Apprehending food waste in Asia: Policies, practices and promising trends

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APPREHENDING FOOD WASTE IN ASIA

Policies, practices and promising trends

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Introduction

Providing nutritious, safe and affordable food for all in a sustainable manner is one of the greatest challenges the world faces today, particularly in the context of Asia – where 515 million people are estimated to be undernourished, with the highest rates of food insecurity in Central and Southern Asia (FAO, IFAD, UNICEF et al., 2018). Yet an estimated one-third of the food produced for human consumption is lost or wasted worldwide (Gustavsson et al., 2011). In developing countries where national economies depend more on the agricultural sector, such as many countries in Asia, food wastage tends to occur at the post-harvest stage, also termed as “food loss” (Schneider, 2013). It is estimated that 11 kg of food per capita per year is wasted in low-income Asian countries, while 80 kg of food per capita per year is wasted in high-income Asian countries (FAO, 2013). Trends in Asia, such as rising income, dietary transition toward Westernized consumption patterns, urbanization (Teng & Trethewie, 2012), modern retail distribution (Reardon & Hopkins, 2006), increasing obesity (Ramachandran & Snehalatha, 2010) and time scarcity (Lee, 2018), are several factors that impact food provisioning and food waste in Asia. A life cycle approach to understanding impacts across the life stages of food provisioning – from agricultural production, to sales, distribution, processing, retail, cooking, consumption and disposal – would enable “true cost” accounting of food waste, namely the inputs of fertilizers, pesticides, energy, water, as well as social issues around land access, gender and labour (Li, 2011) that go into the production of food. The paradox of wasting food in the face of global food insecurity exemplifies the failure of the global food system, and highlights the relevance of food waste prevention and reduction in sustainability efforts.

Whether related to improving nutrition or reducing environmental and social impacts, managing food waste in Asia is a relevant and timely research agenda. Globally, research on food wastage arose in the late 1980s and, since 2005, data on this issue has become more...
widely available (Schneider, 2013). However, there is little available data in the food waste research landscape in Asia. As we will uncover in this chapter, food waste is tied up with national, city and even community-level decision-making processes. This chapter brings together contributions by scholars involved in public management, policy analysis, waste management, sociology, planning, environmental sciences and industrial ecology, to uncover existing food waste practices in five countries, with a spotlight on urban centres, in Cambodia, India, Indonesia, Japan and the Philippines. We begin with a review of the literature on food waste in Asia, followed by an overview of the five case studies – considering countries and cities in relation to food waste management policies and practices. We then provide some insights on what lies ahead, in terms of ongoing trends and future opportunities, and conclude with a call for further research in the region.

**Literature review**

There is significant variation in the types and resolution of data available on food wastage across Asia. As English is not a primary language in many Asian countries, this poses two challenges: first, the inaccessibility of literature and data published in regional languages, and second, the difficulties of comparing data and problems associated with misinterpretation, especially in the use of varying terms that are subject to cultural context: for example, the distinction between food waste, and food loss or spoilage (pre-consumer waste during harvest, transport, distribution and processing), as well as categories such as unavoidable food waste (peels, stalks, bones) and avoidable food waste (leftovers) (Schneider, 2013). Food cultures relate to different habits, rituals and preferences when it comes to preparing, eating and sharing a meal, which vary in different contexts – influencing how food is prepared and what is wasted, and what food is consumed or considered non-consumable (Sahakian et al., 2016). For example, eating meat offal, or vegetable stalks and peels, may be a part of an existing culinary tradition in some contexts but not in others.

Data on wholesale distribution, wastage during processing and transportation, treatment pathways for Municipal Solid Waste (MSW) and liquid food waste is also scarce in Asia. In industrialized countries, food wastage is identified with the post-harvest stage; one explanation might be the preference for produce with high-quality appearance, along with sales arguments and policies that align with this preference (The Guardian, 2013). Despite this concentration of food waste in the post-harvest stages in industrialized countries, MSW consists of less organic matter (< 50%) owing to the increased amount of packaging compared to developing countries (> 50%) (Hoornweg & Bhada-Tata, 2012). Household data on food waste is also more readily available in the West than in Asian countries, due to the lack of source segregated waste collection across Asia. While the practice of composting and, more recently, anaerobic digestion is widespread in rural areas of India and China, the management of urban food waste using these treatment options is more recent (Cheng & Hu, 2010; Sharma et al., 1997). That being said, there is a growing literature on composting in Asia, specifically community-based composting – as will be further discussed below (Pasang et al., 2007).

There is more available data on food waste in more affluent Asian countries such as Japan and South Korea, where food waste at the consumer stage is also higher – for example, for Singapore (Gustavsson et al., 2011). Japan has a detailed life cycle assessment on food wastage from households, and comprehensive data all along the food chain starting from the quantitative difference between food supply and food intake, amount of food discarded, including by-products and edible food from processing
Facilities, food processing industry recycling rates, information from food loss surveys, and composition of MSW (Matsuda et al., 2012; Watanabe, 2009). However, Japan imports around 60% of its food in terms of the output value of the nation’s agricultural production (MAFF, 2015) and data on wastage during production, storage, processing, and transport is lacking. Furthermore, 94% of food waste generated by household is incinerated or landfilled in Japan, with implementation of decentralized lower environmental impact treatment options such as anaerobic digestion and composting lacking (Liu et al., 2016). In South Korea, data is more concentrated at the end of the food chain, involving detailed information on the generation of food waste from consumers (Lee, 2018), and disposal methods (KWMN, 2001).

Given the research interest in the topic of food waste over the past decade, there has also been an increase in academic studies on this topic, leading to insightful, albeit dispersed, data from different stages of the food chain. A research project on food consumption among the middle classes in Bangalore/Bengaluru and Metro Manila resulted in a series of publications, including an edited book titled Food, Consumption in the City: Practices and Patterns in Urban Asia and the Pacific (Ramaehandra, 2011), as well as a special issue in the International Development Policy Journal. Emerging food waste research in Asia includes Anantharaman’s (2014) work in Bengaluru, where she draws on ecological citizenship theory to discuss how composting is being implemented through networks of socio-economically privileged middle-class individuals. Based on journal keeping and weighing food, a material flow analysis among middle-class households in Bengaluru was combined with a social practice approach to understanding how and in what way food is wasted post-consumption (Leray et al., 2016). Taste preference has also been examined in the context of food provisioning and wastage in Bengaluru and Metro Manila (Sahakian et al., 2018).

For the edited collection on food consumption in Asian cities mentioned above (Sahakian et al., 2016), several authors addressed the issue of food waste: in a contribution from Japan, Watabe, Liu and Bengtsson (2016) consider uneaten food in relation to changing food consumption practices in Japanese society over time, embedded in specific cultural and social contexts, but also influenced by changing systems of provision. For Shanghai, Zhang (2016) studies the moral dimension of food waste, distinguishing frugality from thrift when it comes to consumer avoidance of food waste. Building on doctoral research in Malaysia, Papargyropoulou (2016) illustrates the question of food waste in Kuala Lumpur through the case of an upscale hotel restaurant, connecting social practices and biophysical patterns of food waste through an interdisciplinary research approach (see also Papargyropoulou et al., 2014). Lee (2016) explores food waste in Seoul’s households at the interface of changing food retail systems, food practices and systems of provision (see also Lee, 2018), while Favis and Estanislao (2016) present the case of a campaign to reduce food waste in a Metro Manila private school.

Other studies have also emerged, including an early study on food waste in Turkey focused on household energy loss due to bread wastage (Gül et al., 2003; Pekcan et al., 2005), and a study on food loss in production systems in the Philippines (Mopera, 2016). Some data is available on post-harvest food losses for India (Hegazy, 2013b), and on potato storage loss in Bangladesh (Hossain & Miah, 2009). In Thailand, research was conducted on ways to reduce wastage resulting from the manual grading of fruits, specifically Javanese apples (Treamanuk et al., 2010). In Indonesia, Soma explores the transformation of household food consumption and food wasting practices with the rise of supermarket consumption (Soma, 2017a, 2018) and critiques the ways in which low-income community members are expected to absorb the leftovers or unwanted surplus of the rich (Soma, 2017b).
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Case studies in food waste management

In this section, we present case studies from Cambodia, India, Indonesia, Japan and the Philippines: first, we discuss the current context in relation to policies and practices; then, we consider points of tension and/or opportunities for interventions. Table 12.1 provides a summary of the main findings.

Cambodia (Phnom Penh)

Statistics on food loss and food waste are almost non-existent in Cambodia, save for those based on a few investigations conducted by stand-alone projects – which results in difficulty to delineate the accurate flow of food waste. Similarly, the lack of a standard definition of waste in the available data (where “organic waste” and “food waste” are often used synonymously) also poses an issue given the presumed dominance of food waste in the organic component of MSW in existing statistics. \(^1\) Phnom Penh Capital Administration (2018) reports the dramatic increase of MSW disposal in the past five years, from 492,380 tonnes in 2012 to 808,530 tonnes in 2017 (“Phnom Penh Waste Management Strategy and Action Plan, 2018–2035”), while the organic content accounted for 70% of the disposed waste in 2009 and is considered to occupy more than 50% in the present day (Sang-Arun et al., 2011).

Policy discussions and interventions have traditionally treated food waste as organic waste under the frame of MSW management. Improvements of waste collection and disposal are given higher priority than treatment in response to weak collection and disposal systems. On the other hand, less attention has been given to the upstream considerations such as food loss at production stage, food waste reduction at consumption stage, or utilization of food waste as a resource at post-consumption stage. There is a significant potential to introduce various recycling methodologies due to the high organic content (51.9% in 2014) in the waste collected in Phnom Penh (MoEC, 2018).

National legal frameworks on waste management such as the “Environmental Guideline on Solid Waste Management in Cambodia” (2006), Sub-decree 113 on Urban Solid Waste Management (2015) and the current draft “National Strategy on Waste Management (2018–2035)” promotes source segregation, collection, and utilization of organic waste based on the 3R approach. Citizens are advised to segregate waste and sub-national governments are expected to develop legal instruments toward implementation of these policies. In addition, more recently, “Technical Guidelines on Urban Solid Waste Management” (2016) were developed with the aim of promoting local implementation, in which anaerobic digestion and composting are listed as primary methodologies for treating food waste. \(^2\)

In Phnom Penh, the “Waste Management Strategy and Action Plan of Phnom Penh (2018–2035)” adopted in 2018 sets out the overall plan and detailed list of action to improve the city’s waste management system and to promote the 3Rs. Organic waste management including food waste is positioned as a key component where the gradual development of resource utilization capacity and phased approach to the introduction of source segregation are planned (Phnom Penh Capital Administration, 2018). In the absence of effective waste collection, treatment and disposal systems, implementation of the 3Rs for food waste is still limited. Sales of food waste to livestock farmers has been a preferred choice for some waste generators (households, restaurants, hotels, etc.) although statistics are lacking to assess its impact. Seng et al. (2012) report a decline of this waste stream due to “marketable animal feed, difficulty of food waste transport and the speed of the animal production”. Private initiatives for food waste reduction, albeit not large scale,
Table 12.1 Overview of food waste management strengths and weaknesses across five cities in Asia

<table>
<thead>
<tr>
<th>Country (City)</th>
<th>Data available</th>
<th>Focus on waste in production processes</th>
<th>Focus on post-consumption waste</th>
<th>National framework for waste management in place</th>
<th>Municipal governance of food waste in place and implemented</th>
<th>Private/citizen actions toward reducing food waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia (Phnom Penh)</td>
<td>− Statistics on food waste in Cambodia including food loss in upstream life stages, during retail consumption and waste generation and treatment of food waste are almost non-existent</td>
<td>− Improvements of waste collection and disposal are given higher priority, as compared to upstream considerations such as food loss at production stage</td>
<td>+ High organic content of waste in Phnom Penh</td>
<td>+ + Environmental Guideline on Solid Waste Management (2006), Sub-decree 113 on Urban Solid Waste Management (2015), draft National Strategy on Waste Management (2018–2035)</td>
<td>+ Waste Management Strategy and Action Plan of Phnom Penh Waste Management Strategy and Action Plan (2018).</td>
<td>+ Initiatives to curb food waste at restaurant buffets.</td>
</tr>
<tr>
<td>India (Bengaluru)</td>
<td>+ Data on post-harvest losses in India, Composition of MSW</td>
<td>+ Government has invested in increasing storage capacity and food processing in production catchment</td>
<td>+ High organic content of waste across India</td>
<td>+ + National-level Solid Waste Management Rules (2016)</td>
<td>+ + BBMP rules 2012, 2013 and Amendments in 2013 to the Karnataka Municipal Corporations Act of 1976</td>
<td>+ + Active involvement of the city corporation BBMP, and various other stakeholders including NGOs</td>
</tr>
<tr>
<td>Indonesia (Jakarta)</td>
<td>+ Data on MSW</td>
<td>− Less focus and emphasis on food waste upstream</td>
<td>+ More focus on post-consumption phase</td>
<td>+ + Government Regulation No. 81/2012 toward waste segregation and management; “National Roadmap toward 2025 Clean from Waste Indonesia”; “2020 Zero Waste Indonesia” programme (2016); Integrated Waste Management Facility to Reduce-Reuse-Recycle Purpose (TPST 3R, 2017)</td>
<td>+ + Existing municipal policy, and strategies For example a Medium-term Development Plan (RPJMD) of Surabaya City for 2010–2015</td>
<td>+ Various citizen-led initiatives toward household level segregation, as well as independent efforts to provide leftover food to those in need.</td>
</tr>
</tbody>
</table>

(Continued)
Table 12.1 (Cont).

<table>
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<th>Private/citizen actions toward reducing food waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan (Kyoto)</td>
<td>++ Data on food waste across the life cycle</td>
<td>++ Emphasis on waste upstream and post-consumption</td>
<td>++ Food Waste Recycling Law enacted in 2001, revised in 2007 and 2015. Targets have been set for different food sectors and stakeholders</td>
<td>++ Large cities and 40% of smaller cities in Japan have at least one policy tackling food waste</td>
<td>++ Awareness campaigns and initiatives among households, with involvement of private sector and NGOs</td>
</tr>
<tr>
<td>Philippines (Metro Manila)</td>
<td>+ Data available at MSW level on food waste as part of biodegradables (including yard waste)</td>
<td>+ Studies exist on food loss in production systems</td>
<td>+ + Initiatives under way to address post-consumption waste</td>
<td>+ + Republic Act 7160 (The Local Government Code of 1991) and Republic Act 9003 (The Ecological Solid Waste Management Act of 2000)</td>
<td>+ + Engagement of NGOs, schools and businesses toward reduced food waste.</td>
</tr>
</tbody>
</table>

Legend: – – very weak; – weak; + strong; ++ very strong
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are emerging in Phnom Penh. For instance, many restaurants have started to charge penalties for excessive leftovers in response to wasteful consumption in buffet restaurants that are recently gaining popularity (Shaﬁk, 2015).

Two issues prevail in relation to waste management in Cambodia: the decentralization of waste management responsibilities from provincial to municipal level can be an issue, depending on what resources are available at the municipal level. Similar to many other developing countries, including Indonesia, the amount of food waste is estimated from the total amount of solid waste. Efforts are needed to collect the necessary data on food waste and make the data accessible for decision making. In terms of opportunities for intervention, the high organic content (51.9% in 2014 [Denney, 2016]) suggests a large potential for introducing various recycling methodologies, thereby reducing organic waste entering the city’s final disposal sites. There are numerous opportunities for upper-stream interventions, including efforts to reduce food loss through improving post-harvest infrastructure, as well as food waste reduction campaigns by both private and civil sectors. For instance, Seng et al. (2012) reports high willingness for source segregation and low penetration of knowledge on small-scale organic waste recycling among waste generators in Phnom Penh, suggesting an untapped potential for reduction.

India (Bengaluru)

In 2013, a study on harvest and post-harvest loss in India (except at the consumer level) estimated that the annual value of this loss for 45 crops was in the order of USD 12.60 billion³ (Jha et al., 2015). This loss was primarily due to the lack of infrastructure for short-term storage (especially at the farm level) and the lack of processing facilities in the production catchment. To address these issues the government continues to increase storage capacity and promote new food processing technologies (GOI, 2018). At the consumer level, citizen initiatives such as The Robin Hood Army (currently active in 13 cities in India) (Vijaykumar, 2015), and the Bangalore Food Bank supported by Griffith Foods (Sinha, 2018) channel surplus food from processing industries and hotels to the homeless and hungry in urban areas.

Although Bengaluru city does not have any food waste policies per se, it has seen significant citizen action to address the problem of post-consumer food waste. In India, around 60 to 75% of MSW consists of wet-waste (food and garden waste) (Ramachandra, 2011). In response to seven public interest litigations, in 2013, the Karnataka Municipal Corporations Act of 1976 was amended to mandate the segregation of MSW at source into dry, wet and sanitary waste (GOK, 2013). This was followed by rules brought out by the city corporation Bruhat Bengaluru Mahanagar Palike (BBMP) to mandate bulk generators (any organization generating more than 10 kg of total waste per day and housing complexes with more than 50 units) to either treat segregated wet-waste onsite using composting or anaerobic digestion, or to procure the services of authorized private vendors to process segregated waste fractions (BBMP, 2013). These rules were influential in framing the 2016 national-level Solid Waste Management Rules to mandate segregation of waste at source and that bulk generators treat wet-waste onsite or use the services of authorized private vendors across the country.

In Bengaluru city, several actors are responsible for the management of food waste generated at the level of markets, households, restaurants and commercial establishments (Zihetl & Steffen, 2015a, 2015c). At the public sector level, there are elected representatives of the BBMP with its elected head and administrative staff. There are also the waste contractors who employ waste-workers or pourakarmikas who sweep streets and collect waste from
houses, and authorized private vendors who manage segregated waste from bulk generators. From the community side, there are NGOs and social ventures, citizen groups and resident welfare associations (Ziherl & Steffen, 2015a, 2015c).

The BBMP has not been effective in ensuring the full implementation of the new Solid Waste Management (SWM) policy that mandates the segregation of waste at source and decentralized treatment of waste fractions. A corrupt nexus between contractors, BBMP elected councillors, and BBMP administrative staff holds the SWM system of the city hostage. Several times, contractors have boycotted the new tendering process that seeks to bring in transparency and accountability (High Court of Karnataka – Bengaluru Bench, 2012). Recently, due to large-scale citizen action, the BBMP is planning to do away with contractors by giving out ward-level contracts, paying pourakarmikas directly and giving separate contracts to those providing machinery and those supplying workforce (Bharadwaj, 2018; Joshi, 2017). Despite the widespread “Not in My Backyard” mindset, a large number of apartment and gated communities have implemented onsite community composting to treat food and garden waste (Anonymous, 2014; Yajaman, 2013).

In relation to opportunities moving forward: although in several countries source segregated wet-waste is composted in a decentralized manner, none of these cities have implemented city-wide community composting at the apartment complex level like Bengaluru has; a map based on self-reported data shows over 300 apartment complexes that segregate waste at source (2bin1bag, 2014). Case studies on apartment complexes in Bengaluru (inhabited by middle- and upper-middle-class income households) found that door-to-door collection of segregated waste and space for retrofitted composting facilities are critical prerequisites for this community-level composting (Shenoy et al., 2017).

NGOs and social enterprises organize workshops to educate residents on how to implement segregation and treatment of segregated waste. Additionally, there is access to free resources such as pamphlets, videos and documents on how to implement this system (2bin1bag; SWMRT, 2014). However, there is no systematic continuous monitoring process to ensure implementation of these rules. NGOs have been pushing the city and state government to mandate that builders of apartment complexes and gated communities plan and construct wet-waste treatment facilities such as anaerobic digesters or composting at the time of construction rather than retrofitting them later.

**Indonesia**

Indonesia is recognized as the world’s second-largest food waste generator with about 300 kilograms of food per person each year (EIU, 2016). However, it is difficult to obtain accurate data on the current status of food waste generation at different stages of the food supply chain. The national waste management data shows Indonesia generates 175,000 tonnes of MSW per day. Out of which, about 70% is disposed in landfills with 65% as organic food waste which is the largest fraction. The issue is particularly sensitive in a country of over 266 million people, where 7.6% of the population still suffers from malnutrition and more than 36% of children under five suffer from stunting – reduced growth due to prolonged malnutrition (Jakarta Globe, 2017a). Like many food-exporting countries, it is estimated that a large amount of waste is caused in the pre-market stage due to defective infrastructures for transporting and storing foods. Many of the agricultural areas still have substandard roads, disorganized transport systems and a lack of access to cold storage units (Jakarta Globe, 2017b). However, Soma (2017b, 2018) has noted in the case of Bogor (West Java), post-harvest food waste is an important point of interest, as “buy today eat today” practices that
promote smaller consumption are changing, with an increasing number of urbanites and middle/upper-income consumers stocking up and shopping at modern supermarkets. In addition, managing household food waste is also becoming problematic as traditional practices such as home composting and burying waste (which was originally biodegradable) have been made challenging with the advent of packaging waste (Soma, 2017b).

The Government of Indonesia has no specific policies, rules and regulations to address food waste. Instead, the issue is covered under the general waste management policies. Government Regulation No. 81/2012 gives direction toward waste segregation and waste management. The government issued the “National Roadmap toward 2025 Clean from Waste Indonesia,” which aims to reduce waste generation by 30% and effective management of waste for at least 70% – to reduce this from being disposed of in the landfills. The Ministry of Environment and Forestry (KLHK) launched the “2020 Zero Waste Indonesia” programme in 2016 to support hundreds of communities throughout Indonesia (The Jakarta Post, 2016). The “Integrated Waste Management Facility to Reduce-Reuse-Recycle Purpose” (TPST 3R) is another programme of the national government to support a better waste management system in densely populated urban areas in Indonesia (UNCRD, 2017).

Following the national policies, some local initiatives have flourished, such as the collection of food waste from households and restaurants, attempts to convert these wastes into animal feed and compost. For example, Surabaya, the second-largest city in Indonesia, succeeded in reducing its MSW to landfills by more than 20% over four years (2005–2008) introducing organic waste composting in addition to its community recycling programmes for non-organic waste. Considering that food waste (organic waste), makes 57% of its waste generation, Surabaya City introduced some measures including organic waste separation (in addition to recyclables) and reduction activities in households. In addition, the city supported community-based waste collection and the promotion of composting practice by setting up composting centres and distributing thousands of home compost baskets to residents (Premakumara et al., 2011; Gilby et al., 2017).

There are also some independent efforts, such as the Green School Bali’s Bio-Bus initiative (www.greenschool.org/support-us/biobus/), which operates buses that run on biodiesel from used cooking oil. The Food Bank of Indonesia is another voluntary initiative that was established in 2015 to bridge the gap between those with excess food and those who need food support. Additionally, a new programme called “A Blessing-To-Share” (https://ablesingtoshare.bridestory.com/) has been implemented in Jakarta. According to its founder Astrid Paramita – this programme is trying to close the gap between the rich and needy by packing leftover food from events, especially from weddings, and delivering them to those in need in partnership with Foodbank of Indonesia (http://foodbankindonesia.org/) and others.

Points of tension remain as the issue of food waste is covered under national and MSW management. This poses two obvious challenges. First, it is difficult to measure the total volume of food waste, as waste collection is still uneven. In Bogor, for example, only 67% of the population receive waste collection services from the municipality (Soma, 2017b). Considering the importance of accurate and available data for decision making, efforts are needed to establish a data management system to collect the necessary data on food waste – in which part of the food system the food is lost and wasted and for what reasons. It is also essential to make this data and analysis up to date and accessible to the policy makers and public.

Second, as MSW management is focused on reducing or reusing the waste at the end-of-pipe stage, there is a lack of consideration on the prevention side (upstream). As is the case
with many developing countries, it is essential to deal with the generation at the upper-
stream stages of the food supply chain in Indonesia. The Ministry of Agriculture implements
a national programme called UPSUS (Upaya Khusus: Special Efforts in Indonesian) aimed
at increasing productivity and production while at the same time reducing yield losses
(2011). The programme promotes various activities such as the implementation of Good
Handling Practices for reduction of post-harvest losses, extension of shelf-life, maintenance
of product freshness, more effective use of resources and facilities, and so on.4 Efforts are
needed to evaluate the efficacy of these action programmes and the potential for scaling up.

**Japan (Kyoto City and Oki Town)**

It is estimated that Japan discarded approximately 28.42 million tonnes of food annually
(including 10.13 million tonnes of by-products such as soybean meal and bran which have
been sold commercially as animal feed or fertilizer) (MAFF, 2018). The amount of food
wasted is about 34% of the annual supplies for domestic consumption. Of this amount,
20.1 million tonnes were from the food industry (processing, wholesale, retail and restaur-
ants) while 8.32 million tonnes were from households. Among them, 6.46 million tonnes
were considered edible at the moment they were discarded. This amount is virtually equiva-
 lent to the amount of the country’s rice production (7.99 million tonnes in 2015), and is
twice the total amount of food aid distributed worldwide (about 3.2 million tonnes in 2015)
(MAFF, 2018). Although food industries contribute a large proportion to the total food
waste, their reducing and recycling rate is higher than 80% (MAFF, 2018). Figure 12.1 pro-
vides an overview of food waste treatment for households and food business sectors.

The Government of Japan has strengthened its policy to tackle food waste with the Food
is to reduce final disposal of food waste through waste prevention and waste reduction
measures, promote utilization of recycled resources in food-relevant industries to increase
food waste recycling as animal feed, fertilizer and to generate energy. The usages are

![Image of food waste treatment diagram]

*Figure 12.1 Status of food waste treatment in Japan in 2015.*

Source: Chen Liu and Atsushi Watake, based on MAFF (2018)
prioritized in the order of animal feed, fertilizers, oil and fat products, and “heat recovery” through methanation if all of the other treatments are difficult. This law mainly focuses on relevant industries (e.g. food manufacturers, wholesalers, retailers and restaurants), requiring these actors to promote the reduction and recycling of food wastes. Recycling/reduction targets have been set for each food-relevant sector. For example, the recycling targets by March 2020 are currently set to food manufacturers (95%), food wholesalers (70%), food retailers (55%) and restaurant industry (50%). Companies with large volumes of food waste generation (more than 100 tonnes per year) have to conduct mandatory regular reporting on food waste-related data (food waste generation, sales, recycled amount, recycling rates) to the ministries every year. The law also sets targets called reference generation units for the control of food waste generation (from April 2014 to March 2019) for 31 groups such as meat product manufacturers, vegetable pickles manufacturers, coffee drinks and juice manufacturers, takeout/delivery food service, hotels, school lunch and hospital food, and so on (MAFF, 2017). The revised law in 2007 encourages local governments to create a recycling loop to promote the usage of fertilizers and animal feed by the local food producers. Companies certified in the recycling loop initiative would benefit from exemption from authorized permission requirements that waste transporters need to acquire (52 certifications as of the end of April 2017) under the Public Cleansing and Waste Management Law (Denney, 2016).

At the industry level, the government also introduced the Eco-feed and Food Recycle Mark certification and registration system for businesses that produce feed and fertilizer made from food waste. As of March 2018, 28 companies have been certified for 49 products under the Eco-feed label, and 13 fertilizer production companies have been licensed under the Food Recycle Mark. The business sector has also made progress through their partnerships with government agencies. In 2012, four government agencies and private enterprises formed a working group for revising some commercial practices toward the reduction of food waste. The group first targeted the revision of the so-called one-third rule that urges manufacturers, wholesalers and retailers to discard food well before the expiration date. The group carried out pilot projects to reduce waste by mitigating this rule. Some companies also reviewed the expiration date (163 items in 2015) and the means of displaying it by month rather than a specific day (115 items in 2015) to reduce the amount of food and beverage discarded.

Local governments have made progress in targeting food waste generated by retailers, restaurants, and households. According to the Consumer Affairs Agency (2018), all prefectures and major cities and 40% of smaller cities and towns have at least one policy tackling food waste. Awareness-raising campaigns for the consumers is the most popular policy, followed by education at schools, and campaigns in restaurants and hotels to avoid leftovers. Partnerships with the food banks, usually operated by civil society organizations, are also becoming popular.

Kyoto City, the city which attracts the largest number of tourists in Japan, pioneered the local actions first by studying the waste component in 2000. The results indicated 96,000 tonnes of edible food was wasted a year. The city aims to halve the amount by 2020 and has introduced a number of actions. The city issued a certificate of “Zero-leftovers-shops and restaurants” to more than 900 shops, restaurants and hotels who promote activities to use up all food items, support customers to reduce and pack leftovers, etc. For the households, the city runs the 3-kiir movement comprising Tsukai-kiir (using-up of food items with practices of shopping, cooking and storing), Tabe-kiir (eating-up with proper knowledge of expiration dates, menus utilizing leftovers, etc.), and Mizu-kiir
(drying of organic waste to reduce the amount). Additionally, the city encourages Eco-School-Excursion where students bring their toothbrushes and eco-bags and avoid leftovers during the tour.

While most of the major cities have more or less similar policies focusing on raising citizens’ awareness as well as tourists’, small towns in the rural areas have participated in turning food waste into resources and operating a closed loop food system. For instance, Oki town, a small town in Fukuoka Prefecture is the site of the Kururun biogas plant. The plant collects all the organic waste generated in the town (by both the household and business sectors), as well as human waste (including septic tank sludge) and produces electricity. The digestive liquid produced in the facility is used as fertilizer by farmers and in private gardens in the town. The food produced in the garden is then used for school lunches or preferentially sold to the town residents at reasonable prices. What town residents eat turns into human waste and septic tank sludge and returns to Kururun.

Civil society organizations and private companies have also run a nation-wide campaign called the NO-FOODLOSS PROJECT together with the government agencies (MAFF 2016). The campaign aims at raising public consciousness and encouraging action by supporting activities at each stage of the food chain. Food banks have also spread over the country, dealing with 7,398 tonnes of food a year (MAFF, 2014). Salvage parties, where participants bring foodstuffs and ready cooked foods that would otherwise not have been used, and prepare food together with the other participants are also becoming common. These initiatives turn uneaten food into something valuable.

In terms of points of tension and future opportunities, all the prefectures and major cities have embarked on policies to reduce food waste, mostly through awareness-raising campaigns to consumers. Although awareness of consumers is a critical element of the issue, it is difficult to ensure changes in behaviour and achieve a substantial reduction of the waste only through the awareness campaigns (Yokohama City, 2018). Further reduction will require changes in all stages of food production, distribution, consumption and post-consumption.

Another untapped challenge is loss and wastage at the uppermost stage, namely, the farms. The data available in Japan lacks an essential part of the food waste issue for this country. While it imports 60% of the total food consumed, the statistic does not tell us the fraction of food produced overseas, to be consumed by Japanese citizens, that is lost and wasted during steps of production, storage, manufacturing and transport.

The Philippines

At the national level, several laws address MSW and food waste in the Philippines, under the over-arching legislation in the Philippines governing waste management, Republic Act 9003, or the Ecological Solid Waste Management Programme. Foremost among these are Republic Act 7160 (The Local Government Code of 1991) and Republic Act 9003 (The Ecological Solid Waste Management Act of 2000). RA 7160 gave governing bodies of provinces, cities, municipalities and barangays (the smallest administrative unit in the Philippines, representing a village, ward or district) the responsibility and jurisdiction over SWM. RA 9003, provides a more holistic approach to SWM, and identifies the barangay as responsible for the collection of source segregated waste from the residential sector. This includes the collection of segregated food waste/yard or garden waste and recyclables which are diverted to the barangay composting facility or materials recovery facility, respectively. While the law downloads the responsibility to the barangay, the national government does not necessarily provide the local governmental units the resources to do so – one criticism of
the law at the time of its ratification. The presence of a robust civil society movement in the country, including a vibrant group of environmental associations, has increased the spread of efforts in food waste management.

At the city level and for the capital region, there are different modes of food waste management in Metro Manila, a metropolitan capital region which is comprised of 16 cities and one municipality. One mode is the collection and purchase of food waste by hog raisers. In some barangays in Quezon City, collectors gather segregated food waste from households for free and sell these to private hog owners for a fee. Some cafeterias also sell food waste to private hog owners. Another mode relates to composting at the barangay or local government level. The local government unit of Marikina City organizes food waste collection through its food waste truck programme. Initially working with restaurants and other food establishments in 2014, this programme has since expanded to cover residential areas. The collected food waste is composted and then used in the city’s urban gardens. Bantay Kalikasan, an NGO, is replicating the programme in other barangays in Marikina as part of its advocacy on waste segregation (Cahayag, 2018).

The issue of food waste became part of the mainstream media coverage in 2013, which was proclaimed the National Year of Rice. During this period, the Philippine Rice Research Institute (PRRI) launched the “Be Riceponsible Campaign” toward reducing rice wastage and increasing local yield and supply. Part of this campaign involved creating a norm around a default serving of half-cup of rice per person, leading to the passage of ordinances in Manila and Quezon City (“On Eco-Feed”). In the wake of the proclamation, the Department of the Interior and Local Government encouraged cities and municipalities to pass ordinances to address waste generated from excess servings of rice, beyond what can be consumed. Coinciding with the National Year of Rice celebration was the filing of Senate Bill 1863, the “Anti-Rice Wastage Act of 2013” on providing half-rice servings in all restaurants (Pasiona, 2016).

In certain buffet restaurants, popular in Metro Manila, awareness around food waste has increased, with messages such as “over-servings of food will be charged”. Other initiatives have emerged in recent years to allow customers in restaurants to order small, medium or large plate sizes (Ziherl & Steffen, 2015b). Currently being debated is the proposed “Zero Food Waste Act” that mandates the state to develop a system to redistribute surplus edible food from restaurants, fast food chains, hotels and other food establishments to people who have less access to food (Gavilan, 2016). This legislation hopefully will end the unsafe and inhumane practice of pagpag, where leftover food scavenged from trash is recooked, sold and consumed by the poorest of the poor in Metro Manila.

Alongside direct food waste reduction initiatives at the city level are ordinances that penalize food establishments who improperly dispose of their used cooking oil and grease trap into the sewerage system, leading to clogged drains – a precursor to flooding. Such initiatives are usually conceptualized as flood prevention and sanitation measures, yet it should also be presented as food waste reduction and recycling methods (Chavez, 2018).

In terms of points of tension, a 2017 proposal to ban unlimited rice – which is popular in fast food chains patronized mostly by low- to middle-income groups – was met with a significant lack of public support (The Manila Times, 2017). The proposal was in response to data indicating an annual volume of rice wastage of roughly two tablespoons of rice per household daily and to failed attempts to achieving self-sufficiency in rice production. Culturally, rice serves as a stomach filler, especially for lower-income groups. For other diners, certain dishes are best eaten with big servings of rice. This campaign shifted the responsibility of lowering food wastage from the government, the system and the rich, to middle- and
low-income individuals. In a country where thousands lack basic nutrition, this shifting of responsibility was seen as highly problematic. Citizens felt that government initiatives to measure and reduce wastage should be the main backbone of the food waste reduction efforts in the country, with individual practices being a supplement to the effort rather than the main focus.

Opportunities to reduce large-scale food wastage lie with the government as they manage production, storage and distribution of large quantities of food. For example, a 2014 audit report found that more than 7,000 family food packs intended for survivors of the Yolanda typhoon were lost due to spoilage from improper storage and mismanagement by the government (Cahayag, 2018).

Discussion and conclusion: looking ahead toward promising food waste strategies in Asia

Asia provides a rich tapestry of cultures and socio-economic dimensions where food wastage can be examined along different systems of food provisioning, and in relation to gender, class, religion and, for India, caste. With its high population, awareness building in Asia has an important role to play in reducing wastage – among the public and private sectors, and citizens alike – yet it is equally significant to examine and explore the systemic issues that exacerbate wastage. The gendered dimension of domestic work and food provisioning is one example of how food waste management post-consumption can give undue responsibility to women over men, as noted by Soma (2017a, 2016). The middle-class activism around food waste also poses issues when it comes to more inclusive and democratic forms of waste management, as underlined by Anantharaman (2014) and Upadhya (in Lutringer & Randeria, 2017). Problems of malnutrition, poverty and access to food are more acute in Asia, raising the question of food waste within the context of environmental and social justice.

As we have discussed in this chapter, food wastage is a highly contextual topic as food can be lost or wasted at different stages due to a variety of social, political, environmental and technological reasons. Solutions to these problems should also be context specific, which we have attempted to uncover through both a national and city-based case study approach. Based on this analysis, we would like to put forward the following key recommendations: First, ensuring harmonized data collection on food waste remains an issue in Asia. Toward this end, Japan has developed a system to collect and analyse statistical data on the current status of food waste generation throughout the food systems. However, in many cities and regions in Asia, including Japan, the amount of food waste is estimated from the total amount of solid waste. Considering the importance of accurate and available data for decision making, efforts are needed to share best practices and encourage partnerships between cities and academic institutions to support waste audits.

Second, there is a need to better understand and improve the governance of waste in Asia, where several countries have set goals toward ambitious waste management systems recycling goals. With the current trend toward decentralization in the ongoing reform of waste sector governance, with increased responsibility placed on provincial and municipal administration – as is the case in Cambodia and the Philippines – the question of adequate resources and political clout for implementing such strategies becomes critical. Such reforms provide an opportunity for municipal administrations to establish a waste management/resource circulation system tailored to local needs and conditions, yet assistance is needed at the municipal level with capacity development, designing sustainable financial mechanisms for waste management, and inviting cooperation from the private and civil sectors. In
The third recommendation is a call for more research and action on source reduction, not solely recycling and final waste management. While many countries in Asia tend to focus on the recycling and reuse of food waste, with economic benefits associated with both processes, there is also a need to further emphasize prevention and absolute reduction of food waste at various stages of the food chain. Tackling the issue of food waste at the source, rather than at the “end of pipe”, will require engagement with different stakeholders, local to global food systems, including farmers and fisherfolk, small and medium enterprises, transnational food companies, civil society and consumer-citizens, as well as both local and national governments – specifically around issues of food distribution, exports and overproduction. There are innovative projects under way across the region – what can be termed “bottom up initiatives” – some of which have been highlighted in this chapter. These provide a clear opportunity for gathering best practices, and sharing examples of social innovation toward source reduction across cultures and contexts. The increasing popularity of the zero-waste movement in the Philippines, including zero-waste food packaging advocacies, is an example of how such an approach can gain resonance and would merit further investigation. Trends in the service sector to penalize leftovers, especially at buffets, are another example, as are the emergence of food banks for the redistribution of surplus food from hotels and restaurants to people in need.

The fourth recommendation is for scholars to better map food consumption and consumer trends across dimensions of gender and class. Eating out is an important trend in relation to food waste, no doubt related to changing and gendered household dynamics. Food preparation has been primarily the responsibility of women in most societies. Additionally, access to domestic helpers, usually female and from the lower-income groups, has become the hallmark of being a middle-class citizen across the Asian region. Provision of knowledge opportunities for women and the enlistment of men toward food waste reduction efforts can be the outcome of such gender analysis. While households have a role to play, food waste in the service industry and changes in taste preference could be prioritized in further research and policy action (Pasiona, 2016). To examine the changing role of gender and class relations, a political economy perspective could reveal how the dynamics of food acquisition, production and waste management shifts.

Ultimately, research in the area of food waste must account for economic trends: while the growing popularity in the circular economy is a promising area for research, policy and action, the ambition of reducing waste and closing loops must be understood in relation to institutional settings and social norms, or not solely ecological economic principles but also those of the social and solidarity economy (Moreau et al., 2017). If capitalist paradigms prevail, it is easy to understand how profitable recycling can be
prioritized over the non-profitable reduction of food waste at source, for example. Rather than privileging profit and monetary gain, there is an increasing call for the promotion of other paradigms which put forward the importance of people and planet—such as relationship with nature, food, and more generally well-being (Kothari & Joy, 2017). Inscribing the waste management system and food waste in particular within a social and solidaristic economy may be one way forward (Sahakian & Dunand, 2015), leading to decent wages for waste-workers, penalties for food wastage in the industry sector, regulations for the safe redistribution of food to those in need, or incentives for waste reductions at source. This would require tackling the institutional frameworks and social norms that shape food waste across contexts and cultures.

Notes
1 Statistics of other dominant organic wastes such as green waste and waste textiles are often compiled as separate independent waste categories.
2 Home scale biodigesters (wet fermentation) are given higher attention based on Cambodia’s unique condition (space limits and food with high moisture contents) and in line with National Biodigester Programme of the Ministry of Agriculture, Forestry and Fisheries, Cambodia.
3 1USD = INR 73.52
4 http://apec-flows.ntu.edu.tw/upload/edit/file/2%20SR_2017_C_S3-03_Indonesia-Revised2.pdf

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