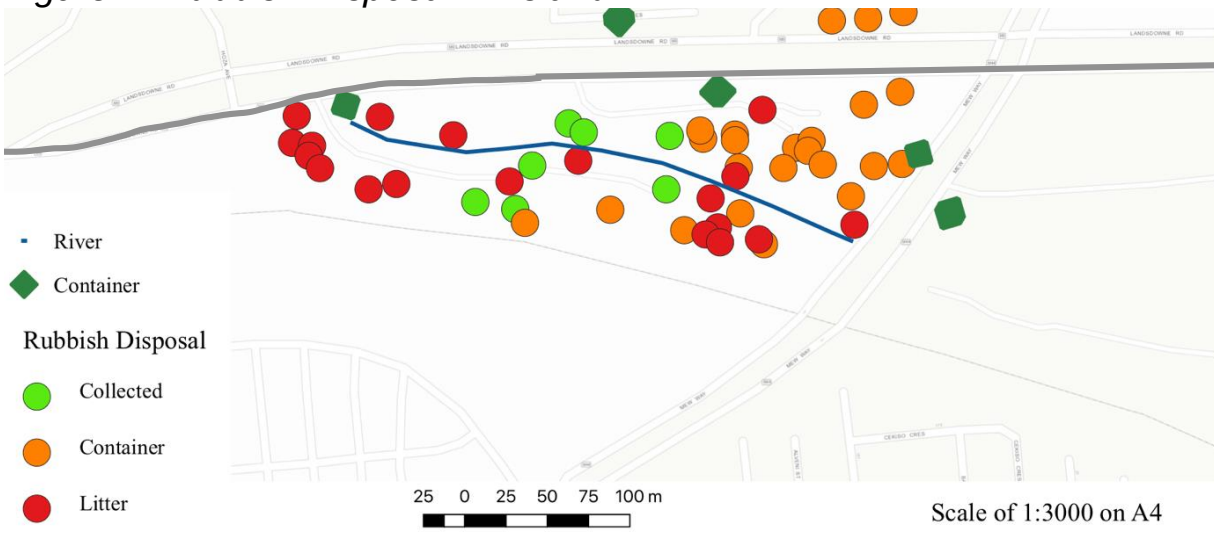
4.3 Does distance from containers drive littering?

The analysis thus far has highlighted that the door-to-door collection system is not working well in informal areas and that people often take rubbish to containers themselves or dump it in the street, river or wetlands. Focus group discussions and conversations with residents during site visits suggested that there were also security concerns regarding taking rubbish to containers. This suggests that the probability of dumping litter is likely to be a function of distance from the container not only because of the time and effort involved, but also because of potential exposure to criminality. This section uses probit models (accounting for survey design effects) to regress a binary variable created from the KRS data set that indicates whether a household dumps its rubbish, rather than taking it to a container, on distance from the container, controlling for other potentially relevant variables. The analysis is limited to the informal areas covered by the KRS survey.

The walking distance variable was created using a measurement tool on the QGIS programme that allowed for a non-linear measurement of the shortest distance along paths and roads between each respondent's dwelling and the nearest container.[10] The disputed container in 'Island' that was largely (if not totally) out of use to residents was excluded in these measurements to gain a realistic idea of how far the respondents around it would have to walk to get to an operating container. Visually (see Figures 7-10 below), households that are located near containers, such as those on the roadside of the river in 'Island', those in the area of 'Taiwan' that borders Govan Mbeki Road, and those in 'Chris Hani', appear to dispose of their rubbish in the containers more than those further away from the containers.

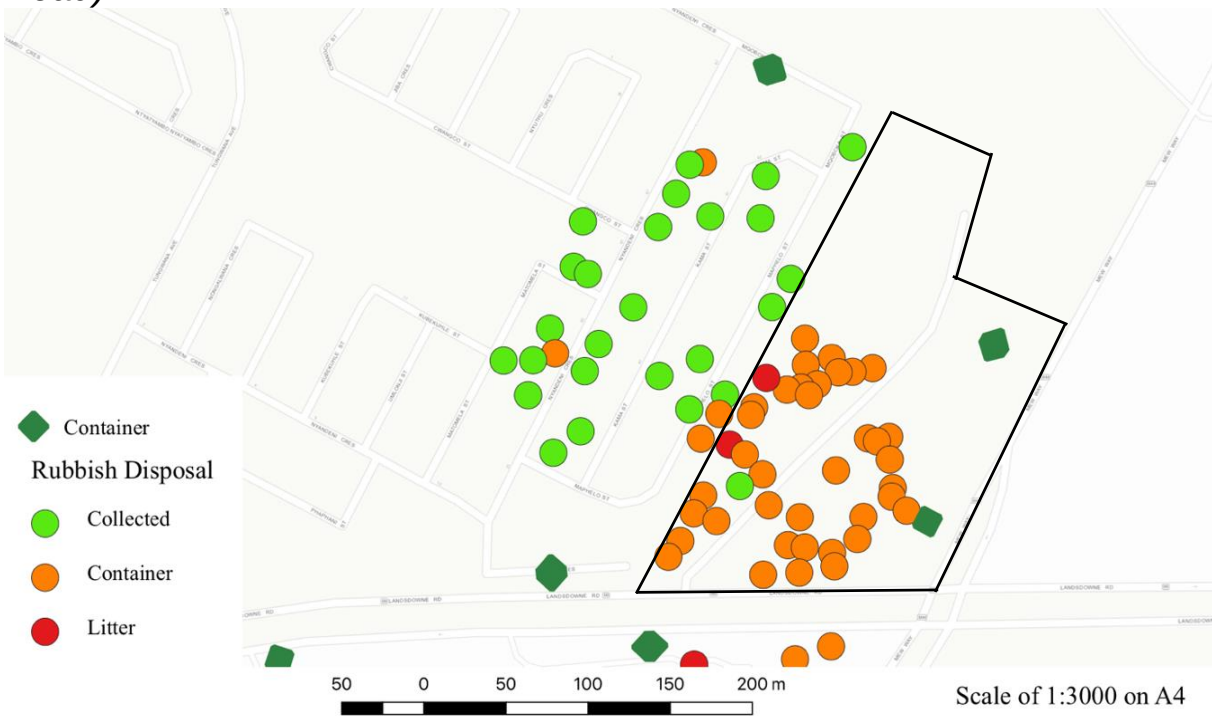
[10] Since this variable was created on QGIS without consultation with household members, the measured routes could have been inaccurate, for example, if the measured route is not actually realistic due to safety or other features not picked up on from the maps, or if there is in fact a shorter route.

Figure 7: Rubbish Disposal in 'Island'.



Most residents on the roadside of the river where there is a container take their rubbish to the container, while residents on the railway side of the river dump their rubbish in the river or railway. The leftmost container is the container that was reported by residents as being out of operation due to 'drug-using youth' sleeping in it at night-time. The container that borders Govan Mbeki Road (highlighted in grey) is the container in which car-washers store their equipment.

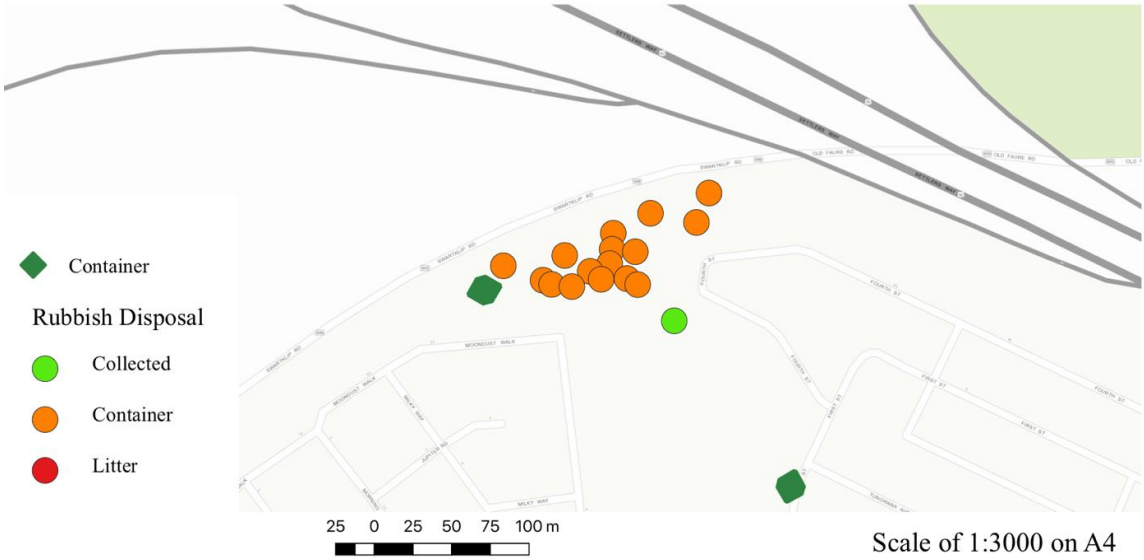
Figure 8: Rubbish Disposal in 'Taiwan' (Govan Mbeki Road).



'Taiwan' is the area enclosed by the polygon in Figure 8. Almost all residents take their rubbish to the nearest container. Only one household reported having

its rubbish collected by cleaners from its door. The area to the left of the polygon is a formal area where almost all rubbish is collected.

Figure 9: Rubbish Disposal in 'Chris Hani'.



There is only one container which is where all surveyed households (except for one which has its rubbish collected) take their rubbish. No households in this area reported dumping their rubbish.

Figure 10: Rubbish Disposal in 'Taiwan' (N2).

There is no container in this area. The nearest container is on the other side of the N2, requiring residents to cross over the nearby bridge. The City of Cape Town uses collection points instead of containers to pile up rubbish for collection by truck since there is no space for a container.

The central hypothesis is that the probability of dumping rubbish is related to the household's walking distance from the container and that it is likely to be affected by household size (because we were told that the two allocated rubbish bags were often inadequate for larger households, leading to dumping in order to re-use bags) and social norms, notably whether people in the neighbourhood chastise litterers. The modelling strategy first tests the simple relationship between distance from the container and the probability of dumping, then it controls for household size and whether neighbours chastise litterers. A third regression controls also for the household's socio-economic status (using the household asset index) to test whether this affects the model. The final regression includes controls also for the socio-economic characteristics of the respondent to test whether there were any respondent effects when asking questions about household behaviour. The results from these four regressions are summarized in Table 2 (which reports average marginal effects).

Table 2: Predicting the probability of littering rather than taking rubbish to the container in informal areas of Site C, Khayelitsha

Regressors	dF/dx [1]	dF/dx [2]	dF/dx [3]	dF/dx [4]
Walking distance from the container	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Agree that neighbours chastise you if you litter		-0.240**	-0.239**	-0.216*
		(0.087)	(0.086)	(0.094)
Household size		0.054**	0.056**	0.052**
		(0.018)	(0.017)	(0.017)
Household asset index (weighted by average price and scaled from 0 to 100)			-0.100	-0.164
			(0.129)	(0.143)
Female				0.018
				(0.084)
Education (grade)				0.009
				(0.023)
Employed				0.002
				(0.080)
Observations (n)	**114**	**114**	**114**	**114**
Wald Test	**F(1,6) = 16.04 Prob >F = 0.007**	**F(3,6) = 14.11 Prob >F = 0.004**	**F(4,6) = 17.06 Prob >F = 0.002**	**F(6,6) = 9.48 Prob >F = 0.008**
Average of 5 Crossfold Root Mean Squared Error (RMSE) estimates	**0.361**	**0.337**	**0.357**	**0.354**

*** p<0.01, ** p<0.05, * p<0.1

Standard errors are in parentheses. The omitted categories are "Disagree or feel neutral that neighbours chastise you if you litter", "Male" and "Unemployed". The Crossfold Root Mean Squared Error (RMSE) estimates are also known as the Brier score for binary outcomes.

Walking distance from the container

Although walking distance to the container was positively and statistically significantly associated with the probability of dumping litter at the one percent level, each additional metre from the container increased the average marginal probability of dumping litter rather than walking it to the container by only 0.1 percentage points, holding all other variables at constant observed values. This effect was robust to the inclusion of other variables throughout all four regressions. This is an unexpectedly small size effect since one would predict that a longer walking distance to the container would make dumping one's rubbish more convenient and also possibly a safer option if residents dump rubbish closer to their homes, especially since working residents may need to dispose of their rubbish during the evening.

Social attitudes

Including household size and a binary variable to measure whether one believes that one's neighbours criticize littering behaviour improves the model's Brier score/RMSE. Believing that one's neighbours criticize littering behaviour decreases the average marginal probability of dumping one's rubbish rather than walking it to the container by 24 percentage points, holding everything else at observed values. This suggests that there are neighbourhood-level social dynamics at play. This was reiterated by the people on the railway side of 'Island' who we opportunistically spoke to on two field trips. They argued that one could not criticize other people who also dump their rubbish since they also had no choice but to do the same [Personal communication, 19/04/2018]. The substantial effect of social attitudes was also emphasized by Mihi who contended that litter in the informal areas of Site C was a purely behavioural issue, since other informal areas, namely Enkanini and Marikana, that receive the same service and which are, in fact, even larger than Site C, are significantly cleaner. Mihi called these "model informal settlements" where littering is not the accepted social norm like it seems to be in some informal areas of Site C [Personal communication, 25/07/2018].

Household Size

In the second regression, each additional member of a household, holding everything else constant at observed values, results in a 5.4 percentage point increase in a household's probability of dumping its rubbish rather than walking it to the container. This is consistent with evidence from the qualitative research

that larger households produce more rubbish, thereby making it more difficult to carry it all to a nearby container especially given the constraints imposed by their allocation of plastic bags. A household with more children could also mean that adults are more focused on child-rearing tasks than on socially responsible refuse disposal. Even so, larger households might also have more people available to take the rubbish to the container, so it is not self-evident why larger households should be more likely to litter – although this is what the data reveals.

Scaled household asset index

Controlling for a household's scaled average price index[11] worsened the model's Brier score without substantively changing the statistical significance or the coefficient sizes in the original model. The third regression in Table 2 shows that a household's scaled average price index has no significant effect on the probability of dumping one's rubbish. This is perhaps a surprising result since poverty has often been cited as a reason why people would prioritise their basic needs over other matters, such as, adequate rubbish disposal (Nshimirimana, 2004; Puling, 2004). It suggests that income differentials play no additional role within largely poor informal settlements plagued by poor service delivery.

Individual Characteristics of the Interviewee

The fourth regression model showed that the key findings were robust to the inclusion of key individual characteristics of the interviewee, namely the respondent's gender, level of education and employment status but that none of these had statistically significant effects on the probability of a household dumping its rubbish.

Overall, believing that one's neighbours do not chastise littering behaviour and having a larger household had the most substantial and statistically significant effects on increasing the probability of a household dumping its rubbish. Therefore, in addressing littering behaviour, policy makers may need to focus

[11] The average price index was created by adding together the index value of each asset owned by a household, which was valued according to the average price of that asset as determined by estimations of their price by three Khayelitsha residents. Where a respondent declared that he/she did not own the asset, refused to answer, did not know the answer or had a missing answer, the asset was given a value of zero. The average price index was then scaled by allocating a value of 1 to the richest respondent, thereby making the index more interpretable.

more closely on behaviour-based solutions and social conditions instead of simply on the placement of containers.

5. Policy Recommendations

Two overarching policy recommendations below aim to offer solutions to the breakdown of the door-to-door collection system in informal areas of Site C and to the resultant littering behaviour of many of its residents.

5.1 Revise the refuse removal system

Irrespective of whether or not contracted cleaners are collecting rubbish and delivering plastic bags, the door-to-door collection system consistently fails at serving residents in the informal areas of Site C where rubbish continues to pile up. While this can partly be attributed to the acceptance of a social norm of littering by many residents who perhaps feel despondent about the system or who, given their socioeconomic circumstances, may not have the capacity to prioritise adequate refuse disposal, it seems as if the refuse removal itself is flawed. The system is unsuitable for residents who work or are not at home during the day since the delivery of plastic bags outside their homes often results in these bags being stolen and many residents are averse to leaving their bags outside of their homes since rodents and dogs tear into them.

For refuse removal in informal areas to be effective, it needs to be remodelled to be more accommodating of the working lifestyles of the people it is serving. Local communities should be consulted about whether plastic bags should be distributed from the containers, community halls or shopping malls, instead of delivered to households where they are often left outside dwelling. If door-to-door rubbish collection is to continue, then households in informal areas should also be issued with wheelie bins or built structures that protect against dogs or rodents tearing into rubbish so that residents are not deterred from leaving their bags out for collection. Alternatively, it should be effectively communicated to residents that they are responsible for taking their own rubbish to the containers and in this case, more accessible containers must be placed within a reasonable walking distance for all. Ideally, the area should also be made safer (through improved policing and better street lighting) to reduce the dangers involved in walking to the container.

Where the cleaning of littered canals or trenches is concerned, contracted refuse removal cleaners should be inoculated and provided with suitable tools and

protective gear so that they can be responsible for keeping these clean instead of depending on the TDA or Roads and Stormwater Department to do so. Alternatively, a more centralized programme of service delivery to informal settlements needs to be created in order to coordinate the efforts of the City of Cape Town's Solid Waste Department, Roads and Stormwater Department, and Water and Sanitation Department.

5.2 Educate residents and cleaners

Educational campaigns might also help the littering problem, though these would need to be multifaceted and appropriate to specific contexts. The City should be required to explain more formally and accessibly how the refuse removal system works and exactly what residents are entitled to so that residents can cooperate by leaving rubbish out for collection at the right time. The City should also provide residents with details about the contractors working their area so that residents can hold them accountable. Campaigns should also highlight the consequences associated with dumping, including health issues, rodent infestations and environmental pollution. In Puling's (2004:64) investigation into the perceived role of environmental education in Lwandle, 82 percent of residents supported the use of this kind of education to improve awareness about waste management issues, which is promising for Site C. These campaigns should also be action-based. This could include involving residents in area clean-ups or engaging them in community meetings where these issues are discussed. Another angle that these education campaigns could take is one which focuses on the benefits of proper refuse management. For example, by teaching residents about the potential generation of income by recycling certain materials, they may be more inclined to follow better refuse disposal mechanisms. This study did not engage systematically with cleaning workers, but it is likely that better training for these workers would also help.

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