Resources, Conservation & Recycling 136 (2018) 142–152

Contents lists available at ScienceDirect

Resources, Conservation & Recycling

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

Full length article

Chiang Rai Zero Waste: Participatory action research to promote source separation in rural areas

Panate Manomaivibool[a,*], Mongkonkorn Srivichai[b], Pattayaporn Unroj[a], Pannipha Dokmaingam[c]

[a] Natural Resources and Environmental Management Research and Training Center, School of Science, Mae Fah Luang University, 5th Fl. Building E3A, 333 Moo 1, Thasud, Muang, Chiangrai, 57100, Thailand
[b] Department of Civil and Environmental Engineering, Faculty of Engineering, Rajamangala University of Technology Lanna Chiang Rai, 57120, Thailand
[c] School of Health Science, Mae Fah Luang University, 7th Fl. Building E3B, 333 Moo 1, Thasud, Muang, Chiangrai, 57100, Thailand

ARTICLE INFO

Keywords:
Community-based management
Home composting
Waste diversion
Recycling
Soft infrastructure
Waste minimization

ABSTRACT

Municipal solid waste management (MSWM) is a challenge for local governments in developing countries. They often lack resources to modernize the hard infrastructures of MSWM. However, the social capitals can be mobilized to develop soft infrastructures for community-based management (CBM) of solid waste in rural areas. Chiang Rai Zero Waste (CRZW) was a participatory action research (PAR). Together with Chiang Rai Provincial Administrative Organization (CR PAO), lessons from previous interventions were used to promote source separation in the north of Thailand. CRZW asked households 1) to install a home composter, called sa-wians, 2) to separate recyclables, and 3) to use the products from composting in home grown garden. This study evaluated the effectiveness of this CBM in the 18 piloting villages. The formative evaluation affirmed the feasibility of the action and its benefits in terms of waste diversion. It also highlighted factors affecting its implementation such as the type of housing and the supports from the local governments at a subdistrict level. Future prospect of this model, its limitations and complimentary solutions to improve the sustainability of MSWM were also discussed. Reflecting on these observations, the management of hazardous waste was added in the next step to make the action more holistic.

1. Introduction

Municipal solid waste management (MSWM) is a daunting task for local governments in developing countries. While the amount of solid waste is rising in these countries, most of them do not have resources, be it manpower, knowhow, budget, or equipment, to properly provide the public services. A global review of MSWM showed that in low income countries the service coverage was poor and even in the middle income countries considerable amount of waste ended up in open-dump sites with little or no safeguard to the environment (Hoornweg and Bhada-Tata, 2012).

MSWM in Thailand was no exception. 3066 out of 7777 local governments were not equipped to offer the waste collection services. According to the Pollution Control Department (2017), only 9.75 out of 27.06 million tons of solid waste was sent for safe disposal in 2016. Subtracting 21% of waste that went to recycling, the rest was either dumped or burnt in open air. In addition, the cost recovery of the services was very poor. While local governments spent around 168 THB per month[1] to manage waste from a household, on average they got back only 23 THB from monthly waste fees.

Source separation could improve the sustainability of MSWM by reducing the quantity of waste for final disposal and related environmental impacts. However, beyond the realm of commercial recycling that often organized in informal sectors (Hamidul Bari et al., 2012; Agarwal et al., 2005; Nas and Jaffe, 2004; Ojeda-Benitez et al., 2002), source separation had not been institutionalized in developing countries. The problems ranged from a lack of public awareness (Moh and Manaf, 2017; Charuvichchaipong and Sajor, 2006) to a challenge to translate positive attitudes into affirmative actions (Babaei et al., 2015). Previous research has shown that training in waste reduction and information campaign were necessary to improve community attitude and knowledge in source separation and, consequently, participation in recycling program (Malik et al., 2015). Additional measures were also needed to reinforce behavioral changes such as environmental cadres, waste banks and pay-as-you-throw (PAYT) programs (Seacat and Boileau, 2018; Dhokhikah et al., 2015). Based on an experiment with four villages in the Northeast of Thailand, Boonrod et al. (2015) showed that social recognition and economic incentives could reinforce voluntary actions and increased a separation efficiency of organic waste from a baseline of 19%–36% and above 50%, respectively.

* Corresponding author.
E-mail address: panate.man@mfu.ac.th (P. Manomaivibool).

https://doi.org/10.1016/j.resconrec.2018.04.002
Received 15 May 2017; Received in revised form 26 March 2018; Accepted 2 April 2018

Chiang Rai Zero Waste (CRZW) was an attempt to promote source separation in Chiang Rai Province, Thailand. A participatory action research (PAR) started with a study to understand mechanisms behind successful source separation. The knowledge was used to plan an intervention to change waste handling practices. The plan consisted of the installation of simple home composters, a social norm of self-sufficiency in a community, and supports from a local government. Chiang Rai Provincial Administrative Organization (CR PAO) had sponsored the action since its inception in 2015. In 2016, it was piloted in 18 villages before being mainstreamed to other villages in 2017.

This paper presents the formative evaluation of the intervention in 18 piloting villages. This was an important step to check the feasibility of the plan and explore key implementing conditions. In order to provide background knowledge of the case, the next section describes MSWM in Chiang Rai before the PAR. Section 3 then explains the research process in particular the materials for this evaluation. Key findings are discussed in Section 4. The last section concludes the work.

2. MSWM in Chiang Rai

Chiang Rai is one of the largest provinces in Thailand with a land area of 11,678.37 sq.km. and a population of 1.28 million. In terms of governance, the province is divided into 18 districts (Amphor), 124 subdistricts (Tambon), and 1751 villages (Baan). There are 144 local governments that provide public services. Chiang Rai Nakorn Municipality is the only city-class municipality serving the city center. The others are either subdistrict-class municipalities or subdistrict administrative organizations (SAO) in rural areas that have not been upgraded into a municipality yet. CR PAO which supported this action is responsible for projects and activities that benefit more than one municipalities and SAOs.

Chiang Rai Provincial Office of Natural Resources and Environment (2014) had estimated that there were 434,496 tons of municipal solid waste generated in the province in 2013. This was equivalent to a waste generation rate of 0.93 kg per person per day. This represented a significant increase in waste generation. Based on the national waste survey in 2004, a weighted average waste generation rate in Chiang Rai was 0.62 kg per person per day (Pollution Control Department, 2004). Fig. 1 compares the composition of waste in 2004 and 2015. Organic waste remained the largest fraction despite its proportion falling down from 74% to 66%. The other notable trend was the rise of plastic waste during the past decade. A higher waste generation rate was reported in the city center at 1.15 kg per person per day and the waste that Chiang Rai Nakorn Municipality managed contained 46% of organic waste (Department of Local Administration, 2017).

According to the Public Health Act, B.E. 2535, a local government has the authority over the collection and disposal of solid waste within its jurisdiction. They can provide the services or authorize private contractors. The law also set a maximum rate for the monthly waste collection fee at 40 THB for a household generating 20 liters of waste or less per day. This ceiling rate had been frozen for more than 20 years before the new Act on the Maintenance of the Cleanliness and Orderliness of the Country, B.E. 2560. The 2017 Act has revised the fee structure allowing local governments to charge the fees for waste collection and waste disposal up to 150 and 200 THB per month, respectively.

However, in reality only 62 out of the 143 municipalities and SAOs in Chiang Rai could provide some sorts of waste collection services to their citizens. The others failed to fulfill their duty due to two main reasons. The first was a financial obstacle. Under the previous fee structure, even if all households in Chiang Rai had paid the maximum fee of 40 THB per month, the annual revenues would only amount to 236 million THB. But, with an average handling cost of 2.62 THB per kg for local governments (Manomaivibool and Dokmaingam, 2017), the total cost of waste collection and disposal in 2013 would be as high as 1.17 billion THB. Therefore, local governments needed to heavily

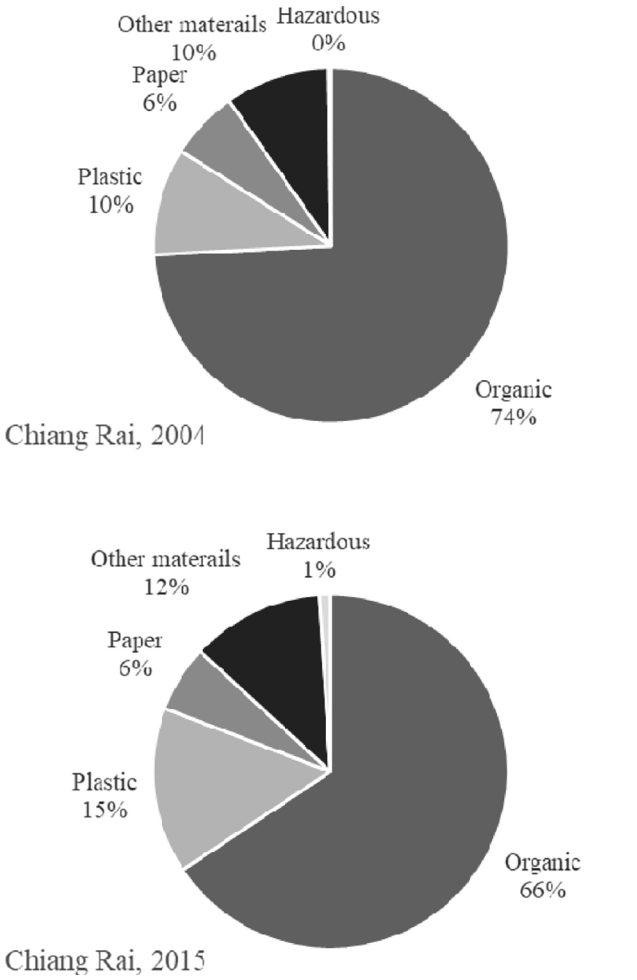

Fig. 1. Waste composition in Chiang Rai (%, in 2004 and 2015). Source: Pollution Control Department (2004) and Dokmaingam and Manomaivibool (2017).

subsidize the services. One study showed that municipalities in Chiang Saen and Chiang Khong Districts paid 70–80% of the operating costs out of their general revenues (Manomaivibool and Hempattarasuwan, 2013). Most SAOs had limited budget and could not afford this. Even though the new fee structure was designed to address this problem, it is expected that most local governments will raise the fee gradually from the current level to prevent backlash.

The second obstacle that had restricted MSWM was a lack of safe waste disposal options. There were only three sanitary landfill sites in Chiang Rai: the largest one operated by Chiang Rai Nakorn Municipality to serve 45,000 households in the city center; another small site was serving the Doitung royal projects and Huai Khrai Tambon Municipality; and, the other only accepted waste for nine local governments in Mae Sai District. Other local governments had to make do with small incinerators or open dumping sites in public and private land. The situation got worsen when communities filed complaints against a large private dumpsite in Mae Chan District that accepted waste from 20 local governments across Chiang Rai. The investigation led by the environmental and industrial authorities in 2012 resulted in a close down of the site. Attempts from CR PAO to construct new centralized waste disposal sites in Mae Chan and Chiang Khong Districts failed due to strong opposition from the local communities.

On a more positive note, Chiang Rai had a few cases of successful CBM that were recognized even at a national level. The most famous was Baan Pong Srinakorn in Rong Chang Subdistrict that won the Zero Waste Award in the national competition organized by Department of