Resources, Conservation & Recycling 131 (2018) 172–180

Contents lists available at ScienceDirect

Resources, Conservation & Recycling

journal homepage: www.elsevier.com/locate/resconrec

Full length article

Challenges in food waste recycling in high-rise buildings and public design for sustainability: A case in Hong Kong

Jia Xin Xiao, Kin Wai Michael Siu*

School of Design, The Hong Kong Polytechnic University, Kowloon, Hung Hom, Hong Kong

ARTICLE INFO

Keywords:
Food waste recycling
High-rise buildings
Public design
Recycling behaviour
Sustainability

ABSTRACT

In recent decades, various studies on policy, management, behaviour, norms and economic incentives related to food waste issues have been conducted. Many of the studies are from a quantitative perspective which has given a wider but general coverage of study and analysis on the matters. However, the impacts of context, such as living environments and social culture, on recycling activities from a qualitative as well as in-depth perspective have seldom been discussed, especially in densely populated communities. Taking Hong Kong as an example, some food waste recycling (FWR) initiatives have been launched in housing estates. However, most projects have been suspended due to many practical problems. Only a few cases are still on-going. Physical setting quality has been identified as a significant factor affecting sustainable behaviour. Inefficient and low-quality public designs that do not consider living environments and specific lifestyles may fail to encourage community participation. This study aims to provide a more in-depth investigation into people's attitudes and actual behaviour towards and to shed light on public design for sustainability. Using the FWR programme in Amoy Gardens as a case, this study uses qualitative research methods to explore FWR experiences and improve its weaknesses. The findings show three potential challenges to FWR in densely populated high-rise buildings: (1) limited space, (2) hygiene issues and (3) implementation and management. This study also provides implications for public design to improve sustainability in communities and encourage public participation in FWR in high-density residential areas.

1. Introduction

With increasing environmental concerns worldwide, food waste has become a vital issue in many cities. Although some researchers have insisted that food waste can be transformed into a valuable resource, waste is most often perceived as a disgusting and annoying matter that must be eliminated as quickly as possible (Hawkins, 2006). To get rid of massive food waste, incinerators and organic waste treatment facilities are built one after another. To deal with food waste issues, researchers and environmentalists have made tremendous efforts on policy and management initiatives. Various studies on waste management, norms and economic incentives have been conducted in recent decades (Chan and Lee, 2006; Chung and Poon, 1996; Fahy and Davies, 2007; Hage et al., 2009; Yau, 2010). 'Pay as You Throw' has been identified as an effective policy contributing to waste recycling (Chang et al., 2008). However, the impacts of context, such as living environments and social culture, on recycling activities and human behaviour have seldom been discussed, especially in densely populated communities. The quality of built environments and facilities has been identified as a significant factor affecting sustainable behaviour (Xiao and Siu, 2016). Food waste generation is directly relevant to daily practices formed in specific environments (O'Brien, 2008). Steg and Vlek (2009) also state that where people live, from dwellings to neighbourhoods and communities, can significantly influence sustainable behaviour.

A number of early studies discussed the factors that influenced public participation in recycling and how to enhance recycling behaviour (Martin et al., 2006; Nigbur et al., 2010; Steg and Vlek, 2009). However, only few studies on public participation in household recycling have focused on particular medium- and high-density dwellings, which have been identified as problematic (Timlett and Williams, 2008). Some reference to surveys of Asian countries, such as Korea and Japan, would facilitate public participation in food waste recycling (FWR). In some Korean neighbourhoods, food processors that can weigh food waste and charge a disposal fee are provided on the ground floor, urging residents to participate in FWR (Lee and Paik, 2011). In Japan, different types of material, including food waste, are collected on a designated date. Residents have to store food waste at home and dispose of them according to a strict waste collection schedule (Siu and

* Corresponding author.
E-mail address: m.siu@polyu.edu.hk (K.W.M. Siu).

https://doi.org/10.1016/j.resconrec.2018.01.007
Received 5 July 2017; Received in revised form 28 December 2017; Accepted 4 January 2018
Available online 10 January 2018
0921-3449/

Xiao, 2016). Any improper or illegal disposal behaviour results in punishment. Compared with Korea and Japan, the high-rise living situation in Hong Kong is much more crowded and diverse. Due to the high density of the population, most residents live in housing estates with more than 20 storeys. The limited private and public space makes it difficult to conduct food waste separation in residential areas.

Most research on FWR in high-density populations has adopted quantitative methods to identify the barriers to and opportunities for FWR (Chung and Poon, 1999; Lee and Paik, 2011; Timlett and Williams, 2009; Yau, 2010). However, studies of design and living contexts that use qualitative methods, such as field observations and interviews, have been especially rare. The results of quantitative research can be used to gather major information with respects to respondents' beliefs, values and attitudes, however, they are not able to address how accurately or truthfully their behaviours and attitudes, and cannot address cause-and-effect relationship (Sommer and Sommer, 1997). As Yin (1993) states, qualitative research can gain useful insights into the complexity of people's behaviours. Qualitative methods are important since they truly reveal the way people operate and the reasons behind their behaviour (de Certeau, 1984).

Recently, some FWR initiatives were launched in housing estates in Hong Kong. However, most of these projects have been suspended due to many practical problems. Only a few cases are still on-going. It is an opportune time to examine FWR programmes by exploring the related experiences and challenges and to improve their weaknesses. Then, three questions arise. First, what are the constraints of and challenges to FWR in high-density high-rise residential areas? Second, what contextual factors affect recycling behaviour? Third, how can built environments and public facilities be improved to encourage public participation in FWR?

2. Food waste recycling in Hong Kong

In the past few decades, the Hong Kong government, environmentalists, non-governmental organisations (NGOs) and some industries have made tremendous efforts to develop policies and measures on waste disposal and recycling. According to the report from the Environmental Protection Department (EPD) in 2010, the local government set out a 10-year waste disposal plan to develop new facilities and strategies in 1989. The Programme on the Source Separation of Domestic Waste has been implemented territory-wide in Hong Kong since 2005. It encourages people to separate recyclables from waste.

Table 1 shows the key schemes, measures, programmes and legislations on food waste that have been launched by governments and NGOs. According to EPD (2011), approximately 3600 t of food waste are generated every day, accounting for 42.3% of the amount of domestic waste. Two thirds of food waste come from households and one third comes from the commercial and industrial sectors. Compared with other materials, such as glass, metals, papers and plastics, the recovery rate of food waste is highly inefficient (0.6%). This low efficiency stems from the complexity and difficulty of FWR in high-rise buildings. Although the local government provides an ideal blueprint for handling the food waste problem, practical barriers make it difficult to effectively implement these strategies. Living environment and lifestyle are two major factors affecting FWR in residential areas (Siu and Lo, 2011). Some new residential buildings provide processors in the kitchen to deal with food waste. However, for most residential buildings that have already been used for a few decades, there exist certain physical FWR constraints. Units are relatively small, especially public housing units (< 40.0 square metres). The limited space of domestic kitchens is no more than 2 square metres, which is not big enough to install any food waste processors. Previous studies have indicated that the cooking and consuming habits of local residents are quite different from those in Western countries (Siu and Lo, 2011). In Hong Kong, people tend to buy fresh food from the wet market rather than frozen food from the supermarket. Their food waste contains a large quantity of water, which is putrescible and may lead to hygiene problems.

In 2003, a SARS epidemic occurred in Hong Kong. Due to the high-rise, high-density built environment, an intense outbreak occurred in Amoy Gardens, spreading via public facilities and infrastructures, such as floor drains. Over 300 residents were infected and moved out for isolation. The SARS outbreak affected not only the inhabitants of Amoy Gardens, but also the entire territory (Wong, 2010). It was a dark time in Hong Kong, but it triggered some positive changes. During this time of SARS outbreak, the government announced emergency measures, such as the cleaning and disinfection of public spaces in buildings. The enhancement and management of public spaces and facilities in terms of environmental issues became increasingly important in households and communities. After the SARS outbreak, residents throughout the community became highly concerned about hygiene-related issues.

Amoy Gardens was typical of the most common style of high-rise private housing estates in Hong Kong built in the 1980s and 1990s. It

Table 1
The key schemes, measures, programmes and legislations on food waste in Hong Kong.

Key schemes, measures, programmes and legislations	*Details*
Launched by governments	
Electric Composters Trial Programme (2002)	Fifteen electric composters were provided in fifteen housing estates in Shatin. The participation rate was 4%.
Wet/Dry Sorting Trial (2003)	Aimed to encourage public participation in source separation. It was suspended because of severe acute respiratory syndrome (SARS).
'Pay as You Throw' Trial Programme (2006)	Launched in 20 housing estates and suspended 3 months later. The bags for collecting food waste were reported as being thin, small and unattractive to residents.
Kowloon Bay Pilot Composting Plant (2008)	The composting plant was set up for recycling food waste with a capacity of 1.5 t per day.
Waste to Food Community Pilot Programme (2009)	An initiative to develop a locally adaptable vermin-composting system. Sixty vermin-composting bins were provided in communities.
Food Waste Recycling Partnership Scheme (2009)	Promoted institutions and commercial and industrial sectors to recover kitchen waste. The collected food waste was delivered to pilot composting plants for recycling.
On-site Meal Portioning Projects in School (2009)	Subsidised schools to conduct conversion works and install facilities for 'on-site meal portioning'.
Food Waste Recycling Projects in Housing Estates (2011)	Funding of HK$50 million was approved to encourage public participation in FWR in housing estates. The participating housing estates were subsidised to install facilities for FWR.
Food Wise Hong Kong Campaign (2013)	Campaign driven by the Food Wise Hong Kong Steering Committee to help the commercial and industrial sectors, schools and NGOs participate in food waste avoidance and reduction.
Green Delight in Estates – Food Waste Recycling Scheme (2014)	Campaign organised by the Hong Kong Housing Authority and Friends of the Earth (Hong Kong). Workshops, lectures and related activities were organised in several public housing estates.
Launched by NGOs	
'Labour Has Value' Food Recovery Programme (2012)	Distributed free vegetables to some families, such as single-parent families, and elderly living alone in the Tin Shui Wai community. However, most organisations had to suspend the project due to a lack of financial assistance and many practical problems.
Food Saving School Tours (2015)	Campaign driven by Friends of the Earth (Hong Kong) to encourage students to treasure food.