

RESEARCH

The Struggle for Sustainable Waste Management in Hong Kong: 1950s–2010s

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As Hong Kong's landfills are expected to reach saturated conditions by 2020, the city can no longer rely on landfilling alone as the sole solution for waste treatment in the long term. Drawing on five months of archival research at the University of Hong Kong and the Hong Kong Public Records Office (PRO) in 2016 as well as 17 months of fieldwork conducted between 2012, 2013 and 2016, this article provides a much-needed overview of why sustainable waste management has always been such a challenge for Hong Kong. Focusing on the city's dependence on landfills and its failure to integrate alternative waste management technologies, namely incineration, into its current waste management regime, we explicate Hong Kong's waste management predicaments from the 1950s to the present day. Through a historical lens, we argue that Hong Kong's waste problems have a historical root and that they are unlikely to be resolved unless the government is willing to learn from its past mistakes and adopt a much more proactive approach in the near future.

Keywords: Waste management; landfills; land reclamation; incineration; recycling; sustainability; Hong Kong

As Hong Kong's landfills are expected to reach saturated conditions by 2020, the city can no longer rely on landfilling alone as the main solution for waste treatment in the long term. Although this is a problem that requires decisive action, the Hong Kong government has made this a low priority since colonial times. In this article, we discuss the past, present, and future of Hong Kong's waste management predicaments since the 1950s. Drawing on five months of archival research at the University of Hong Kong and the Hong Kong Public Records Office (PRO) in 2016 as well as 17 months of fieldwork conducted between 2012, 2013, and 2016, this article provides a much-needed overview of why sustainable waste management has always been such a challenge for Hong Kong. To begin, we examine the social and historical factors that have contributed to the emergence of solid waste pollution and the absence of an integrated incineration facility in Hong Kong, both of which led to the region's sole dependence on landfills over the next few decades. We then assess the current government's proposal to solve the city's waste problems by extending the landfills and building a new incinerator. In conclusion, we argue that unless the Hong Kong government 1) implements a holistic waste-management solution; 2) incentivizes the recycling industry; 3) and puts in place a better, more transparent recycling

system, the current waste crisis is likely to continue if not intensify.

The Historical Roots of Hong Kong's Landfill Dependence

From organic waste to dirty waste

As industrial production skyrocketed in the post-war years (Schenk 2001: 14; 1994), Hong Kong was confronted with an unprecedented amount of solid waste pollution. For a long time, organic waste had made up the majority of local waste in Hong Kong (*Hong Kong Hansard* 1923: 146). But since the kick-start of industrialization in the 1950s, the composition of local waste shifted from mostly organic waste to a mix of toxic waste water, industrial wastes, and plastics (Mansell Consultants Asia 1974). In addition, a sharp rise in motorised traffic, increasing exploitation of local environmental resources, and a lack of a comprehensive environmental protection policy all resulted in a deterioration of air and water quality (Wu 1988; Zhuang 1997; Environment Bureau 2013a). In particular, the unfiltered discharge of sewage and industrial liquid wastes had severely polluted Hong Kong's coastal waters (Morton 1976; Tanner (Tanner), Lai & Pan 2000: 771).

The influx of migrants from Mainland China between the 1950s and 1980s also dramatically sped up Hong Kong's production of household waste. In the course of the refugee crisis, Hong Kong's population almost doubled from 1.6 million in 1946 to 2.5 million by 1956 (Peterson 2008: 172; Mark 2007: 1146). By 1969, it had doubled once again to about four million (Tsang 2004:

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199). Correspondingly, annual household waste production rose from 322,000 tonnes in 1952 to 877,400 tonnes in 1972 (Urban Council 1952, 1973), almost tripling within only 20 years. This is most likely due to economic growth and the increased consumption that came with it. As **Table 1** shows, during the economic boom between the 1960s and the 1980s, household waste production increased proportionally to population growth, especially between the 1970s and 1980s. Previous research on the refugee crisis tends to focus on the pressure of new migrants on social services;¹ however, less attention has been paid to the ways and the extent to which the population explosion put pressure on the local environment.

Using waste in land reclamation

As early as in 1956, a Chinese member of the Scavenging and Conservancy Select Committee of Hong Kong's Urban Council² had warned the government about Hong Kong's severe shortage of waste treatment infrastructure: '[A]s our population keeps on growing, so will the amount of refuse keep pace with the growth, and in time there will be nowhere to dump it' (HKRS-716-1-11). Although the council member was right about what turned out to be one of Hong Kong's most pressing environmental problems for years to come, his foresight was not taken seriously by his fellow members in the Urban Council.

Indeed, prior to the infrastructural modernization of the 1950s, Hong Kong's Urban Council had maintained a rather minimalist approach to waste management, relying exclusively on unregulated dumping sites that barely satisfied the basic requirements of a sanitary landfill.³ Such a minimalist approach to waste management during the first half of the twentieth century stood in stark contrast to the waste management regimes found in Europe and Japan, where most municipalities had kept up with the latest technologies. For example, by the 1960s, Britain was already equipped with the kind of waste technologies that were 'prerequisite to the emergence of the "throwaway society"' (Cooper 2010: 1046). Contrary to the waste regime in the UK, where waste management was mainly about preventing waste accumulation in urban spaces (Cooper and Bulmer 2013: 265), for a long time, waste accumulation was viewed as a public health threat rather than an environmental risk in colonial Hong Kong. Of course, these two dimensions were never clearly separated. Even in Europe, waste was also perceived as a health issue rather than an environmental concern until

relatively recently. According to Kirk Smith's theory of environmental risk transition (Smith 1990), as societies become more developed economically and technologically, the threat of 'traditional risks' (i.e., waterborne diseases, famines, and mortality resulting from bacterial or viral infections) are usually significantly reduced. Gradually, 'modern risks' like industrial pollution replace concerns over 'traditional risks' (Smith 1990). Smith's theory partly explains the difference between Hong Kong and its colonizers in terms of perceptions and their approaches to waste as it was clear that the two societies had undergone 'environmental risk transition' at a different pace during the early to mid-twentieth century.

Despite concerns over the public health consequences of urban waste, there was little incentive for the colonial government to acquire new forms of waste treatment during the early twentieth to mid-twentieth century. This is because at that time, household and construction waste were used as a major fill material for land reclamation, serving the colony's need for more levelled ground. Just like other coastal metropolises including New York, Singapore, and Macao (Glaser, Habertzettl & Walsh 1991; Nagle 2014), colonial Hong Kong expanded its sparse coastal flatlands by filling the reclamation sites with household and construction waste. In fact, large parts of Hong Kong's high-rise skyline and the Kowloon coastline we see today are land that was reclaimed in this way thanks to the unlimited supply of household and construction waste. Reclamation sites that used waste as fill material should not be confused with landfills as they are two different types of waste dumps. While reclamation sites are enclosed areas on sea located along the coastline, landfills are located on land. In Hong Kong, reclamation sites were filled with waste and drained consecutively until they became connected with the coast, whereupon new pieces of solid land were formed. As landfills were often used to even out hilly terrain, in cases where a landfill and a reclamation site existed right next to one another, the two kinds of dump were usually conjoined into one single landfill after completion of the reclamation process to facilitate further engineering and construction measures (Government of Hong Kong 1969: 7–9).

Land reclamation with waste materials was a major strategy to bury waste and create new land in the colony from the 1840s all the way to the late 1960s (see **Figure 1**). This explains why the colonial government had resorted to landfills at the expense of all other waste treatment

Table 1: Population and household waste production increase in Hong Kong, 1950s to 1980s. Demographic data based on: Hong Kong Monthly Digest of Statistics 1972; Census and Statistics Department 2012. Data on waste production based on: Engineering Seminar 1982; Urban Council 1952; Urban Council 1973.

	Population (mio. inhabitants)	Proportional increase since previous decade	Waste production (tonnes/year)	Proportional increase since previous decade
1950s	2,360,000 (1950)		322,000 (1952)	
1960s	3,133,131 (1961)	32%	568,600 (1968)	76%
1970s	3,936,795 (1971)	25%	877,400 (1972)	54%
1980s	5,524,600 (1986)	40%	>2,190,000 (1982)	149%

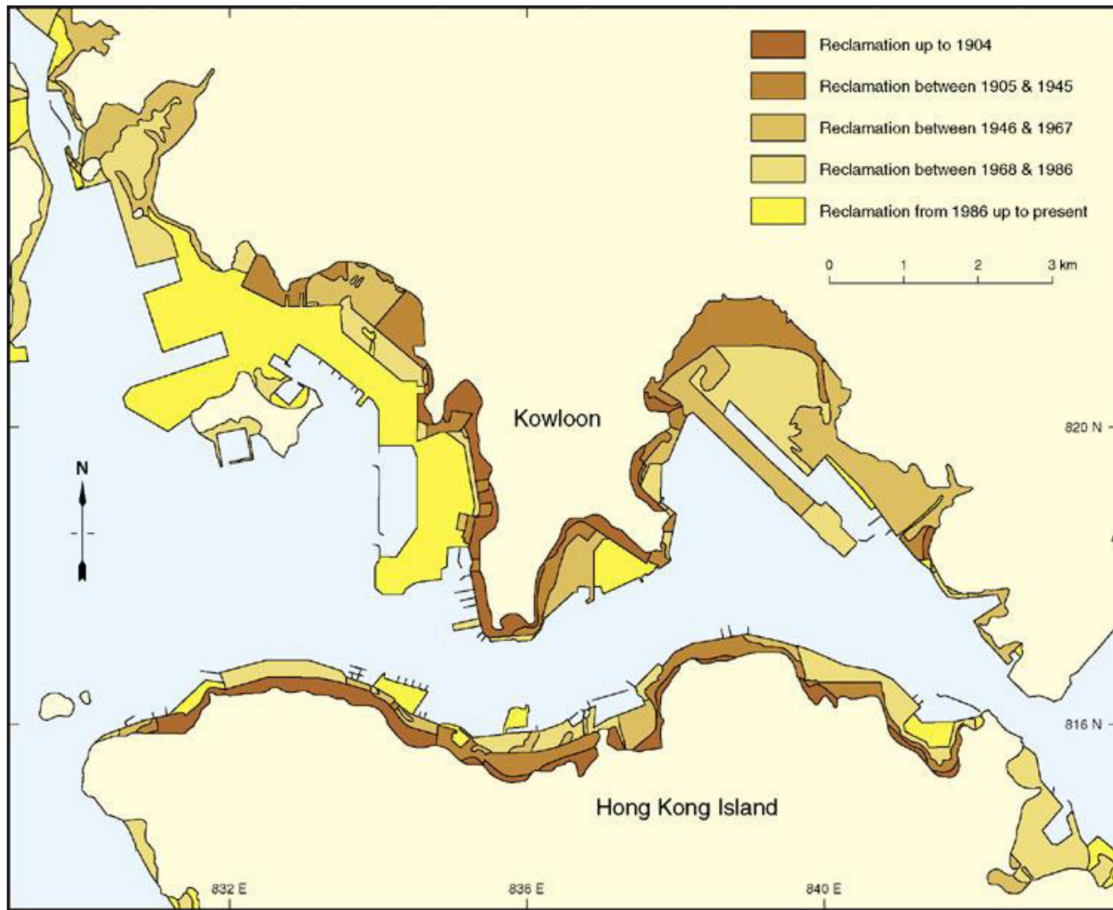


Figure 1: The development of reclamation in Hong Kong to 2000. The authors would like to thank the Head of the Geotechnical Engineering Office and the Director of the Civil Engineering and Development, the Government of the Hong Kong Special Administrative Region, for their kind permission to reprint this map. The Government of the Hong Kong Special Administrative Region does not accept responsibility for the accuracy, completeness or up-to-date nature of any reproduced versions of its materials.

options: waste was not considered a problem but, in fact, a benefit. In the eyes of the government, the only administrative challenge was proper waste collection and transportation (Urban Services Department 1968). In addition, reclamation with waste was made possible because the composition of Hong Kong’s solid waste remained more or less the same despite a growing population from the late nineteenth century to the early 1950s. As stated earlier, Hong Kong’s waste composition consisted of mainly organic waste such as kitchen waste, vegetable matter, road sweepings, rattan shavings and other plant matter, paper, glass, rags, and building debris, most of which decompose relatively quickly after disposal. Industrial waste only constituted a small percentage of the total waste (The Hong Kong Government Gazette 1899, 341; Mansell Consultants Asia 1974: 27, 168). Back in the days, it was not considered a problem to discard such waste in landfills or at sea. Consequently, the Hong Kong government was able to use this relatively ‘clean’ household waste as a resource for land reclamation. Night soil or ‘human waste’ was excluded from disposal as it was collected and then sold to the New Territories and Guangdong province as fertiliser (The Hongkong Government Gazette 1899: 544; Hong Kong Hansard 1923: 146; HKRS-716-1-11; Mansell Consultants Asia 1974: 68).

However, by the late 1950s, the Urban Council came to realize that land reclamation was no longer a sustainable waste management solution for Hong Kong (HKRS-202-1-13; Lumb 1976; Hudson 1970: 183–184, 208–221; Luo 1997). This was because Hong Kong had entered an era of post-war industrialization and an environmentally harmful mixture of solid wastes had begun to replace organic waste. The new mixture, containing plastics, packaging, and industrial sludges, was either partially toxic or non-degradable (Mansell Consultants Asia 1974: 11, 51). Using them for land reclamation had caused a number of problems. First, the harbour basin began to silt up due to the new mixture of toxic materials (HKRS-716-1-11). Second, gas build-ups and water contamination started to occur in various reclamation sites. These problems were further exacerbated by new damages caused by sewage and industrial wastewater discharge. Acknowledging this problem, the Urban Council ultimately abandoned the use of organic waste in the reclamation sites and turned to sanitary landfilling. In 1960, Gin Drinkers Bay, the then-largest reclamation site in Hong Kong (today’s Kwai Chung Park), was transformed into a sanitary landfill with a capacity of a decade’s worth of waste (Yu 2006). Due to its limited capacity, landfilling alone was insufficient to cope with Hong Kong’s rising waste production, which prompted

the Urban Council to introduce an incineration scheme in Hong Kong for the first time.

The failure of Hong Kong's first incineration scheme (1960s–1990s)

As early as in the 1900s, both the colonial government and the English-speaking public expressed the wish to build an incinerator in Hong Kong. Those who were in favour of incineration were convinced that incineration was a clean waste management technology. They also liked the idea of a built-in mechanical waste screening section commonly found in incinerators back then, which could be used to sort valuables like scrap metal for reuse or resale. Despite the enthusiasm, the Legislative Council (LegCo) eventually opposed the construction of an incineration plant during the first half of the twentieth century (*South China Morning Post* 1905: 4; 1926: 7; 1935: 9; *The China Mail* 1925: 1; *Hong Kong Daily Press* 1928: 6). There were several reasons for this: First, incineration was a costly investment. It required not only the import of an entire plant and its components from Europe, but also frequent maintenance by specially trained staff to monitor the plant continuously, day and night. Second, incineration is very energy intensive. In order to keep the maintenance costs at a reasonable level, the plant has to be fed constantly. In theory, an incineration plant can produce a stable output of heat energy for use in other facilities. But because waste in Hong Kong had a high moisture content and low calorific value,⁴ it would not produce the benefits that waste-to-energy incineration is designed to produce. In fact, under such conditions an incineration plant would not even produce enough energy to cover its own operation costs, let alone generate financial profit.⁵ Cost, however, is an important matter to consider in waste management planning. It had been the sanitary authorities' priority to keep the costs down, which explains their minimalist approach. All of these factors resulted in a low motivation to introduce incineration during the early twentieth century (HKRS-202-1-13).

Eventually, the first incineration scheme was introduced in Hong Kong in the 1960s to relieve the burdens on landfills. The scheme was developed over several phases: the first two incinerators in Kennedy Town and Lai Chi Kok went into service in 1967 and 1969, followed by the third one in Kwai Chung in 1979 and the fourth one in Mui Wo in 1987 (Lo 1984: 74–75, 81; Environmental Protection Department 2006). This incineration scheme shared the city's waste burden until the 1980s when they reached their maximum capacities one by one. Coincidentally, this was also the time when incineration technology faced a backlash in the industrialised West as debates about environmental justice and the adverse effects of incineration started to emerge.⁶ During this period, Hong Kong also witnessed a number of not-in-my-backyard (NIMBY) protests against incineration (Walsh (Walsh), Warland & Smith 1993; Furuseth/O'Callaghan 1991; Petts 1992). In retrospect, the people's fear was not completely unfounded, as it was later confirmed in an official white paper that the old incinerators did constitute 'a major source of pollution in the urban areas', which contradicted the government's

initial claim that these incinerators would be 'free of nuisance' (*South China Morning Post* 1966: 9). According to the white paper, these incinerators accounted for approximately 18% of all respirable particulates emitted into the atmosphere, many of which were highly toxic (Environmental Protection Department 1989).

Following the publication of the white paper, all four incinerators were decommissioned in the 1990s (see **Table 2**) due to public pressure and the fact that the incinerators had reached their maximum capacities. Since then, Hong Kong has had no choice but to rely on landfilling, which remains the only method of waste treatment in Hong Kong to date.

The Current State of Landfilling and Incineration in Hong Kong

Hong Kong is a densely populated city with scarce land resources. With only 1,104 square kilometres of land, Hong Kong's land prices are second highest in the world (Shen et al. 2009: 24; World Atlas 2019). Economically speaking, landfilling is an unattractive option, not to mention the environmental problems that it entails. Although it is possible to transform former landfills into usable land again—there have also been successful cases of such transformation in the past—the metamorphosis of a former landfill is a slow process with environmental drawbacks that would 'repel both the wider public and real estate investors' (Wong et al. 2013: 443–444).

Considering the limitation of landfills, in 2008, the Hong Kong SAR government proposed to construct an Integrated Waste Management Facility (IWMF) on an artificial island near Shek Kwu Chau to alleviate pressure on landfilling. If everything goes as planned, the IWMF Phase One is expected to be fully commissioned by 2024 (Environmental Protection Department 2014). While opponents were adamant that incineration was not the best solution to Hong Kong's longstanding waste problems, many considered it a necessary evil. After all, landfilling was thought to be no more sustainable than incineration in the long run. In addition, supporters of the IWMF claimed that compared to the older generations of incinerators, the new incinerator is not only 'well-ried and tested' in Europe, Japan, and Taiwan (Environmental Protection Department 2014), its estimated emission is also 'well below the tightest European emissions standards' (Wong 2014). Last but not least, people were excited about the new IWMF's capacity to treat over 3,000 tonnes of mixed Municipal Solid Waste (MSW) per

Table 2: Timeline of initial operation and closure of Hong Kong's incineration plants.

Name	Year operation commenced	Year of decommission
Kennedy Town	1967	1993
Lai Chi Kok	1969	1991
Mui Wo	1987	1994
Kwai Chung	1978	1997

day. What they did not realize, however, was that this figure only accounted for one third of the total MSW currently received at landfills in Hong Kong (Environmental Protection Department 2014).

Despite the apparent benefits of the new IWMF, environmental pollution remained a major concern for people living close to Shek Kwu Chau—not least because there is a general lack of trust in government when it comes to siting and constructing unwanted facilities in Hong Kong (Lam & Woo 2009). In March 2011, nearly a thousand Cheung Chau residents marched from Central Cheung Chau Pier to the Government Headquarters to protest against the IWMF and the preceding reclamation. Since fishermen were among the most affected group of people, during the protest they placed bags of dead fish and shrimps in front of the Government Headquarters to symbolise the irreparable damages the construction would do to marine ecology, fisheries, and people's livelihood. Residents also worried that the smell emitted from the incinerator would affect their health and tourism on the island.

Despite the oppositions, the Environment Protection Department (EPD) went ahead with the plan. In 2017, the EPD announced that Keppel Seghers-Zhen Hua, a Singapore-China joint venture, had won the contract to design, build, and operate the IWMF (phase one). To pacify local residents, the government offered to set up air quality monitoring stations at Shek Kwu Chau, Cheung Chau and South Lantau to provide 'objective data on local air quality' and ensure 'the operation of the facilities will not affect the surrounding environment' (Government of the Hong Kong SAR 2017a). In spite of this, controversy continued over the cost of the facility. At 31 billion Hong Kong Dollars, critics argued that the Shek Kwu Chau IWMF could well be the most expensive incinerator in the world (Williams 2012). Overall, opponents were highly sceptical of the government's bogus claims on the new IWMF's low operating costs and its environmental benefits (Williams 2012).

To date, Hong Kong has had sixteen government-run landfill sites, thirteen of which are now closed. The three still existing landfills, which have been in operation since the 1990s, are located in the North East New Territories (NENT), South East New Territories (SENT), and West New Territories (WENT). At the time of writing, Hong Kong depends solely on these three landfills for waste management, yet they are expected to be full, one by one, by the late 2020s. Previously, the government had warned the public that these landfills would reach their maximum capacities by 2019 if not extended. But as the 'deadline' approached, the Environmental Protection Department (EPD) has discreetly extended the 'deadline' for another decade (Environmental Protection Department 2016), giving itself some leeway even if it has openly admitted that there is no solution in place beyond this new deadline.

Although the problem of landfill dependence had been first identified almost half a century earlier, it was not until the early 2010s that the Hong Kong government admitted that it is indeed a serious problem. The sense of urgency is captured in a document titled 'Hong Kong Blueprint for Sustainable Use of Resources 2013–2022', in which the

Environment Bureau (EB) ambitiously set goals to reduce the city's solid waste by 40% in a decade's time. For the first time in Hong Kong's waste management history, the government admitted that 'a key aspect of Hong Kong's failure in waste management to date is to have relied for too long on landfills'. Significantly, they acknowledged that 'landfill space must be regarded as one of the city's most precious assets' and a 'last resort' for waste management in the future (Environment Bureau 2013b).

While policy development, new legislation, and community education all play a role in cutting waste at the source, more urgent measures are needed to relieve pressure on the three operating landfills. Since the early 2010s, the EPD has been calling for public support for their plans to extend the three landfills and build the IWMF. More commonly known as the 'Three Landfills, One Incinerator' (*saam deoi jat lou*) in Cantonese the plans were supposed to give Hong Kong some 'breathing space to put in place the full complement of waste reduction, recycling and treatment infrastructure' (Wong 2014). In other words, even though the government agrees that landfilling is unsustainable in the long run, Hong Kong needs to buy itself time if it does not want to become a city besieged by mountains of waste.

Despite the apparent urgency, LegCo vetoed the EB's proposal to extend the three landfills in 2013. Normally, lawmakers and District Councillors from the pro-establishment political parties would back most, if not all, government proposals. But this time, even the pro-establishment lawmakers dare not to support the government. They feared that if they supported the 'Three Landfills, One Incinerator' proposal regardless of the fierce opposition from local residents, their loyal voters would consider it a betrayal. By the time the government realized that they were unable to convince the largest pro-government political party to support them, the EB had no choice but to temporarily withdraw the plan to expand the Tseung Kwan O (SENT) landfill. From the EB's point of view, they hoped that the climbdown of the Tseung Kwan O landfill extension would help them secure LegCo's support for the expansion of the other two landfills in Tuen Mun (WENT) and Tai Kwu Ling (NENT) (Cheung 2013). The political concession was made on the basis that residents in Tuen Mun and Tai Kwu Ling were perceived to be less enraged than their counterparts in Tseung Kwan O. Unfortunately, this proved to be a total misjudgement. As soon as the fenceline communities of WENT and NENT learned that the EB had suspended their plan to expand the SENT landfill, they were so infuriated that they took it to the street. In fact, some protesters even went on hunger strikes for nearly 35 hours. Albert Ho, a former lawmaker of the Democratic Party, criticized the concession as hypocritical and unfair to Tuen Mun residents, who have already lived with more offensive facilities than residents in other districts. 'Tuen Mun should not be made responsible for Hong Kong's waste burden. Expanding the WENT landfill would only intensify the current environmental injustice,' Ho said in a newspaper interview (Oriental Daily 2010).

According to a study by Lam and Woo (2009), the Hong Kong public's perception of locally unwanted facilities is

influenced by four main factors: 1) the perceived need for the facilities concerned (in our case, the extension of the three landfills and the construction of a new incinerator); 2) the perceived impacts and risks; 3) the perceived fairness of the process; 4) the public's trust in those who make decisions (Lam & Woo 2009: 852). As we can see, for communities that are burdened with a disproportionately heavy share of offensive facilities, there is a general lack of trust in the government's decisions. As such, the siting process was seen by many as not only unjustified but also unfair (Lam & Woo 2009: 851). One of the most frequently cited criticisms we heard from these residents was that the government 'had done nothing' to prevent waste from going into the landfills. But should the government be blamed entirely for sending over 15,000 tonnes per day of solid waste to the landfills everyday (Environmental Protection Department 2017)?⁷ Are individual citizens also responsible in this regard? In the next section, we assess the validity of such accusations and identify a number of historical factors that have contributed to today's waste crisis.

Explaining Hong Kong's Large Waste Load

Structurally speaking, Hong Kong's large waste load was and still is strongly connected to the administration's pro-growth mindset and the city's urban development agenda. Throughout the decades leading to 1997, the colonial government had ambitiously promoted urban development in order to ensure that Hong Kong's economic upsurge would not be deflated. Although the colonial government had made a verbal commitment to sustainability during its final decade of governance, it hesitated to implement comprehensive new legislation. On the whole, sustainability and pollution mitigation remained subordinate to development plans because the colonial government did not want to risk appearing too restrictive in the eyes of investors, businessmen, and land developers, many of whom had already considered to relocate to Guangdong province where labour and production costs were much cheaper (Hung 1994: 263; 1995: 350). Such pro-growth mindset persists all the way till after the 1997 handover. As Hills and Baron state, 'it is clear that many Hong Kong government officials remain primarily growth-oriented and even now regard environmental considerations as, at best, an optional "add-on" after growth has been ensured' (Hills & Baron 1997: 42).

Although several important legislations on pollution mitigation were introduced around 1997—the year Hong Kong was handed over to China (Hills & Barron 1997: 42)—effective environmental governance remains very challenging in Hong Kong. One of the most common criticisms of Hong Kong's waste management regime is its lack of a holistic vision, which Hills and Baron attribute to the rigid structure of the colonial government, which was dominated by a relatively undemocratic, 'exclusively executive-led administrative system'. This structure has remained more or less unchanged after 1997 (Hills & Barron 1997: 48–49; Gouldson, Hills & Welford 2008: 328). But environmental issues are multidimensional problems that require interdisciplinary approaches. This

is especially the case when it comes to waste management and recycling. However, the existing structures of the civil services do not give departments any incentives to work with each other (Harris 2012; Hills & Barron 1997). There is also 'no guarantee that branches and their associated departments will see issues in the same way or agree upon the courses of action to be followed' (Hills & Barron 1997: 45). As Hills and Barron have observed, 'fragmentation of responsibility, lack of communication and competition between different branches and departments and the absence of a strategic policy on the environment are serious constraints to the pursuit of sustainable development in the territory' (Hills & Barron 1997: 48–49). This problem is particularly salient in trans-sectoral areas like environmental health and waste management. As a former employee of the Food and Environmental Hygiene Department (FEHD) confessed to one of the authors:

In Hong Kong, waste is handled by the Food and Environmental Hygiene Department under the Food and Health Bureau. The Food and Health Bureau is a bureau managed by health and medical professionals, whose main concern is whether or not the environment is hygienic, clean, and germ-free. Environmental protection is the last thing they have in mind. FEHD has nothing to do with environmental protection. They deal with things like rats, mosquitoes, and garbage collection. It's ridiculous that the FEHD is put in the front line of our city's waste management.

While there is no doubt that the government is responsible for Hong Kong's failure to transition to a more sustainable society, individual citizens and the industries are also complicit in contributing to Hong Kong's large waste load. After Hong Kong's economy had started to develop, the production of commercial, industrial, construction, and special wastes (21,752 tonnes per day in 1984) outweighed household waste (3,649 tonnes per day) by almost six times. Significantly, construction waste alone made up for over two thirds of the total waste production (Environmental Protection Agency 1984: 119), a clear evidence that Hong Kong's large waste load is directly related to its economic and urban development. For the past 30 years, Hong Kong's MSW production has increased by nearly 80% while its population has grown by 36% and Gross Domestic Product (GDP) has increased twofold (Environment Bureau 2013). Intriguingly, while the public blames the government for 'doing nothing' about waste and recycling, the government attributes Hong Kong's large waste load entirely to individual citizens' 'wasteful habits' while playing down the fact that MSW in Hong Kong comprises household waste as well as commercial and industrial waste. Last but not least, this official discourse dismisses the intrinsic difficulties of recycling and the ramifications of China's recent foreign waste ban on Hong Kong. In the final two sections we will discuss these challenges and explore the possibility of preventing waste at source rather than focusing on end-of-pipe solutions.

The Intrinsic Challenges of Recycling in Hong Kong

Recycling is an area badly affected by the government's fragmented approach to environmental issues. Since the roll out of a territory-wide recycling scheme (i.e., the Waste Reduction Framework Plan) in 1998, the government has installed over 22,000 waste separation bins, known in Cantonese Chinese as the 'three colors separation bins' (*saam sik tung*), to promote public participation in recycling. Surprisingly, the EPD is not the only department overseeing waste collection and recycling. Depending on the locality, the bins are set up and managed by four different departments, including the EPD, the FEHD, the Leisure and Cultural Services Department (LCSD), and the Agriculture, Fisheries and Conservation Department (AFCD). Only plastics that are collected by the EPD would be sent to the EcoPark (a waste-sourcing industrial business park sponsored by the Hong Kong government) for further processing. When this arrangement was made known to our eco-conscious interlocutors during a field trip to the EcoPark in 2013, it had caused outrage among people who took household recycling very seriously as it was unclear to them what would happen to plastics collected by other departments. Earlier that year, journalists had uncovered the scandal of a waste collection company (a government contractor) covertly dumping recyclable materials in landfills. The contractor denied the allegation, arguing that they were forced to dispose of any 'contaminated recyclables'. There was no way to tell if the contractor was lying, but contaminants in recyclables have become a major concern after the PRC government enforced 'Operation Green Fence' to filter out contaminated scraps and tighten the standards of imported foreign waste in February 2013.

As local environmental NGO Green Power famously remarked, 'Hong Kong collects recyclables without actually recycling them' (*jau wui sau, mou zoi zou*). According to the Waste Statistics in 2016, unlike economies that rely heavily on primary or secondary industries, Hong Kong has a very limited capacity for recycling. As such, most recyclable materials collected in Hong Kong are exported to China or Southeast Asia for further processing (Environmental Protection Department 2017). Because Hong Kong lacks the capacity to treat recyclables locally, as soon as China put a cap on the imports of foreign waste—as it did in January 2018—local and foreign recyclables risk being stranded in Hong Kong if the government and the local recycling industry do not adapt to the changing circumstances promptly. While recycling companies in Hong Kong are working to increase the region's capacity to treat waste locally with newly acquired government funding (Lam 2018), the EPD has limited itself to recycling only 'three types of waste paper and two types of waste plastic containers' (*saam zi loeng gaau*) (Government of the Hong Kong SAR 2018)⁸ because China imposes a ban on low-quality foreign waste. This new policy has been criticized by environmental NGOs for adding a burden to the city's landfills and undermining citizens' motivation and goodwill to recycle as much as possible in their everyday life (Cheung 2017). Indeed, the motivation for household waste recycling has decreased steadily since 2011 (Table 3).⁹ Despite various measures

Table 3: Hong Kong waste recycling statistics. Table based on: Environmental Protection Department 2019.

Year	Percentage of Municipal Solid Waste Recovered for Recycling
2017	32%
2016	34%
2015	35%
2014	37%
2013	37%
2012	39%
2011	48%

to cope with the current waste crisis, as internal and external pressure mounted up, Hong Kong's waste problem is bound to intensify as China now restricts the import of foreign waste.

Sustainable Waste Management: Alternatives and Continuous Struggle

This article offers a much-needed historical analysis of Hong Kong's struggle for sustainable waste management from the 1950s to 2010s. As our research has shown, the current predicament was fermented by decades of inaction and mismanagement. To conclude, these problems and patterns can be summarised in three points:

1. *Lack of foresight and planning:* As Graham and Marvin (2001: 193) point out, waste management must be considered in conjunction with space in any given urban system. Therefore, one of Hong Kong's main challenges in waste management is the lack of physical space. For many years, the colonial government regarded solid waste as an asset rather than a threat because it satisfied the region's need for land reclamation with waste. But as Hong Kong was transformed into a densely populated metropolis, land reclamation proved unsuitable. The discontinuation of incineration without a backup plan in the early 1990s, again, demonstrated the authority's lack of foresight, as it put even more pressure on the existing landfills. In hindsight, the 1980s and 1990s would have been the prime time to develop a more sustainable waste management system for Hong Kong but the colonial government missed this opportunity. The SAR government has inherited this legacy from its colonial past and has done little to rectify the problems until the early 2010s when they finally realized that the three existing landfills are about to run out.
2. *Lack of auxiliary waste management technology:* Considering Hong Kong's land shortage, it should be obvious to the government that Hong Kong cannot rely on landfilling as the only waste management method. Although incineration may pose some threat to environmental health, incineration technology should not be ruled out completely and

prematurely. Also, any waste management scheme must take the society's needs into consideration. In the past, land reclamation worked because it was compatible with the economic structures and consumption patterns of pre-war Hong Kong. It also fulfilled Hong Kong's need for urban extension. Likewise, incineration was once deemed a suitable solution when Hong Kong was far less dense than it is today. As one of the most densely populated cities in the world, finding a location for the incinerator that minimises potential risks to public health and the environment is of paramount importance. Unfortunately, the current government has failed to convince communities near Shek Kwu Chau, thus the controversy remains. While we believe that Hong Kong needs an incinerator more than ever, the IWMF is definitely not a panacea for Hong Kong's waste problems. For one, it is only equipped to treat one third of the city's MSW currently received at landfills (3,000 tonnes per day). Without additional support systems like an effective recycling scheme, the other two thirds will still end up in landfills.

3. *Limited capacity to recycle:* The fact that Hong Kong is a service economy without primary and secondary industries means that there are very few incentives for the government and local businesses to develop a sustainable recycling industry locally. Although 'the waste collection industry is reasonably efficient at collecting higher value wastes, such as metals, paper and second-hand electrical and electronic products, for reprocessing or reuse elsewhere' (Environment Bureau 2013), 'the same cannot be said of lower value recyclables, including waste plastic, waste glass and food waste, which have less commercial attraction' (Environment Bureau 2013). Hence, to prevent waste from going to landfills, waste separation and recycling become very important. In terms of household waste, although public awareness of the '3R' (Reduce, Reuse, Recycle) principle has increased over the years and that many people have made an effort to reduce the consumption of disposable plastics and separate waste at home (Lou 2017), there are 'doubts being raised about whether some waste collectors just lump everything from the recycling bins together and take them to the landfill' (Environment Bureau 2013). To overcome public distrust, the government must provide the public with a more comprehensive and convenient recycling system and be transparent about the process of recyclables collection and treatment.

Despite these problems, we would like to end our article on a positive note. We believe that waste need not be seen as a given or a side effect of economic growth. With sufficient awareness, planning, and creativity, it is possible to cut waste at the source. For example, previous research on sustainable living in Hong Kong has demonstrated the ingenious ways environmentalists and eco-conscious citizens turned waste into 'vibrant matters' in their day-to-day life (Lou 2017). Furthermore, zero-waste practices and

anti-consumption movements like freecycling and freeganism are also gaining momentum amongst the more progressive greens in Hong Kong (Lou 2019). At the time of writing, the Municipal Solid Waste Charging Scheme (hereafter the Scheme) is expected to come into full force in the second half of 2020 after years of debate and consultation (Government of the Hong Kong SAR 2017b). The Scheme is composed of two charging modes. The first mode 'applies to most residential buildings, street-level shops and public organization venues that currently use the waste collection service provided by the Food & Environmental Hygiene Department' (Information Services Department 2017). Under this mode, residents must put their waste into designated garbage bags—ranging from 3–100 liters in volume—before disposal. 'Each liter will be charged 11 cents, while the price of the oversized waste labels will be set at a uniform rate of \$11 each' (Information Services Department 2017). 'The second charging mode applies to those who hire private rubbish collectors to dispose of waste directly at landfills or Refuse Transfer Stations. Charging will be based on the weight of the waste disposed of at these facilities. Each tonne of waste will be charged \$365' (Information Services Department 2017).

It is estimated that each household in Hong Kong will have to pay around HK\$33 to HK\$51 (equivalent to \$4.2 to \$6.5 USD) a month to dispose of their rubbish under the MSW Charging Scheme (South China Morning Post 2017a). During our fieldwork in 2013 we found that even though there were concerns about the Scheme being an extra burden to poor working-class families, overall, environmentalists and eco-conscious citizens welcomed the long-awaited Municipal Solid Waste Charging Scheme. To cater for the need of lower-income households, some environmentalists have urged the government to consider using incentives as well as penalties to change citizens' behaviour (South China Morning Post 2017b). It is too soon to tell whether or not the 'Polluter Pays Principle' (PPP) will motivate Hong Kong people to reduce waste and encourage industries to recover recyclables, but at the very least, the Scheme shows that the current government is finally willing to get to the root of the waste problem. But unless the issues that we identify in this article are fully and seriously addressed in the near future, we should not underestimate the environmental and social ramifications of China's ban on foreign trash, which will only intensify Hong Kong's decades-long waste management crisis.

Notes

¹ For example, one of the prominent outcomes of the struggle was the development of a comprehensive welfare system (Chan 2009: 28).

² The Urban Council was one of Hong Kong's municipal administrative institutions between 1935 and 1999. Replacing the former Sanitary Board, its executive organ, the Urban Services Department organised and supervised public medical services, public works, and public sanitation including waste management and night soil collection. In 1999, its functions were taken

over by the newly founded Food and Environmental Hygiene Department and the Leisure and Cultural Services Department (Lau 2002: 73–5).

- ³ The 'sanitary landfill' is a British invention of the 1920s. It solved a variety of hygienic and environmental problems deriving from the 'crude' and 'unregulated' dumping practices of earlier times. The sanitary landfill isolates and seals off layers of waste within the dump until biodegradation is completed, preventing contamination of the surrounding air and landscape (Cooper 2010). In Hong Kong, sanitary landfilling was not implemented fully until the late 1980s when the newly founded EPD (founded in 1986) reviewed its waste management strategies in order to achieve new 'safe condition[s]' (Environmental Protection Department 2005).
- ⁴ Several different investigations, conducted at different points in time during the twentieth century, repeatedly found that Hong Kong's waste was of 'poor quality' for incineration. According to experts' estimates, it contained too much moist kitchen waste and plant scraps in relation to too little easily combustible matter such as tinder or ashes (*The Hongkong Government Gazette* 1899: 341; Mansell Consultants Asia 1974: 31).
- ⁵ The process of generating electricity, heat, or combustible fuel gases from the combustion of waste material (especially MSW)—today called 'waste-to-energy'—is an idea that was formed early on with the invention of incineration technology in late nineteenth century Britain. Clark describes this multi-purpose function of the first 'refuse destructors' as an initial 'via media between reuse and disposal', feeding 'the flames of postconsumption waste generation in a fully realised capitalist economy' while being itself economically highly efficient. Thus, incinerators were designed to not only handle large waste accumulations, but also to generate profit for the local or even national economy (Clark 2007: 256–7).
- ⁶ Actually, the negative effect of incineration surfaced soon after the commissioning of the first incinerator in Hong Kong. As early as 1969, public oppositions against incineration were regularly reported in local newspapers like the *South China Morning Post*. Residents of the fenceline communities described the smell emitted from the incinerator as 'obnoxious', 'foul', and 'smothering' (*South China Morning Post* 1969: 12; Paul 1974: 8; Fung 1979: 20; Wallace 1974: 12).
- ⁷ Here solid waste refers to MSW, especially construction waste and special waste.
- ⁸ The three types of waste paper include paperboard, newspapers, and office papers; the two types of waste plastic containers include plastic containers for beverages and those for personal care products.
- ⁹ Environmentalists have long argued that the official figure is an unreliable indication of the actual recycling rate in Hong Kong, which they believed to be far lower than the published figure. For example, even the EPD admitted that the recycling rate in 2010 (52%) was drastically overstated as they had mistakenly

included 'imported waste' (foreign waste awaiting to be exported to China) into their calculations.

Competing Interests

The authors have no competing interests to declare.

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