The Role of the Informal Waste Sector in Affecting Alternate Waste Treatment

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ABSTRACT

The management of municipal solid waste in developing countries is documented as being a significant burden on solid waste managers charged with delivering the service to the general public. Solid waste management is generally shown to have poor management with the potential to have positive social, environmental and financial impacts. The services are shown to be a financially unsustainable drain on municipal budgets with the operational and capital costs being heavily subsidised from government level. Collection and processing services are shown to be lacking, especially in low income areas, where services are often shown to be inadequate.

An informal waste sector has developed out of the unemployed sector of developing countries that attempt to render collection and processing services in exchange for a small income to support their families. There is potential to integrate the informal waste sector into the solid waste management model that could result in improved working conditions (social change), job creation for the unemployed and improved efficiencies for the solid waste managers.

The paper presents at an alternative separation at source program that could improve recycling efficiencies, reduce costs to the waste managers and potentially incorporate the informal waste sector in the management activities. The use of economic instruments and programs to address the financial shortfall when trying to develop a more sustainable business model are also presented.

1 INTRODUCTION

Sustainable solid waste management in developing countries presents numerous challenges to the regulators, municipalities and authorities that have been charged with public collection services and management of solid waste streams. Typically, the collection services have been shown to be rudimentary and highly ineffective, lacking developed environmental control systems. There is widespread illegal dumping and scavenging that centres around poor environmental and waste awareness in the general public (Matete & Trois 2008).

In developing countries, migration from rural to urban areas is prevalent with the majority of the new inhabitants unable to afford formal housing. The result is that cities face an increasing flux of unemployed inhabitants into low income townships (slums) surrounding the urban centres (Medina 2005). An informal waste sector (IWS) has established itself around waste management hubs in developing countries which see the “poorest of the poor” of the unemployment sector separating valuable recyclable material from the MSW stream for resale in the attempt to generate some form of income (Medina 2005). Municipalities have typically ignored or attempted to suppress the informal waste management activities which has been shown to be ineffective presenting its own list of issues (Medina 2005; Paul et al. 2012).

A review of the study area reveals the fact that the management of solid waste has far reaching potential incorporating the environmental, social, financial, economic, private business and municipal sectors. From the case studies, it is clear that many developing countries present similar issues when it comes to the sustainable management of their solid waste (Paul et al. 2012; Medina 2005; Bleck & Wettberg 2012; Matete & Trois 2008)

By assessing the role of extended producer responsibility programs and the like, one could develop possible business models that could be applied to reduce the dependency of solid waste management on significant lifelong subsidies bringing financial and economic sustainability to the fore.

2 SOLID WASTE MANAGEMENT STATUS QUO

Municipalities are typically legislated as being responsible for the management of Municipal Solid waste (MSW), but the implementation of sustainable solid waste management practices has been shown to present significant problems. The available municipal budgets for the management of solid waste in the urban environments of developing countries are typically less than budget allocations for potable water, foul sewer and other civil services (Medina 2005). In both Mexico and the Philippines a large portion of the population (especially low income households) do not receive adequate waste collection services which results in negative environmental impacts through illegal dumping activities and dumping in environmentally sensitive areas (Medina 2005; Paul et al. 2012).

South Africa presents a scenario no different from what has been highlighted in other developing countries. Waste management services are often unreliable and disparate across different communities. Areas consistently identified as having poor service delivery are categorised by unacceptable waste management practices from a social and environmental perspective. These poor delivery areas are often governed by poor financial planning which has seen the level of service delivery decrease instead of increase (Matete & Trois 2008).

The separation of waste at source prior to collection is not yet commonplace in developing countries which results in the majority of municipal solid waste (MSW) being disposed of to landfills without the implementation of waste minimisation measures. To date, recycling in South Africa is an activity carried out by private recycling companies with municipal buy-back centres and drop offs contributing only 1% to waste minimisation. Waste minimisation activities through scavenging and informal activities as municipal facilities also only contributes 1% to waste minimisation (des Ligneris 2000).

3 THE ROLE OF THE INFORMAL WASTE SECTOR

An informal waste sector (IWS) has developed in many developing countries surrounding the waste management activities. The demographic break-down of the IWS show strong representation of non-native immigrants and unemployed members of society (Medina 2005; Paul et al. 2012).

Municipalities have typically ignored or attempted to suppress the informal waste management activities which has been shown to be ineffective presenting its own list of issues (Medina 2005; Paul et al. 2012). There are many health and social issues around the manner in which these informal waste pickers (IWP) operate. IWPs enjoy very little official recognition or support from regulatory bodies and other sectors, operate in unsafe and unsecure workspaces, and are exposed to unreliable income streams and exploitation by the industries and bodies to whom they sell their waste. (Paul et al. 2012). A study of the IWS in Iloilo City, Philippines showed that the majority of the members of the IWS to be under the age of 39 years old with elementary school education with a gender split of 55% female. (Paul et al. 2012). The operations of the informal sector occur on a small scale and is largely characterised as being labour intensive with services often being carried out by entire family or extended family units operating in unison (Wilson et al. 2006).

The contribution of the IWS to the collection of MSW from areas not serviced by the municipalities in many Mexican cities is significant. Despite the hardships and negative social stigmas associated with these informal waste collectors (called carretoneros), these informal waste collectors (IWC) have managed to create a market for their services that earns as much a six times the Mexican minimum wage in some instances (Medina 2005).

The IWS has been shown to contribute a high percentage of recovered recyclables out of the MSW stream and have also shown to reduce both the cost of waste collection to the municipalities and create the much needed job opportunities in developing countries (Medina 2005; Paul et al. 2012). Across cities in Latin America and Asia, it is reported that 2% of the population receives and income from informal waste picking activities (Wilson et al. 2006).

Wilson et al. (2006) report that there are four primary informal waste picking activities that take place across the developing world. A waste flow chart of informal waste collection is shown in **Figure 1.** The activities are categorised as follows:

a. *Itinerant waste buyers:* Waste collectors who travel door to door trading or bartering for recyclables or wastes associated with recycling value. These waste pickers invest capital and possess means of transport to move the wares to cooperatives and buy-back centres. Prevalent in developing countries in Asia.

b. *Street waste picking:* Raw material scavenging from mixed waste disposed to the streets or available in communal bins before formal collection takes place.

c. *Municipal waste collection crew* - Secondary raw materials are recovered from vehicles that transport MSW to the landfill sites. High prevalence in Mexico, Columbia, Thailand and the Philippines. **Figure 2** shows the recyclables present in a typical MSW collection vehicle from South Africa.

d. Waste picking from dumps - Secondary raw materials are recovered post placement at the landfill prior to covering taking place. This type of scavenging is typically undertaken by pickers living in shack style housing close to the landfill site. **Figure 3** depicts informal waste picking at a South African landfill.

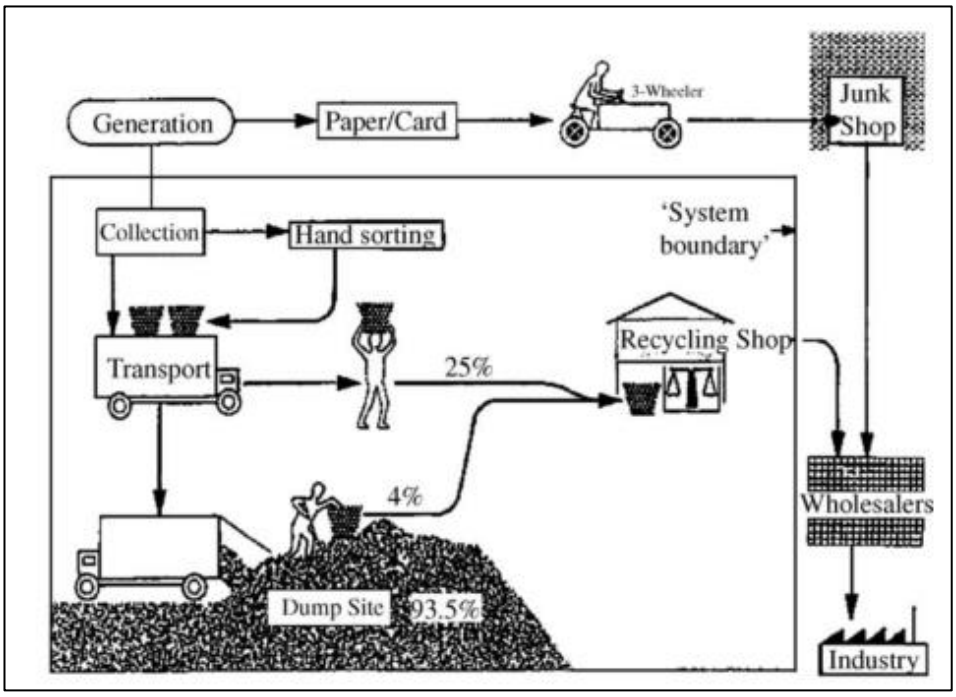

Figure 1 - Waste flow chart for the informal recycling sector (Taken from Wilson et al. 2006)

Figure 2 - Recyclables in a MSW collection vehicle (Photo courtesy of R. Emery 2014)

Figure 3 - Secondary raw material recovery at landfill (Photo courtesy of R. Emery 2002)

The organisation behind the IWS activities are directly linked to the degree of exploitation imposed by upstream buyers of the secondary recyclables. More organised the IWS services results in a higher value of the secondary raw materials extracted by the picker crews. This in turn fetches a better selling price at the cooperatives and buyback centres due to the internal support with the IWS in the area (Wilson et al. 2006). The value of the secondary raw materials follows a trend based on the level at which the materials are traded within the greater recycling network. This value change hierarchy is highlighted in **Figure 4**. The IWS typically operates in the lowest levels of this hierarchy and as such are exposed to the lowest potential for income generation from secondary raw material recycling (Wilson et al. 2006).

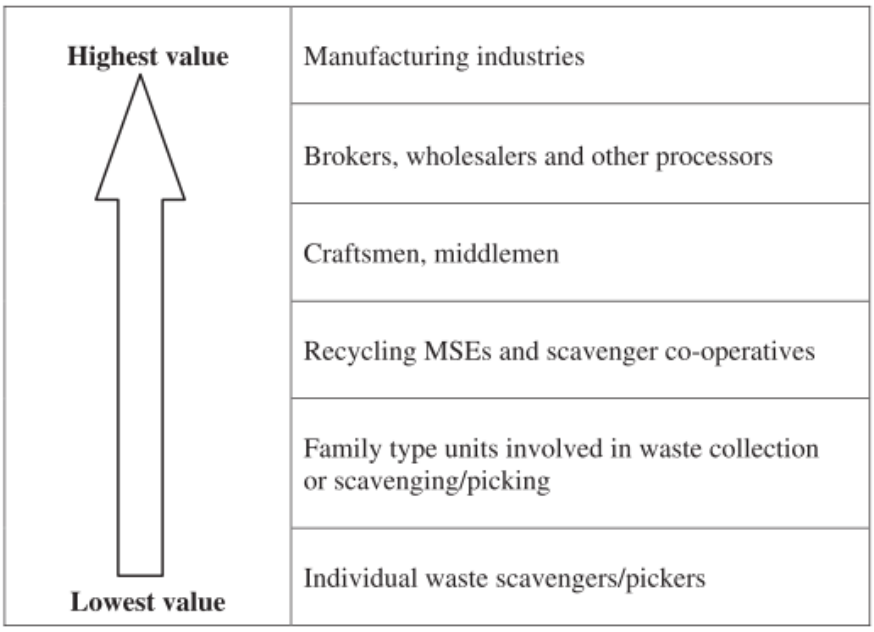

Figure 4 - Secondary Recyclable Value Chain Hierarchy (Taken from Wilson et al. 2006*)*

The informal waste sector needs greater organisation and support from formal structures to reduce the exploitation of the IWS by the buyers of the recyclables. A case study of Iliolo city, Philippines is presented below which highlights the steps taken by the municipality in trying to incorporate the IWS into the solid waste management operations of the city.

The municipality implemented a series of workshops with members of the IWS as a part of their development of a sustainable livelihood approach (SLA) with the aims of trying to establish an Informal Waste Pickers Association to incorporate the concerns and needs of the IWS into the management of MSW in the city (Paul et al. 2012). An output of the workshops and engagements was the formulation of a waste management program that focussed on addressing the challenges faced by the members of the IWS. The Informal Waste Pickers Association was successfully established in 2009 as a part of the SLA programme, by 2011 the programme had delivered the following key results (Paul et al. 2012):

a. Average daily incomes for the IWPs had increased
b. The value of both social and financial assets for the SLA had improved
c. The IWS began to naturally depend more on team work and collaboration as a unit which offered support structures to the IWS.
d. Waste picking at a MRF was clearly the preferred alternative over waste picking at the landfill.
e. The skills development program had started up small scale entrepreneurial endeavours that were outside mechanical separation jobs (i.e. Business sector opportunities had developed over the physical unskilled labour opportunities).

4 ALTERNATIVE ECONOMIC INSTRUMENTS

The fact that municipalities are under stress to provide sustainable solid waste management services on limited budgets has been highlighted above. While incorporating the IWS into waste management activities could provide some cost savings to the municipality, alternative economic funding opportunities are needed to assist those charged with waste management in affecting sustainable management systems.

It is now understood that the most financially cost effective solid waste management option is disposal to landfill. Proponents for a more sustainable management understand that this idea needs to be challenged but financial resources to effect meaningful change are still limited (Nahman & Godfrey 2010; Medina 2005; Paul et al. 2012; Matete & Trois 2008). Economic Instruments (EIs) are presented by Nahman & Godfrey (2010) that make use of instruments such as environmental taxes and subsidies that may affect behaviour indirectly and positively. Revenues generated by the EIs can be used to offset the costs of providing the waste management services or to help subsidise taxes elsewhere in the economy where they may be unbalanced.

South Africa, in line with international trends, has developed an increased interest in an environmental policy approach called extended producer responsibility (EPR) that extends the producer's responsibility for a product to the post-consumer stage of the product development cycle. Through the implementation of EPR, the responsibility of environmental (and social) impacts throughout a product lifecycle shifts from the general public (ultimately the municipalities) to the waste generators themselves (Nahman 2010). EPR can be seen as an EI that aligns with the polluter pays principle where the costs associated with the management of waste is passed back to the waste generators, which can assist with providing the financial shortfall experienced by municipalities in developing countries (Department of Environmental Affairs 2011). EPR programs have been developed as a mechanism that present options to producers, authorities and consumers for the management of specific waste streams in a meaningful and sustainable manner (Nahman 2010).

EPRs can be broken into two main derivatives namely: mandatory programs, that is legislated programs that are enforced by authorities, or voluntary, which are programs that are established voluntarily to manage a specific waste stream. Both types of EPR present a funding mechanism (for example mandatory product levies or contributions from manufacturers and producers) and have specific mandates with regards to how these funds are spent to facilitate sustainable management of the waste stream. EPR programs have been shown to have positive impacts in terms of environmental and social impacts and have been able to provide, in one example, some stability the highly variable markets for recyclables. EPR programs can be setup in such a way as to support the IWS by providing a support structure and job creation opportunities for IWCs to sell their recovered recyclables (Nahman 2010).

Recycling, as an alternative to disposing waste to landfill, has been a common theme appearing the literature study thus far. The fact that the full cost analysis of recycling yields advantages over landfilling, such as reduced environmental impacts and decreased pressure on virgin resource stocks, has already been presented above. The promotion of recycling over other mechanisms, however, cannot be fully justified without delving further into the sustainability and potential limitations of recycling as a solid waste management mechanism.

The market that dictates the price that the recyclables are sold for is highly variable and as such can be associated with offering a low return on investment for investors at times (Paul et al. 2012; Nahman 2010). Logistics around the transportation of waste was highlighted by Nahman & Godfrey (2010) as one of the key needs that challenge solid waste management. The sustainability of recycling is also linked transportation costs. High transportation costs can eat into potential returns for operators trying to operate a profitable recycling facility. The profitability of a recycling operation is seen to be heavily reliant on the concept of supply and demand. A recyclable waste stream will only identify itself as worth the collection and transportation costs once the initial supply of the waste stream exceeds a certain amount. The supply of the raw material is then similarly linked to the market demand of the waste stream post-consumption (Nahman 2010). Careful consideration into the supply and demand behaviour in the proposed industry is required before implementing a mechanism to increase diversion of the waste stream into recycling. This is crucial to ensuring the future sustainability of any intervention.

5 SUSTAINABLE SOLID WASTE MANAGEMENT

Recyclables can be recovered from the MSW stream at landfills, usually by the IWC, or by separation at source programs with different efficiencies (Paul et al. 2012). The recovered recyclables are taken to a Materials Recycling Facility (MRF) that is typically owned privately or by the municipalities. Recyclables are sorted an baled to be sold to the recycling industry (Medina 2005; Paul et al. 2012).

The study by Medina (2005) shows that the IWS is a successful mechanism for the collection of MSW from hard to reach areas in low income areas with the communities being willing to pay for their own waste collection services. Illegal dumping was also less prevalent in areas where the IWCs didn't have to transport the waste over long distances (Medina 2005). By using IWCs to collect waste in hard to reach, low income areas and ensuring that the density of drop-offs centres are high, municipalities could possibly see tangible improvement in collection efficiencies and a reduction in illegal dumping activities. These styles of interventions could also stimulate job creation programs, reduce environmental impacts and reduce exposure to health and sanitation risks.

In developing countries, the realisation of waste management mandates are focussed on trying to combine both labour intensive and simple technology solutions. This focus results in the creation of new jobs suitable for an unskilled, unemployed population (Paul et al. 2012; Medina 2005; Trois & Simelane 2010).

In South Africa, waste separation at source programs have typically focussed on removing uncontaminated recyclables from the mixed MSW stream (Trois & Simelane 2010). The study by Trois & Simelane (2010) present an alternative separation program that separates the dry waste, comprising recyclable and inorganic residual non-recyclables, from the wet waste, comprising food and other green garden wastes. The idea of separating the organic fraction from the mixed MSW is congruent with the current practices in the Philippines (Paul et al. 2012).

When implementing this alternative waste management system, wet and dry waste would be separated out at source (2 bag policy). Both of the separated waste fractions would be transported to a central integrated waste processing facility (in this instance the landfill) which negates doubling handling or double logistics costs. Once at the central processing facility, the wet (organic) waste is composted for beneficial reuse while the dry waste is mechanically sorted to remove the recyclable component at a MRF. The residual inorganic waste is then disposed to the landfill (Trois & Simelane 2010). The composting and mechanical separation activities could potentially be undertaken by the IWS under a dedicated program that involves social upliftment and job creation objectives as presented in the study by Paul et al. (2012). A further opportunity to investigate the role of the IWS presents itself in line with what is working in Mexico (Medina 2005). If such a system proved viable in the South African waste management climate, one could see a significant improvement in service delivery, the reduction of environmental impacts, social upliftment and improvement to the financial models surrounding solid waste management.

6 CONCLUSION

The management of solid waste in developing countries is typically characterised by poor service delivery, inefficient and improper management and is a drain on the coffers of the institutions charged with effecting responsible and sustainable solid waste management.

Waste management activities in densely populated urban areas is further complicated due to the increasing influx of unskilled unemployed inhabitants to low income (slum) areas. An informal waste sector (IWS) has developed around the management of solid waste in cities of developing nations around the world. Although typically the recipients of hostility, the IWS has been shown to undertake the following duties in developing countries around the world:

a. Waste collection services
b. Mechanical waste separation services
c. Transportation of separated waste to recycling facilities and/or buy-back centres

Formally including the IWS has been shown to present positive impacts from a financial, environmental and social point of view. The IWS could be incorporated into waste collection services and could undertake simple technology waste treatment at a central waste processing facility with the goal of diverting waste from landfill.

Towards the implementation of more sustainable waste management practices, separating wet waste from dry waste is an alternative separation at source system that could potentially improve the recovery of clean recyclables while separating organic waste from the general domestic waste stream for easier processing.

Extended producer responsibility programs present economic alternatives to sourcing the funds to affect more sustainable solid waste management while potentially reducing the dependence of solid waste management on the authorities responsible for implementing solid waste management services in urban environments.

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