Strengthening Informal Supply Chains: The Case of Recycling in Bandung, Indonesia

by

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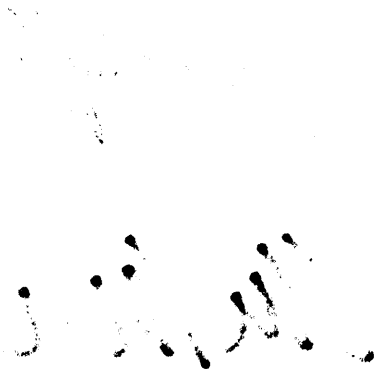

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Abstract

A large degree of economic activity in developing countries operates unregulated and unreported in what has become known as the informal economy. Within the informal economy, a large number of individuals work in waste picking and recycling. In Indonesia, up to 70% of all employment is within the informal economy. In Bandung, the nation's third largest city, there are estimated to be more than 3000 individuals working in the informal recycling sector as waste pickers and middlemen.

The informal recycling supply chain begins with waste pickers that collect waste materials from homes, businesses, streets, waste transfer sites, and landfills. These materials are then sold through a series of middlemen before reaching the factories that reuse them as inputs to production. Traditionally, academics, policy makers, and advocacy groups have focused their attention on waste pickers, while dismissing recycling middlemen as being exploitative. However, in the case of Bandung, the middlemen industry has a great deal of heterogeneity in terms of earnings and vulnerability. Middlemen also add value to supply chain by providing needed capital and transportation.

Using the case of recycling in Bandung, this thesis argues in favor of policies that take into consideration all actors within an informal supply chain. In order to design effective policies, policy makers should have a clear understanding of the supply chain dynamics as well as the roles that each actor in the system serves. This thesis purposes an evaluation tool to aid policy makers in assessing informal supply chains on aspects of both efficiency and social conditions. The application of this tool is then demonstrated in the design of several policy recommendations for enhancing informal recycling activities in Bandung.

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List of Abbreviations:

APKI: Asosiasi Pulp dan Kertas Indonesia

BPS: Badan Pusat Statistik

CCBA: Cairo Cleansing and Beautification Authority

CPG: Consumer Packaged Goods

CSR: Corporate Social Responsibility

EPA: Environmental Protection Agency

EPC: Environmental Protection Company

EQI: Environmental Quality International

ILO: International Labour Organization

ITB: Institut Teknologi Bandung

NGO: Non-government Organization

PET: Polyethylene terephthalate

PP: Polypropylene

PS: Polystyrene

Rp.: Indonesian Rupiah

SLU: Superintendência de Limpeza Urbana

THR: Tunjangan Hari Raya

TPA: Tempat Perbuangan Akhir

TPS: Tempat Perbuangan Sampah

WIEGO: Women in the Informal Economy: Globalizing and Organizing

1. Introduction

The city of Bandung, Indonesia relies heavily on recycling to reduce the stress on the existing waste management infrastructure and as a means of survival for thousands of informal recyclers in the city who spend their days collecting and processing these materials in order to earn enough money to support themselves and their families. Motivated by economic incentives, individuals can enter and exit the industry with ease, creating an informal market for recycling that operates independent of the formal solid waste collection system. Through a complex recycling supply chain, these informal workers and establishments have been able to reach a level of efficiency comparable to the capital-intensive centralized systems in the U.S.

These activities occur throughout the developing world, although they are often ignored by policy makers. The way in which a city handles its solid waste impacts the environment, public health, and social welfare. It has been estimated that up to 2% of the world's urban population depends on waste either directly or indirectly for their income (Medina 2000). This number is expected to grow due to high economic and population growth rates occurring throughout the world. Informal recycling systems provide the poor in developing countries with jobs, supply industries with raw materials, and reduce the stress on municipal infrastructure, such as collection and landfills (Gerdes and Gunsilius 2010). Effective recycling systems can reduce the negative impacts on the environment due to improper waste disposal methods, such as burning and open dumping in public spaces and rivers,

and from the excessive resource use of virgin materials by industries. With respect to recycling rates, the informal supply chain in Bandung achieves a high level of efficiency, however the system fails to address issues of the protection and promotion of the workforce involved.

This thesis uses the case of informal recycling activities in Bandung, Indonesia in order to identify effective ways for policy makers to evaluate and enhance informal supply chains. To ensure that policies deliver the intended result, policy makers need to have an in-depth understanding of the operational aspects of the current informal system and design policies that take into account these dynamics. The typical supply chain for recycling in Bandung begins with informal self-employed waste pickers who collect waste materials from households, businesses, streets, waste disposal transfer sites, and landfills. These materials are then sold through a chain of informal and formal middlemen establishments, and are ultimately processed and used as inputs in the manufacturing of new products. This thesis places a particular focus on understanding the role of middlemen within the supply chain, as they are often overlooked in the literature on the topic, or are simply dismissed as being exploitative of waste pickers. This approach has led to policies that primarily focus on waste pickers while ignoring other players within the system. However, in the case of Bandung, middlemen play an important role in the efficiency of the system, while also facing many of the problems associated with operating in the informal sector. Therefore there is cause for local governments to support the efforts of informal recyclers and promote the external benefits their

services provide, while also playing an active role in designing policies that address the negative aspects that arise from these activities.

This thesis will present a framework for evaluating informal supply chains based on the perspectives of all stakeholders involved. This framework takes into consideration aspects of both efficiency and social concerns, evaluating each against a given set of metrics. While literature on the informal economy has highlighted common problems faced by informal workers, there is currently no framework that aids policy makers in assessing the current state of informal activities that is useful for designing policy. Similarly, there is currently no framework in the supply chain management literature designed for evaluating an entire supply chain from a policy perspective. This thesis will suggest a framework for evaluating the recycling supply chain in Bandung, as well as present several policy recommendations based on the results of the evaluation.

1.1 Location Overview

Indonesia is the fourth largest country in the world with a population of roughly 240 million people and represents the world's seventeenth largest economy. The archipelago is made up of over 13,000 islands, and more than 300 ethnicities (Suharno 2007). While the official language is Bahasa Indonesia, there are 250 languages spoken in the country (Suharno 2007).

Bandung is Indonesia's third largest city, with a population of 2.4 million inhabitants, and is the capital of the West Java province, on the island of Java (Badan Pusat Statistik 2010). Ethnically the majority of the city's natives are Sundanese, the country's second largest ethnic group, and the Sundanese language commonly spoken alongside the nation's official language.

GDP per capita income in Indonesia in 2010 was $3015 and 13.7% of the population live below the poverty line (IMF 2010, World Bank 2012). Much of the country's labor force works in the informal economy. According to statistics reported by the Indonesian central government, 53% of all non-agricultural employment operates within the informal sector. Once agricultural work is included this number rises to 69% of the total workforce (Badan Pusat Statistik 2010).

1.1.2 Solid Waste Management in Bandung

Waste management in Bandung consists of a formal collection and disposal service and a parallel recycling system existing primarily in the informal economy. The formal solid waste management system in Bandung is run by a government owned enterprise called PD Kebersihan. PD Kebersihan owns and manages the 182 tempat perbuangan sampah (TPS) throughout the city that serve as waste transfer sites where Bandung residents and businesses dispose of their waste (Sembiring and Nitivattananon 2009). The company then collects the waste from the TPS and transports it to the city's landfill, Tempat Perbuangan Akhir (TPA) Sarimukti, which is located 30 miles west of the city. Recent studies have shown that PD Kebersihan

has a handling capacity limited to only 60% of the 1500 tons of waste produced daily in the city (Sembiring and Nitivattananon 2009). The remaining waste that is not reclaimed by informal recyclers is left to pile up at the TPS, or is disposed of improperly by residents, either by open dumping or burning.

Figure 1-1: Tempat Perbuangan Sampah (TPS): A waste transfer site in Bandung, Indonesia

The issue of waste management in Bandung attracted local and national attention in 2005 when the city's former landfill, TPA Leuwigajah, collapsed causing a severe landslide that killed 147 inhabitants, most of whom were waste pickers that had built their homes in the vicinity of the landfill (Satriastanti 2009). The landfill had served as the final disposal site for the city's waste for more than thirty years. After the disaster, the landfill was closed and for several weeks garbage was left in the streets and accumulating at the TPS throughout Bandung until a new landfill could be opened at the present location of TPA Sarimukti (PD Kebersihan, interview by author, Bandung, Indonesia, 23 June 2011). This presented the city with serious

public health concerns and drew the attention of many academic, NGOs, and government officials.

Currently the city is dependent on informal recyclers that reclaim valuable materials from the waste stream and reduce the amount of waste sent to the landfill. The number of informal recyclers in the city has been estimated around 3000 (Sembiring and Nitivattananon 2009). Although these recyclers perform a much-needed service for the city free of cost, local policy makers maintain an attitude of indifference towards the sector, neither supporting nor restricting their efforts.

1.2 Summary of Subsequent Chapters

Chapter 2 provides a review of the current literature on the topics of the informal economy, and informal recycling in particular. By highlighting two case studies of government intervention on informal recycling activities, this literature review strives to illustrate the impacts of public policy on informal recycling supply chains.

Chapter 3 presents the methodology used for conducting this research. It highlights the qualitative methods employed, as well as the interview rationale and techniques.

Chapter 4 introduces the basic structure of the recycling supply chain in the specific context of Bandung, Indonesia. This includes an in depth examination of each role within the supply chain, beginning with the waste pickers, then looking at the

various stages of middlemen in the system, concluding with the processors, factories, and exporters as the end consumers of recyclable materials.

Chapter 5 offers a series of case studies of six middlemen operating within the supply chain. I provide these case studies to explain how individuals start recycling businesses, and the challenges and strategies within the system. The cases chosen represent different origins, sizes, and stages of growth, and present a spectrum of different strategies that middlemen pursue in the recycling sector.

Chapter 6 will then analyze the current industry position. This will rely on the framework laid out by Michael Porter in his 1980 book *Competitive Strategy*. The factors to be analyzed include: threat of new entrants, supplier and buyer power, availability of substitutes, and relative strength of competitors. I will examine how each of these factors shape the dynamics of the supply chain, and how players seek to leverage strengths or overcome barriers inherent in the industry structure. This framework will aid policy makers in designing effective policies that take into account the current dynamics of the system.

Chapter 7 introduces a framework for assisting policy makers in the evaluation of informal supply chains from both an efficiency and social standpoint. This framework is used to evaluate the current status of the system by taking into account the perspectives of the municipal government as well as each stakeholder in the supply chain.

Chapter 8 uses the results of the evaluation to present several policy recommendations for strengthening the informal recycling supply chain in Bandung.

Chapter 9 presents the conclusions of the research and suggests areas for future study.

2. Literature Review

In recent decades there has been increasing attention and debate from academics and policy makers around the rise of the informal economy. Within this body of literature, a particular focus has been placed on informal recycling and waste picking in developing countries, although there remains relatively little written on the topic. What little attention has been given to informal recycling has been focused primarily on waste pickers, and has been in the context of a few specific geographical areas, while the majority of developing countries remain understudied.

This literature review will first present the broader theories of the informal economy before looking at the literature focusing on informal recycling more specifically. It will present the four fundamental schools of thought on the informal economy and will discuss how each of these approaches influence policy decisions. Following this will be a review of the literature within the study of the informal economy that focuses specifically on informal recycling, with particular attention placed on two important papers written on waste picking activities in Bandung, Indonesia. Two present day case studies of cities in the developing world will then be used to illustrate the effects of government policy on informal recycling, as well as the response to these policies by supply chain actors. Understanding the theories of the origins and workings of the informal economy and informal recycling will assist in designing policies that are effective at improving recycling activities in Bandung.

The two case studies presented focus on Belo Horizonte, Brazil and Cairo, Egypt respectively. These are two cities in the developing world currently affected by government intervention on existing informal systems. However, they illustrate two very different scenarios.

The first case focuses on Belo Horizonte, Brazil, where the government instituted a participatory approach to waste management policy, planning, and implementation that gave waste picker cooperatives and informal groups legitimacy and voice in the work they are doing in the city. The second case is that of the Zabaleen (also spelled Zabbaleen or Zabbalin) community in Cairo, Egypt, which has a long history of managing the city's solid waste. In recent years the Zabaleen have been facing increasing pressure from the government and large waste management corporations that threaten the community's ability to operate and thrive.

2.1 Informal Economy

It is important for policy makers to understand the theory behind the dynamics of the informal economy, of which the recycling industry in Bandung is a part. The term "informal sector" was first coined by Keith Hart in his research on the commercial activities of migrant workers in Ghana in 1971 that were engaged in low productivity work on the margins of the economy. The current definition of the informal economy recognized by the International Labour Organization (ILO) has been broadened to encompass self-employed workers in informal jobs, as well as wage employees in both informal and formal enterprises (Chen 2008). Chen (2001)

categorizes the emerging theories into four dominant schools of thought. These include the dualists, the structuralists, the legalists, and the voluntarists.

The *Dualist* school originated based on fieldwork done by the International Labour Organization (ILO) in Kenya in 1972 (ILO 1972). Dualists view the informal economy as being distinctly separate and apart from the formal economy with very few linkages existing between the two. The ILO's initial study purposes that the origins of the informal economy stem from labor force growth rates that outpace economic growth and employment opportunities. Hart's study of migrant workers in Ghana further identifies social barriers such as nepotism and informal networks that exclude certain groups from readily finding formal employment as contributing to the growth of the informal sector (Hart 1973). Dualists see the structure of informal sector industries as being characterized by low barriers to entry, small-scale operations, simple technology, and skills acquired outside the formal education system (ILO 1972). They see this as being in distinct contrast to the characteristics of formal industries. Dualists support policies that address the imbalances in economic growth, while also targeting inequity and income redistribution.

The *Structuralist* schools take the opposing view of the dualists, seeing the formal and informal sectors as being explicitly linked, with the informal economy arising out of a reaction by formal firms to increased competitiveness, globalization, and heightened regulation, rather than being based on structural characteristics of the

activities (Castells and Portes 1989, Moser 1978). They see this as often being in the form of formal firms sub-contracting production to informal establishments in order to avoid regulation or union contracts (Castells and Portes 1989). Structuralists see the informal economy as being universal and heterogeneous. Castells and Portes view the relationship between the formal and informal economies as one of "flexibility and exploitation, productivity and abuse, aggressive entrepreneurs and defenseless workers", and view the informal economy as growing at the expense of formal employment (1989). Structuralists support policies that protect informal workers and enterprises and that help eliminate the barriers that uphold the asymmetrical power relations between the formal and informal firms.

The *Legalist* school, led by Hernando de Soto (1989), reason that informality arises because the legal system imposes high costs and bureaucratic barriers to becoming and remaining formal. In his study of Peru, he found that it required 289 days and $194.40 to fulfill the all requirements for establishing a formal business (1989). This provides too big of a hurdle and discourages small firms from formalizing. Legalists argue that the solution for addressing the problems of the informal economy is through legal reform that removes the barriers and costs associated with starting a business and simplifies the formalization process.

Finally, the *Voluntarists* see a voluntary choice of whether to operate in the formal or informal sector. Individuals operating in the informal economy do so based on an implicit cost-benefit analysis between the two options, and view the informal

economy as being the more profitable choice. To illustrate this theory, Maloney (2004) uses the example of younger workers who enter formal employment to accumulate knowledge, skills, and capital, and later quit to open their own informal businesses. He further purposes that the costs of informality rise with the size of a business. When firms are small, operating informally helps reduce costs. However, as firms grow, the benefits of informality are outweighed by the exclusion from formal labor and capital markets that accompanies it. Maloney also views the informal economy as being an attractive choice for workers based on the flexibility informal work offers the self-employed, which particularly benefits mothers and the elderly. Being that informal workers prefer the informal economy to formal employment, voluntarists believe any policies that support or assist informal workers will only encourage the sector to grow.

Perry et al. (2007) attempt to create a more comprehensive theory of the informal economy that takes into account all of the factors proposed by the schools of thought above. They cite the informal economy as arising from a combination of exit, entry, exclusion, and exploitation (Chen 2008). Exit refers to workers who exit the formal sector in favor of the informal sector, similar to the theories of the voluntarists. Entry refers to the scenario proposed by the legalists in which informal workers would enter the formal economy if costs and burdens of doing so were reduced enough to make it possible. Exclusion refers to fact that social protections are not extended to informal workers thus excluding them from the system. Finally, exploitation refers to the case of the structuralists in which formal firms choose to

outsource work to the informal industrial outworkers in order to avoid regulation and keep costs low. Each of these causal theories can be used to explain the origins of one segment of the informal economy, but not the informal economy as a whole (Chen 2008). This integrative theory can assist policy makers in designing sector-based policies that reflect the particular conditions specific to that sector.

How a government views the informal economy shapes various policies. Medina discusses four attitudes that policy makers can have towards the informal economy, and for addressing informal recycling in particular. These attitudes include: stimulation, collusion, neglect, or repression (Medina 2007). Stimulation refers to a situation where governments, nongovernment organizations (NGOs), and private foundations actively support and promote the activities of informal recyclers. Collusion refers to instances where government officials enter into relationships with informal recyclers motivated by opportunities for exploitation, mutual benefits, or mutual assistance. Neglect refers to an attitude of indifference towards informal recyclers. Finally, repression refers to policy that restricts the activities of informal recyclers or declares waste picking illegal. In the case studies discussed below, Belo Horizonte illustrates an approach of stimulation, Cairo illustrates one of repression, while in Bandung, local governments have taken an attitude of neglect towards informal recyclers.

2.2 Overview of Waste Picking Literature

Increasing attention has been paid to the work being done by waste pickers around the world since the 1970s (Medina 2007). Most of the early studies on waste picking concluded that it was a marginal activity conducted on the fringes of society with few linkages to the formal economy (Medina 2007). Chris Birkbeck challenged this idea with a set of papers based on fieldwork in Cali, Colombia published in 1978 and 1979. Birkbeck proposed that these activities were directly linked to the formal sector by supplying raw materials to manufacturers that held a strong control over prices. Inspiring the title of his work, Birkbeck concludes that the waste pickers in Cali were exploited "self-employed proletarians in an informal factory" (1978). With regard to middlemen, Birkbeck sees two underlying reasons for their existence within the supply chain (which he refers to as the industry hierarchy). The first is due to the locational needs of waste pickers who do not have the means to transport the materials to a single central warehouse. The second reason has to do with the capital requirements needed to operate in the sector, and the attractive mark ups that accompany it (1979). These reasons, among others, for the existence of middlemen in Bandung will be explored further in Chapter 5 and 6. However, while Birkbeck denounces middlemen as exploitative from a Marxist viewpoint, I will argue that they add value to system for these same reasons and that they contribute to the efficiency of the recycling supply chain.

More recently, the international organization WIEGO (Women in the Informal Economy: Globalizing and Organizing) has sought to bring the issues of waste

picking to the global level. WIEGO has played a large part in contributing to the literature on waste picking, the gathering of statistics on the sector, and in advocating policy reform. Most importantly, WIEGO has played an active role in organizing workers in the sector around the world. WIEGO assisted in the creation of the Latin American Waste Picker Network in 2005 as well as similar national organizations in South Africa and South Asia (Samson 2008). In 2008, WIEGO initiated the First World Conference of Waste Pickers in Bogotá, Colombia that was attended by seven hundred waste pickers from thirty-four countries around the world (WIEGO 2008).

2.3 Waste Picking in Bandung, Indonesia

In Hans Versnel's paper *Scavenging in Indonesian Cities* (1986) he describes the informal recycling supply chain in Bandung as it existed at the time from the perspective of the waste picker. He describes a rigid hierarchical environment of exploitation and harsh government policies. The paper opens with a narrative that follows a woman, Ibu Toeti, through her life as a waste picker surviving from cigarette butts that she and her husband collect for sale, as she is ignored, marginalized, and even forcefully relocated by the government to another city on another island to work in rice fields.

In the system described it is difficult for waste pickers to enter or move up in the value chain. Many live in the direct vicinity of the waste transfer points that they collect from. Waste picking activities at the transfer points are coordinated by

supervisors from the formal disposal agency who dictate who can access what materials and when. The informal communities of waste pickers that arise around the transfer points are led by exploitative dealers that serve as the only channels waste pickers have to sell their materials and are often the source of a great deal of conflict.

Versnel takes a dualist view of the system, attributing its origins to rapid urbanization that outpaces the growth in infrastructure. He views the informal recycling industry as an asset that provides valuable services to the city and the environment and proposes policy interventions directed at waste pickers to address the exploitation they face from middlemen and that provide them with access to basic services and social protections. However, he notes that the waste pickers in Bandung are highly individualistic and competitive, which poses challenges for attempts to organize them.

In 1991, Daniel Sicular published a study on waste picking in Bandung that suggested that the activities were a form of non-capitalist production a kin to "peasants engaged in hunting and gathering". Sicular sees waste pickers in Bandung as being marginalized peasants pushed out of the countryside due to a transitioning economy. He classifies the individuals willing to undertake the work as being "the mentally unstable, the physically handicapped, ex-convicts, petty criminals, prostitutes, and people who are escaping arranged marriages" (Sicular 1991). The market for recyclables is created by growing inequities: high levels of consumerism

creates a vast supply of waste materials, while growing poverty supplies an increasingly growing labor force willing to undertake the work. Sicular proposed that the only way to improve the conditions of waste pickers, given his view of them as peasants, is to dissolve the patron-client relationship between waste pickers and middlemen and replace it with an "institution that is able to fill the role of ensuring survival, but that would not be exploitative" (Sicular 1991).

However, I will argue that the present situation in Bandung is very different than is described by either Versnel and Sicular in that it offers a high degree of choice and mobility to waste pickers, both around who they can sell to and with regard to forward integration into the middleman business. This allows for waste pickers to avoid exploitation, increase their earning potential, and leads to a system where middlemen assist in promoting efficiency throughout the system, rather than simply extracting value from waste pickers at the bottom of the value chain.

2.4 Belo Horizonte, Brazil

Belo Horizonte, a city of nearly 2.5 million inhabitants and the capital of Minas Gerais State in Brazil, has a long history of waste picking and recycling. In the 1960s many of the city's poor began work in the municipal open dump, earning their income from recyclable materials they salvaged. In 1973, the city closed the dump to replace it with a sanitary landfill (Dias 2011b). The informal waste pickers were evicted and many were forced into the streets where they continued to search out

materials. The local government enacted repressive policies and police often took harsh measures against the waste pickers in an attempt to beautify the city (Dias and Alves 2008). These waste pickers, who were responsible for the only means of recycling in the city, were viewed by the population as beggars and criminals, and slept in the streets guarding their materials at night, since they did not have anywhere to store them (Dias 2011b).

In 1987, Pastoral de Rua, a Non-Government Organization (NGO) led by the Catholic Church, first began organizing waste pickers in Belo Horizonte, resulting in the establishment of the city's first waste picker association, ASMARE, in 1990 (Dias and Alves 2008). ASMARE worked to promote the right for waste pickers to earn their living from recycling, and was frequently in conflict with the municipal government (Dias 2011b).

In 1993, the Workers Party was elected into local government and advocated the establishment of the Superintendência de Limpeza Urbana (SLU). As the public cleansing authority for Belo Horizonte, SLU became responsible for all of the city's solid waste services. In the same year, SLU approached ASMARE and Pastoral de Rua to determine a model for the city's solid waste management system. An agreement between ASMARE and SLU grew out of this that included monthly subsidies to ASMARE, infrastructure investments in facilities where waste pickers could store and sort materials, trucks to be used for collection, and environmental

education. In turn, ASMARE agreed to manage the warehouses, sort materials, and provide information on their activities to the municipal government (Samson 2009).

Legislation has since been passed in Belo Horizonte that makes recycling, social inclusion, job creation, and income generation the four pillars of the city's solid waste management system (Dias 2011a). In addition to ASMARE there are a total of eight registered waste picker cooperatives in Belo Horizonte. These organizations are responsible for the collection and sale of recyclables obtained from drop-off locations, curbside residential pick up, and door-to-door commercial pick up. Associates are each given their own space in the warehouses to sort and store their materials and are paid based on the volume of materials they collect (Dias 2011a). From the period 1990 to 2008, ASMARE's membership grew from 31 to 380 individuals, with an average income 20% higher than the minimum wage (Dias and Alves 2008) The city continues to aid the waste picker associations by investing in processing equipment and capacity building that allows cooperatives to position themselves higher in the recycling supply chain and increase their profitability (Dias 2011c). One complaint of the cooperatives, however, is that their funding is still received as a subsidy, rather than a payment for their services, arguing that it does not properly acknowledge the service they are providing (Samson 2009). Another challenge facing the cooperatives in Brazil comes from informal waste pickers that have chosen not to join the cooperatives and compete against them for materials (Dias 2011b).

In 1998, a National Forum called Waste & Citizenship was established in Brazil through the leadership of UNICEF with the intent to eradicate the prevalence of child labor in waste picking activities, establish sanitary landfills in place of open dumps, and promote partnerships between local governments and waste picker associations in recycling programs (Dias and Alves 2008). The new forum brought national attention to the activities of waste pickers and shifted political thought away from repressive policies and towards the adoption of inclusive policies that granted legal backing, redistribution, and social recognition to waste picker associations (Dias 2011c). Waste & Citizenship forums created multi-stakeholder dialogues that incorporate the voices of waste picker organizations into decision-making processes. This resulted in policies designed and implemented with the participation of waste pickers, rather than just programs that are done for waste pickers (Dias 2011c). These forums helped produce laws that recognize waste pickers as service providers, policies that support the development of waste picker cooperatives, and the inclusion of cooperatives in formal waste management systems (Dias 2011c).

Concern for waste pickers remains a focus of national policy. In 2001, federal legislation was passed acknowledging waste picking as a legitimate profession in the Brazilian Occupation Classification (Dias 2011d). Later, in 2006, a presidential degree was passed implementing the source separation of recyclables at state institutions and the allocation of these materials to waste picker groups (Dias

2011d). The passing of these inclusive policies has made Brazil one of the most progressive countries in the world with regard to waste pickers (Dias 2011d).

It should be noted that the success of Belo Horizonte's waste picker cooperatives was the result, not only of the right political environment and strong support for individual policy makers, but also because of direct action and advocacy on the part of the cooperatives. This includes protests and demonstrations as well as advocacy and activism such as participating on committees and meeting with public officers (Dias 2011d). These groups also received strong support from NGOs and civil society advocacy groups working on their behalf. All of these conditions, which are absent in places like Bandung, Indonesia, make these types of policies difficult to replicate.

2.5 Cairo, Egypt

For centuries, Cairo's solid waste management has been undertaken informally by various community groups (Assaad 1996). At the beginning of the 20th century a group of migrants from the Dakhla oasis, known as the Wahiya, began to engage in the collection and disposal of the city's waste, charging residents a fee for their services (Fahmi 2005). Beginning in the 1930s, a new group of migrant Coptic Christians came to Cairo and began to purchase organic waste from the Wahiya to be used as pig fodder. These newcomers eventually found that it was easier for them to collect the waste themselves, paying the Wahiya for access to the waste, rather than purchasing it from them directly. They began traveling door-to-door with

donkey-pulled carts collecting waste from the residents. This group soon became known as the Zabaleen, which literally means 'garbage men', and has since established themselves as a dominant provider of the waste management services for 30% of the population of Cairo, with recycling rates of up to 80% (Iskandar 2009). The Wahiya continue to exercise an informal right to the waste and receive the service fees from residents, while the Zabaleen pay the Wahiya to gain access to the waste. The Zabaleen earn revenues from the recyclables salvaged as well as from the pig meat that they raise on the organic waste. Together, the Zabaleen and Wahiya have created what has been argued to be the world's most efficient recycling system (Fahmi 2005).

Despite their success in collection rates and the service they are providing the city and the environment at no cost, the way of life for the Zabaleen has constantly been threatened. In his 1996 paper, Ragui Assaad discusses the Zabaleen's response to government attempts to modernize the municipal solid waste collection system by opening the industry up to large corporations. Focusing on more recent developments, Wael Salel Fahmi describes the government's attempts to relocate the Zabaleen's settlement and stimulate multi-national industry participation in the city's solid waste management services (2005). Both papers focus on the Muqattam settlement, which is the largest of seven Zabaleen communities.

In his paper, Assaad addresses the challenges faced by the Zabaleen, focusing primarily on the time after the World Bank began to assist the community in 1980

through a partnership with a local NGO called Environmental Quality International (EQI). In 1983, a presidential decree established the Cairo Cleansing and Beautification Authority (CCBA) to serve as the principal oversight agency for all of the municipal sanitation services. The CCBA's first move was to try to replace the traditional system with a more modern mechanized system. The CCBA approved contracts and set service fees, with a monthly licensing fee paid by the contractor to the CCBA. It seemed inevitable that the new companies would replace the Zabaleen, particularly as tensions grew between the Zabaleen and the Wahiya over whether the latter would make investments for the former in motorized collection vehicles. Ultimately, the Wahiya saw the threat to their operations and invested in trucks to replace the Zabaleen's donkey carts in order to meet the CCBA requirements.

In order to gain access to service licenses from the CCBA, the Zabaleen and Wahiya cooperated to found a legally recognized private company called the Environmental Protection Company (EPC) in 1987, with the help of EQI and a grant from a European charity. In the new system, the Wahiya still collected user fees from residents but had to use company receipts and were required to remit half of the earnings back into the company to cover transportation, capital, and licensing costs. However, the company's board consisted primarily of outsiders who did not understand the informal terms of trade that existed between the two communities (Assaad 1996). This lack of understanding caused tensions between the Zabaleen and Wahiya in addition to the increased pressures put upon them by the CCBA. Starting in 1989, new companies were established by Wahiya and joint ventures

between Wahiya and Zabaleen. Due to the local knowledge of the individuals managing these companies, they were able to survive the increasing competition that forced the EPC into bankruptcy after they lost a major contract to a large corporation, Misr Service, who agreed to undertake street cleaning in addition to garbage collection.

However, under the new agreements, many residents were willing to pay the Zabaleen for their service while also paying Misr Service for a service they did not receive. One reason for this is that while Misr Service did provide street cleaning, they did not collect door-to-door like the Zabaleen, but rather required residents to bring their waste to collection points (Assaad 1996). In addition to this, the Wahiya were able to use their informal contracts and strong relationships with doormen to block both Misr Service and the CCBA from collecting household waste, often by sharing their revenues with the doormen. As fees charged by the CCBA were three times higher than that of the Wahiya, they found difficulty collecting payments from residents and in five months generated less than 4% of what they owed Misr Service (Assaad 1996). Assaad concludes his paper with what was a win for the Zabaleen in 1996. EQI intermediated on the their behalf with the CCBA granting new company licenses with a higher fee levied for street cleaning.

In a series of more recent papers, Fahmi highlights some of the subsequent challenges faced by the Zabaleen. Since 1996, the government has further opened up the waste management sector to multinational corporations, primarily those from

Spain and Italy (Fahmi and Sutton 2006). While the Zabaleen now face tougher competition, they are also faced with threats from the government to relocate their settlement to an area 25 kilometers outside of the city. The city claims that this is due to the unhygienic quality of their current settlement (W. S. Fahmi 2005). In 2009, at the peak of the swine flu epidemic, the government ordered the slaughtering of all of the 300,000 pigs in the Zabaleen community, despite it being well known that there was no link between pigs and the transmission of the virus. Because the pigs were used to dispose of up to 60% of the collected waste, many Zabaleen gave up collecting, leaving the waste to pile up on city streets and causing even worse threats to public health (Fahmi and Sutton 2010).

This case shows that, even as the Zabaleen proved that they could compete against large capital-intensive companies, that their largest threat continues to come from public policy and the government interventions. When considering the current system for recycling in Bandung I will take into account the internal politics and informal practices such as these that may present difficulties when trying to introduce changes to the system. These barriers must be identified and incorporated into the improved system to ensure its success.

3. Methodology

This thesis employs qualitative research techniques, relying on loosely structured open-ended interviews and direct field observation. All fieldwork was conducted over the periods June 23, 2011 to August 5, 2011 and December 23, 2011 to January 6, 2012. While data on the area is limited, several relevant recent studies (Damanhuri, et al. 2009, Hapsari and Damanhuri 2010, Sembiring & Nitivattananon 2009) are used to provide quantitative data on waste production and recycling rates in the city and are used to support the qualitative results. Interview respondents were classified in categories described in section 3.1, while section 3.2 describes the respondent selection process and the structure of the interviews. A sample of the interview questions is presented in English and Bahasa Indonesia and is included in Appendix 1.

3.1 Interview Respondent Categories

Interview respondents can be classified into two groups: primary and secondary stakeholders. The primary respondents, or middlemen, are the main focus of this research. Interviews with primary respondents can be further classified as principal and supportive. Secondary stakeholders fall into two categories: those internal to the supply chain and those external to the supply chain. Figure 3-1 illustrates this structure and the number of respondents included in each group.

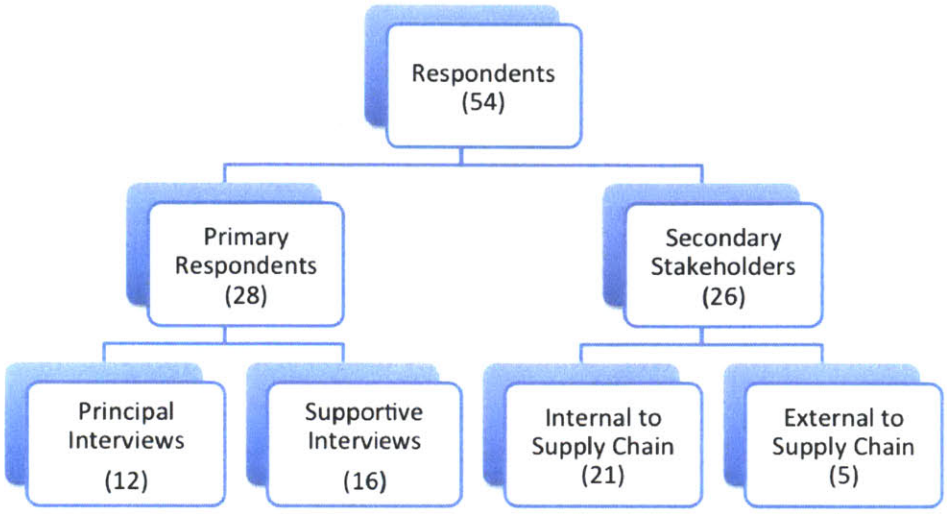

Figure 3-1: Structure of Interview Respondent Categories

3.1.1 Primary Respondents

Interviews with primary respondents were conducted with 28 of the estimated 126 middlemen operating throughout Bandung (Sembiring and Nitivattanonan 2009). Primary interviews were further categorized as being either principal or supportive. Principal interviews were lengthy, in-depth sessions, lasting between one and half and two hours, with twelve middlemen. Of the twelve middlemen, six are presented as case studies in Chapter 5 of this thesis. These six cases were chosen strategically to represent the diverse background and varying recycling strategies of middlemen in Bandung. In addition to these principal interviews, I conducted sixteen brief supportive interviews with other middlemen, lasting between ten minutes and one hour. Supportive interviews serve to provide additional information to validate and support observations presented in the case studies.

3.1.2 Secondary Respondents

Interviews with secondary stakeholders revealed information about the informal recycling system in Bandung, and the dynamics between middlemen and other stakeholders. Respondents included other actors within the recycling supply chain and parties indirectly influencing or impacted by the recycling supply chain.

Interviews with supply chain actors were conducted in a similar manner to the supportive middlemen interviews. These interviews lasted between ten minutes and one hour. These consist of seventeen interviews with waste pickers, two with material sorters employed by middlemen, one plastic processing factory, and one paper manufacturing company. Table 3-1 lists the secondary interviews of internal stakeholders.

Table 3-1: Summary of Secondary Interviews Internal to Supply Chain

Occupation	Number of Respondents
Waste picker	20
Sorter	2
Plastic Processor	1
Paper Manufacturer	1

Interviews with external supply chain actors generally lasted between one and two hours. These interviews attempted to capture an outsider's evaluation of the system and the impact of the supply chain on other aspects of society. Respondents included one lecturer of environmental engineering at the Institut Teknologi

Bandung (ITB), one public relations officer at PD Kebersihan— the government-owned company responsible for Bandung's solid waste management, one director of Yayasan Kontak, a non-government organization (NGO) working to promote the rights of waste pickers in Bandung, and one interview with three community leaders of Cireundeu Village, which was impacted by the 2005 disaster at the Leuwigajah landfill. Table 3-2 lists the secondary interviews of external stakeholders.

Table 3-2: Summary of Secondary Interviews External to Supply Chain

Affiliation	Position
Institut Teknologi Bandung	Lecturer of Environmental Engineering
PD Kebersihan	Public Relations Officer
Yayasan Kontak (NGO)	Director
Cireundeu Village	Community Leaders (3)

3.2 Respondent Selection and Interview Structure

For all interviews internal to the supply chain, participants were chosen in such a way as to gain a representative sample. This took into account: volume of materials, location, age of owner, and relation to the supply chain. Interviews were conducted in person at the respondent's place of business. The interviews were conducted in Bahasa Indonesia (or Sundanese in two cases) through the use of a translator and were recorded with the consent of the individuals involved. My accounts were later translated verbatim by a native speaker. Interviews were structured in stages based on four categories of questions. Question categories were established based on personal background, origins of the business, business operations and strategy, and

sensitive information. Certain questions were introduced or omitted for a given respondent based on their responses to previous questions.

The first section of each interview consisted of general questions about the background of the respondent, including the individual's name, age, hometown, marital status, and previous employment.

The second section consisted of questions regarding the origins of their business, including questions about the respondent's reasons for entering the industry, capital requirements, barriers to entry, location decisions, etc.

The third section targeted the present conditions of the business and specific business strategies employed. Each respondent was asked to discuss how they choose buyers and sellers, set prices, and go about growing their business.

The final category of questions covered the most sensitive issues that a respondent might hesitate to answer honestly. Questions asked about an individual's income, education level, and the legal status of the business. The motivation here was to slowly build trust with an individual, making it more likely that they would provide complete and honest answers to the questions.

A similar structure was followed for secondary stakeholders, although some questions were modified to better suit their functions within the supply chain. For

instance, in interviews with waste pickers, I wanted to know how they choose which middlemen to work with and how they evaluate these relationships.

Interviews with secondary stakeholders outside of the supply chain were less structured and were adapted during the course of the interview as new information was revealed about their perception of and relationship with the supply chain.

Insights into the operations of the recycling supply chain in Bandung were also drawn from direct field observations. This entailed observing individuals in their place of business, witnessing transactions, and viewing sorting and storage techniques.

It should be noted that all of the information contained in the case studies was self-reported by the business owner and may be biased to a certain extent, particularly regarding topics pertaining to socially sensitive issues, or to questions that might be perceived as threatening to the individual or the operations of the business.

4. Supply Chain Overview and Definition of Local Terms

In order for policies aimed at addressing problems associated with informal recycling to achieve their desired results, policy makers must first understand the dynamics of the existing system. A firm understanding of the drivers of the supply chain will help identify problems and their root causes, and will better allow for the inclusion of all relevant stakeholders. Failure to understand the system could lead to backlash from supply chain actors or unanticipated consequences that prevent policies from achieving their desired result.

The typical recycling supply chain in Bandung begins when waste materials are produced as a byproduct of the production or consumption of households, offices, and factories. After the waste is disposed of it is then reclaimed by waste pickers and sold through a series of middlemen before reaching the factory that reprocesses it into new products. The typical structure of the supply chain is illustrated in Figure 4-1 on page 43. This chapter will further describe the supply chain actors and their roles within the system, and will define local terms. The recycling supply chain actors can be broadly categorized into waste pickers, middlemen, and processors. Local terms include: *pemulung, tukang loak, lapak, bandar, bandar besar,* and *penggilingan*. The term lapak refers to an establishment, while bandar and bandar besar can refer to either an establishment or the profession of the individual managing the establishment. Penggilingan refers only to an establishment. Each of these terms can be used to refer to the singular as well as the plural form.

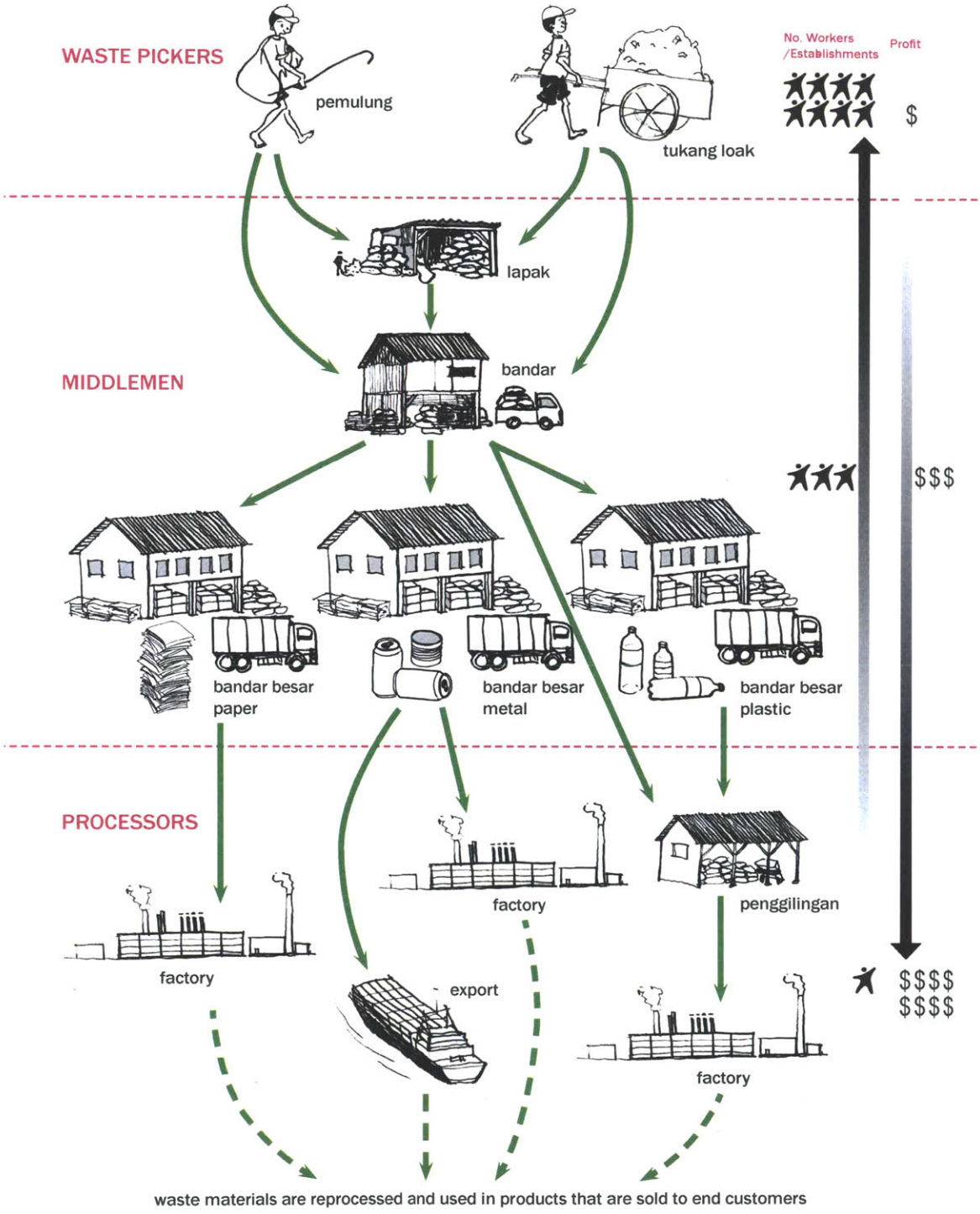

Figure 4-1: A Typical Recycling Supply Chain in Bandung, Indonesia.

(Concept: Michael Tuori, Illustration: Jia Zheng 2012)

4.1 Waste pickers: Pemulung and Tukang Loak

A variety of terms are used to describe the work of waste pickers. Among these are scavenger, rag and bone man, binner, salvager, and reclaimer (Samson 2010). In 2008 the participants at the First World Conferences of Waste Pickers in Bogota, Colombia agreed upon the use of the term 'waste picker' to describe their work in the English language (WIEGO 2012). Many experts in the field have rejected the commonly used term 'scavenger', as it demeans workers to the status of animals that scavenge waste and carcasses for food (Samson 2010). This thesis will use the term waste picker interchangeably with the local terms in Bahasa Indonesia *pemulung* and *tukang loak*, in order to make a distinction between the two occupations and the different roles they play within the system. When used, the term *waste picker* will refer to both *pemulung* and *tukang loak* jointly, while the local terms will be used when it is necessary to distinguish between the two groups. In the literature on the topic, the term *informal recycler* often refers to waste pickers, however in this thesis the term is used to refer to any informal worker or establishment operating in the recycling supply chain. This includes a majority of the middlemen and recycling processors in the city, in addition to waste pickers.

A distinction can be made between pemulung and tukang loak based on collection modes. Pemulung travel the street on foot collecting recyclable materials in a sack that they carry over their shoulder. Tukang loak transport materials in a pushcart or a three-wheeled bicycle with an attached cart. Another major distinction between these two groups has to do with the areas they collect from. Pemulung mostly

collect materials directly out of the formal waste stream: from temporary waste collection sites located throughout the city (*Tempat Pembuangan Sementara, or TPS*) and landfills (*Tempat Pembuangan Akhir, or TPA*), as well as litter discarded in the streets. Tukang loak, on the other hand, travel door-to-door to households and businesses purchasing materials. The work being done by tukang loak requires some amount of working capital and usually involves larger volumes of materials (such as cardboard packaging from shops), or higher value materials (such broken appliances, plastic toys, and construction materials) than those collected by pemulung.

4.2 Middlemen: Lapak, Bandar, and Bandar Besar

After the materials are collected by the pemulung and tukang loak they are sold through a series of middlemen. The smallest of these are called *Lapak* and the largest are called *Bandar Besar*, simply meaning 'Large Middleman' in English. It is unsurprising, given the informal nature of the industry, that there is no clear dividing line between these categories. Dr. Benno Rahardya, a lecturer in the Department of Environmental Engineering at the Institut Teknologi Bandung, defines bandar as any middleman that purchases from other middleman (Rahardya, B., interview by author, Bandung, Indonesia, 23 June 2011).

Lapak tend to be small, informal businesses, with the owner often participating as a pemulung or tukang loak, supplementing their own work with materials purchased from waste pickers. Once materials are obtained they are cleaned and sorted. This

involves some preparation including cutting the tops and labels off of plastic containers and cutting plastic bottles so they can be stacked. This preparation commands a higher price from the bandar it is then sold to, but lapak can also sell the materials mixed at a lower price. Lapak tend to earn low profits and typically do not hire employees or own their own transportation.

For Bandar, a larger portion of their business is earned through purchases from lapak (and other, smaller bandar) than from pemulung and tukang loak. However, the term "bandar" refers to a spectrum of middlemen rather than to a single category. Smaller bandar and lapak may tend to "employ" pemulung by allowing them to sleep on the premises while purchasing the materials they collect each day. Tukang loak are also employed by a given bandar and frequently are given small amounts of capital by the bandar to purchase materials from households and shops, with the income earned being the difference between the loans made and the value of the materials collected. However, in both of these cases the workers are still technically self-employed, as the salary they earn is based solely on the volume of materials they collect, although some waste pickers may supplement their earnings with wage work, such as the sorting of the materials, for the lapak or bandar they sell to. Larger bandar are less likely to employ pemulung and tukang loak directly through the provision of shelter, and instead focus on building relationships with lapak and smaller bandar from whom they buy larger volumes of materials. This requires more working capital to be invested in recyclables at a given time, as well as to pay the higher selling price commanded by the smaller middlemen.

Bandar besar are typically specialized to deal with one specific type of material, such as metal or paper, and interact directly with the factories they supply. These bandar tend to make the highest profits of the middlemen and are more likely to run formal enterprises. There are cases where several bandar besar belong to a single owner, often as part of a portfolio outside of the owner's core operations. The owner then employs managers and workers to carry out the daily activities of the business. However, there are many bandar besar that have grown organically from small informal lapak and bandar.

For the recycling of paper, for instance, there are sixteen approved bandar besar (also referred to as *suppliers*) that are authorized to supply the three paper manufactures in the city (paper manufacturer, interview by author, Bandung, Indonesia, 1 April 2012). The factories set targets for the bandar besar and evaluate the suppliers annually on their performance. If a bandar besar repeatedly fails to meet the target of a factory, they will no longer be approved as a supplier.

There are few bandar besar that specialize solely in the trade of plastic as the primary processing of plastic has a low degree of technological and capital intensiveness. This has led to the rise of a large number of *penggilingan* that purchase plastic directly from bandar and process the materials into a raw form that can then be sold to plastic manufactures.

Value-added activities performed by lapak, bandar, and bandar besar, consist of: aggregating, cleaning, sorting, and simple preparation of materials that are to be resold. However, the important sources of value for these middlemen— that differentiate them from one another— come from providing capital, transportation, and managing relationships with buyers and sellers.

4.3 Processors: Penggilingan, Factories, and Exporters

Penggilingan are plastic processing mills that perform the rudimentary stages of recycling. Here plastics are sorted, cleaned, and chipped or pelletized. While bandar sort mostly based on product type, penggilingan have to further sort the materials based on plastic type. This includes polyethylene terephthalate (PET), polypropylene (PP), polystyrene (PS), among others. After the plastic is processed it is then sold to one of several plastic manufacturing companies in Bandung to be used as an input to production.

There are three paper factories that operate in Bandung, each of which is supplied by sixteen approved bandar besar in the city. The price is set on the global market and communicated throughout the country by the Asosiasi Pulp dan Kertas Indonesia (APKI). However the companies often adjust the price based on their individual demand. These fluctuations in price are due to both the supply of waste paper, as well as the production levels of a given factory. Aside from the three paper factories in Bandung there are also other factories located outside of the city, mostly

in Jakarta and Surabaya, that any bandar can sell to if they have the transportation means, or if the buyers travel to Bandung to purchase materials.

Metals are sold exclusively by specialized bandar besar to factories or exporters outside of Bandung, most of which are located in Jakarta. The processing of metals is capital intensive, resulting in a small number of establishments with the machinery, capacity, and skills to do so.

It is also important to note that the supply chain reaches beyond the factories or exporters, to the customers of the end products that are made from the recycled materials. This is an important distinction. The demand for these products ultimately affects the demand for waste materials and their prices, as illustrated in the example of the paper industry shown above. This effect is mostly captured in the regular price fluctuations, although extreme cases can occur. The global recession beginning in September of 2009, for instance, resulted in a severe drop in demand for recyclables that left waste accumulating in streets, warehouses, and harbors around the world (WIEGO and SEWA 2009).

5. Middlemen: Case Studies

This chapter presents six cases studies highlighting the lives and business practices of informal recycling middlemen operating in Bandung. These focus on the backgrounds of the individuals, as well as the origins, functions, and strategies of the businesses. These case studies serve to highlight the ways in which middlemen shape the recycling supply chain and the important contribution they add to recycling efficiency. Further, these cases illustrate the importance of considering middlemen in the design and implementation of recycling policies.

5.1 Pak Herdi: Lapak

Figure 5-1: Pak Herdi- lapak owner in Bandung

Pak Herdi has been working in the recycling sector since he left school at the age of 13 to become a tukang loak in his hometown of Ciamis, a city of 124,000 people located 75 miles southeast of Bandung. He started out by travelling the streets with a pushcart collecting and buying materials from street vendors. When he was 15 years old he left Ciamis to move to Bandung where he opened his first lapak. At the age of 38, Pak Herdi has owned and operated lapak in four different locations in Bandung. In each case he was evicted from the land after the property was sold by the owner.

Pak Herdi established his current location in 2009 with the small amount of start up capital of 200,000 Rupiah (Rp.) ($23). He settled into the new location in his usual fashion—by collecting recyclables for sale and saving any discarded pieces of wood, tarps, and corrugated iron that he could find to use to build his home. His house consists of a small bedroom for him and his wife, and an attached room with a dirt floor containing a scale, a chair, and a small cook stove, from which he operates the business. The walls are made from a colorful mix of bamboo, metal, plastic, cloth, and cardboard. A small hand-painted sign hangs on the front of the house with the Islamic crescent moon and the word "Buka" to let his customers know he is open for business. Out front sits the two carts that Pak Herdi uses to collect materials, one with two wheels that is pushed by hand, and another with three wheels and an attached bicycle. In the back of the house there is an attached shelter that is used to store recyclables.

Figure 5-2: Pak Herdi's home and recycling business

Pak Herdi has two children that are grown and have moved away. His wife stays at home to help with the lapak. Each day Pak Herdi travels the area with his pushcarts collecting and purchasing any waste materials he can find and taking them back to his home to sort. He also buys from other pemulung and tukang loak in the area. He has tried to buy from other lapak in the past, but says it is too expensive, since he has to pay them the same price he receives from the bandar that he sells to.

On average Pak Herdi claims to earn a profit of around Rp. 50,000 ($5.70) per day, however the amount of materials he purchases and the capital he spends is highly variable and unpredictable. At times he can spend up to two or three million rupiah

($228 - $342) in a day purchasing materials, other times only Rp. 100,000 ($12). Occasionally he goes a entire day without any business at all. Once he has accumulated enough materials he will call the bandar to come and collect the materials and then he goes with the bandar to weigh the materials and receive his payment. He does not have any minimum requirement to sell to the bandar, however if the volume is low bandar will offer a lower price. This has to do with the transportation costs incurred by the bandar, some of which is transferred to Pak Herdi if the volume of materials is too low to cover the full cost. At times it can take weeks for him to accumulate enough volume to sell. Pak Herdi relies heavily on frequent loans from bandar to help deal with the uncertainty in volume and lack of working capital. He later repays the loans with materials. Pak Herdi claims that he would have likely been more successful growing the business if he had not been forced to relocate and start over several times. He says that the location he is in now is good, but that in the past he has faced problems from other residents who did not like the lapak in their area. Pak Herdi says that this location has also been good for business, and that he was able to purchase a cell phone six months ago that has helped him with the business.

The only police harassment that Pak Herdi has faced has been from mistakenly purchasing stolen materials. He claims this is a real threat. He has been arrested for this once and was taken to jail and forced to pay five million rupiah ($568) because of materials for which he only paid Rp. 1500 ($0.17) per kilogram.

(Pak Herdi, interview by author, Bandung, Indonesia, 5 Jan. 2012)

5.2 Pak Ade Supriana: Bandar

Figure 5-3: Pak Ade Supriana- owner of a bandar near a TPS in central Bandung

At fifty-three years old, Pak Ade Supriana has been running his bandar for thirty years. He is married with two children and two grandchildren. Both of his children completed high school and live in different areas with their families. The bandar provides the only source of income for him and his wife.

Pak Ade left school after junior high to join one of his friends working as a pemulung, collecting waste from restaurants that he could sell to local middlemen. This eventually led him to starting his own bandar in Bandung. He saw an opportunity when the local government developed a tempat pembuangan

sementara (TPS) in the area near the Institut Teknologi Bandung (ITB), the city's largest university. Although he has no legal entitlement to the land he uses, and pays neither taxes nor rent, he has been able to operate at the site for thirty years. According to him, the government is happy to have someone looking over the TPS, and claims he was able to gain access to the land "by being the first one there" when the site was built. He does not receive assistance, nor is he harassed by the local government.

Figure 5-4: TPS and entrance to Pak Ade's bandar

At the time he was establishing his business he already had relationships with some of the local bandar, which aided him in entering the market. A friend of his in the industry worked to train him, educate him about prices, and helped him further establish relationships with buyers. A second friend assisted him with a loan and

they split the profits he earned. However, Pak Ade paid back the loan within six months, as he wanted to grow the business and was afraid of becoming trapped in debt. At the bandar he purchases various plastics, (including soft drink bottles, various packaging materials, and waste from construction sites), he also purchases metal, paper, and cardboard. These materials are then sold to bandar besar and factories that each specialize in one of five specific materials. That is, plastic bottles and packaging materials are sold to bandar besar in Kopo, paper is sold to a relative of his operating a bandar besar in Cimuncang, metal and plastic buckets to bandar besar in Leuwigajah, and pvc piping is sold to bandar besar in Majalaya.

Pak Ade does not employ any pemulung or tukang loak directly to collect waste for him by providing them with shelter. Instead he buys from anyone who comes to him. On site, he generally purchases materials from pemulung, tukang loak, and offices. Households dispose of their waste at the TPS, but he says only very few separate their recyclables to sell to him. He also drives to various smaller lapak and bandar to purchase materials from them. He offers a higher price to the lapak and bandar as well as to regular sellers. Regular customers receive a price that is just Rp. 100 ($0.01) per kilogram above his usual price, while lapak and bandar must be paid a higher price because they have already purchased the materials from pemulung and tukang loak. Many pemulung and tukang loak who are employed by other bandar come to him daily to sell him half of their materials as he offers a higher price than their employer who is providing them with shelter.

To operate the business, Pak Ade employs four workers. Two individuals are employed to sort and clean the materials, while the other two are hired as drivers. He owns one vehicle, and a second is owned by one of the drivers who is a relative of his. All four employees are paid the same salary of Rp. 750,000 ($85) at the end of each month and are given a small amount of money each day for cigarettes and food.

Pak Ade reports that he spends a minimum of ten million rupiah ($1136) daily on purchasing materials, but it is often as high as thirty million ($3410). He purchases around five hundred kilograms of each type of material each day, making four trips daily to sell the materials. He owns a small scale on which he weighs the materials and he pays the sellers on the spot. He does not keep any records of the transactions he makes. If he is ever short of the necessary capital to make the purchases from lapak or bandar, he is able to collect the materials on credit, paying the following day. This is possible due to long standing relationships he has with sellers. If he does not have a full vehicle load at the end of the day, he will hold off selling until the following day in order to avoid losing money on transportation costs.

For each material he sells, he keeps a relationship with several bandar besar. For plastic packaging material for instance, he sells to four different bandar besar. He will sell the majority of the materials to whomever offers the highest price, but he always sells to all four in order to maintain the relationships. The prices rarely change, and when they do the bandar will call him. It is usually the same bandar that always offers the best price but having several options gives him leverage.

Every year the prices for materials fall substantially during the month of Ramadhan due to a decline in production and demand from factories. In 2009 the prices fell so dramatically that Pak Ade was forced to sell his vehicle. Since then he has rented a storage site where he keeps five hundred kilograms of materials as security. He sells some from storage twice a week and is constantly replenishing the stock. If the price is high he will sell it all. Likewise, if the price falls so low that he is short on funds he can sell the materials for the additional cash. He pays fifteen million rupiah ($1705) annually for the location in Kunclut, north Bandung.

In the future, he plans to grow the business, and while he says he has frequent offers from larger bandar to loan him money, he is very wary of accepting loans that would force him to only sell to them, and would potentially lower the price he receives. He claims that not having to take on debt is his number one priority in the business.

Pak Ade claims that he has rarely been cheated by sellers; only occasionally has he opened a packet of cardboard and found a rock inside. He says this is infrequent and the cost to him is small so he is not very concerned about it. In an attempt to avoid purchasing stolen materials, Pak Ade does not buy anything at night, and often turns away materials of high quality. He claims that he has only had materials stolen from the premises twice.

The area nearby the TPS has recently been reclaimed by the government to be developed as green space and most of the small informal shops and restaurants in the area have been evicted and demolished. Pak Ade says the government has not spoken with him about any plans for his business during the new development, but he claims that he is not worried about being evicted, since the area depends on the TPS to dispose of their waste and it is difficult to move. However, given the informal nature of the business and the fact that he has no legal entitlement to the land, this could prove to be a problem in the future.

(Pak Ade Supriana, interview by author, Bandung, Indonesia, 23 Dec. 2011)

5.3 Pak Maman: Bandar

Figure 5-5: Pak Maman's bandar and employee

Pak Maman operates a bandar in the Siliwangi district of central Bandung. At fifty-four years old, he has been running the business for six years. He is from the village of Ciamis, seventy-five miles east of Bandung where his wife and four children live. He rents a room in Bandung and makes the two-hour trip to Ciamis twice per month. His wife is not employed and all of his children are still in school, with the oldest currently in senior high school. After completing junior high, Pak Maman left school to become a truck driver. This was his occupation for many years in Ciamis, but it became increasingly difficult for him to find consistent work to support his family, so he left the village to start a bandar in Bandung.

He found a vacant lot he could rent in the area of Siliwangi. There are several other bandar and a TPS along the poorly kept road, which is isolated between the railway tracks and the army barracks. Pak Maman started the business with five million rupiah ($568) of his own savings. The most challenging aspect of starting the business was finding lapak to buy from. He sought out the lapak and built relationships with them slowly over time. He never faced problems with incumbent bandar or harassment from the government. He continues to operate the business informally, without registering the business or paying any taxes.

He buys the majority of his materials from smaller lapak and bandar, while also buying small amounts from pemulung and tukang loak. He does not hire any pemulung or tukang loak directly, but there are some that sell to him regularly. He does not provide any daily capital to tukang loak, but occasionally makes loans to

those he can trust. He claims that being located near the army quarters prevents any crime in the area, and while he is occasionally cheated by those he buys from, it does not affect him enough to influence his business.

Pak Maman says that the materials he buys fall into five categories: plastic, metal, cardboard, PVC piping, and plastic toys. He sells to five different bandar besar, one for each specific material. He chose the first bandar besar he met and has continued to sell to them ever since. He says there is no reason to consider changing bandar as they all offer basically the same prices. The bandar besar are located in Cicabe, two in Cijerah, and two in Kucungberung. He calls each bandar besar and they come to buy from him once per day. He sells all of the materials he purchases the same day as he receives them. On average he spends around twenty million rupiah ($2270) per day buying materials. He purchases around five to six hundred kilograms of plastic, one ton of metal, and two tons of cardboard per day. He relies mostly on his existing relationships with lapak, and only finds new customers when a new lapak is started. Occasionally, however, if a new lapak opens, they will seek him out, which he claims is a benefit of being well established. He does not keep any records of the materials he purchases, but the bandar besar he sells to keep records of all the transactions.

At the bandar, Pak Maman employs eight workers as either sorters or drivers. They all receive the same salary of six hundred thousand rupiah ($68.20) per month, with an additional fifteen thousand rupiah ($1.70) given each day for meals. He has three

trucks that he uses to drive from lapak to lapak to purchase materials. One vehicle is paid off completely, while on the other two he makes payments of 2.4 million rupiah ($273) each per month. He collects the materials from the lapak he has built relationships with, weighing it once he returns to his bandar. Sometimes the owners come with him to weigh the materials, but other times he estimates and pays them at a later time.

Pak Maman purchases from pemulung and tukang loak at the price of Rp. 2500 ($0.28) per kilogram for unsorted materials, and Rp. 5000 ($0.57) per kilogram from lapak. If the materials have previously been sorted, he pays different prices based on the rates he receives for each material. He talks with other bandar to try to coordinate with the prices they set. He claims there would be no tension between competing bandar if he were to set a higher purchasing price, but that it wouldn't be profitable to him to do so. He makes approximately one to two million rupiah ($115 – $225) per month in profits from the business. He does not have any savings and occasionally receives a loan from the bandar besar who buy from him, using these loans to grow the business.

(Pak Maman, interview by author, Bandung, Indonesia, 28 Dec. 2011)

5.4 Pak Edi Lasmana

Figure 5-6: Pak Edi Lasmana's bandar

Two years ago Pak Edi Lasmana opened a bandar in his rented home in the quiet middle class residential area of Dago Pondok in north Bandung. Pak Edi was born in the village of Garut forty miles south of Bandung. He dropped out of school at twelve years old and left home to look for work in the city. For several years he moved from job to job doing any type of work he could find. He worked cleaning homes, in restaurants, and as a driver. He met his wife in Bandung where they have raised two children and are expecting another on the way. In 2008 Pak Edi began working at the bandar his in-laws have been running for more than thirty years in Ciropahan. This provided him with the necessary training and experience, and after six months he left to open his own business. He started his bandar with only Rp. 500,000 ($57), one employee, and a handcart. Now, at thirty-two, Pak Edi spends six to twenty million rupiah ($680 - $2270) per day buying materials, and generates

approximately ten million rupiah ($1136) in profits per month. He prefers this work to his previous work as a driver because owning a bandar allows him the opportunity to grow and expand the business. He said that when he worked as a driver he was just waiting to receive his salary, which was low and barely made ends meet. There was no opportunity for him to improve his situation.

After becoming pregnant with their third child, Pak Edi's wife left her job at a textile factory to join her husband working in the bandar. After giving birth to their child she plans to stay in the home doing administrative work for the business. Their other two children are currently living with their grandmother in Bandung.

While he said that it does not take much capital to open a bandar, there are significant challenges and many go bankrupt in a short period of time. He established customers early on by going one-by-one to negotiate the best price for the materials. The lapak he bought from often cheated him, having him pay up front, and then never supplying the materials. Now he only does business with lapak he trusts and has built strong relationships with fifteen. He was not able to use the connections with lapak from his previous work with his in-laws, but instead had to build his own network. The in-laws would become angry if he tried to purchase materials from their regular sellers.

The government was also a source of problems when he opened. Because it is an unregistered, informal business, police would frequently harass him demanding that

he pay them bribes. He says that now that he is established this no longer happens. Rather, the police often approach him wanting to invest in the business by providing loans to him.

Currently, in addition to the fifteen lapak he buys from, he also purchases from tukang loak and small shops and groceries. He does not buy from pemulung because he is located in a residential neighborhood and does not want complaints from neighbors for giving them a place to sort or allowing them to sleep on the premises. When he first opened, he would travel from shop to shop searching for materials, but now he can call the management of the large stores and have them deliver directly to him.

He presently has five employees. Three individuals work sorting the materials for him, one works as a driver, and one assists the driver. The sorters are paid Rp. 40,000 ($4.55) per day, the driver Rp. 50,000 ($5.70), and the driver's assistant Rp. 30,000 ($3.40). They work seven days per week from 7 am until 7 pm. He is proud to talk about how he has grown the business from just one employee with a handcart, to five employees and his own vehicle.

Pak Edi purchases metals, plastics, paper, and cardboard. Paper and cardboard are sold to a factory in Bandung, plastic is sold to a penggilingan processing intermediary, and metal is sold to a bandar besar, who then sells it to a factory in Jakarta. He compares the prices offered by the different factories based on

advertisements they post, or other bandar he knows will send him SMS messages with the prices. Prices change about once per week, and he receives payment from the factories two or three days after he delivers the materials. He also compares his purchasing price with that of other bandar and sets the same price.

Per day, Pak Edi tends to spend between six and twenty million rupiah ($681-$2275) purchasing materials. The total mark up is around one million per day. After paying his workers' salaries and the cost of gasoline, he earns around Rp. 300,000 ($34) in profit per day. Pak Edi uses this profit to grow the business. He avoids taking loans from other bandar and factories, and he has nothing with which to guarantee a loan from the bank. He hopes in the future to purchase another vehicle as he encounters problems when more than one lapak need him to pick up materials at the same time. He also hopes to begin shipping metal to Jakarta himself to receive a better price.

(Pak Edi Lasmana, interview by author, Bandung, Indonesia, 30 Dec. 2011)

5.5 Pak Emin Sulaiman and Ibu Rani

Pak Emin and his wife Rani opened their bandar in the industrial area of West Bandung in 2004. They are both originally from the village of Garut but have been living in Bandung since they were married and have raised five children in the city. Pak Emin worked as a tukang loak at his brother's bandar since he finished senior high school in 1978. In 2004, Pak Emin bought his mother's home and converted into a bandar. His wife joined him in the business after the garment factory she was

working for closed. The business is located on Jalan Soekarno-Hatta, a major highway in an industrial area that is populated with many factories and competing bandar.

Figure 5-7: Pak Emin and Ibu Rani at their bandar in west Bandung

In the beginning it was difficult for them to find customers, since there are many bandar in the area. Ibu Rani claims that competition is intense and many bandar try to cheat by offering a higher price, while manipulating the scale to under-weigh materials. Their strategy is to be honest and build trust with sellers, while also purchasing a wider range of materials than other bandar. For instance, they purchase and sort ten types of plastic, compared to the three or four types that is

typical of other bandar. They offer a standard price for mixed materials, or negotiate prices based on the degree of sorting already done by the seller.

Pak Emin and Ibu Rani purchase from pemulung, tukang loak, smaller bandar and lapak. Another major source of materials for the business comes from trucking backhauls where the driver sells the waste packaging materials after making a delivery. This is often a way for drivers to supplement their income, however, company managers frequently contact the bandar by phone beforehand to formally arrange the sale of the materials.

The bandar has been registered as a formal business since 2006. The decision to formalize the business came from the fact that they were frequently targeted by Satuan Polisi Pamong Praja (Satpol PP), a local level civil service policing unit in Indonesia. Before registering the business they paid up to Rp. 650,000 ($74) per year in fines. They still have daily problems with the police who issue tickets to sellers illegally parked in front of the business, but say that they do not interfere with business.

Prices are determined by considering the selling price they receive and setting a margin that gives them a desired profit. Prices are set for each type of material or negotiated based on the degree of sorting already done by the seller. They are not aware of the prices offered by competition as they do not feel it affects their business.

On average, five to ten million rupiah ($570 - $1135) are spent daily purchasing materials. Pak Emin and his wife employ fourteen workers to check, clean, and sort materials, and to serve as drivers for the five vehicles owned by the business. Every employee is expected to do all the duties and earn on average between Rp. 800,000 ($91) and Rp. 1,200,000 ($136) per month plus food each day. The employees are expected to work from 7 am until 5 pm each day, seven days a week. However, Pak Emin claims that it is not uncommon for him to open the bandar at any hour to buy materials.

Profits average between two and ten million rupiah ($228 - $1135) per month, but can reach up to twenty million ($2275). Occasionally factories will contact them directly to source materials, in which case they can make large profits. Large profits are also made when nearby factories go out of business and they are able to claim the machinery.

Plastic is sold to a panggilingan for processing. Paper is sold directly to PT. Papyrus Sakti, one of three paper manufactures in Bandung. Pak Emin and Ibu Rani serve as one of sixteen approved suppliers to the factory. Metal is sold to a local bandar besar in the area. If they are not able to reach the quota volume required by the buyers, they will purchase materials from other bandar of equivalent size at prices similar to what they receive in order to reach the target volume.

(Pak Emin Sulaiman, Ibu Rani, interview by author, Bandung, Indonesia, 3 Jan. 2012)

5.6 Pak Ade: Bandar Besar- Paper

Figure 5-8: Employees at Pak Ade's paper bandar besar in central Bandung

Pak Ade entered the recycling industry when opened his first lapak with his brother in 1996 in Kiaracondong, in east Bandung. At the time he was working full-time as a public school teacher and part-time as a tukang loak with his brother collecting materials in a handcart. The business failed three times before they were successful. Pak Ade claims that they failed due to a lack of experience. They were unable to manage the purchasing price and the selling price of the materials they were trading, and often found themselves operating at a loss. They collected materials of low quality and buyers were only willing to pay a small price for them, often less than what it cost them to purchase the materials. The rainy season gave them

particular troubles as the quality of materials drops significantly. However they were eventually able to get the business running sufficiently, after which Pak Ade quit his job as a teacher to join his brother working fulltime at the bandar. In 2007 they outgrew their location in Kiaracondong and moved the operation to their present location in central Bandung.

When the business reached a certain size, they made the decision to specialize solely in the purchase of paper, becoming a bandar besar that directly supplied the paper factories. Pak Ade said this was due to the fact that it is easy for them to quickly accumulate large volumes of paper and that it has a fast turn around. With paper, they can purchase enough materials to be able to sell to the factories everyday, as opposed to metal which he said could take up to one week. They purchase materials mostly from lapak and other bandar. They no longer purchase from pemulung or tukang loak since the volume they collect is too small. They have relationships with lapak and bandar and maintain a schedule for each to collect materials from them once or twice per week. Now that they are established, Pak Ade says that they no longer have to search out new sellers, but rather are approached by sellers. This is a change from when they were small and had to spend much of their time searching out materials.

In 2010 Pak Ade and his brother registered the business formally due to pressure from the government. They said they did not have problems with the government

when they were small, but as the business grew the tax officials began to take notice, especially because their current location is near the government tax office.

The prices they pay are determined by the price they receive from the factories. If the price paid by the factories falls, they lower the price they pay to sellers. They rarely compare prices with other bandar and instead consider it more important to focus on building and maintaining relationships with their sellers than to compete on price.

When they first started out as a small lapak they financed everything with their own capital. Now, for large capital investments, they finance operations with loans from banks, but they also accept small loans from the paper factories when they are in need of working capital. They sell to all three paper factories in Bandung, and occasionally ship materials to Jakarta and Surabaya depending on the selling price. They rarely check the prices offered by the Bandung factories, claiming that they only change about one time per month, and when they do, the factory will contact them.

The bandar besar has twelve employees who work as drivers, sorter, and operators of the baling machine. Their salaries vary, with the most senior employee earning more than one million rupiah ($114) per month. The bandar besar is open six days a week and is closed on Sunday. On average they spend around twenty million rupiah

($2273) per day purchasing paper with Saturday being the busiest day. However, Pak Ade was not willing to reveal the profits earned by the company.

(Pak Ade, interview by author, Bandung, Indonesia, 31 Dec. 2011)

5.7 Case Study Findings

Several conclusions can be drawn from these six case studies, and the twenty two additional interviews with recycling middlemen in Bandung, that are useful for policy makers to consider when dealing with the informal recycling industry. The key findings from this research can be summarized in the following ways:

- The recycling middlemen industry is heterogeneous
- Middlemen add value and contribute to the efficiency of the supply chain
- The recycling middlemen industry provides the regions poor with a potential opportunity for social mobility

Each of these points will be described in further detail in this section.

5.7.1 Heterogeneity of Middlemen Industry

The current literature on informal recycling treats the recycling middlemen industry in developing countries as being homogeneous, particularly in terms of their profitability and treatment of waste pickers. Little research has been done to understand the backgrounds and socioeconomic conditions of the individuals operating these businesses or the services they provide. These case studies show

that in Bandung there is a great deal of heterogeneity among middlemen in the industry. Middlemen in Bandung differ greatly one from another in terms of profitability, size, personal and socioeconomic backgrounds, legal status of the business, and supplier base.

In terms of income and profitability there are large differences between middlemen. Monthly profits of individuals interviewed ranged from less than one million to more than twenty million rupiah ($170 - $2275). There is also large degree of variability in day-to-day purchases, making incomes unpredictable. Middlemen reported volumes and profits as a range, indicating that there are supply fluctuations that are outside of their control. The types of physical establishments that the businesses are operating from also vary greatly. Lapàk tend to operate out of small shacks and open lots. Bandar tend to have larger establishments, although many operate out of their homes or in open areas near TPS. Other bandar have large warehouses where they store materials.

Related to income are the socioeconomic backgrounds of individuals in the middlemen industry. This also tends to be highly varied. Only 2 out of 22 bandar interviewed were natives of Bandung, while the others were migrants from smaller villages in West Java. 12 previously worked as either pemulung or tukang loak before opening the bandar, while 7 came from other informal occupations, such as truck drivers, while others previously worked in factories or garages.

It is also important to note that the degree of legality and formality of a business is largely a function of size and location. Of the three middlemen interviewed that ran formal businesses, all stated that they formalized due to pressure from the government. This pressure occurred largely because they were in a highly visible location, such as on a major road or near a government office, or because they reached a certain size where it was no longer feasible for them to remain informal. However, it remains unknown whether the employees of formal middlemen are in fact formal wageworkers. An employee of a former business is considered informal if they lack formal contracts or social protection by their employers (Chen 2008).

The final major distinction between different middlemen in the supply chain can be determined based on their supplier base (in this case, the individuals or establishments that a given middleman purchases materials from). Smaller middlemen tend to depend more on waste pickers as their primary source of income, while larger middlemen tend to buy more from other, smaller middlemen. This shows that waste pickers account for only a portion of the materials sold in the supply chain.

5.7.2 Value Added Activities of Middlemen

The primary ways that middlemen add value and contribute to the efficiency of the recycling supply chain is by providing capital, transportation and storage, and by managing relationships for the purchase and delivery of materials. A sufficient amount of working capital is required to carry out the daily operations of a

middlemen business. As shown in the case studies, up to twenty million rupiah per day can be tied up in warehoused materials. Lending of capital is also a frequent activity in the industry. While many middlemen view these loans as having a negative impact on growth, they can serve a positive purpose in two ways: 1) they provide middlemen with short-term working capital requirements to meet spikes in demand, and 2) they provide smaller middlemen and waste pickers a means of income smoothing. These loans may lower the profits one receives, but it may be worth it to an individual if it allows them to either increase the volume of materials they can purchase in a day, or if it reduces some of the uncertainty involved with daily earnings in the sector.

By providing transportation and storage of materials, middlemen contribute to the efficiency of the supply chain by supporting a reverse distribution system that, through a decentralized network of middlemen, can aggregate materials from a large number of dispersed locations to a few centralized facilities. This process requires a great deal of trust among players on both sides, and middlemen bear some of the risk associated with dealing with both factories and waste pickers.

5.7.3 Social Mobility

It has also been shown that middlemen businesses have provided individuals with a means to improve their economic situations. While many respondents reported that they entered the business after losing formal employment, or because they followed a friend or a family member, 22 out of 28 stated that they planned to stay in the

industry because it gives them the opportunity to grow their business and improve their income earning potential. However, the business is not an easy one, and many who enter fail. The industry requires the knowledge of many non-conventional skills, such as the understanding of the rules of informal contracts and how to build informal networks. There is a steep learning curve for businesses that are just starting out, and overcoming these barriers requires a degree of business acumen and entrepreneurial spirit that is an asset to the supply chain.

These findings show that policy makers need to better understand the recycling middlemen industry and make the case that middlemen should be considered in policy making both from a social and rights perspective, as well as from an efficiency standpoint. The subsequent chapters will be dedicated to further understanding the middlemen industry, evaluating the current status of the supply chain, and proposing policy recommendations to address its weak areas.

6. Middlemen: An Industry Analysis

Using the case studies presented in Chapter 5, I will now provide a closer examination of the middlemen industry structure and its implications. The term *recycling middlemen industry* refers only to the segment of the supply chain operated by middlemen, as depicted in Figure 4-1 on page 43. The term *recycling industry* refers to the all actors in the supply chain.

This analysis will explore the strategies of lapak, bandar, and bandar besar in overcoming structural challenges. The industry analysis will be performed using the Five Forces framework developed by Michael Porter in his book *Competitive Strategy* (Porter 1980). This will assist in identifying the drivers of the industry and the influence of middlemen on other actors in the supply chain. Public policy aimed at changing the dynamics of informal recycling must be aligned with the existing industry structure to avoid a backlash from the system or other unintended consequences. Government regulation is a main factor in shaping and influencing the competitive forces of an industry. Understanding this framework can help anticipate changes and reactions that occur in the industry in response to policies.

6.1 Overview of the Five Forces Framework

In 1980 Michael Porter published his Five Forces framework for competitive analysis in his book *Competitive Analysis.* Since that time, the framework has become widely respected by academics and business professionals for its ability to determine the potential profitability of an industry based on five structural factors.

The framework has also assisted policy makers in determining which industries should be regulated, and which regulations would be most effective. These factors, shown in Figure 6-1, are threat of new entrants, bargaining power of suppliers, bargaining power of buyers, threat of substitute services, and rivalry among existing competitors. Profitability of an industry decreases as the relative strength of a given force increases. I will use these forces to analyze the recycling middlemen industry in Bandung to determine their position and influence in the supply chain to be used in making policy recommendations regarding the system. Each competitive force will be rated on a scale ranging from low to high depending on its relative strength in the industry. A force with a low impact on the industry has a positive effect on profitability, while a force with a high impact has a negative effect on potential profits.

Figure 6-1: The Five Forces that shape industry competition (Porter 2008)

Given the nature of a reverse logistics system such as recycling, the terms 'buyers' and 'sellers' will be used in place of 'customers' and 'suppliers' in order to avoid confusion. In the case of recycling middlemen, the buyers are generally factories and processing facilities, and the sellers are waste pickers and other middlemen within the industry.

6.1.1 Threat of New Entrants

The threat of new entrants is determined by the existing barriers that prevent or discourage new firms from entering an industry. Overall the barriers to entry for recycling middlemen in Bandung are low, and therefore the threat of new entrants is high. The existence of low barriers to entry is one of the main reasons it is an attractive industry for the region's poor. Fixed and sunk costs are next to nothing. Since middlemen operate within the informal sector, the lack of regulatory fees and administrative hurdles further reduce barriers to entry.

The largest physical deterrent preventing entry is the need for land. This does not serve as a large barrier for many, however, since the businesses can be run directly out of an individual's home. Others establish businesses on vacant and public land at little or no cost, such as the areas surrounding waste transfer sites (TPS) or under overpasses. However, as most waste pickers are migrants from rural areas they tend to work for a middleman in exchange for a place to sleep, or rent a small room not big enough to store materials. Therefore this can serve as a barrier to forward integration by waste pickers, although there are many instances of waste pickers

establishing their own lapak from which they can grow a successful middleman business.

While there are few monetary barriers to entry, existing middlemen have shaped the industry in ways that make it difficult for new entrants to succeed. The biggest barrier to entry for lapak and bandar is the challenge of establishing relationships with sellers. The common practice is for middlemen to establish informal purchasing agreements with waste pickers, lapak and smaller bandar. This can be done by providing small loans to the seller, or through daily pick-ups by the buyer. The strength of the informal contacts is high, and while they have little legitimacy and are difficult to enforce, they may be held together by strong cultural factors. In this environment, even if the entrant has the capital to make large material purchases, they will find it difficult to identify sellers to buy from.

The strong reliance on networks of buyers and sellers serves as more than just a barrier to entry for newcomers, but is the number one way that middlemen shape the competitive forces within the industry to increase profitability in their favor.

6.1.2 Bargaining Power of Buyers

In the recycling supply chain, buyers (meaning processors and exporters, as well as larger middlemen within the same industry) have substantial bargaining power. This is in turn bad for the profitability of an individual business operating within the middlemen industry. Recyclable waste is non-differentiable and is treated as a

commodity with prices set by the global market. This leads to fairly uniform prices being set by buyers, with a small margin added by each intermediary along the value chain.

The use of loans granted by buyers to sellers is important. By granting loans to sellers, buyers can secure informal contracts with sellers, thereby increasing their bargaining power. The avoidance of accepting loans, and the practice of granting loans are both frequent strategies pursued by successful middlemen.

6.1.3 Bargaining Power of Sellers

The suppliers in this case are anyone who sells materials to middlemen, this includes pemulung, tukang loak, and other relatively smaller middlemen. For the purposes of this thesis, these suppliers are referred to as 'sellers', in order to avoid any confusion that may arise given the nature of the reverse supply chain.

The bargaining power of sellers is determined in nearly the opposite way from buyers. Due to the large numbers of sellers, undifferentiated materials, and the lack of enforceable switching costs, sellers have very little bargaining power with respect to the industry.

Small lapak further reduce the selling power of waste pickers by providing them with a place to sleep and loans, or by providing tukang loak with daily capital, in an attempt to secure them as sellers. This is not always a successful strategy, however,

since many pemulung and tukang loak continue to sell a portion of their materials to other lapak and bandar at a higher rate. Lapak also provide pemulung with shelter in order to build trust and to prevent being cheated. For example, a common practice among pemulung and tukang loak is to soak cardboard and paper in water, or include non-recyclable materials (such as stones) mixed with recyclables, in order to increase the weight of materials and earn a higher income. As evidenced through the case studies in Chapter 5, larger bandar are not as concerned with being cheated by waste pickers since they only account for a very small portion of the materials they purchase, and thus are less concerned about providing them shelter.

Most bandar interviewed mentioned that they discuss prices with other bandar of the same size. The bandar then set their prices to match them rather than compete against them on price. However, the number of bandar operating in Bandung is so great that this hardly forms a cartel. Prices in general are set by the factories and communicated down through the supply chain, giving middlemen little room to influence the market.

There is also a social component at play toward the bottom of the value chain. As sellers, most waste pickers and small lapak are uneducated and marginalized citizens. Most are migrants from rural areas. The immediate need for daily income puts them in a weakened bargaining position vis a vis their suppliers. In situations where they are cheated or abused by middlemen they have no legal protection. All

of these factors further reduce the ability of waste pickers to improve their position in the supply chain.

6.1.4 Threat of Substitute Services

There are very few substitutes for the services provided by recycling middlemen. There is no formal channel for the sale of recyclable materials. This may change in the future however, given the recent attention to environmental and social concerns in the area. Increased pressure is being put on the government to improve recycling in the city. Non-government organizations (NGOs) are also beginning to intervene in the area on behalf of the waste pickers. One NGO, Yayasan Kontak, has begun purchasing recyclables from a small number of waste pickers on a not-for-profit basis with a price that is subsidized by the government. While these threats are small at the moment, they are likely to increase in the future.

6.1.5 Rivalry Among Existing Competitors

Rivalry among competitors in the industry is high given the large number of firms, low barriers to entry, and undifferentiated products and services among middlemen. The main way middlemen are able to differentiate their service from competitors is by providing their own transportation. This better situates them to compete for the smaller middlemen who are supplying them with materials. This also helps them to increase their bargaining position with buyers and sellers. They are able to secure sellers by establishing regular pick-up times, or allowing sellers to

call them directly when they are ready to sell. Having one's own source of transportation also allows a bandar to choose which business to sell to, thereby increasing their bargaining position.

The main driver keeping rivalry low is the shear abundance of waste in the city. Recyclable materials are commodities, and while quality of materials is important to a certain extent, the materials are essentially undifferentiable. Lower quality materials are purchased at a lower price, while higher quality materials command a higher price, however, there is an abundance of both so there is no competition by middlemen for the higher quality materials. This fact drives down prices to razor thin margins. The only saving grace is the abundance of waste available that leads middlemen to collude on prices rather than compete, and prevents a price war from eroding all profitability.

6.2 Summary of Competitive Forces

This industry analysis presents the relative strengths of the competitive forces in the recycling middlemen industry in Bandung, Indonesia. In general, the competitive forces are such that profitability is low at the bottom of the recycling value chain, which is primarily made up of waste pickers, and increases as one moves along the value chain. The industry in which factories and exporters operate is less fragmented than the rest of the supply chain and best protected against the five forces, and is thus the most profitable. The same is true with regard to the middlemen industry, as one moves along the value chain from lapak to bandar besar

the degree of fragmentation decreases, and the profitability of individual businesses increases.

Middlemen in Bandung actively employ tactics to better position themselves in the industry or to influence the competitive forces. Since in this case there are middlemen serving as buyers and sellers to other middlemen within the same industry, this results in growth and a higher position for the firm in the supply chain. Instances of this include: reducing seller power by providing loans and instituting volume requirements; reducing buyer power by owning transportation; reducing rivalry by colluding on prices; as well as by employing non-conventional tactics such as trickery and deceit.

While the existence of informal contracts between buyers and sellers is generally seen as a barrier to growth by the seller or entrant, it does provide several benefits. Many middlemen entering the industry are looking for a stable income with low risk and are thereby satisfied with entering into an agreement with the first buyer they meet. They see the price differences between buyers as marginal and unimportant, and loans assist them with working capital or income smoothing. Many middlemen are not interested in taking the risks required to achieve growth, but are still able to earn an income better than what they could as waste pickers or in other jobs given their skills, and the work affords them the flexibility they need to take care of their families and other commitments.

As a middleman business grows, they become more dependent on the small middlemen to supply them with materials. The overall efficiency of the system also depends on small middlemen that are located across a broad geographic area in order to optimize transportation and the aggregation of materials in the city. One way this is done is by larger sellers positioning themselves with very strong buyer power against smaller middlemen, securing them as sellers and inhibiting their growth. However, it has been evidenced that many middlemen start out small due to the difficultly in building the required networks of sellers needed to scale the business, but are able to grow the business within a few years. Therefore, another way to maintain this system is through the mobility of small businesses, and a low level of barriers to entry that ensure a constant flow of small suppliers, who either grow, fail, or remain small, depending on the entrepreneurial skill and ambition of the owner to grow the business.

This analysis further supports the view of the recycling middlemen industry as being heterogeneous in terms of size and profits. While the industry overall is not very profitable, it does present such benefits in that it is easy to enter and exit, provides flexibility for workers, provides a stable income, and provides a degree of social mobility. Most of the small lapak who depend on materials from waste pickers are often poor themselves, most with origins in waste picking. Many continue to collect waste materials, or receive materials from family members, while running the small middleman business. This shows that it is too simplistic of a view to simply categorize middlemen as exploitative and to focus policy on trying to circumvent

them in the supply chain. When addressing informal recycling policy makers need to consider all actors within the supply chain and draft policies that reflect these conditions. The next chapter presents a framework that can aid policy makers in evaluating informal supply chains. This framework can assist policy makers in designing policies that reflect the interests of all relevant stakeholders.

7. Framework for Evaluating an Informal Supply Chain

This chapter will propose a framework for evaluating informal supply chains that takes into account all actors in the supply chain and can aid policy makers in designing policies that address appropriate problems, identify potential tradeoffs, and assist in finding creative solutions that make all stakeholders better off. While the current literature identifies common problems associated with informal activities and suggests frameworks for policy making, there is currently no framework for evaluating an informal supply chain's current state with respect to the issues that these policies are designed to address. Additionally, there is no framework currently in the supply chain management literature for evaluating a supply chain from a policy perspective that addresses both efficiency and social aspects of an industry. This chapter attempts to contribute to the development of such a tool. Figure 7-1 presents a matrix highlighting the current condition of the recycling supply chain in Bandung for each of its relevant stakeholders with respect to a set of criteria on which they are evaluated. The stakeholders that are considered are: the city (and the service it provides for the public), waste pickers, middlemen, and the factories that process the waste material. The criteria I propose for this evaluation are: Efficiency, Health and Safety, Income, Social Protection, and Legal Protection. These criteria are chosen to reflect the service to the public and the environment that recycling provides, as well as the social and equity concerns that are frequently associated with activities in the informal economy. Different stakeholders are concerned with different aspects of this criteria and the matrix is adapted to account only for relevant factors. For instance, the current structure of

the recycling supply chain has little impact on the wages paid by the factories to their workers so it is not considered. This matrix can be expanded to include additional stakeholders and criteria as needed. Given the limited scope of my research on several of these areas, I will provide a basic estimate of the current situation, while suggesting additional benchmarks that should be assessed in future studies.

	Waste Pickers	Middlemen	Factories	City
Efficiency	High	High	High	High
Income	Med/Low	Med/High	N/A	N/A
Health and Safety	Low	Low	N/A	Low
Social Protection	Low	Low	N/A	N/A
Legal Protection	Low	Low	N/A	N/A

Figure 7-1: An evaluation of the current state of the recycling supply chain in Bandung with respect to the various stakeholders involved.

7.1 Efficiency: City

The city should be concerned with the efficiency of recycling activities based on two measures: recycling rates and cost to maintain. I will argue that the current informal system rates high on both accounts. Efficiency based on high recycling rates will be measured using a comparative analysis against both a comparable city in the developing world, Belo Horizonte, Brazil, and against the highly centralized, capital-intensive systems of the United States. The comparison between Belo Horizonte and Bandung will be based on studies done by Sonia Dias, et al. (2010) and Enri Damahuri, et al. (2009) respectively. The comparison of Bandung to the U.S. will be based on figures published by the Environment Protection Agency (EPA) for 2009,

while several recent studies will be used to provide data on Bandung. Following this will be an analysis of the estimated costs saved by the municipal government that can be directly attributed to the informal recycling supply chain.

7.1.1 Efficiency: City- A Comparison of Bandung, Indonesia and Belo Horizonte, Brazil

As discussed in Chapter 2, Belo Horizonte, Brazil has recently been heralded as a model for recycling systems in the developing world for its inclusive policies and partnerships between local government and organized waste picker cooperatives that have existed for nearly twenty years (Dias 2011). Based on this attention and the similar characteristics of the cities, Belo Horizonte serves as a good basis for comparison for the informal recycling activities in Bandung, Indonesia. The two cities have comparable populations of approximately 2.4 million. Belo Horizonte has a higher production of waste overall annually of approximately 2,000,000 tons, compared to approximately 600,000 tons per year in Bandung. However, the composition of the waste is very similar, with both cities having a composition of organic waste that accounts for more than 50% of the total waste. The recycling potential for Belo Horizonte is higher than Bandung, with 24% of the total waste consisting of recyclable materials, compared to 16% in Bandung. However, as of 2008, Belo Horizonte was only able to capture 3% of the potential, while the informal recycling sector in Bandung reclaimed nearly 50% of the total recyclables in the waste stream. This attributed to an 8% reduction in total waste in Bandung

that was sent to the landfill, while in Belo Horizonte this rate was less than 1% of the total waste produced in the city.

This comparison is not meant to say that the system in Belo Horizonte is not effective; it has in fact increased recycling rates for the city since its implementation. The system has also made tremendous advancements towards increasing the incomes, health standards, and social protection of the workers in the sector. This comparison is only meant to show that Bandung is starting from a different level of efficiency that policy makers should seek to maintain as one of their polices goals.

7.1.2 Efficiency: City- A Comparison of Bandung and the United States

Many cities in the developing world see the solution to their solid waste problems as being a need for the modern, capital-intensive systems that exist in industrialized nations. However, in doing so they often overlook and ignore the existing informal systems in their countries that may already be reaching high levels of efficiency. Additionally, cities may find that these technologies are not as effective given local conditions as they are in the industrialized nations they come from. For instances, high levels of organic waste can cause problems for compacting trucks and narrow residential streets may prevent trucks from reaching many areas (Medina 2007). The example in Chapter 2 of recent government interventions in Cairo, Egypt illustrates these problems. This comparison will show that the informal recycling system in Bandung, Indonesia already reaches capture rates comparable to those in

the U.S and should therefore be promoted over the privatization by foreign firms or large-scale capital investments in western systems.

While the 8% recycling rate for Bandung appears low compared to the U.S. average of 25.2% (EPA 2009), the composition of the waste is very different between the two locales. The first major distinction between the waste produced in Bandung and in the United States is the proportion made up by organic waste. While in the U.S. 27% of waste produced is organic (14% food waste and 13% yard waste), organic materials in Bandung represent 52% of the total waste (Damanhuri et al 2009).

The effectiveness of informal recycling in Bandung can be seen when comparing the redemption rates of specific materials. For instance, 41.55% of all plastics in Bandung are recycled (Rahardyan 2007), while rates are at only 7.1% in U.S (EPA 2009). Similarly, 86% of waste paper produced in Bandung is recycled (Sembiring and Nitivattananon 2009), compared to 62% in the U.S. While data for metal recycling rates are not available for Bandung, they are 34% in the U.S. Overall, 18% of the total waste stream in Bandung is comprised of recyclable materials (Ali and Sakano 2009). In the U.S. this figure is around 60%. Therefore, the overall efficiency of the two systems is comparable when considering that each are able to capture around half of the potential of recyclable materials produced.

There are several reasons for this high level of efficiency in Bandung. First of all is the fact that the informal system in Bandung provides the incentive to maximize the

level of recycling in the city. As has been shown through the case studies in Chapter 5 and the Porter analysis in Chapter 6, there is an economic incentive driving the recycling system in Bandung toward maximizing material recovery. This differs from the U.S. model of waste management that is designed to maximize collection and disposal (Medina 2007).

Another reason recycling is successful in Bandung is due to its decentralized approach and its relationship to the formal disposal system. In this system materials are removed from the waste stream at multiple points in the formal system, while the in the centralized model of industrialized countries, materials are separated only at the source for recycling. While source separation is important for maintaining the quality of materials and promoting a positive attitude about recycling to the public, when this is the only means of recovery, any materials that are not recovered at the source will be disposed of in landfills or incinerated. In the Bandung system however, materials that are not collected from the source can be recovered from the TPS, and then again from the landfill, leading to a high recovery rate. While this recovery is done primarily by waste pickers, they are assisted by a highly decentralized network of middlemen that facilitate the aggregation and transportation of materials throughout the city. Thus the overall efficiency of the system can be directly attributed to both groups and should be reflected in the policies aimed the industry. Figures 7-2 and 7-3 on the following page illustrate the relationship between disposal and recovery for the United States and Bandung respectively.

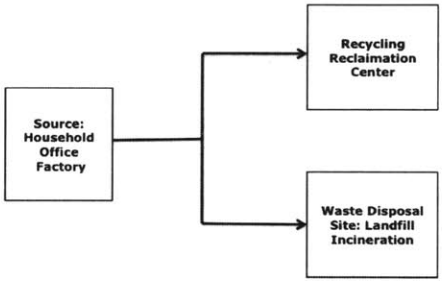

Figure 7-2: The centralized model of recycling present in most industrialized nations. Recyclables are sorted and reclaimed at the source and processed in centralized facilities.

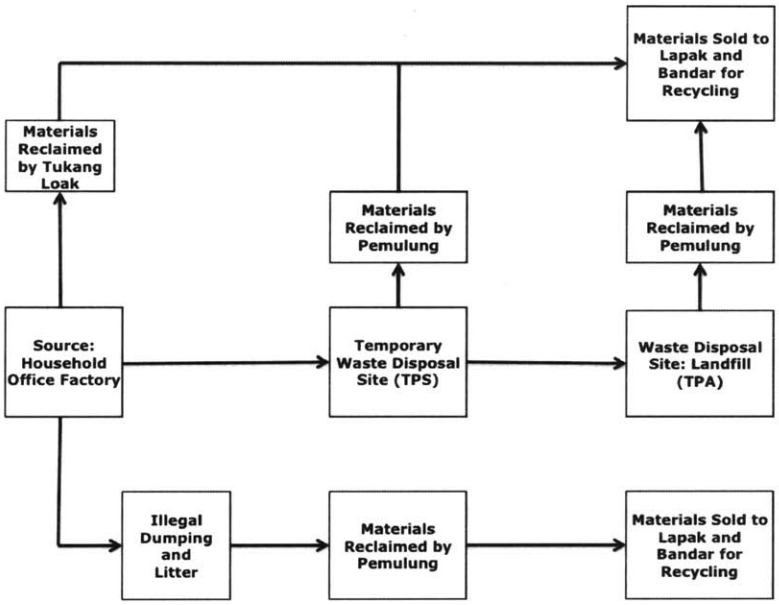

Figure 7-3: The decentralized informal model of Bandung. Recyclables are reclaimed from every point along the formal municipal solid waste chain increasing efficiency.

It should be noted that there has been a long-standing debate around the trade-offs between public health and recycling efficiency goals. For instance, the United States depended on resource recovery by waste pickers extensively until the turn of the 20th century when a debate began between industrialists that were in favor of resource utilization and sanitation engineers that were concerned with the

associated effects of waste management on public health and the environment. Eventually, the sanitation engineers won the debate and policy in the US shifted toward optimizing the speedy disposal of solid waste (Medina 2007). This debate, which is highly valid, continues throughout the developing world where waste pickers are being evicted as open dumps are closed to make way for sanitary landfills. Policy makers can use this framework to evaluate these types of policy trade-offs as well as to identify and respond to the resulting impacts on each relevant stakeholder group in the supply chain.

7.1.3 Efficiency: City- Costs

PD Kerbersihan, a local government-owned company, handles solid waste management in Bandung. Current estimates of their capacity to collect and dispose of the city's waste are at 64% (Damanhuri 2009). Additional dilemmas have been faced by the city after a landslide at the Leuwigajah landfill killed 147 residents living around the dumpsite in 2005 and forced it to close (Jakarta Globe 2005). Since the tragedy, community members and environmental advocacy groups have been putting increasing pressure on government officials to improve the environmental conditions and waste management practices of the city. The fact is, informal recyclers are providing a service for the public that would otherwise need to be supported by the municipal government.

In a study of six cities in the developing world, Scheinberg, et al (2010) estimate that informal recyclers save their municipal governments in total around $50 million per

year. The study also shows that the informal sector is more cost effective than formal recycling systems and that informal recycling plays a large role in the reduction of carbon emissions by avoiding the disposal of materials, reducing raw material extraction, and returning waste materials to the production cycle (Scheinberg et al. 2010).

In the case of Bandung, the city is charged Rp. 62,000 ($7) per ton (Rp. 29,000 tipping fee + Rp. 33,000 to offset environmental damages) for waste that is disposed of in the Sarimukti landfill, amounting to thirteen billion rupiah ($1.5 million) per year (PD Kebersihan, interview by author, Bandung, Indonesia, 1 Aug. 2011). Therefore, based on disposal fees to the landfill alone, informal recyclers save the city 2.7 billion rupiah ($300,000) per year. This figure will be much higher once transportation costs and the negative costs imposed on society due to capacity restraints are considered.

This analysis shows that the informal recycling industry in Bandung provides a highly effective service that saves the municipality money and produces positive benefits for society. This provides reasoning for policies that support informal recycling activities, as well as preserve the basic structure of the system.

7.2 Efficiency: Waste Pickers

Efficiency, as it pertains to an individual waste picker, is determined by the collection and sale of recyclable materials. This is largely a function of volume and

the availability of materials. However, other factors can be taken into consideration, such as the distance one has to travel to sell materials, choice with regard to buyers, and completeness of information. However, these aspects are difficult to measure, although pemulung interviewed did mention that competition in the area has been increasing in recent year, making materials harder to find.

7.3 Efficiency: Middlemen

Similar to waste pickers, efficiency for middlemen is mostly driven by volume. Access to capital plays a large role in this to ensure that the money is always available to purchase materials. Several middlemen interviewed said that the lack of capital was a problem. However, others said if they were ever short on working capital to make a purchase, they could either receive a short-term loan from their buyer, or receive the materials on credit from the seller, paying them at a later time. Also, none of the middlemen interviewed said that they ever had troubles selling the materials they had, indicating that there is always a demand for recyclables. One of the driving factors of the efficiency of the supply chain is that if one business is less efficient (i.e. lacking capital, or transportation), other actors higher in the supply chain will assist them, thereby increasing the efficiency and profitability of both businesses. However, while this is true in the short-term, it may come at the expense of long-term growth for the seller.

7.4 Efficiency: Factories

Determining the efficiency of factories largely goes beyond the scope of this thesis. However, some benchmarks that policy makers should take into consideration when evaluating factories stake in the supply chain are: adequate supply and quality of materials, and flexibility of operations in dealing with spikes in demand. In the case of paper this is achieved mainly through the decentralization of activities to a few trusted suppliers that are responsible for maintaining supply and monitoring the quality of materials.

7.5 Income: Waste Pickers

The income earning potential for waste pickers is rated as being low to medium. While, in general, the incomes can be thought of as being low, waste pickers are relatively well paid with respect to other low-skill occupations in Indonesia. The benchmarks used to evaluate incomes are: the minimum wage of West Java province, the average monthly expenditure for the province (The Indonesia government does report statistics on household incomes but instead measures expenditure as proxy for incomes and indicator of welfare. See: *Jawa Barat Dalam Angka* (BPS 2010) pg. 505), and the salary of formal municipal waste collection employees. Based on interviews with twenty waste pickers, the reported earnings were between Rp. 15,000 – 30,000 ($1.70 - $3.40) per day. Rather than reporting a point estimate, waste pickers reported their income as a range, with these figures

being the minimum and maximum earnings per day, reflecting a great deal of uncertainty and variability in earnings. These figures are consistent with a larger-sample study done by Ali and Sakano (2009), which reports average wages of waste pickers at Rp. 32,000 ($3.64) per day. Based on these figures, monthly incomes for waste pickers range between Rp. 390,000 and Rp. 780,000 ($44.30 - $88.60). While the pre-tax minimum wage for formal employment in West Java province is Rp. 732,000 ($83.20) per month, the average monthly household expenditure was only Rp. 483,802 in 2010 (BPS 2010). Formal waste collectors employed by PD Kebersihan, for instance, earn a monthly salary of only Rp. 450,000 ($51.10) (Ali and Sakano 2009). Waste pickers can therefore earn well above the poverty line of Rp. 253,016 ($28.75) per month, set by the central government, and below which 10.65% of the population of West Java, and thirty million Indonesians live (BPS 2011).

7.6 Income: Middlemen

Income earning potential for middlemen rate as medium to high. This takes into account the owner of the establishment as well as the individuals they employee. As seen in Chapter 5, the incomes of middlemen vary extensively, with many small middlemen earning not much more than the waste pickers they buy from. Middlemen also create employment opportunities for materials sorters and drivers, who on average earn above the minimum wage. Policy makers may want to further segment the evaluation into categories of lapak, bandar, and bandar besar, to

further understand the income earning potential of each group to further assist in designing policy.

7.7 Health and Safety: City

The city is concerned with the health and safety of all citizens based on public health concerns that arise from the spread of diseases due to improper disposal of waste. Organic waste can be a source of disease and a breeding ground for insects that transmit illnesses. Improper disposal can also contaminate groundwater and lead to other environmental concerns. Since the informal recycling supply chain is directly linked to the formal waste disposal system, it is difficult separate the evaluation of the two systems. For the most part, informal recyclers contribute to the reduction of these health concerns by decreasing the amount of waste handled by the municipal waste management service. However, when evaluating the formal disposal system in this regard, the impact of policies addressing these concerns must also include their impact on recyclers and the efficiency of the recycling system.

7.8 Health and Safety: Waste pickers and Middlemen

Little research exists on the health and safety aspects of informal recycling activities and what does exist is focused solely on waste pickers. However, these activities in general are acknowledged as being highly dangerous and workers in the industry are at risk of exposure to disease pathogens and hazardous working conditions (Gutberlet and Baeder 2008). While my personal research did not have a specific

focus on the health and safety conditions of recycling, I can draw from a few observations that suggest that both waste pickers and middlemen rate low on this criteria. For instance, in informal recycling in Bandung, the use of safety equipment such as gloves and closed-toed shoes is low for both waste pickers and individuals working in middlemen establishments. Waste pickers are in frequent contact with contaminated and hazardous materials, such as medical and electronic waste, which do not have designated disposal methods. Child labor is particularly prevalent in waste picking at the landfill site where health and safety risks are likely to be higher. These conditions show the need for a full quantitative study to be carried out for both waste pickers and middlemen to understand the current state of health and safety conditions in the informal recycling industry in Bandung. Gutberlet and Baeder's study *Informal Recycling and Occupational Health in Santo André, Brazil* (2008) provides a useful reference for appropriate methodology and benchmarks for a study of this type. Suggested benchmarks for evaluating health and safety standards include: number of accidents/injuries in a specified period of time, number and types of illnesses, frequency of pain, number of days of work missed due to illness or injury.

7.9 Social Protection: Waste Pickers and Middlemen

Lack of social protection is one of the defining factors of informal employment (Chen 2008). Social protection commonly refers to, but is not limited to, universal pensions and health care coverage (WIEGO 2012). I suggest that for evaluation purposes—and particularly for a sector-based supply chain analysis— that current

formal social protection coverage levels should be used as a benchmark for evaluating informal supply. Given the major problems associated with the delivery of social protection benefits, these benchmarks should be based specifically on the number of persons covered by a given policy, rather than the intentions of the policy. For instance, in Indonesia, less than 5% of workers in the formal economy are covered by old age protection and only 7% of formal employees are covered by health care under the national social security program, Jamsostek (Thabrany 2011). This shows that policies aimed at extending formal social protection to informal workers is likely to be unsuccessful, and that policies aimed at informal recyclers should pursue innovative delivery methods or should be discussed at a much broader policy level than a sector based approach.

One area of social protection in Indonesia that reaches a large number of formal workers but does not cover the informal economy is the law concerning Tunjangan Hari Raya. Tunjangan Hari Raya (THR) is a legally mandated salary imposed by the Ministry of Workforce and Transmigration that requires all employers to pay a bonus equal to one months salary to every employee at Idul Fitri, which occurs at the end of the holy month of Ramadhan (Menteri Tenaga Kerja Republik Indonesia 1994). While it is estimated that 99% of formal businesses operating in Bandung pay THR to their workers, this does not extend to informal workers (Wulandari 2011). This is particularly important given that the production of factories declines during this month, lowering the demand for waste materials as well as the price, throughout the supply chain. This fact is true for waste pickers as well as informal

middlemen and their informal employees. Waste pickers and middlemen reported that the decline in income during Ramadhan presents them with severe challenges.

Other aspects of social protection that can be measured through questionnaires directed at informal waste pickers and middlemen include: access to shelter, children's education, and subsidies and benefits received from NGOs.

7.10 Legal Protection: Waste Pickers and Middlemen

Legal protection should be considered with respect to property rights and dispute resolution. Both waste pickers and middlemen rate low on this respect. Evaluating the state of legal protection for an informal supply chain requires detailed quantitative studies that take into account harassment from the public sector and disputes between supply chain actors. Benchmarks should include: Bribes paid to police and government officials, confiscation and eviction rates, as well as rates of theft and other crimes committed against informal workers.

Currently informal recyclers do not report a high degree of harassment from public officials, however there are no policies preventing it. This presents a large threat for informal recyclers as the policy attitude could shift from one of indifference to one of repression without warning. Additionally, if informal workers are cheated or taken advantage of, they have no legal protection or formal channels for dispute resolution. Given their informal status, it is unlikely that the police would intervene in disputes, or even that waste pickers and business owners would approach the

police, for fear of inviting unwanted harassment and risk. Contracts in the industry are informal and it is unlikely any party could make legal claims, even if they were attempted. Again, a larger degree of research is needed to gain the full perspective of the supply chain with respect to legal protection.

7.11 Policy Applications of Evaluation Framework

Once a thorough quantitative evaluation of the supply chain has been undertaken for all actors, it can be used to inform and aid policy makers in decision-making. For instance, if the example of Cairo in Chapter 2, where government officials attempted to replace the informal system through the privatization of services, were applied to Bandung, it would fail in all accounts of the framework by lowering recycling rates, raising costs to the municipality, lowering incomes of informal workers, and lowering the efficiency of the factories that demand the recyclable materials.

Following the Belo Horizonte model would lead to increased incomes for waste pickers, but lower incomes for middlemen, higher costs for the municipality, and potentially lower rates of recovery and efficiency given the loss of valuable knowledge and skills of middlemen. In the case of Belo Horizonte the income of middlemen may have rated so much higher than that of waste pickers that the trade off was justified, but I would argue that in Bandung, policy makers are better off trying to identify policies that make both the waste pickers and middlemen better off.

8. Policy Recommendations

Using the supply chain evaluation framework presented in Chapter 7, I will now present several policy recommendations for enhancing the informal recycling industry in Bandung, Indonesia.

As shown in Chapter 7, the benefits produced by the recycling activities of the industry are deserving of policy makers' attention and support. The matrix in Figure 7-1, on page 90 shows that some aspects of the supply chain are functioning well, while other areas require policy intervention. The current informal system reaches recycling rates comparable to those in the United States, while saving the municipal government hundreds of thousands of dollars a year. However, there are problems surrounding health and safety and legal protection that require the involvement of the public sector. This chapter will present several policy measures focusing specifically on improving health and safety standards and increasing the incomes of waste pickers and small-scale middlemen, while maintaining the current levels of efficiency. These recommendations are not meant to be viewed as comprehensive or addressing all of the problems of the supply chain but rather to demonstrate the applications of the framework presented in Chapter 7.

8.1 Investments in Health and Safety Infrastructure

Chapter 7 presented several ways in which workers in the informal recycling sector are at risk for health and safety hazards. Given the unregulated nature and low profitability of the industry it is unlikely that businesses and self-employed

individuals in the industry will address these issues without policy intervention. I will present two ways in which policy can be used to effectively address the unsafe working conditions in the industry.

My first recommendation is for the establishment of mobile health clinics that serve both waste pickers and middlemen while providing education on proper waste handling practices and providing workers with basic safety equipment such as gloves and facemasks. These mobile units could be supported by the public sector or through partnerships with local NGOs or private businesses. Mobile units would be able to reach a larger area and hence a larger population than health care plans or subsidized clinics. These units can travel to middlemen businesses and TPS to reach many informal recyclers who are not educated about health and illnesses and may be hesitant to go to a clinic, even if the service were free. Also, providing health benefits or clinics requires some type of registration or identification, which informal workers tend not to have. Mobile units that travel to individuals at the places where they work will save workers time away from work, as well as allow the city to collect data on the individuals working in the recycling sector that can be used for the development of future policies.

The second recommendation for addressing the issues of health and safety is for the development of sanitation facilities in the areas where waste pickers are working, particularly near TPS. These facilities should contain a toilet and sink stocked with

soap at minimum. This will assist in improving the health standards of waste pickers working in these areas.

Both of these policies will increase the health and safety conditions for waste pickers and middlemen working in the sector without decreasing the overall efficiency of the supply chain or reducing the incomes of informal workers. While this will require public investment, thus increasing the cost to the city, it can be justified on the basis that informal recyclers are already saving the city hundreds of thousands of dollars annually with the services they provide.

8.2 Promotion of Corporate Social Responsibility Initiatives

Corporate Social Responsibility (CSR) is based on the idea that corporations should be accountable to a larger group of stakeholders than simply their shareholders. CSR extends responsibility to the long-term welfare of the environment and society in which corporations operate. However, the boundaries of what constitutes CSR have yet to be clearly defined (Faisal 2010). While many corporations have approached CSR as a way to boost their public image through charity, Porter and Kramer (2001) have proposed that CSR be imbedded directly within the business strategy. In the case of informal recycling, there is justification for strategic CSR for both the producers and consumers of recyclable waste. An example of a "waste producer" would be a consumer packaged goods (CPG) company, while an example of a "waste consumer" would be a paper manufacturer that purchases waste paper from recycling middlemen to be used in production.

An example of a successful CSR program started by a collective of waste producers is Cempre, an NGO in Brazil that promotes the recycling of post-consumer packaging materials. Through a partnership with thirteen multinational corporations, including Coca-Cola, Procter and Gamble, Pepsi Co., and Tetra Pak, Cempre focuses on the capacity building of waste picker cooperatives, while also conducting research on recycling activities that are beneficial to both policy makers and informal recycling businesses—such as consulting on legislation and routinely publishing material prices (Brazil Recycling Commitment 1996).

Also in Brazil, a PET recycling company called Frompet has made significant progress in strategic CSR from the recyclable waste consumer side. Frompet offers in-house training for waste pickers and waste picker cooperatives, after which they become direct suppliers to the company. Frompet also invests in processing equipment for the cooperatives to improve their efficiency. This has increased both the quantity and the quality of the materials purchased by Frompet, while also increasing the prices received by the waste pickers and decreasing the cost to the end consumers of PET products (Santander 2010). This serves as a great example of how companies can use strategic CSR initiatives to make all stakeholders in the recycling supply chain better off.

While corporations will need to find CSR strategies that match the existing capabilities of the informal recycling supply chain in Bandung, these cases illustrate

innovative solutions that benefit both society and the implementing company. In Bandung it is necessary for policy makers to ensure that there is a policy environment conducive to these types of CSR initiatives. In 2007, Indonesia became the first country to enact laws mandating private enterprises to allocate budgets for CSR programs (Kiroyan 2007). However, it is important for local governments to go beyond regulation to actively promoting CSR through public-private partnerships by both simplifying the process for corporations to establish innovative CSR programs, and by providing specific expertise to these initiatives.

9. Conclusion

In this thesis I have attempted to establish a framework that aids policy makers in addressing the problems associated with informal industries from a supply chain management perspective. I have illustrated the application of this tool using the case of informal recycling in Bandung, Indonesia. I have shown that there is a need for an understanding of the drivers of all industries within a supply chain in order to design effective policy measures, rather than simply focusing on the most vulnerable segment of the supply chain. By placing particular attention on recycling middlemen, who are often seen as exploiting waste pickers, I have shown that the industry in Bandung is heterogeneous in terms of income and vulnerability, provides value added activities, and serves as a means of social mobility for the region's poor. Chapter 7 presents a matrix for evaluating informal supply chains based on the interests of each relevant stakeholder. This evaluation tool is then used to assess the current recycling activities in Bandung and to draft several policy recommendations for improving the system.

This framework should not be limited to recycling, however; it can be adapted for evaluating any supply chain. Similarly, this tool is relevant not only to public policy. It is also relevant for private companies, given the increasing pressure on global corporations to incorporate principles of sustainability and to be accountable for all aspects of their supply chains. This can help corporations identify weak segments of their supply chains and aid them in strategically intervening to benefit not just

society and the environment but also themselves by increasing their profitability and eliminating supply chain risk.

For this research I employed qualitative research methods to gain a deep understanding of the industry dynamics and the strategies of individual middlemen businesses. Future research should focus on expanding this work to incorporate rigorous quantitative research, both on the efficiency and economics of the recycling system, as well as on the social and public health risks associated with the activities. This will assist policy makers in further identifying weaknesses within the system that could benefit from policy intervention.

In addition to conducting further research in these areas, there is a need to expand the understanding of informal recycling in Bandung to the regional level. While this thesis has shown that the recycling supply chain in Bandung achieves a high level of efficiency, recycling activities outside of the urban center are constrained by low volumes of waste materials and high transportation costs. Further studies can be done to identify policies and strategic public-private partnerships that can effectively bring recycling to underserved areas in Indonesia.

Finally, studies can be done to identify the existence of economies of scope within the recycling industry in Bandung. Guided by the supply chain evaluation framework, future research can focus on trying to develop profitable business models for dealing with organic waste that can diversify the revenue streams of

middlemen and increase the incomes of waste pickers and middlemen near the bottom of the value chain. Current technological advancement in the areas of waste-to-energy and modern composting methods could prove to be promising solutions to the public health concerns and capacity constraints of Bandung's municipal waste management services, while also improving the businesses and livelihoods of informal recyclers in the city.

Most importantly, public policy makers need to acknowledge the service that informal recyclers provide to society and the environment, and actively seek to promote and improve these activities. The city cannot afford to ignore the issues of waste management and recycling any longer—and rather than attempting to replace the existing system with a modern centralized system, the local government should play an active role in preserving the highly effective informal system that has been successfully managing the city's recycling for many years.

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Appendix 1: Sample Interview

Sample Primary Interview- English

Personal Background

What is your name?

How old are you?

Where are you from?

How many members are in your family?

What work does your wife/husband do?

What work do you children do?

Starting the Business

How long have you been working as lapak/bandar/bandar besar?

Why did you become lapak/bandar/bandar besar?

What work were you doing before this?

What challenges did you face at the beginning?

Did you have difficulty finding people to buy from?

What was the response from other lapak/bandar/bandar besar?

What was the response from the government?

Why did you choose this location?

How did you acquire this land?

Do you own or rent the land?

How much capital did it take to start this business?

How did you finance the business at the beginning?

Did you take any loans? From whom?

Business Operations

What materials do you buy?

Are any materials repaired or reused or sold for repairs or reuse?

Who do you buy from?

How do you determine purchasing prices?

Do you compare prices with other lapak/bandar/bandar besar?

How do you find out what prices they set?

How often do you check?

How does your price compare to other lapak/bandar/bandar besar?

How do you respond to price changes by competitors?

Does the relative price affect the number of customers you get?

Do you buy from pemulung?

Do you provide them with shelter?

Do you buy from independent pemulung?

Does the price you offer differ between the types of sellers (i.e. pemulung, tukang loak, lapak)?

How do you find pemulung to work here?

How many pemulung work here?

How many tukang loak work here?

Do provide the cart for tukang loak?

Do you provide daily capital to tukang loak?

How much capital do you provide them with?

How long do most pemulung/tukang loak work here?

How do you decide to hire someone as either pemulung or tukang loak?

What are the differences between the two jobs? In terms of the work? Earnings? Skills? Anything else?

How many total employees do you have?

What are their jobs?

Do you buy from lapak and bandar?

Do you offer a different price to them versus pemulung?

What determines the prices?

It is always the same lapak and bandar that you buy from?

How many times per week do you sell your materials?

Do you keep and records of sales?

Where do you get the capital for daily operations? Loans? From whom? Do they charge interest? What are the conditions of the loans?

How has the business grown since you started?

How do you approach investments and growth?

What are the daily operating costs?

How do you transport the materials? What are the costs associated with this?

How do you store the materials? What are the costs associated with this?

Who do you sell to?

Is it always the same person?

Do you sell all the materials to the same person?

How did you choose this person/people to sell to?

How long have you been selling to this person/people?

How often do you sell materials to them?

What price do you receive?

How often does the price change?

Do you know the prices offered by other buyers?

Do you frequently compare prices?

Do you have a contract/agreement with the buyer/s?

Do you receive capital from the buyers?

What keeps you from changing buyers?

Do you ever speak with other lapak/bandar/ bandar besar?

What does this consist of?

How do you view competition among lapak/bandar/ bandar besar?

Is there any cooperation among lapak/bandar/ bandar besar?

In what ways would you like to improve your business?

In what ways are you currently trying to improve your business?

How do you see the business changing in the future?

How long do you plan to stay in this industry?

Sensitive Information

What is your level of education?

Have you registered this business with the government?

Do you receive any assistance from the government?

Do you receive any assistance from non-government organizations?

Do you pay any taxes?

How are you treated by the government/police? Are you forced to pay bribes etc.?

How much do you spend daily buying materials?

How much do you earn (in profits) on average from the business?

What does your personal spending consist of?

Do you have any savings?

Sample Primary Interview- Bahasa Indonesia

Latar Belakang Individu

Siapa nama anda?

Berapa usia anda?

Dari mana asal anda?

Berapa jumlah anggota dalam keluarga anda?

Apa pekerjaan istri/suami anda?

Apakah anak anda juga bekerja dengan anda?

Apa yang mereka kerjakan?

Memulai Usaha

Berapa lama anda telah bekerja sebagai lapak/bandar/bandar besar?

Apa alasan anda menjadi lapak/bandar/bandar besar?

Apa pekerjaan anda sebelum menjadi lapak/bandar/bandar besar?

Apa tantangan yang anda hadapi saat memulai bisnis ini?

Apa anda menemui kesulitan menemukan orang yang mau menjual maerial?

Apa reaksi dari Bandar lain mengenai bisnis anda?

Apa reaksi dari pemerintah?

Mengapa anda memilih lokasi ini?

Bagaimana anda mendapat tanah yang anda tempati sekarang?

Apakah anda memiliki atau menyewa tanah ini?

Berapa jumlah modal yang anda gunakan saat memulai bisnis ini?

Bagaimana anda membiayai bisnis ini pada awalnya?

Apa anda mengambil pinjaman? Jika iya, dari mana?

Menjalankan Usaha

Material apa yang anda beli?

Apakah anda memperbaiki atau menggunakan kembali atau menjual material untuk diperbaiki atau digunakan kembali?

Dari mana anda membeli material?

Bagaimana anda menentukan harga beli?

Apakah anda membandingkan harga dengan Bandar lain?

Bagaimana anda mengetahui harga yang Bandar lain tetapkan?

Seberapa sering anda memeriksa harga?

Bagaimana harga anda dibandingkan dengan harga dari Bandar lain?

Bagaimana anda merespon perubahan harga oleh pesaing?

Apakah perbedaan harga anda dengan bandar lain mempengaruhi jumlah pelanggan yang anda dapat?

Apakah anda membeli dari pemulung?

Apakah anda menyediakan tempat tinggal bagi pemulung?

Apakah anda membeli dari pemulung yang berbeda-beda?

Apakah harga yang anda tawarkan berbeda antara jenis penjual (seperti pemulung, tukang loak, lapak)?

Bagaimana anda menemukan pemulung untuk bekerja disini?

Berapa jumlah pemulung yang bekerja disini?

Berapa banyak tukang loak yang bekerja disini?

Apakah anda menyediakan gerobak untuk tukang loak?

Apakah anda menyediakan modal harian untuk tukang loak?

Berapa banyak modal yang anda sediakan untuk tukang loak?

Berapa lama kebanyanya pemulung/tukang loak bekerja disini?

Bagimana anda memutuskan untuk mempekerjakan seseorang sebagai pemulung atau tukang loak?

Apa perbedaan antara kedua pekerjaan tersebut?apakah dalam hal yang dikerjakan, pendapatan, ketrampilan atau yang lain?

Berapa jumlah keseluruhan pekerja anda?

Apa saja tanggung jawab mereka?

Apakah anda membeli dari lapak dan Bandar?

Apakah anda menawarkan harga yang berbeda terhadap lapak dan Bandar dibandingkan dengan pemulung?

Faktor apa yang menentukan harga?

Apakah anda selalu membeli dari lapak dan Bandar yang sama?

Berapa kali dalam seminggu anda menjual material anda?

Apakah anda mencatat dan menyimpan bukti penjualan anda?

Dari mana anda mendapat modal untuk beroperasi sehari-hari? Apakah dari pinjaman? Jika iya, dari mana? Apakah ada bunga? Apa saja syarat dari pinjaman?

Bagaimana bisnis anda telah berkembang sejak bisnis ini dimulai?

Bagaimana pendekatan anda terhadap investasi dan pertumbuhan?

Berapa biaya operasi sehari-hari?

Bagaimana anda mengangkut material-material ini? Berapa biaya untuk pengangkutan?

Bagaimana anda menyimpan material-material ini? Berapa biaya penyimpanannya?

Kepada siapa anda menjual?

Apakah kepada orang yang sama?

Apakah anda menjual semua material kepada orang yang sama?

Bagimana anda memilih orang untuk menjual material?

Berapa lama anda telah menjual material kepada orang ini?

Seberapa sering anda menjual material pada mereka?

Berapa harga yang anda terima?

Seberapa sering harga berubah?

Apa anda mengetahui harga yang ditawarkan oleh pembeli lain?

Apakah anda sering membandingkan harga?

Apakah anda memiliki perjanjian dengan pembeli?

Apakah anda menerima modal dari pembeli?

Apa yang membuat anda merubah pembeli?

Apakah anda pernah berbicara dengan Bandar lain?

Apa saja yang dibicarakan?

Bagaimana anda melihat persaingan antar Bandar?

Apakah ada kerjasama antar Bandar?

Dengan cara bagaimana anda ingin meningkatkan bisnis anda?

Saat ini, bagaimana cara anda meningkatkan bisnis?

Bagaimana anda melihat bisnis berubah di masa depan?

Berapa lama anda berencana berada dalam bisnis ini?

Informasi Tambahan

Apa tingkat pendidikan anda?

Apakah anda mendaftarkan bisnis ini kepada pemerintah?

Apakah anda menerima bantuan dari pemerintah?

Apakah anda menerima bantuan dari badan non-pemerintah?

Apakah anda membayar pajak?

Bagaimana pemerintah atau polisi memperlakukan anda? Apakah anda dipaksa untuk membayar suap atau biaya-biaya lain?

Berapa uang yang anda habiskan untuk membeli material dalam sehari?

Berapa rata-rata keuntungan yang anda peroleh dari bisnis ini?

Apa saja yang termasuk pengeluaran pribadi bagi anda?

Apakah anda menabung?