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INTERROGATING DECENTRALISATION IN AFRICA

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Formal and Informal Actors in Addis Ababa's Solid Waste Management System

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Abstract Decentralisation reforms in Ethiopia aimed to empower both formal and informal actors involved in different socioeconomic development efforts. However, an investigation of solid waste management in Addis Ababa shows that informal actors that play a significant role in solid waste collection – and especially in recycling, in which the city government has no capacity of its own – are not recognised by the city government and excluded from the management of the system. Using social network analysis, this article argues that the integration of informal waste collectors and recyclers within the city's waste management system will improve the state of services offered to Addis Ababa's residents.

Keywords: participatory decentralisation, Ethiopia, informal sector, solid waste, recycling, networks.

1 Introduction

Solid waste management is a serious challenge faced by African cities today (Guerrero, Maas and Hogland 2013). Most cities are unable to manage the alarming increase in volumes of solid waste due to rapid urbanisation and population growth. As a result, poor urban environment, poor public health and illegal dumps are evident in the major cities of Africa. In response to these problems, African cities adopted decentralisation policies and strategies for solid waste collection and disposal (UN-Habitat 2010a). The aim was to give more power to lower levels of city administrations to deal with these issues at a more local level, and to bring non-state actors into solid waste management in order to enable 'good rubbish governance' through more public–private partnerships and more cost-effective service delivery (UN-Habitat 2010b).

In Ethiopia, solid waste management was highly centralised until 2003. As part of a broader decentralisation effort in that year, the city administration of Addis Ababa was divided into ten sub-cities and 117 districts that comprise the local administration (FDRE 2003). The purpose of reorganising the city was to give more power to lower

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levels of the city administration, and to empower local communities and their institutions (Taye and Tegegne 2007; Paulos 2007). As part of the reforms, the city government promoted integrated solid waste management by local administrations, and strengthened the role of both formal, informal, public and private sectors in solid waste collection, transportation, disposal and recycling activities (FDRE 2003). At the beginning of the reform, many informal private enterprises were involved in the collection and disposal of waste, and were allowed to operate without paying taxes. In a very short period, the number of actors involved in solid waste collection and disposal increased significantly. There was high competition among the informal operators and this reduced the price they charged for their services. The problems related to solid waste in the city were subsequently reduced; more waste was collected and the city became cleaner (Zelalem 2006; Bjerkli 2015).

The city government decided to change the system of solid waste management in 2005. It shifted the focus of waste collection, transportation and disposal activities towards government-affiliated cooperatives and micro- and small-scale enterprises (MSSEs). Informal private collectors were now excluded, and this resulted in the systematic eviction of pre-existing informal enterprises from their established service areas (Zelalem 2006). Part of this decision was politically driven, as the MSSEs and cooperatives provided an additional source of employment that the city government and the ruling party could use to distribute patronage to party members. Today, the majority of waste collection, transportation and disposal is carried out by these government-affiliated organisations together with the city, sub-city and district-level governments. This politically driven reconfiguration of services worsened the situation of solid waste management in the city. The existing waste management system is rated inefficient and characterised by inappropriate collection, lack of provision of containers and collection trucks, illegal dumping, and complex waste collection fees (Bjerkli 2013).

The fact that the informal sector can contribute in significant ways to the improvement of local government service delivery is supported by a growing number of empirical studies, and by experiences in other countries (Azam and Ali 2004, 2006; Baud, Grafakos and Post 2005; Kaseva and Mbuligwe 2005; Oteng-Ababio 2010; Tukahirwa, Mol and Oosterveer 2010). Mohmand (2016) argues that the inclusion of informal institutions in formal governance can make a difference to service delivery by encouraging greater citizen participation in decision-making around services, and ensuring that public service delivery meets the specific needs of different populations. Rouse (2004, 2008) argues that informal enterprises are vital parts of urban service provision and there is a need for a paradigm shift in the way informal service providers are viewed. Other scholars in both the academic and donor literature call for policies aimed at integrating informal actors into municipal solid waste management strategies (Asmamaw 2003; Azam and Ali 2004; Wilson, Velis and Cheeseman 2006; UN-Habitat 2010b; Omer *et al.* 2015).

In line with this literature, this article aims to investigate the role of informal actors in the solid waste collection and recycling system in Addis Ababa. There is evidence to suggest that despite their exclusion from waste management services in Addis Ababa, informal actors play an important role in waste collection, and especially in recycling waste material, in which the city government has no capacity of its own. The main question the article asks is about the extent to which informal actors continue to be involved in the waste management system in Addis Ababa – given all the changes over the last decade – and about the particular nature of their role within the system. Social network analysis is used to provide answers to both questions. It helps define the specific role that various informal actors play; to better understand the nature of the interaction between different formal and informal actors; and to identify bottlenecks in resources and information sharing that affect daily operations and strategic planning, and which have led to the deterioration of Addis Ababa's waste collection and disposal system. The finding that informal actors are indeed a key part of this system, and that they help connect a number of formal and informal actors within the network of solid waste management in Addis Ababa, leads to the conclusion that a greater integration across formal and informal actors would lead to more sustainable and effective solutions to the city's current waste management issues.

2 Solid waste management in Addis Ababa

Addis Ababa – the capital city of Ethiopia and the diplomatic centre of Africa, where the African Union is head-quartered – was founded in 1887. According to the Central Statistical Authority (CSA 2016), close to 4 million people now live in Addis Ababa, over 30 per cent of the urban population of Ethiopia, and it is one of the fastest growing cities on the continent. Its population has nearly doubled every decade, and as a result, Addis Ababa has expanded geographically to cover about 540sq km. Its geographic location, combined with its political and socioeconomic status, have made it a melting pot for hundreds of thousands of people that come from all corners of the country in search of employment opportunities and services (SBPDA 2003; UN-Habitat 2008). Demographic pressure has led to a high rate of unemployment, high concentration of slum dwellers, and very poor quality housing infrastructure and sanitary development (AACG 2006).

Prior to 2003, solid waste management in Addis Ababa was highly centralised (Kokebe 2007). Addis Ababa Health Bureau was responsible for managing solid waste in the city and the municipal system for waste collection was based on door-to-door collections and the use of containers. However, this door-to-door service was only available to households near main roads, where containers were placed in open spaces close to the roads. The system was largely ineffective due to a lack of trucks, high operational costs, lack of awareness among people, and the lack of a proper landfill site (SBPDA 2003).

In response to the need for better service, the city government reorganised the structure in 2003 and changed the centralised solid

Figure 1 **The waste collection system in Addis Ababa: waste materials identified for sale (left) and a container for collecting waste (right)**

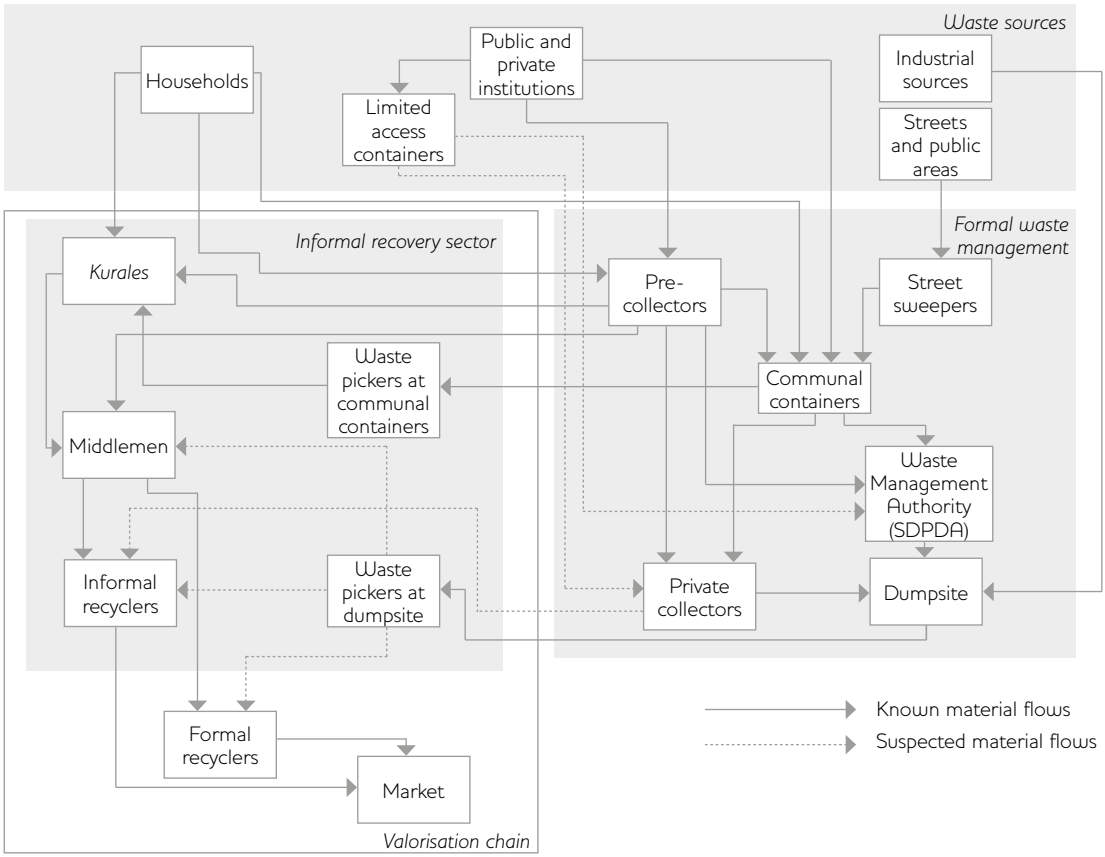
Source Author's own.

waste management system to a relatively decentralised approach, at least in principle. An agency called the Sanitation, Beautification and Park Development Authority (SBPDA) was established and made responsible for solid waste collection, transportation and disposal. It was also responsible for the coordination of different stakeholders in solid waste management. Compared to the previous system, more power was given to the lower level administrative bodies. A solid waste manager was appointed for each sub-city and district level. The aim was to stimulate more efficient delivery of urban services by promoting decentralisation, participation, transparency and accountability, in line with good governance in service delivery (Bjerkli 2015).

During this time, the city government recognised and formalised the informal collectors operating in the city. The city administration seemed quite amenable to these informal actors. They were registered and given licences to allow them to operate as private enterprises, and were exempted from tax payments. As explained earlier, all this changed in 2005, when the city government suddenly decided to establish MSSEs, and forced informal enterprises out of solid waste management. The city government has now formally established cooperatives to manage solid waste under the supervision and support of the city government.

Currently, the daily solid waste generation by households, institutions and public spaces in Addis Ababa is estimated to be 0.36kg per capita per day. The majority of waste generated is organic in nature. While wastes like vegetables, wood, bone, combustible and non-combustible leaves, and miscellaneous other wastes are collected and disposed by the government solid waste collection system, informal actors remain involved in the collection of plastics, metals, glass, paper and clothes for resale and recycling purposes. They are particularly central to the recycling system, so that even though there is no formal waste recycling in the city, informal recyclers use solid waste to produce glue, plastic bags, shoes and different types of equipment. The picture on the left in Figure 1 shows valuable waste materials collected by informal actors and traded for recycling.

Figure 2 **Waste management system in Addis Ababa**



Source Escalante, Rymkiewicz and Kranert (2010).

Waste collection and disposal in Addis Ababa, therefore, follows formal and informal approaches. The formal approach is the sole responsibility of the city government. This is handled in two ways: door-to-door collection for households along accessible streets, and the container system under which residents are expected to carry and dump their waste in containers located at accessible sites. The picture on the right in Figure 1 shows these containers, where most non-recyclable waste in the city finds its way. Once these are full, municipal trucks dispose of this waste in two major landfill sites in Addis Ababa, called Repi and Koshe. Door-to-door primary collection is carried out by pre-collectors' associations and street sweepers, and this too is put in containers for final disposal by the waste management agency, SBPDA. So in practice, the majority of waste is collected via the containers system, but the efficiency of this method is limited because of a lack of capacity of the city government to deploy adequate numbers of vehicles and waste containers. Besides, containers are not protected from rain and sun, which makes the rubbish rot and smell, creates unsightly urban spots, and leads to the deterioration of neighbourhoods and a disturbance of human activities. The site is also exposed to stray animals that scatter the waste while scavenging.

The second approach is the informal recovery and recycling system. *Qoralés*[1] buy waste materials door-to-door from households and institutions. Waste pickers collect waste materials from municipal containers and from Rupi or Koshe dumpsites. Once the materials have been collected by *Qoralés* and waste pickers, they are taken to the market at Minalesh Tera, a central market of Addis Ababa, and sold to middlemen or wholesalers. These then sell the materials to formal and informal recyclers. Figure 2 illustrates Addis Ababa's full waste management system and shows both formal and informal actors. Despite the role that informal actors quite obviously and visibly play within this system, their role is ignored and unacknowledged by the city government. This has put pressure on the system which makes it important to re-examine both formal and informal institutional arrangements and networks for waste management in Addis Ababa. The following sections deal centrally with this task.

3 Methods and data

Social network and stakeholders' analysis methods are used to better understand actors' roles, actions and interactions within networks, and to investigate relationships between individuals, groups and systems (Wasserman and Fraust 1999; Caniato *et al.* 2014). This is, therefore, a useful methodology to better understand the nature of the role and influence of the various formal and informal actors involved in the solid waste management network in Figure 2.

The study targeted solid waste collection, disposal and recycling in the whole city of Addis Ababa. In social network analysis, sampling is not possible. Therefore, all stakeholders were identified and included in the study. First, 31 stakeholders were identified with the help of local experts in the waste management sector and then categorised as informal actors, formal (public), formal (private), formal (local non-governmental organisations, NGOs), academia, households, media and international organisations.

The following were included under the category of informal actors:

1 *Qoralés* (itinerant scrap buyers who purchase small quantities of waste such as plastic, paper, glass, metals, etc. from households);

2 *Scavengers* (those who collect different kinds of materials at the municipal landfill site);

3 *Foragers* (those who pick waste materials from municipal containers, rubbish bins and streets);

4 *Wholesalers* (those who buy the waste materials from the collectors);

5 *Middlemen* (those who supply waste material to wholesalers or factories);

6 *Local factories* (who use the collected waste in the manufacture of new metal or plastic products);

Table 1 Parameters and value scales used in key informant interviews

Parameter	Possible response	Score
Interest: This measures the interest stakeholders have in solid waste collection, disposal and recycling.	No or minimum interest	1–2
	Limited interest	3–4
	General interest	5–6
	High interest	7–8
	Primary interest	9–10
Power: This measures the power and level of influence of stakeholders in decisions on solid waste collection, disposal and recycling.	Low power	1–3
	Medium power	4–7
	High power	8–10
Interaction: This measures the level of interaction between the stakeholder interviewed and other stakeholders.	Rare interaction	1
	Quite frequent interaction	2
	Frequent interaction	3
Material exchange: This measures whether there was waste material exchange between the interviewed actor and other actors.	No exchange	0
	There is exchange	1

Source Adapted from Caniato *et al.* (2014).

7 *Small artisans* (who are involved in recycling the waste materials in the form of shoes, metal equipment); and

8 *Rural traders* (who come from rural areas to buy waste materials to resell).

Formal government organisations identified as stakeholders include:

1 Addis Ababa City Administration (AACA);

2 Sub-city administrations;

3 District (*kebele*) administrations;

4 Sanitation, Beautification and Park Development Authority (SBPDA);

5 Addis Ababa Environmental Protection Authority (AAEPA);

6 Ministry of Health (MoH); and

7 Ministry of Urban Development (MOUD).

A number of other organisations were also identified and included in the study. These included formal private organisations, such as cooperatives, MSSEs, private companies, and the plastic Union, as

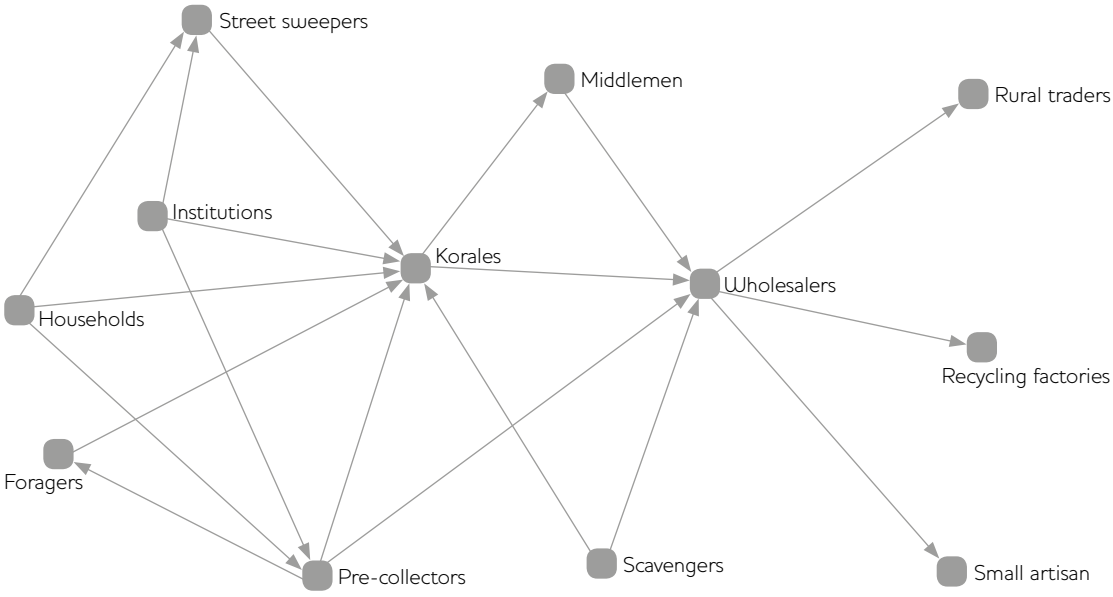
well as some local NGOs and international organisations, like GIZ and the International Labour Organization (ILO). Moreover, universities, Wub Consult (a consulting firm working in environmental issues) and some media groups were also included in the study. A few households were included for the purpose of understanding how they interact with pre-collectors and *Qoralés*, and were selected purposively and interviewed as a group.

The empirical data analysed in this study was collected from each category of stakeholders using semi-structured interviews. First, a total of 31 stakeholders were identified, of which eight were informal actors and 23 were formal actors. All of them were then interviewed as key informants. Both formal and informal actors were asked standardised questions regarding their power, interest, interaction and material exchanges in solid waste collection and recycling. Power in this case refers to the decision-making ability of stakeholders and their level of influence within the solid waste management system. Interest refers to their level of involvement within the network, based either on their responsibility to play certain roles, or because they derive economic benefit from the activities they are involved in (Ackermann and Eden 2011). Respondents were asked a range of questions within each of the categories indicated in Table 1, and measures were assigned accordingly.

Stakeholders were analysed with respect to their power and the interest they have in solid waste management, using a power–interest matrix that illustrates how powerful different stakeholders are, and the extent to which they are interested in solid waste management. The scores for power and interest were recorded, calculated and then visually represented in a matrix (see Figure 4).

The network data were collected with the various stakeholders considered as 'nodes', and the relationship between them as 'oriented ties'. Arrows (as in Figure 3) indicate the direction of the flow of resources or relations as reported by the interviewees. Social networks were graphically represented with the use of the UCINET software program (Borgatti, Everett and Freeman 2002). Three main social network measures were used to see how actors interact in the solid waste management network. These are: (a) *degree centrality* (a measure of connectedness in the network, calculated by recording the actual number of ties as a proportion of the maximum number of possible ties); (b) *closeness* (the degree to which an individual lies closer to all others in the network); and (c) *betweenness* (the extent to which a node lies between and helps connect other nodes) (Borgatti, Everett and Freeman 2013). Each of these measure different aspects of the centrality of an actor within a network, and imply the following: an actor with a higher degree score indicates a very active actor with many direct connections with other actors within the network; an actor that has a higher closeness score indicates that the actor has the shortest paths to all others, and is thus in an excellent position to monitor the information flow in the network; and an actor with a greater betweenness score

Figure 3 **Waste material exchange network among informal actors in Addis Ababa**



Source Field data, 2016.

implies that the actor can play a broker role in the network because they connect the other actors in the network to one another. In addition to the social network data, other qualitative data from key informant interviews and document reviews were used to support the argument.

The remaining sections of this article present the results and findings of this methodological strategy, and are organised as follows. Section 4 provides a descriptive overview of the types of exchanges that take place between the different actors involved in the network of solid waste management in Addis Ababa. Section 5 then maps these various actors in terms of their influence and interest within this network. The aim here is to find where power really lies within the decentralised system, and whether power has been devolved to local actors. Section 6 then analyses centrality measures for the various types of actors, formal and informal, to provide more concrete evidence for the extent to which informal actors play a role within solid waste management networks in Addis Ababa.

4 Informal actors and the waste material exchange network

The interviews probed respondents on the particular exchanges that occur between different actors, especially informal ones, in the system of waste management in Addis Ababa. Their responses revealed that waste material flows from the source – from households and institutions – to recyclers in a fairly organised way in Addis Ababa, and involves a wide array of informal actors that include *Qoralés*, scavengers, wholesalers, middlemen, small artisans, rural traders and recycling

factories. These exchanges are mapped in the network diagram in Figure 3, and described in the rest of this section.

Households and institutions are the primary sources of waste materials. Most of this waste is collected by street sweepers and pre-collectors that are employed by government-affiliated cooperatives and MSSEs to keep streets and neighbourhoods clean. However, waste that can be recycled – such as metals, plastics, glasses, old shoes, electronic materials, and so on – is often separated out by households and sold to *Qoralés*, who are scrap buyers that collect these directly at the house. *Qoralés* carry bags over their shoulders and wander from neighbourhood to neighbourhood, calling out 'Qoralé' as they go to inform people of their presence, so that people can come out to the street with their recyclable materials. According to interviewees, the value of the waste material depends on its type, quantity and quality. In principle, the formal employees – street sweepers and pre-collectors – are not allowed to sell waste material to anyone, especially since the city government is now trying to curb the activities of the informal sector, but they often sell large volumes of waste materials to *Qoralés* informally to make some extra income.

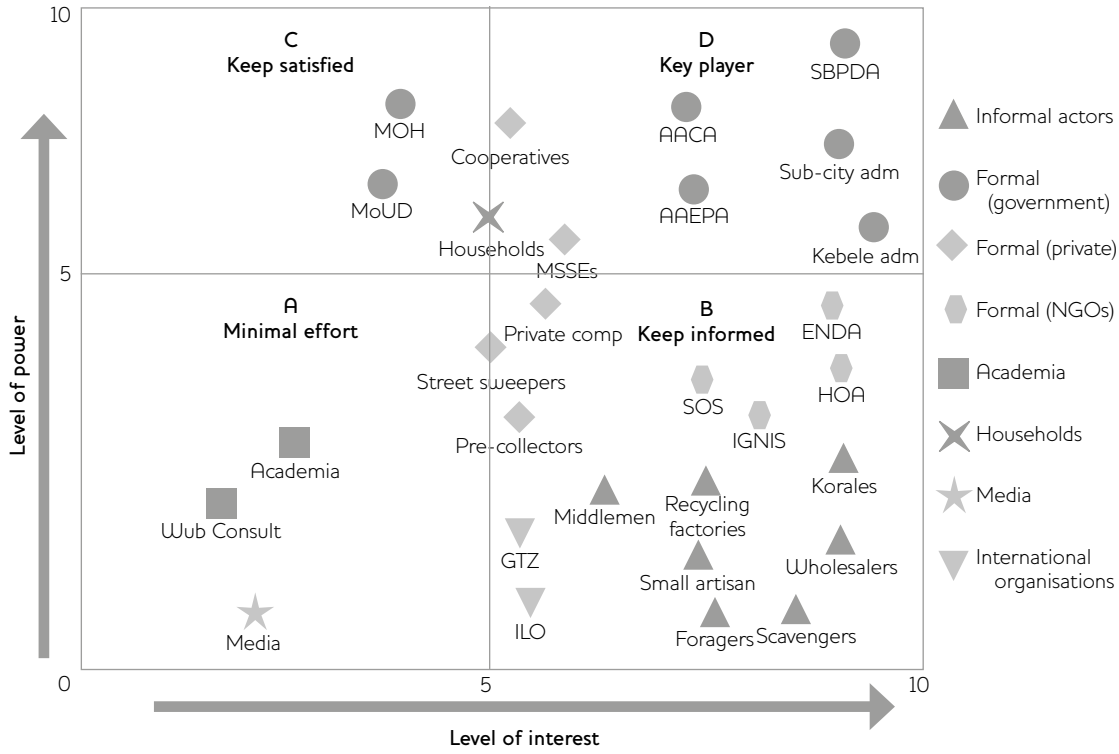
There are a number of other informal actors that also sell material to the *Qoralés.* These include foragers, who are young boys that sit near the municipal containers and wait for valuable materials to arrive, which they collect and sell to the *Qoralés*. Sometimes these foragers also collect waste materials directly from pre-collectors. Scavengers work as gangs who collect different kinds of materials at the municipal landfill site, around which they usually live. They collect waste material from the dumping sites on a regular basis and sell it mainly to wholesalers and *Qoralés* as a means of livelihood.

Qoralés sell their collected materials to middlemen or directly to wholesalers who specialise in certain materials. Quite often, *Qoralés* have a contractual agreement with wholesalers, who may also extend them financial assistance and guarantee to purchase their collected waste. Middlemen supply these used waste materials to several recycling factories in and around the city. They act as brokers to link *Qoralés* with wholesalers, and wholesalers with recycling factories. These factories use the waste to produce glue, plastic bottles, shopping bags, and plastic shoes.

Wholesalers and middlemen also sell their waste to small artisans and rural traders, who come from rural areas to buy waste materials (plastic or metal) to sell in rural areas for reuse. Small artisans recycle waste materials based on traditional technology, such as, for example, plastic shoemakers, blacksmiths and electronic maintenance service providers.

Constructing the network of waste material exchange in this manner helps establish that although the city government does not recognise the contribution of informal actors within this system now, they play a critical role in solid waste collection and recycling in Addis Ababa, and that *Qoralés* and wholesalers in particular are key players in the network.

Figure 4 **Stakeholders power–interest matrix in Addis Ababa**



Source Field data, 2016.

To what extent are these actors able to play a defining role within the formal management of this system? This is answered next.

5 Mapping actors by power and interest

Bjerkli (2015) points out that one of the main aims of decentralising the delivery of urban services in Ethiopia was to promote greater participation by local actors, and that the city of Addis Ababa had introduced various reforms to bring more power to local actors. Interviews confirmed these efforts. However, to what extent has this really happened? A power–interest matrix, using the key concepts developed earlier, is a useful instrument for answering this question.

According to Gardner, Rachlin and Sweeny (1986), power–interest matrices classify stakeholders in terms of the power that they hold and the extent to which they are likely to be involved in a given network, in this case the network of solid waste management in Addis Ababa. The level of power of each stakeholder is measured on the vertical axis in Figure 4, and their level of interest is measured on the horizontal axis. So actors in Group A in the lower left corner of the matrix have little power and interest, while those in Group D in the upper right corner have a lot of both power and interest. Actors in Group B have more interest than power, and those in Group C have more power than interest.

The power–interest matrix can be used to identify the type of strategy required to interact with each set of actors within any proposed policy reforms. The stakeholders in Group A require only minimal effort and monitoring since they are not influential and they have fairly low stakes and interest within the network. The stakeholders in Group B should be kept informed. They have little power but their stakes may be higher, and they can thus be important and committed allies in influencing the more powerful stakeholders. The stakeholders in Group C are powerful, but their interest is low. They are generally relatively passive, but certain events and moments can spike their interest and move them to Group D on that issue. The stakeholders in Group D are the key players within the network. They are both powerful, and highly interested in the strategies of the solid waste management sector. Any proposed strategies and changes must be acceptable to this group to be effective. Figure 4 uses the empirical data to map the various actors of Addis Ababa's waste management system according to these categories, and the rest of this section provides details of the actors that fall within each quadrant.

Quadrant A: As stated earlier, this group represents actors that have low power and low interest within the network of solid waste management in Addis Ababa. Media, academia, and consultants fall within this category – they are connected at the periphery but they do not play an important role in solid waste management. For example, both the media and some scholars may regularly report on the state of pollution or other environmental hazards in the city, but beyond that they do not have invested stakes within the sector, and usually have little influence on government policy in this area. The interviews revealed that interest within such sectors was quite low, and this may explain why very few studies are launched in solid waste collection and recycling. It is also evident that in Ethiopia the role of this sector is limited by the autocratic nature of the government. Various interviews revealed that researchers, academia and consultants have an important role to play in highlighting environmental problems and suggesting workable solutions, but that they do not play a prominent role in this respect.

Quadrant B: This group represents a low power of influence on the system but a high level of interest in the issue of solid waste management. In this category lie international NGOs (ILO, GTZ), formal local NGOs, such as ENDA (Environmental Development Action), HOA (Horn of Africa), SOS Addis and IGNIS, which work on environmental and waste management issues, some formal private actors (pre-collectors, street sweepers and private companies) and all informal actors (middlemen, recycling factories, small artisans, foragers, wholesalers and scavengers). International and local environmental NGOs are engaged in a variety of environmental protection activities and sustainable waste management projects. Some NGOs have played a very important role in several waste collection and recycling projects in the past few years, but they have relatively few resources and little influence over the city government in terms of policy.

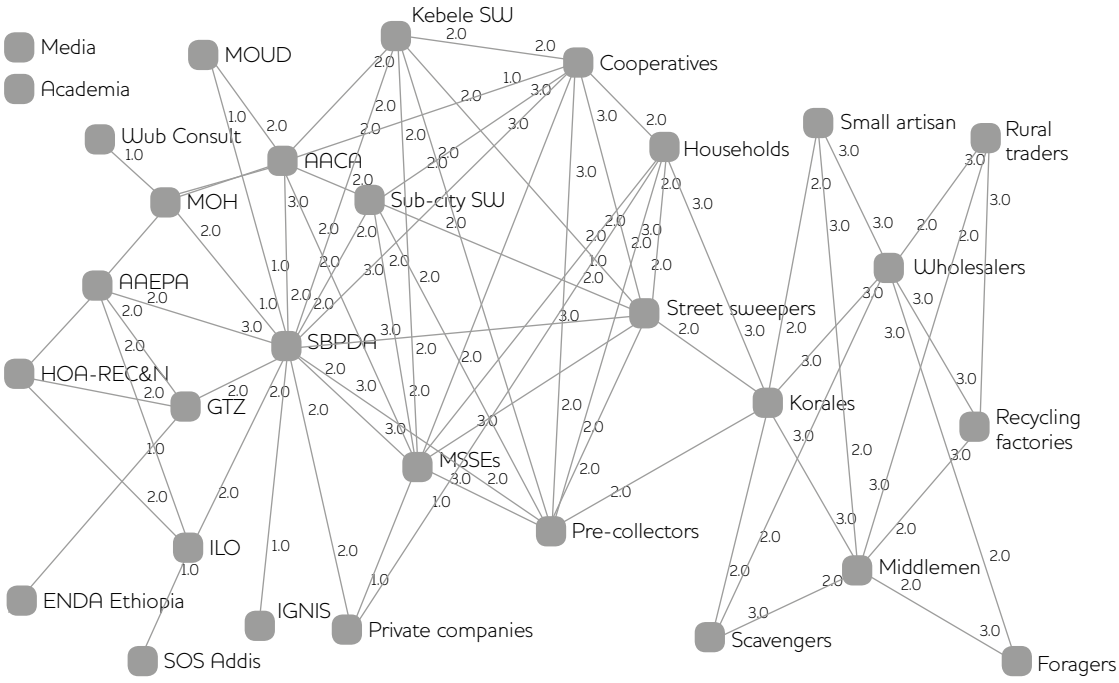
Informal actors are amongst the most interested stakeholders of waste separation and recycling, because for many this constitutes their main economic activity and livelihood. Their influence over the system on which their business depends, however, is low and in the current situation, their role has no recognition from the city government. Their risk is high, and so their capital investment is low. The restriction of their role, regardless of their high interest in the sector, has created waste management issues with detrimental effects for the whole city. The interviews suggested that more recognition, financial support and a conducive working environment for these actors could help resolve the current deterioration of waste management in the city.

Quadrant C: Actors in this group represent a high power of influence but low interest in the sector. The ministries of Health, and Urban Development and Construction fall within this category. They have the power to influence the system but the interviews revealed that they have not shown much interest in getting directly involved in solving the existing issues within this sector. However, this is not how things have always been. Officials from Addis Ababa's health bureau mentioned that their role within the same had been much greater five years ago, but that this had shrunk considerably once the main responsibility for managing the waste collection and disposal system moved to SBPDA. This is the main reason for their lack of interest now. This division of responsibility has contributed to a less integrated and less multi-sectoral approach to waste management.

Quadrant D: This group of actors have both high power of influence and high interest. In Addis Ababa, government organisations such as AACA and SBPDA, sub-city and district (*kebele*) administrations, government-sponsored cooperatives, MSSEs and households are included in this category. The city government is the most important actor related to policymaking, strategic planning, solid waste operation and supervision. However, the whole system is dominated by either government or affiliated organisations.

Mapping where actors lie within the matrix in terms of their power of influence and interest in solid waste collection and recycling helps identify that in line with what we know about the recent reforms, government organisations have strong power of influence and interest in solid waste management, while almost all informal actors and local NGOs have strong interest but not much power of influence. This provides an interesting point of analysis. In theory, decentralisation reforms were meant to empower local actors in the management of solid waste in the city (Taye and Tegegne 2007). In practice, Figure 4 shows that the system is highly controlled by government and its affiliated actors, and that most other interested actors exist on the periphery of the system and have little say within decision-making processes. This implies that the system is largely non-participatory and that decision-making rests with formal state institutions, despite the existence and involvement of a multitude of other actors within the system that have high stakes within it, and depend on it for their livelihoods.

Figure 5 **Actors' frequency of interaction in solid waste management in Addis Ababa**



Source Field data, 2016.

6 Measuring network centrality of formal and informal actors

Both formal and informal actors were asked questions about the frequency of their interaction with other actors, with regard to waste collection and recycling in Addis Ababa. Their responses are used to create the network of interaction in Figure 5. The evidence shows that almost all actors, except for the media and academia, lie within a connected network, and engage with one another on a regular basis.

The frequency of their interaction, however, varies. SBPDA, as the government organisation responsible for solid waste management, is the key player in the network. Table 2 provides further details of the centrality of each actor by providing measures for their *degree centrality*, *closeness* and *betweenness.* SBPDA has the highest number of ties at almost 47, indicating multiple ties with a number of actors, such as government and formal private organisations. It is also the highest ranked actor in terms of *closeness* and *betweenness* measures, which shows that it is the most active and best located actor within the network, and can access any other actor more quickly than anyone else.

What is important to note here is the extent to which SBPDA's scores are replicated by the scores of the informal *Qoralés*. Though their *degree* score is similar to a number of other actors (such as middlemen and wholesalers), their *betweenness* and *closeness* measures are much higher than those of other actors. *Betweenness centrality* is a measure of the

Table 2 **Centrality measures: degree, closeness and betweenness**

Stakeholders	Degree	Closeness	Betweenness
	Informal actors		
Scavengers	10.000	20.270	0.000
Foragers	6.667	17.751	0.000
Qoralés	**23.333**	**23.622**	**36.858**
Middlemen	23.333	20.979	10.996
Wholesalers	23.333	20.979	10.996
Small artisan	10.000	20.270	0.000
Recycling factories	13.333	18.072	6.207
Rural traders	10.000	17.964	0.000
Households	20.000	22.901	4.023
	Formal actors		
Pre-collectors	26.667	25.210	16.309
Street sweepers	26.667	25.210	16.309
Cooperatives	26.667	23.622	1.442
MSSEs	30.000	23.810	2.017
Private companies	10.000	22.727	0.466
MOUD	6.667	20.979	0.000
AACA	23.333	22.059	1.845
SBPDA	**46.667**	**25.641**	**44.895**
AAEPA	16.667	22.059	3.333
MoH	13.333	21.583	6.379

Source Field data, 2016.

extent to which a node serves as a bridge between other nodes, or actors. SBPDA clearly forms this bridge within the formal system with a high score of 45, but *Qoralés* have a fairly similar score and play an important role in serving as a bridge within the informal system with a score of 37. This is true also of the *closeness* measure, where they score 24, in comparison to SBPDA's score of 26. This shows that the *Qoralés* are almost as well located within the network as SBPDA, and serve as an important bridging node that connect formal and informal actors.

The policy implication of this finding is that despite all the recent changes, the *Qoralés* in particular continue to be central to the network of waste management in Addis Ababa. They interact regularly and work closely with a large number of actors within the system, and

connect a number of other informal actors, not just to one another but also to various formal actors. This is mainly because they collect waste from households, pre-collectors and street sweepers and then sell this to different informal actors. It seems reasonable, therefore, to suggest that a system that integrates the work of the formal and informal systems may provide more effective solutions to Addis Ababa's current waste management issues. Such an integration would require the city government to recognise, once again and in particular, the role that *Qoralés* still play within the waste management system of the city. This will allow for more coordinated service delivery, especially between waste collectors in the formal system and recyclers that lie almost entirely in the informal sector.

7 Conclusion

The decentralisation reforms of 2003 in Ethiopia were aimed at the improvement of service delivery at the local level. Using the case of solid waste management in the city of Addis Ababa, this article found that despite a considerable restructuring of the city administration and its service delivery system, actual service provision has not improved. A large part of the reason for this is that in restructuring its systems, the city has moved away from its previous close collaboration with informal actors in the delivery of waste collection and disposal services.

This article investigated the network of solid waste collection and recycling in Addis Ababa and found that informal actors continue to play a significant and central role within these. Yet they are ignored by the city administration. Informal actors have a high level of interest and stakes in solid waste management, but they have no power of influence and cannot affect decision-making, despite the fact that their livelihoods are directly affected by many policy decisions. They are particularly important players within waste material exchange networks, and given that the city has never developed any formal system to recycle municipal waste, most of this is carried out by informal actors. Where the state sees 'waste' (something to get rid of), informal actors see 'recycling' (an opportunity). Despite this, the system continues to be controlled by government and its affiliated actors, and leaves most stakeholders out of decision-making processes. The article concludes that by ignoring informal actors, the decentralised government has an incomplete view of waste management, and that a reintegration of informal actors into the system would lead to more coordinated and efficient service delivery.

Notes

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1 This is a local term for scrap buyers who purchase small quantities of waste such as plastic, paper, glass, metals, etc. directly from households. The word is also sometimes spelt as *Kurales*, as in Figure 2. *Qoralé* comes from '*Qorkoro Yaläh*' in Amharic, which literally means, 'Do you have any scrap metals?'

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