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Applying value chain analysis to informal sector recycling: A case study of the Zabaleen

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ABSTRACT

A methodology has been developed to apply value chain analysis (VCA) to the informal recycling sector, and demonstrated using the Zabaleen in Cairo, Egypt as a case study. The VCA methodology provides a 'toolkit' comprising four stages. The first involves mapping the value chain and has been demonstrated using the recycling of polyethylene terephthalate (PET) bottles as the particular example. Stage 2 tabulates the value added at each step in the value chain; this has been demonstrated for different types of plastics as well as other recycled fractions. Stage 3 identifies and then applies a set of indicators for the development of the informal sector recycling value chain in order to address technical and socio-economic challenges. The indicators proposed are in three categories: connections in the value chain, waste valorisation and the enabling environment. Stage 4 involves developing a system dynamic map that shows connections between the indicators, and the stocks and flow variables in the value chain. In particular, it identifies the most highly connected indicators on which to focus interventions, as these are likely to have the greatest impact on the overall system. For the Zabaleen, these are improving the quality of waste inputs into the value chain through source segregation, optimising access to waste and upgrading recycling activities through access to finance and technical knowledge.

1. Introduction

Recycling is an integral part of sustainable waste management that can be a formal or informal sector valorisation activity (Wilson et al., 2013; UNEP, 2015). It relies on source segregation, collection, sorting, mechanical processing and trading into local, national and international industrial and agricultural markets (Scheinberg, 2012). The concept of waste valorisation is broader than the concept of recycling because it takes into account the commercialisation of recycled materials (Scheinberg, 2011, 2012). In developing countries valorisation activities are usually performed by informal recycling value chains (Medina, 2000, 2007; Ahmed and Ali, 2004; ILO, 2004; Wilson et al., 2006, 2009, 2012; Gutberlet, 2008, 2015; Samson, 2010; Scheinberg et al., 2010; Gunsilius et al., 2011a; Ezeah et al., 2013; Linzner and Lange, 2013; Schluep, 2014; Rodic, 2015). Developing the value chain is essential to fully integrate the informal sector into the waste management system (Velis et al., 2012).

Scheinberg uses the term 'value chain recycling' to describe private sector recycling activities that depend solely on the revenues from selling recovered materials, as opposed to municipal recycling where the economics is driven also by the price of competing alternative disposal routes (Scheinberg and Simpson, 2015). Informal sector recycling in developing countries often exists independently of the formal municipal solid waste management sector, seeking otherwise unoccupied economic niches within the formal industrial or agricultural value chains (Scheinberg, 2011). Much of the literature explores opportunities for inclusion or integration of informal recyclers within the municipal solid waste management system (e.g. Gunsilius et al., 2011b; Scheinberg et al., 2011; Scheinberg, 2012; Mavropoulos et al., 2014; Scheinberg and Savain, 2015). Velis et al. (2012) present a framework for use in designing interventions, while Scheinberg and Simpson (2015) have developed a visualisation tool which examines the degree of overlap of the service and value chains. Cohen et al. (2013) provide an operational guide for preparing an informal sector inclusion plan.

The position of informal sector recyclers is often at the beginning of the value chain, collecting dirty materials for sale at a low

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price to which others add value. Value chain analysis (VCA) has been widely used in agriculture to help improve the livelihoods of poor farmers (Kaplinsky and Morris, 2001; KIT et al., 2006; Riisgaard and Ponte, 2011; Trienekens, 2011). VCA originates from the work of Porter (1985, 1990) and Womack and Jones (1996). Kaplinsky and Morris (2001) defined a value chain as "*the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use*". Each step or link in the value chain involves a source input, a process of value addition and selling the material to the next link in the chain. Each step adds value to the product and often generates more revenue than the previous step. VCA seeks to identify the different steps and actors in the value chain and evaluate their performance. This allows an analysis of how to improve the livelihoods of those upstream, towards the beginning of the chain, for example by modifying particular steps within the chain and the interactions between them (Humphrey and Navas-Alemán, 2010).

The potential for application of VCA to the informal recycling sector has been recognised (Velis et al., 2012), but so far most work has appeared in the grey literature, is unpublished or is relatively narrow in scope. VCA was applied in a qualitative manner to cardboard recycling in Durban (Mueller, 2005). It was used to study plastics recycling in Delhi (Bagadayeva, 2009) and has been used as a framework to study the informal recycling sector in India (Dr Sanjay Gupta, personal communication, 2011). The GTZ (now GIZ) Private Sector Development Programme prepared a Value Chain Development (VCD) tool, again primarily for application in the agricultural sector (Will et al., 2008). This was applied to the plastics recycling sector in Egypt (Staffeld, 2010). CHF International (2012) applied a specific version of VCA to examine the youth job creation potential of SWM interventions in Accra, Ghana. Rakiman et al. (2014) used qualitative VCA to examine aluminium recycling in developed countries and Rigasi et al. (2015) used a qualitative version of VCA to analyse and propose improvements to informal sector recycling in Nigeria.

The primary aim of this research was to develop a framework for applying Value Chain Analysis (VCA) to informal sector recycling. This required the selection of a practical case study, as the development and demonstration of the component VCA methods are inextricably linked. The ideal situation would be to study a local informal recycling sector that has already made substantial progress in developing additional value added steps beyond the simple collection of materials to sell on for recycling, and therefore this research has focussed on the Zabaleen recycling community in Cairo, Egypt.

The Zabaleen are a Coptic Christian community who first came to Cairo and Alexandria in the 1930s. They have traditionally provided a door-to-door waste collection service for a fee to higher-income households. However, their main source of income is from sorting the waste and selling the recovered dry materials and raising pigs on the organic waste component. Local NGOs and international development agencies have been actively working with the Zabaleen since the 1980s, with an early Oxfam-funded project focusing on helping the Zabaleen to develop small businesses to add value to the raw materials they separate. This has resulted in a complex value chain within the Zabaleen community (Conrad and Joos, 2010; Didero, 2012; Schluep, 2014). The Zabaleen have received much international attention recently, particularly because of a long running 'conflict' with official efforts since 2002 to contract waste collection and disposal in Cairo to international private companies (Fahmi, 2005; Fahmi and Sutton, 2006, 2010; Iskandar and Tjell, 2009). The Zabaleen in Cairo have been used as a case study in two major international GIZ studies of the informal recycling sector, one focusing on the economic aspects (C.I.D. Consulting Group, 2008; Scheinberg et al., 2010, 2011; Gunsilius et al., 2011a) and the other on integration opportunities (Gerdes and Gunsilius, 2010; Gunsilius et al., 2011b). A tool for financial and social cost-benefit analysis has previously been applied to the Zabaleen (Bowman et al., 2011).

The Zabaleen in Cairo represents about 80% of the total informal waste management sector in Egypt and there are currently six main active Zabaleen settlements collecting waste from the adjoining governorates of Cairo, Giza and Qalyubeya (collectively Greater Cairo) (Shaker, 2014a). Waste generation in Greater Cairo is estimated at 23,000 t per day (Zaki et al., 2013), of which the Zabaleen collect just under 40%.

The aims of the work reported here were thus to develop a method for applying VCA to the informal recycling sector, demonstrate the method by applying it to the Zabaleen and make recommendations from the VCA on how the informal sector recycling of the Zabaleen could be further improved.

2. Approach

The application of VCA to the informal recycling sector was developed from the use of VCA in the agricultural sector. The VCA methodology provides a 'toolkit' comprising four stages. The first two stages are adaptations of standard VCA methods. The third uses a categorisation adapted from previous experience, with the detailed selection of indicators based on knowledge gained from the case study in Cairo. The fourth stage allows identification of the critical indicators which are most highly connected and thus are likely to have the most impact on the overall value chain.

Background information on waste management in Cairo and on the Zabaleen recycling system was provided by the GIZ project team based in Cairo, who were in the fourth year of the National Solid Waste Management Programme supporting the Ministry of the Environment (GIZ, 2015). Interviews were conducted with a number of GIZ team members and other Egyptian solid waste management professionals. This information was supplemented by primary data collection carried out in Cairo in June 2015. A total of 45 semi-formal and informal interviews were conducted, including 22 interviews in small and medium recycling enterprises in the Zabaleen communities in Mokkatam and Ezzbat el Nakhl. The Zabaleen were asked how they perform their task, what could be improved, what they needed to expand their businesses and also to provide cost and other economic data. In addition, informal interviews were conducted with the residents of Zamalek, a high-income district in Cairo, in order to gain the perspective of service users about the current SWM system.

3. VCA toolkit for the informal recycling sector

The four inter-linked stages used to apply VCA to informal sector recycling are summarised in Table 1.

Stage 1 *maps the value chain.* This is standard practice in VCA (Kaplinsky and Morris, 2001). This visualises the different steps/actors in a particular value chain and allows clear understanding of the connections between the actors. Mapping has previously been used by Mueller (2005) for cardboard recycling and to provide a generic overview of the sector (Scheinberg, 2011, 2012). A proprietary software package has been used in this work to standardise the process.

Stage 2 determines the *value added at each step* of (or by each actor in) the value chain. This is also standard practice in VCA (Kogut, 1985; Porter, 1985; Kaplinsky and Morris, 2001). The format of Staffeld (2010) was used to facilitate comparison of our data with 2010 data for the Zabaleen.