

1 Open crowd

Just-in-time food rescue

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Introduction

Food waste is a problem on the global and local agenda. Every year, 1.3 billion tonnes of food goes to waste, amounting to approximately one-third of all food produced for human consumption (FAO 2013). In sustainability discourses, this is represented as a squandering of resources—a waste of land, water and energy as well as the human labour and capital that went into the production of food. As an environmental issue, food waste is seen as a pollutant, the world's third-largest source of carbon emissions and greenhouse gases that contribute directly to global warming and climate change (FAO 2013). Alongside environmental and sustainability issues, food waste is also a major topic in food security. In this arena, food waste is represented as a missed opportunity, as there are 821 million people suffering from malnutrition and other hunger-related diseases (FAO et al. 2018).

Juxtaposed alongside these staggering figures is the question of world population growth and rapid urbanisation. The 2019 UN World Population Prospects estimates that by 2050, there will be 9.7 billion people on the planet, two-thirds of whom will be living in urban environments (United Nations, Department of Economic and Social Affairs 2019). In these discourses, affluent places are presented as resource-intensive sites; rich countries consume double the food of developing economies, and cities account for 75 per cent of global natural resource consumption (UNEP 2013, 4). The rapid urban population growth is preceded by an even faster rate of waste production: while waste increased tenfold in the last hundred years, the figure is expected to double by 2025 and over half of that is organic food waste (Hoornweg and Bhada-Tata 2012).

These figures are commonly quoted in studies relating to food waste: from climate and environmental sciences; agriculture and nutrition; food policy and security to planning and governance. Within each discipline, how food waste is conceptualised—that is, *how* and *when* food becomes waste—is understood differently, mobilising registers of different scales and measures (carbon emissions, calories, blue water footprint etc.) such that different solutions to solving the problem are generated. In this chapter,

I suggest that waste, as matter out of place, is produced by temporal systems of enclosure: hoarding, either through storage or proprietorship, restricts access and eventually leads to degradation and decomposition. This can be observed in our urban commercial food systems, where edibility and waste go hand in hand. Food rescue, as a form of surplus redistribution, extends the life span of food and reduces waste by facilitating circulation. This form of food sharing has been hailed as an “all win” solution. In practice, however, there are still many challenges that need further investigation. In this chapter, I explore the becoming and unbecoming of commercial food, attending to its temporal specificities by approaching the question of food waste as matter out of time. I also present Breadline, a web application I developed to demonstrate a possible solution to the temporal and spatial challenges of food rescue. In other words, this chapter presents my own action research on food waste—it is both a conceptual and practical investigation—and contributes to the current lack of examples of innovative food waste management coming from Asia.

Expiration—matter out of time

One hot summer evening, I came face-to-face with my research problem while grocery shopping at a 24-hour supermarket in Hong Kong. It was just past midnight when I brought my basket to the till. As the cashier scanned my items, she realised with the jump of the digits that the best-before date had passed, and the pot of yoghurt was no longer available for sale. Without wanting to enter into a discussion about food safety, I offered to take the pot of yoghurt for free, as this might relieve the supermarket of any liability should the yoghurt be contaminated, and I were to suffer food poisoning. But that option was not available either: instead the staff had to log the product and send it back to the manufacturer as per company guidelines, where it would be disposed of in the city’s near-saturated landfill, and where it would continue to decompose and cause air, soil and water pollution.

Waste is commonly presented as a problem, unsightly and undesirable, and experienced as a nuisance through its qualities of dirtiness, untidiness and untimely presence. It is seen to pollute, contaminating and tarnishing the environment with its existence. However, as scholars have made clear, the discarded is not a fixed category (Evans 2014; Hawkins 2006; Strasser 1999), and studying waste is not just about understanding its inherent properties or its excess and management, but rather a question of apprehending classification systems that create and destroy value (Douglas 2001; Scanlan 2005; Thompson 1979). In other words, it requires an analysis of how things become rejected and why waste came to be.

The British anthropologist Mary Douglas demonstrates the structuring capacities of our classification systems through her study of dirt. In *Purity and Danger*, she distils from her observations on polluting behaviours the conclusion that dirt simply “exists in the eye of the beholder” (2001, 2).

Cleansing, as the ritualistic response to dirt, involves separating and classifying the pure from the impure, such that the concept of dirt, when abstracted from its pathogenic and hygienic qualities, is merely “matter out of place” (2001, 36) and cleansing becomes a way of re-ordering the environment. In this conceptualisation, Douglas successfully argues that dirt is produced by categorical systems: “where there is dirt there is system. Dirt is the by-product of a systematic ordering and classification of matter, in so far as ordering involves rejecting inappropriate elements” (2001, 36).

Where value is concerned, what is deemed worthy in our classification systems is maintained by a balance of what is both accepted and rejected (Schor 1999). The economic idea of value comes from utility, but it also depends on exclusivity; the rejection of goods can sometimes be used to exchange, maintain or create value in different circuits. For example, in Marcel Mauss’s study of potlatch societies, wasting, as the absolute form of expenditure, creates value through prestige for one’s family or tribe. Conspicuous destruction, rather than accumulation, demonstrates the family’s capacity for unproductive expenditure of time and money, and, as a display of wealth and superiority, it allows them to move up the social scale (Mauss 2002). In these societies, gifting is a form of socialised exchange, where the value of objects is transformed through reciprocity. The importance lies in ongoing circulation, which forms the basis of social relationships.

While our food system could not be paralleled with the Indigenous cultures of both Douglas’s and Mauss’s studies, the ontological framing allows a different perspective from the established discourses of food waste. What the example of my midnight grocery excursion demonstrates is that food waste, much like the category of dirt in Douglas’s study, is matter out of place, produced by temporal enclosures and barred from circulation. Food, wasted as a result of time-stamped protocols, is literally *matter out of time*. Tackling the problem of food waste therefore requires a reconfiguration of our system so that we can extend the lifespan of food that is “out of time.” This changes our perspective on food waste, shifting it from a problem of storage to a problem of circulation—of how to keep things moving.

Temporal ontology of food waste

In our urban food system, constituting something as food is not as straightforward as equating it with edibility. The realities of what is considered food (and non-food) are shaped by practices of knowing, which in turn construct what is possible. This is what Mol (1999), drawing on a Foucauldian analytic, calls “multiple ontologies,” where different ontological versions of the object create conditions of possibilities and lead to different ecologies of practice.

In our commercial industrial food system, food loss and waste occur in all steps of the value chain, from production, handling and storage, processing and packaging, distribution and retail to finally consumption. In general,

“food loss and waste” is a term that refers to the phenomenon when things that are valued as food—“the edible parts of plants and animals that are produced or harvested for human consumption” (Lipinski et al. 2013, 1)—are not ultimately eaten. However, within the food industry, a further distinction is made, defining food loss as “food that spills, spoils, incurs an abnormal reduction in quality such as bruising or wilting, or otherwise gets lost before it reaches the consumer” (Lipinski et al. 2013, 1). Food waste, on the other hand, refers to “food that is of good quality and fit for human consumption but that does not get consumed because it is discarded—either before or after it spoils” (Lipinski et al. 2013, 1). In this conception, loss and waste are defined by intention, the former understood as the unintended result of agricultural processes or technical limitations, while the latter is the result of negligence or a conscious decision to throw food away. This particular ontology frames food waste as two distinct problems: a question of optimisation in the production cycle, and an issue of awareness on the consumption end. Within this understanding, food loss can be tackled by creating better infrastructure in supply chains, and on the other hand, improving consumer awareness and household management. A recent study found that up to 600 tonnes of food waste produced in the retail and consumer sector could be prevented, with a corresponding saving of up to \$260 billion annually (Hegnsholt et al. 2018). While this may be the case, this separation between intentional and unintentional wasting does not account for the obsolescence of food loss generated as part of the normal production cycles of commercial food.

In the industrial process, edible products go through cycles of becoming and unbecoming food. In other words, the conditions under which things become food (Blake 2019; Nyman 2019) and the ways edibility is maintained (Morrow 2018; Weymes and Davies 2019) are a relational process shaped by rules and regulations as much as degradation caused by human and non-human actors (Davies and Evans 2019; Midgley 2014). Here I would like to articulate the particular ontology of commercial food through the lens of time. Commercial food is defined by a series of time-bound processes. The conditions of how and when things become defined as food, surplus and waste (and what is then done with them) are all bound by temporal enclosures. In the commercial food supply chain, edible materials become viable food products only if they do what it says on the tin. This means having the right content in the right amount that matches the label on the packaging, calculated during normal speed of production. “Food” in this context comprises not just the edible material, but also the packaging and the production process, including machinery and labour, branding and food regulations (Blake 2019). For example, during the manufacturing process, machines need to reach a certain speed of calibrated flow; when a part of the process is faulty or when recipes or product line changes, machines continue to operate as it is more resource-intensive to reset. The interim outputs are redirected to waste, which, while edible, is not sellable

as it does not meet industry standards (Blake 2018). Packaging is also part of the becoming of food: quality and appearance are maintained often by modifying the atmosphere inside the packaging, literally trapping matter in time (see also Tam and Hall 2019). Much of the debate around packaging protocols such as best-before dates also revolves around what is edible but not commercially viable. Best-before dates have their roots in the 1970s, when the British supermarket chain Marks and Spencer introduced the sell-by date as a stock control aid to retailers to ensure a certain turnover of goods (Blythman 2015). Today it is used to indicate the shelf life of a product, a manufacturer's guarantee to ensure the appearance and texture of the food. Edibility is not part of that concern but consumer confusion around the topic is nonetheless a significant source of waste (Li and Leung 2017; Rosengren 2017; Sawa 2019).

In trying to alleviate the issue of food waste, there is first a need to distinguish between the different types of waste and where, when and how they are produced. By articulating the becoming and unbecoming of food, I am highlighting the conditions of possibility generated within the temporal ontology of commercial foods. Here, edibility is not necessarily valued as the intrinsic quality of food. Products that are edible but classified as commercially nonviable—which is still food but treated as waste—are lost not because of negligence or lack of optimisation, but because a system that is geared around efficiency and viability in fact *produces* them as waste. In a profit-driven production line where time is of the essence, the most efficient way of using money, labour and food resources is to waste.

Food rescue: tackling temporal enclosures

Food that is fit for consumption but not commercially viable is considered surplus—tolerated losses within the normal production cycle, which occur as a result of faulty or excess production during manufacturing. At the retail stage, overstocking, slow sales or unsold goods that are too close to their end-of-life cycle are also written off as loss. It has been observed that many retailers destroy surpluses at the end of the day by pouring bleach or other contaminants onto the food itself, rendering it inedible and unsalvageable (Lo 2012). This intentional (albeit not publicly conspicuous) destruction serves to maintain the value of commercial products. As a shop manager from a local supermarket chain in Hong Kong explained to me, “If people can come take it for free, then who would pay full price for our products?” Shop staff who are generally tasked with the destruction of food justify the act by saying, “We don't want people to eat the food and get sick. This [pouring bleach] would discourage them [from dumpster diving].” Maintaining optimum pricing of the product or avoiding liability are common responses when retailers are questioned about such practices.

The act of wilfully destroying food can be understood as a result of proprietorship. Claiming ownership, whether via appropriation through

pollution (Serres 2011), or through accumulation and stockpiling, constructs enclosures by restricting access. Although these acts of privatisation are intended to preserve and safeguard food, in fact they contribute directly to the decay of edible produce. Waste that occurs under such circumstances is not so much a squandering of resources as an expenditure, one that results from enclosure and containment (see also Tam et al. 2016). In the context of food as a carrier for potential profit (Clapp 2014), it also demonstrates the enclosure as the continuous characteristic of capital logic (De Angelis 2004). Food rescue, or surplus food distribution, shifts food away from its commoditised ontological state. Donating extends the life cycle of surplus food by facilitating its circulation, allowing its use value as sustenance to continue in alternative economies. Donating and sharing food interrupts the logic of capital accumulation through non-market forms of exchange and is considered by some a challenge to the market economy (Santala and McGuirk 2019).

Food rescue is understood as “the practice of safely diverting edible food that would otherwise go into waste disposal systems and distributing it to those in need—the food insecure” (Reynolds, Piantadosi and Boland 2015, 4708). This is often regarded as a win-win-win solution—contributing positively to environmental protection and improving food security for the socially vulnerable while being economically beneficial. The redistribution of food is considered by some to be a form of food sharing (Davies and Evans 2019; Davies and Legg 2018; Edwards and Davies 2018). This scholarship often traces food sharing as one of the oldest forms of collaborative behaviour (Jones 2007). Indeed, sharing parts of a meal together is a form of social practice that creates and cements social relationships (Kaplan and Gurven 2005), understood by anthropologists and sociologists as playing an important role in shaping human history and cooperative psychology. As a communal act, it is seen to promote social cohesion and intensify social relationships (Belk 2010; Kennedy 2016; Schor 1999). When framed within an alternative economy discourse, it is positioned as a challenge to competitive and profit-driven economic structures (Frenken and Schor 2017; Friedman 2013; Heinrichs 2013). By democratising access to services and goods, sharing is also credited with improving social equality and social justice (Botsman and Rogers 2010; McLaren and Agyeman 2015). Finally, it is also seen to contribute positively to reducing waste by decreasing consumption and by promoting recycling, reuse and redistribution of assets (Agyeman 2013; Rifkin 2014).

With the rise of information and communications technology (ICT), digitally enabled forms of food sharing have proliferated in the past decade and the landscape is ever-changing (Davies et al. 2017). ICT has transformed the status quo by enabling information to reach large numbers of people outside of immediate geographical networks, reshaping practices by bypassing traditional enclosures such as shops and supermarket chains, which improves access to services and goods, and maximising underutilised

resources. The burgeoning academic literature that examines ICT-mediated food rescue remains limited, however, with case studies mainly emerging from the Minority World (Australia, U.S., Europe). Most studies offer descriptions of current practices (Ciaghi and Villafiorta 2016; Corbo and Fraticelli 2015) and investigate the environmental and socio-economic drivers and impacts of food rescue (Davies and Legg 2018; Weymes and Davies 2018). Following the traditional inquiry of food rescue, the majority of case studies present viewpoints from social justice, food politics or food security points of view. Due to the nature of food rescue, most case studies are site-specific in order to account for local practices and governance. ICT-enabled food sharing covers a very wide range of initiatives—from community mapping for example, surplus harvests; end-of-day flash sales; meal sharing to community fridges; employing various models of community organisation, charity to social ventures and for-profit models. Within the specific realm of surplus food distribution, there are also different ways of employing ICT. Some initiatives offer a marketplace that matches donors to beneficiaries or operate as collection points that aggregate and distribute surplus food, for example, food banks; others deliver direct services, running soup kitchens or meal deliveries.

ICT-enabled models problematise the concept of sharing: within the digital world, networked sharing is considered a form of communication rather than a cultural practice. Sharing on social media, for example, could take on meanings of participation, content production, consumption and scaled distribution (Kennedy 2016). As an economic term, sharing is also problematic when used in an indistinct manner to refer to the array of online platforms that match supply and demand, particularly in accommodation and transportation. These platforms, which employ the language of sharing but do not involve collaboration, further confuse what sharing means. Botsman (2015) defines the sharing economy as “an economic system based on sharing underused assets or services, for free or for a fee, directly from individuals.” The appropriation of positive values that are associated with generosity and community has been critically challenged because this kind of digitally mediated sharing economy effectively transforms sharing and its associated values into commodified experiences (Belk 2010; Cheng 2016; Holloway 2010; Rifkin 2000). O’Regan and Choe (2017) argue that Airbnb uses sharing as the utopic front to put forward socio-ideological motifs and mobilises the language of collaboration, intimacy and relationship building to legitimise its business model, which ultimately commodifies social relationships. The blurring between what is private and what is public also provokes questions of regulation and protection (van Dijk 2013). The sharing angle of the on-demand transport service Uber has similarly been tarnished by lawsuits filed against worker exploitation. The labour force that supports the dark side of the sharing economy extends the hyper-precarisation of workers who are increasingly disposable and less protected (Scholz 2016).

The next section looks at the food rescue practices in the city of Hong Kong and in particular the development of Breadline, a web application that facilitates the rescue of surplus bread. Breadline is ICT-enabled, but I do not wish to put it forward as an example of a food sharing initiative, but rather as a logistical tool that focuses on the temporal challenges presented by end-of-life goods. In this context, the web application borrows notions from the sharing economy and carries certain characteristics of sharing platforms in that it is efficiency-seeking, relies on internet technologies to coordinate access, attends to the latent capacity of underutilised resources, opens up institutional barriers and decentralises information to facilitate circulation. However, it should be noted that Breadline is developed as a research tool and as such does not have a business model.

Breadline

Hong Kong exemplifies much of the food waste problem faced globally. As a fully urbanised, high-income city, Hong Kong spends 5.26 per cent of its GDP on importing food from all across the world. Food waste is a pressing issue; it is the single-largest category of municipal solid waste, estimated at 3,600 tonnes a day (the weight of 250 double-decker buses), and it is pressuring the city's near-saturated landfill sites (HK Environment Bureau 2014). At the same time, Hong Kong is a developed economy with one of the highest GINI coefficients; 1.3 million of the wealthy city's population is poor: amongst the 20 per cent of the population who live on the poverty line (Government of the Hong Kong Special Administrative Region 2018, viii, 19), one in three elderly and one in four children face food insecurity, without adequate nutrition to sustain an active and healthy life (HK Census and Statistics 2017). As with global narratives that surround food rescue, forms of food redistribution are highlighted as key strategies for environmental protection as well as poverty alleviation.

Despite positive responses to food rescue by the government, academic research has typically adopted a more critical approach. Poppendieck (1998) and Heldke (2009), for example, have noted the limitations of the right-to-food model adopted by charities, which tends to displace systemic issues of social equity. Van der Horst, Pascucci and Bol (2014), Vlaholias et al. (2015) and Garthwaite (2016), amongst others, document feelings of shame, noting that social othering adds to the costs of human dignity when one is at the receiving end of charity. Aside from this, there is also the practical challenge of how effective food rescue operations are beyond the optimistic claims. Studies have shown common challenges include food rescue's difficulties in providing nutritionally sound food (Wilson, Szwed and Renzaho 2012); lack of consumer acceptance of food; inefficient operational logistics; and instability with supply and distribution (Caraher and Cavicchi 2014).

Attending to the specificities of the "leftover" nature of surplus food, food rescue offers an interesting logistical challenge. Food rescue has been

described as a “random” process (Nair, Rashidi and Dixit 2017) whose functioning depends on variables of quantity, time and place. It is often difficult to predict when and where food becomes available, and even with regular donations from certain outlets, the volume can never be guaranteed. Surpluses also have a limited time window before they go to waste; “rescue” is indeed the temporal challenge of getting to the food in time. The uncertainty of what is available also presents a challenge for organisations to plan for the equitable distribution of recovered food, as they must operate with little information prior to collection. A forecasting model that could be used for operational decisions has yet to be seen.

In terms of governance, Hong Kong does not have in place the Good Samaritan Law, which exempts food donors from civil and criminal liability if they donate food in good faith to non-profit organisations (The Law Reform Commission 2017a, 2017b). The organised food rescue operations in Hong Kong are undertaken largely by charities, which collect food from a selection of retail outlets, including supermarkets, hotels and canteens and local wet markets, as well as from individual ad hoc events such as banquets. These organisations could be largely separated into local district-based and city-wide operations. For the purpose of this chapter, the focus is on city-wide operations, and the point to note here is that within the ecology of surplus food distribution, rules and regulations from commercial chains still hold sway, where protocols are used to ensure food safety and to avoid liability issues for donors and charities. It is also important to delineate these commercial operations from food (commercial and non-commercial) that is redistributed in other, more informal sites, where personal judgements of edibility could be utilised.

In the following case study, I will focus on the end-of-day surplus from a major bakery chain in Hong Kong. Bread is part of the modern local diet, and as a low-risk and packaged food item it can be collected by volunteers and redistributed as part of breakfast programmes. Indeed, most of the local charities collect bread as part of their purview. However, to collect surpluses from over 300 bakeries located in disparate locations within a limited time window is a logistical challenge. Local charities like Feeding Hong Kong and FoodLink recruit volunteers to collect from designated shops. Given the restricted time window, most volunteers would be able to collect from two to three bakeries located near each other, but there is no guarantee of the amount of bread that is left over and available for donation. One charity reported that for every evening of the collection, around 20 to 30 per cent of the shops sell out.

The research project I have developed with the bread donation programme FoodLink takes on the logistical challenge of providing just-in-time food rescue. Key to a successful rescue is ensuring that the information about the availability and location of surpluses reaches volunteers in time. Given the time-sensitive nature of both data and food, as well as the high adoption rate of mobile technology in the city, a digital platform has been

identified as the most appropriate tool to coordinate between donors, volunteers and charities. The web application named Breadline is a Free Open Source Software platform that coordinates food rescue in real time across the city. By enabling bakery staff to share information on the approximate amount of bread available an hour before closing, the application allows volunteers to respond to the fluctuating spatial distribution of surplus food more efficiently. This enables a more effective use of the volunteers' time and resources, allowing bakeries and charities to generate more impact.

The design of Breadline is premised on the idea of opening the enclosures that surround food rescue, which applies to the food itself but also to the data surrounding the food. Previously, only shop staff had knowledge about stock availability but by giving tacit knowledge to a data body, the platform allows bakeries to share information directly with volunteers in real time. This enables volunteers to respond in an agile manner to the differential availabilities of surplus food. Given the time sensitivities of food rescue, data has also been identified as a perishable item in this scenario. During the pilot phase, Breadline has demonstrated that it is four times more volunteer efficient than previous collection schedules, as it enables volunteers to avoid empty runs and capitalise on last-minute opportunities.

In another manner of description, Breadline is a platform that crowdsources logistics for food rescue. Crowdsourcing can be understood as a process whereby communities work together by eliciting contributions and compiling them to serve a specific purpose. It has been successfully deployed for a range of purposes such as knowledge gathering and map creation, for example, Wikipedia and OpenStreetMap. These successful cases have demonstrated that given the right conditions, individuals could work together collectively and achieve a result whose sum is bigger than its parts. The design of Breadline is premised on a similar idea; the challenge, however, is to extend crowdsourcing beyond the realm of digital data and into the movement of physical goods. While many other food rescue platforms utilise the distributive capacity of ICT technologies, most are focused on collecting, verifying and broadcasting information about surplus food. Breadline tries to extend the capacity of the digital platform by allowing volunteers to *act* on the information—changing their routes based on real-time information while on the run. Breadline has been developed as a digital tool to manage crowd-based distribution, collection, transportation and delivery of goods for public consumption that tests the feasibility of orchestrating on-the-ground movements in real time.

The crowd is noise; undifferentiated and distracting, it jams and it congests. But it can also be tuned into, tapped as a resource to provide just-in-time food rescue. Hong Kong is a dense city, with a high concentration of foot traffic, especially in shopping malls and other commercial areas. At the same time, recruiting volunteers to collect bread is a common challenge for non-governmental organisations (NGOs). One charity reported that fewer

than 1 per cent of their volunteers return to continue with the work, making it a labour-intensive process with low return on time investment. This could also be partially attributed to compassion fatigue, with many social and environmental issues competing for attention, but it could also simply be that volunteers are short on time. Many reported that they found the event meaningful, but that their personal schedules do not allow for it, with their participation frequently restricted to the sanctioned time of their company's corporate social responsibility events. Breadline therefore tries to harness the power of the crowd by tapping into the downtime of volunteers. During interviews with existing food rescue operators, many have observed that daily commutes to and from work offer ample opportunities for pick-ups; if volunteers could collect bread "on the way" it would greatly reduce their time commitment. In another possible scenario, volunteering could also happen on a more ad hoc basis; a delayed appointment, for example, could offer 30 minutes of idle time to collect available surpluses nearby even if volunteers have not signed up previously.

Conclusion

The web application Breadline attends to the temporal and spatial challenges of rescuing commercial surpluses. By understanding waste as something produced out of temporal enclosures, the design of the platform focuses on facilitating circulation—both of information and of food. Preliminary results have shown a more agile response by improving access to information, making it four times more volunteer efficient. Academic scholarship has conventionally placed food redistribution within the arena of food sharing, focusing on the transformational qualities of conviviality, while also questioning the power structures that go behind such sharing. However, by attending to the temporalities of food rescue, this chapter offers a new, alternative perspective by understanding digital platforms such as Breadline as a logistical solution that warrants both conceptual and practical lines of inquiry.

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