When Necessity Begets Ingenuity: E-Waste Scavenging as a Livelihood Strategy in Accra, Ghana.

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Abstract: This paper describes how due to lack of formal job opportunities, e-waste scavenging has emerged as a major livelihood (survival) strategy for a rapidly growing urban population. It documents how the process has been fueled by neo-liberal economic policies adopted since 1983 that not only failed to create a "vibrant urban economy" but also exacerbated the unemployment and under-employment rates and created a general economic crisis. The study relied on both qualitative and quantitative data as well as discussions and interviews with stakeholders, affected, and interested persons to provide data for analysis. The paper explores the various aspects of their work: economic, financial, environmental and social. Since the equipment has both pollution and resource potentials, the need for proper control and monitoring of the informal handling and recycling practice is highlighted. The study calls for the formalization of the informal activity not only to sustain the livelihood for the urban poor but also for efficient e-waste management.

Introduction

Many individuals within urban space, especially in developing nations, have adopted multiple and diverse means of seeking a livelihood. One such strategy is e-waste scavenging that has in recent years attracted many diverse disciples. The situation is aggravated in Ghana where years of economic decline resulted in the institution of the Structural Adjustment Program (SAP) that was negotiated with the World Bank and the International Monetary Fund (IMF). This culminated in trade liberalization, privatization of state–owned enterprises, removal of government subsidies, and retrenchment, among other "austerity" measures.[1] The shrinkage in the formal economy was further propelled by neo-liberal globalization, increasing unemployment levels, and a weakening of government's capacity to respond to growing poverty.[2] These challenges assumed a pivotal position in defining the contemporary urban change. The substantial cuts in expenditure on social services and the introduction of service charges on health care, electricity etc affected the basic livelihoods of many individuals and households.[3] Many had to depend on "survival industries" for livelihood and according to the

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International Labour Organization (ILO) (2002) more than 50 percent of the urban workforce in sub-Saharan Africa is engaged in this informal sector.

In Ghana, the private sector remains the largest employer, accounting for two-thirds (66.7 percent) of employment, with 28.5 percent in formal public sector employment.[4] This realization is reflected in the government's medium term objectives in the Vision 2020 document (1996-2000) that sought to create an enabling environment for the private sector to thrive. One of the "nouvelle" enterprises that has recently attracted many disciples is e-waste scavenging. Until the last three to four years, this practice was virtually unknown in the Ghanaian urban livelihood vocabulary.[5] However, the failure of the formal sector to generate enough job opportunities to meet the growing numbers of urban job seekers has compelled many who are qualified but unemployed and those with low employability to turn to the informal sector for survival.

E-waste (also known as waste electrical and electronic equipment [WEEE]) refers to discarded electrical and electronic materials that enter the waste stream and are destined for reuse, resale, recycling, or disposal. It contains secondary raw materials such as copper, steel, plastic, etc. The term scavenging is used in this context to describe the act of:

- Picking recyclable elements from mixed waste wherever it may be temporarily accessible or disposed of; and
- Manually dismantling computers monitors and TV sets for resalable items at numerous small workshops.[6]

Conceptualizing the Informal Urban Economy in Ghana

The informal sector of urban economy has been well studied.[7] The consensus is that the sector offers the best alternative to formal sector employment. It is said that the sector's contribution to the overall restructuring and functioning of the urban economy is most appreciated through the livelihood strategy perspective though initially that strategy was an instrument for assessing the dynamics of rural economy.[8] The application of the livelihood strategy in the urban milieu acknowledges that a household's ability to achieve increased well-being is determined by its access to capital assets and also that the effects of external conditioning variables constrain or encourage the productive use or accumulation of such assets.[9]

Owusu (2007), however, suggests an alternative framework for understanding contemporary livelihood in urban areas—the "Multiple Modes of Livelihood Approach" that according to him has its antecedent in the household survival strategy and the informal sector literature. He supports the definition of a "livelihood system" as "the mix of individual and household strategies, developed over a given period of time that seeks to mobilize available resources and opportunities."[10] The present study also resonates with this thinking and focuses on how a transient population makes a living in a globalizing city where formal employment is not only limited but for which access may be restricted.

Increasingly, studies in most African countries have shown that individuals and households of all social and economic backgrounds within the urban milieu engage in multiple economic strategies to earn a living.[11] These micro level strategies have been inspired by macro

level economic changes that are primarily the results of the economic crises of the 1970s and 1980s that culminated in the adoption of neo-liberal reforms.

This economic restructuring intensified poverty and negatively affected livelihoods because of the government's response which led to policies such as liberalization of trade, privatization of state owned enterprises, and the introduction of cost recovery measures under a negotiated World Bank Structural Adjustment Programme (SAP).[12] The results included the state's withdrawal from economic management leading to an escalation of prices of critical urban services while the real salaries of formal sector employees stagnated and in some cases, even declined.[13] Other effects included employment freeze, public sector labor retrenchment (redeployment) and limited job creation potentials of the private sector.[14]

Ultimately, the unemployment, and by implication poverty, levels in most African countries increased during the restructuring period, and this was quite pronounced in urban areas.[15] As SAP weakened the state's capacity to respond to the growing poverty situation in the city, individuals and households of varying socio-economic backgrounds also adopted different practices to withstand, cope with, and manipulate the combined effects of the neo-liberal economic reforms and urbanization of poverty.[16]

In Ghana, the informal economy, whose recent growth is a direct response to the economic crisis of the 1980s, has become the biggest receptacle for the urban poor in particular.[17] It accounts for 60 percent of the total employment generated in the country and 93 percent of the private sector, contributing 22 percent of real GDP.[18] The agricultural sector, which traditionally employed about 55 percent of the population, is being shunned, probably because of the un-remunerative commodity prices.[19] The situation in the northern part of the country is worsened by protracted chieftaincy conflicts and intensified climate variability that have rendered farming not only a tremendously risky venture but has also given impetus for households to move southwards in search of better livelihood opportunities.[20]

To such a vulnerable society, the development of multiple household strategies and the dispersal of family members geographically is one of a variety of strategies for surviving the effects of both the neo-liberal policies and internal contradictions. Other activities include street trading and hawking, the provision of "street services" such as shoe repairs, vulcanizing, and hairdressing, all of which currently appear very saturated. The situation has made e-waste scavenging one of the most visible manifestations of such livelihood strategies, particularly in the capital city Accra and principally among the transient population from the north. Some studies have highlighted the e-waste activities at Agbogbloshie disposal site.[21]

Analyzing critically the nature and scope of e-waste scavenging as an efficient livelihood strategy and asset accumulation process, however, has received very little scholarly attention. Such data deficiency tends to give justification for the occasional castigation of the practice by some media and environmental NGOs.[22] This study contributes in filling this information deficiency by examining how e-waste scavenging serves as a source of livelihood and its impact on the urban space. The study is informative by documenting the changing livelihood strategies of a transient population, its implication for development, and possible guidance for future research. It also helps bridge the gap in this nascent literature by examining the validity and variability of e-waste scavenging as a livelihood strategy, using findings from

Agbogbloshie, the biggest e-waste recycling site in Ghana. The findings will help in developing an appropriate regulatory framework for e-waste management in the country.

Methods

Data Collection

The data for the study were collected at Agbogbloshie Scrap Yard whose genesis dates back to the early 1980s.[23] The area is about 31.3 hectares, and currently less than a kilometer from Central Business District (CBD) of Accra, with an estimated population of 79,684 (see Figure 1).[24] E-waste scavenging as a work category emerged some five to six years ago.

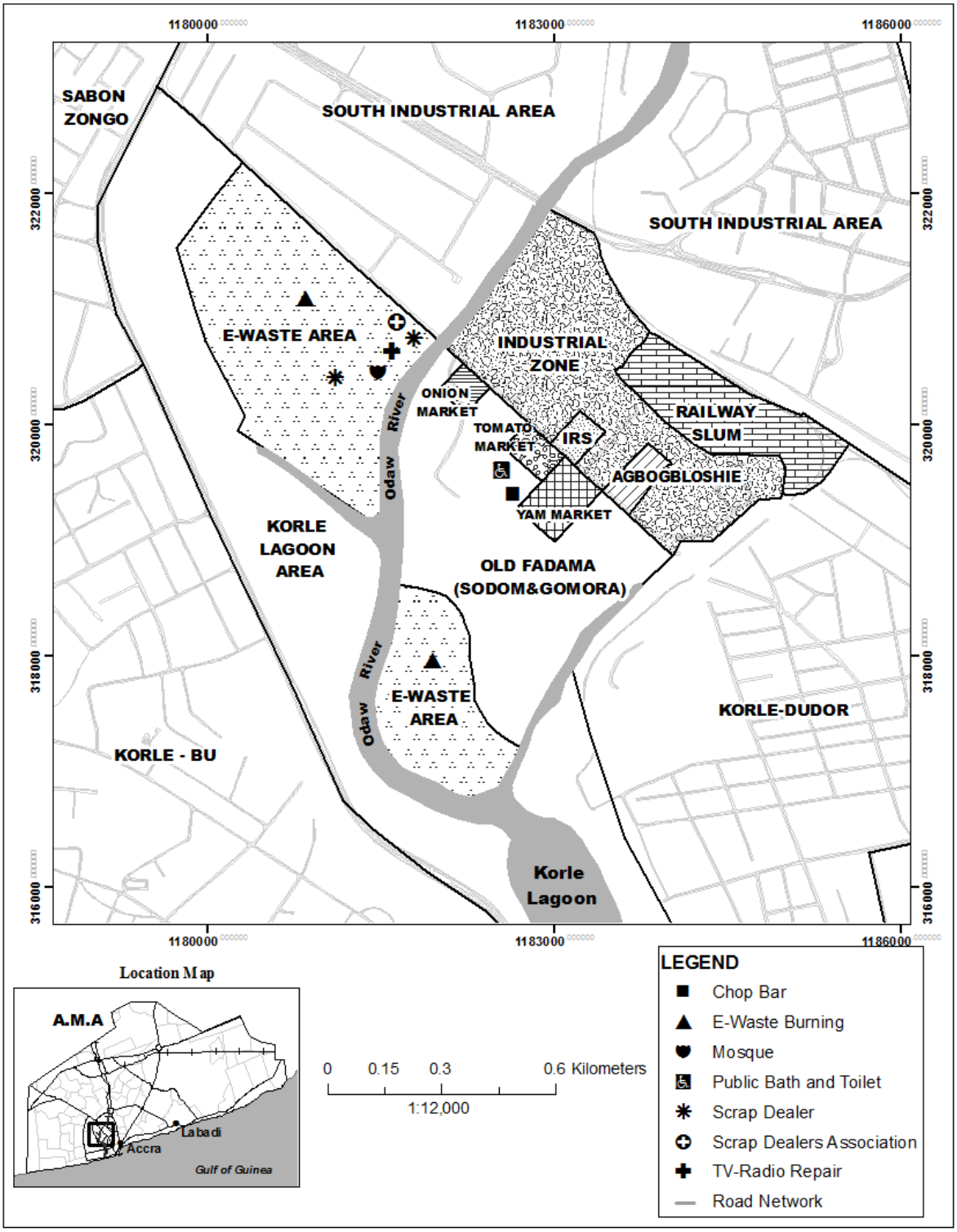
Using participant observation, this study builds on earlier work.[25] The study adopted an ethnographic approach that involved three months of critical participant observation of the operations of the scavengers, thus giving better insight into the diverse ways of organizing the e-waste activities. The field work also incorporated other instruments like questionnaire and in-depth interviews. The purposive random sampling technique was employed in order to obtain maximum information about the e-waste space economy.[26] This technique helped in identifying the chain of activities associated with e-waste recycling: collection, disassembly, open-burning, refurbishing, and metal trading.

A total of eighty participants (sixty of them directly involved in e-waste recycling and twenty in e-waste related activities) were surveyed using a structured questionnaire. Critical issues addressed by the questionnaire included respondent's socio-economic characteristics, roles in the process of recycling, wages, profitability, among others. The refusal rate was generally high (46 percent) and this could be attributed to the growing public negative commentary about the activities of the recyclers in the study area in particular.[27]

In order to obtain a more balanced perspective, additional twenty in-depth interviews were also conducted with selected key stakeholders whose activities impact on the current e-waste management. These include shop owners, executives of the Scrap Dealers' Association, and some public officials from the Accra Metropolitan Assembly (AMA), the Environmental Protection Agency (EPA), and Ministries of Local Government; Environment; Employment and Social Welfare; and Health to ascertain their perspective on the practice. I conducted the interviews with the recyclers personally at their "work places" which also provided another opportunity to observe labor intensities and recycling processes. I also observed the recyclers disassembling computers and their retrieval of resalable and reusable parts using rudimentary tools (e.g., spanners, screwdrivers). Further, I also observed the open incineration, retrieval of byproducts, weighing, and metal trading during my fieldwork.

This participatory methodology was carried out conscious of the fact that such qualitative research (and in this instance, the luxury of previous studies in the area) entails the possibility of building relations and familiarity with research participants, which could introduce some biases.[28] The interviews were recorded with the consent of the interviewees and later transcribed to draw patterns along the themes identified. The processes were supplemented with a comprehensive literature review. This facilitated the appreciation of the possible impact

Figure 1: Map of AMA Showing the Agbogbloshie E-waste Recycling Site



Source: Author's own construct.

of their livelihood on their health and the environment as well as its implications for development.[29] The primary data was computed and analyzed with the Statistical Package for Social Sciences (SPSS 17), while the personal observations and responses to open-ended interviews were organized into themes and used to complement the survey research results.

An Overview of E-waste Scavengers at Agbogbloshie

The demographic aspects of respondents captured during the survey include gender, ethnicity, level of education, age, and marital status. As was expected, the scavengers were male dominated (86 percent) with only 14 percent female representation. This is mainly because most of the activities involved rigorous hours of pulling handcarts to transport waste electronics from different parts of the city to the scrap yard for processing. The few women engaged with the industry center their activities on providing complementary services in the value chain, including the sale of collectors' tools (i.e. hammers, chisels, and spanners), which is quite a crowded activity, the merchandising of the end products, and "life support" services such as food, water, etc.

In terms of nationality, out of the total respondents, 82 percent were Ghanaians, while the remainder were either of Nigerian or Liberian origin. Of great significance is the fact that as many as 90 percent of the respondents were born outside their current place of abode (Accra) and are possibly seeking greater economic opportunity in Accra. The results show that about 63 percent of the respondents were of northern extraction (i.e., people from the three northern regions of Ghana). This is an important indicator of the regional inequalities that partly sustain out-migration and scavenging, mainly becoming an occupational niche for male migrants from the north.[30] The findings also show that scavengers are mostly youthful, with fifty-nine of them (81 percent) below twenty-nine years of age. The Ghana National Youth Policy (2010) defines a "youth" as "a person who is within the age bracket of fifteen (15) and thirty-five (35)." Apart from this group, the rest consists of the above thirty-year olds (about 19 percent) who probably have been unsuccessful in their quest for employment or have been retrenched. However, the unifying factor is that all these groups depend on e-waste as their source of employment and livelihood.

In terms of education, 19 percent of the respondents had no formal education, 40 percent had either primary or secondary education, and only one respondent (a Nigerian) had a university education. By implication, the low level of education of most scavengers makes it difficult for them to obtain alternative employment opportunities in the formal sector of the economy, and as noted by Holmes (1999), higher school completion is an important determinant of one's future earnings.

E-waste scavenging can be seen as a direct response to the influx of used computers into the Ghanaian waste stream when the government, in 2004, zero-rated their importation in terms of import duties, and secondly, the widespread unemployment after SAP.[31] Currently, it is estimated that three hundred to six hundred shipping containers arrive at the Tema port monthly without any official regulatory framework or infrastructure for its end-of-life management.[32] This has created an opportunity for some individuals to ingeniously adopt and recycle the contents as a source of livelihood. Today, e-waste scavenging plays a pivotal role in the constitution of the urban economy, at least because it employs about 4,500 to 6,000 people in

Accra directly and about 30,000 within the broader chain of activities, but also because it generates about $105 million to $268 million annually and sustains the livelihood of about 200,000 people nationwide.[33]

Unlocking the Scavenging Trajectory in Ghana

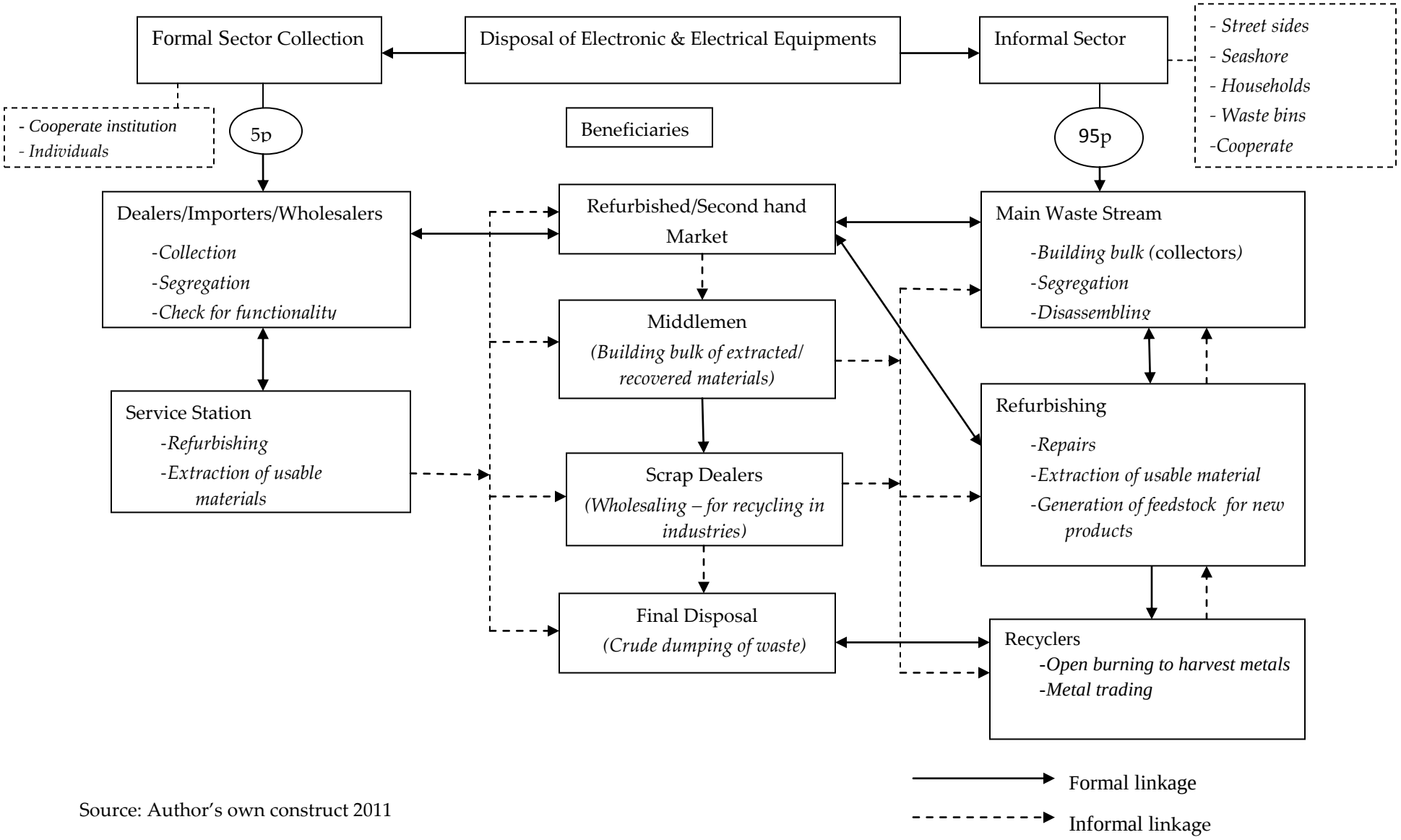
The current functional inter-relationship involved in e-waste scavenging (commodity chain) is shown in Figure 2. It would suffice to state that reuse of older electronic products is a common practice and the most environmentally preferable option in dealing with electrical and electronic equipments (EEE). Economically, it is also the means through which many people in Ghana (where 28.5 percent of the population live below the poverty line) can access such products.[34] It also conserves energy and raw materials needed to produce new products and reduces pollution associated with energy use and manufacturing.

After discussions with importers of second-hand EEE, refurbishers, scavengers, and civil society as well as my personal experience after years of research into e-waste, it is estimated that less than 5 percent of used e-products get back to the dealers (importers and wholesalers) for possible exchange. Apart from the fact that the warranty system is non-functional in the country, the dealers also have very limited outlets aside from Accra (and possibly, to a limited extent, Kumasi, Takoradi, and Tamale) where non-functional EEE could be deposited. Furthermore, there is currently no official policy, regulation or channel in respect to used EEE. These setbacks in the face of growing importation of used EEE and poorly organized or monitored second-hand markets have made e-waste one of the fastest growing items in the Ghanaian waste stream.

It is therefore not uncommon to see most individuals (about 95 percent) discarding their waste electronics directly into the main waste stream or leaving it "permanently" with local repairers. The few that get to the dealers are tested for functionality and, if repairable, re-enter the second-hand market. Those unserviceable ones are cannibalized for workable components that are then used to repair others for the second-hand market. Those that cannot be used end up at the backyard of the scrap dealers where every object, component, and material tends to have some value. It was gathered during the study that these scrap dealers were initially enticed by the importers of these gadgets "to clear the waste." However, today, they are required to pay "a token," and the amount is increasing steadily as the market gets saturated with the daily entrance of new migrants.

From the informal sector perspective, waste pickers collect used EEE from waysides, seashores, waste bins, dumpsites, etc. and because of the abundance of "cheap labor," the recycling economy has not only generated income earning opportunities for thousands of mostly extremely poor people, but it has also led to the emergence of dynamic entities with intense linkages between the formal and informal economy. Agbogbloshie has currently earned the reputation as the hub for the most rapid installers of used components and has an extensive inventory of accumulated parts that others travel from far and near to source. Even the non-recyclable components meant for disposal such as wires are burned to harvest copper, which also has ready markets both internally and internationally.

Figure 2. The Current Recycling and Disposal Practices in the Study Area



Source: Author's own construct 2011

Table 1 presents a comparison of local and international metal prices. Evidently, most local prices with the exception of that of steel are well below international market prices, which range from 40 percent to 150 percent higher than local prices. It can be inferred that the e-waste enterprise is growing mainly due to the availability of market and the high price of its components (e.g., gold and copper). One significant aftermath of the current practice of retrieving copper is that, the site is constantly on fire, which is also possibly an attempt to reduce the volume of waste generated. Be that as it may, these fires lead to the accumulation of ash and partially burned materials which have health implications, and probably explains why the Odaw River, which lie alongside the settlement has become "lifeless" to marine species.[35]

Table 1: Local and International Scrap Metal Prices

Metal	Agbogblosie market price per kilogram in US dollars	International market price per kilogram in US dollars	Quantity in a PC (in grams)
Copper	3.91	6.11	4.13
Brass	3.13	5.78	n.a.
Zinc	0.93	2.33	25.9
Aluminum	0.78	1.80	550.2
Steel	0.78	0.67	6,737.5
Iron	0.21	0.30	n.a.
Gold	n.a.	48,834.97	0.26

Source: Author's fieldwork (2010); Prakash et al (2010)

Micro-geographies of E-waste Scavenging: Economic Impact

The study explored the working conditions and economic viability of e-waste recycling in Accra. Broadly, it captured three main categories of workers directly involved in the chain of activities: the waste collectors, popularly called "recyclers", the middlemen, and the scrap dealers.[36] The collectors who are the lowest barrier of entry for most collectors specialize in the picking of actual recyclable elements from dump sites, houses and companies to sell to the middlemen before or after processing. The middlemen build bulk and eventually sell to the scrap dealers who also sell to big companies and exporters in Tema.

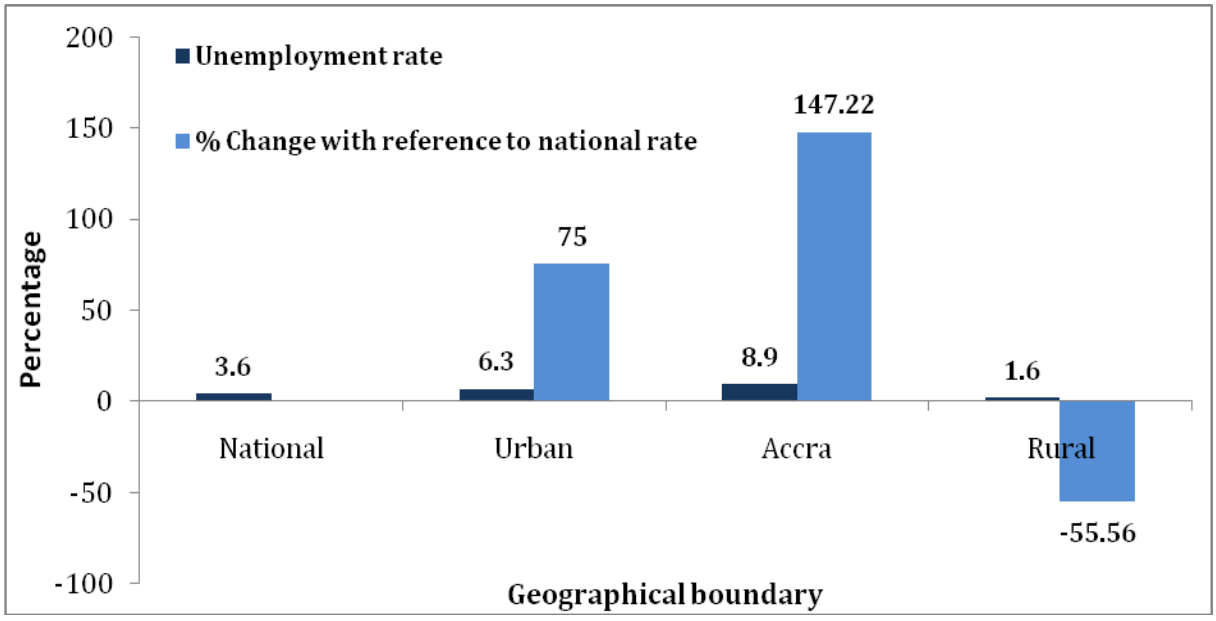
Like in most informal activities, these scavengers do not maintain any records on quantities of collected commodities or financial revenues that accrue from their transactions. However, the estimates of income derived from the sale of items, underscored the financial contribution of scavenging to the household economy. In terms of earnings, most collectors seemed to have no difficulty in remembering expenditure and profits, although they did not keep written records of their cash flows. All participants described the "industry" as providing a better livelihood than the official daily minimum wage of GH¢3.11 ($2.15).[37]

The study reveals that, e-waste collectors earn on the average US $3.50 daily, which is about two and a half times the official average income for informal economic worker in Ghana.[38] Further, those e-waste collectors who also engage in dismantling and metal recovery earn even more (US $8 a day) while the youth under fifteen, many of whom participate in the process as part-time collectors mainly after school activities or as truants, earn approximately

US $20 per month. Bearing in mind that the overwhelming majority of informal workers have very low working capital, it is not surprising that most of the scavengers earn "small profits" from their activities. Nevertheless, the findings show that e-waste scavengers make a reasonable profit from their activities, and that this return is favourable in comparison to other available and accessible alternative sources of income.[39]

The study was however challenged when it came to assessing the earnings of the middlemen and scrap dealers partly because of tax fears. However, a few middlemen who obliged to this question reported earning averagely US $20 a day, while some scrap dealers mentioned netting US $50 daily, though that may be an exception rather that the rule. One important feature about their livelihood identified by all respondents was the variability of their earnings. That withstanding, the picture still appears positive when viewed against the fact that unemployment rate among the economically active population in Ghana is about 17.6 percent while about 28.5 percent of the total population lives below the poverty line.[40] Indeed, studies have shown that the national unemployment rate to be 3.6 percent compared to 6.3 percent recorded in urban areas and 8.9 percent recorded in Accra (See Figure 3).

Figure 3: Unemployment Rate in Ghana



Source: GLSS, 2008

To fully appreciate the impact of the "new enterprise" attempts were made to analyse respondents, previous occupational experiences. The results clearly demonstrate why any enterprise whose start-up capital is next to zero with virtually no entry requirements but "substantial" monetary returns is likely to attract the army of unemployed "distressed" population, as exhibited in the study area. Figure 4 provides a breakdown of the previous employment of respondents before entering into the e-waste trade. The number of workers in each category is expressed as a percentage of the sample.

The findings shows that 31 percent of the respondents were either unemployed or retrenched and therefore were participating as a matter of survival while 41 percent were either into farming or self employed and 28 percent civil and public (formal) sector employees. Significantly the findings show that participation in e-waste scavenging is not limited to the urban poor, but it also include other social class (formal sector employees) that were previously assumed to be immune to the pressures of economic change.

This observation similarly supports Mustapha's (1992) argument that although the involvement in multiple economic activities has a long history in Nigerian society, recent economic conditions have led to the intensification of the practice, bringing the professional class which traditionally was not part of the practice, into the dynamics. He distinguishes between the survival strategies of the working class and livelihood strategies of the professional class, arguing that, for most members of the latter (working) class, engagement in multiple modes of activities is critical to individual survival. For the professional class however, the threat to survival is not that "stark and dire," as the case of those "condemned" to the informal sector appears, and thus, is seen as a "means of containing, and possibly reversing the slide in their living standards."[41]

Figure 4: Previous Employment of Respondents

Source: Field Survey, February/April, 2010

Admittedly, this study did not estimate the previous earnings of the respondents. However, earlier studies have revealed that public and civil servants earn an average basic monthly salary of approximately GH¢ 137.28 or GH¢ 0.78 per hour.[42] In the same vein, farming, which is mostly subsistence, appears poorly paid and unattractive, with the lowest basic hourly earnings of GH¢ 0.41.[43] The situation is even worse for the youth from the northern Ghana (forming 63 percent of respondents) who have very little control over the proceeds of their labour which is often at the discretion of the father.

A partial comparative analysis was conducted between the ''before'' and ''after'' economic status of respondents. It is important to state that one has to treat incomes and expenditures generated from the operators in the informal economy with caution due partly to the significant

fluctuations in their fortunes, and as already noted, they hardly keep books on their business transactions. They also tend to mix businesses, and these present a challenge when estimating their average monthly income. However, to have an idea of how well they were performing regarding capital accumulation, the waste collectors (the lowest paid in the industry) were asked to indicate the amount they earned in the month preceding the interview, after accounting for "all their expenditure." This approach was adopted due to the poor responses to questions on profit level during the pilot test of the research instrument.

The result shows that, an average e-waste collector at Agbogbloshie earns a monthly gross income of about US $380 whilst those engaged in metal recovery earn about US $460. Although they should account for their daily expenditure including shelter, bathing, food, and hiring of push trucks for their daily expedition, the result glaringly puts them far and above that of an average public servant in Ghana who earns approximately US $93.04 a month. This is significant not because the national daily minimum wage is GH ¢3.11 (US $2.15), but because most participants (63 percent) hail from the northern regions where majority live below the lower poverty line.[44] This might explain why e-waste chain of activities remains the second largest employment category for the 79,684 residents of Agbobgloshie after retailing.[45]

The findings contradict some other studies on the informal sector activities in other parts of Africa. Lighthelm (2004) for example states that the average monthly gross profit for informal market activity in Pretoria is R1010 (approximately US $151.00), which is only half the amount required to sustain an average African household in Pretoria.[46] This compares favorably with craft and trade workers in Ghana who earn GH¢ 114.4 (US $70.2) monthly.[47] The study however, resonates with the study of Yankson (2007), which revealed that the mean daily profit levels per male and female street traders in Ghana were US $5.3 and US $7.62 respectively. The study has also empirically demonstrated that e-waste scavenging provides a livelihood for many urban poor and that at least in the short to medium term, it has the potential of moving many out of the poverty zone. During the study, 65 percent of the respondents rejected any suggestion for the ban of the current practice.

Micro-geographies of E-waste Scavenging: Environmental and Health Impacts

The literature on e-waste is replete with studies indicating that e-waste contains intricate blends of plastics and chemicals, which when improperly handled, can be harmful.[48] Lead and mercury, for example, are known to be highly potent neurotoxins, particularly among children, who can suffer IQ deficiency and developmental abnormalities (BAN/SVTC, 2002) while the brominated flame retardants (BFR) in plastics pose serious health risks.[49] It is therefore to be expected that at Agbogbloshie where e-waste is dismantled and recycled by hand, harmful chemicals and plastic are possibly introduced into the environment via water, air and soil, while workers who burn the e-waste to retrieve valuable metals are also exposed to heavy metals, and organic acids, which have long term health risks.[50]

This possibility was re-echoed in an interview with a medical officer from the Ghana Health Service, Accra. Citing a World Bank Report (2007), she noted that "in Ghana, about five million children die annually from illness caused by poor environment. . . . poor resource management costs the country about 10 percent of GDP, with 40 percent attributed to water and air pollution." She further conceded that although no epidemiological studies have been

conducted in Agbogbloshie, the recent increase in cases of convulsion in the area could be a striking coincidence that warrants further studies.

Ironically, participants in the study demonstrated some knowledge of the health and environmental impact of the practice. However, their perceived impact was restricted mainly to accident-related and other obvious effects (burns, cuts, etc) that are in sharp contrast with those reported in other epidemiological studies.[51] In this study, 51 percent of the respondents complained of incessant chest pains and this is to be expected in a "profession" which involves carrying heavy loads and pulling handcarts over long distances across the city to the scrap yard. Additionally, in an environment where waste is routinely burned in an uncontrolled manner and in open dumps (burning to harvest metals, copper wires), coughing can be expected.[52] A waste collector re-counted: "I normally have to receive intense massaging from my friends every weekend (Sunday). I normally experience severe body and chest pains when we have to haul huge loads from outside Accra."

One commonality among most participants (90 percent), however, was their perception that the emission of smoke through the constant burning of e-waste to retrieve metals could pollute the environment. An executive of Scrap Dealers Association recounted rather pessimistically: "The burning of electronic cables and other electrical components in order to melt off the plastic and reclaim the copper wires may affect our health; I am not very sure. However, I am very certain that it negatively affects the environment as toxic chemicals are constantly released into the atmosphere."

Incidentally most shop owners, who are at a distance from the burning sites, see the open burning on the hitherto derelict waterlogged land as a means of controlling the breeding of mosquitos, which has been their major challenge.[53] The position taken by this group appears to have been informed by the apparent poor sanitation, including open defecation, which they see as more environmentally polluting and threatening. Indeed, the participatory technique helped to uncover an emerging but virtually neglected health hazard where some local butchers operating within the study area use e-waste generated fire to singe livestock for the local restaurants (chop bars). Although the observation is beyond the scope of this paper, its potential to cause impairment of public health is very high and thus needs a detailed epidemiological investigation.

It is important to stress that it is not possible from this study to comprehensively evaluate the damage likely to be caused to human health and environment from these widespread practices. Nevertheless, the results indicate that the likelihood of exposure to hazardous chemicals arising from e-waste scavenging (though the practice remains a major source of livelihood for many people from diverse background) can be locally severe and nationally costly. It can affect development and therefore warrants further studies.

Rethinking E-waste Scavenging as a Livelihood Strategy

The changing dynamics of the Ghanaian urban economy especially in the capital city, Accra, orchestrated by neo-liberal globalization and rapid urbanization, has made some informal activities like e-waste scavenging not only a survival strategy but perhaps, an opportunity for others (including formal sector employees) to either alleviate or shore against uncertainties. The study has shown how migrant populations, particularly from the northern regions of Ghana,

subsist mainly on e-waste scavenging not only by choice but also as a result of necessity. There is also empirical evidence to infer that some participate in the industry to cushion themselves against the vagaries of neo-liberal policies.

This finding thus questions whether theoretically, the long held notion that a segment of the urban society that exclusively participates in informality tells the complete story.[54] It demonstrates the functional linkages and fluidity between the formal and informal sector. For example, the reuse of older electronic products is a common practice and the only means through which many formal sector employees can economically access electronic products and participate in the information technology revolution. Also the separation of working components for repairs of faulty electronics has become a common practice. It is also instructive how people move seamlessly from the civil/public sector or the dominant poorly remunerative agricultural sector to participate in this new industry.

Admittedly, the scope of the present study is limited. However, it provides useful insights on how e-waste scavenging serves as a strategic response to macro-economic change and political contradiction within the broader urban space. Further studies will perhaps help to establish in details for example, the socio-economic background of those involved in the chain of activities associated with e-waste, and its impact on the national economy as a whole. Ultimately, this will impact how contemporary urban economies and spaces are conceptualized and how urban planning are conceived and executed.

Proper appreciation and understanding of the nature and scope of activities and the geography of the opportunities for participation will inform policy makers and city authorities to design targeted policies that take advantage of the spatial variations and nature of such activities. This is particularly important since Ghana's pursuit for economic growth cannot be independent of the ICT revolution, and the fact that inefficient management of the end-of-life of e-products can cause serious environmental and health hazards. Hence, the need for policies that are based on empirically ascertained data to help regulate and integrate the practice into the formal sector.

The overall goal for such integration should be to build a better functioning, more inclusive, healthier and socially sustainable city. This new partnership should see the local government playing a pivotal role and should be given greater authority, discretion and enhanced capacity to mobilize local support and resources, and take stakeholder needs and views into account in formulating and implementing policies and programes. This is premised on the fact that local authorities are better placed than distant central governments to broker and harmonize the new partnerships among the various stakeholders. To play the envisaged role effectively, local authorities need improved technical, administrative and financial capacity through genuine decentralization and increased support from national and international development agencies, including NGOs.

At the national level, government ought to realize that the informal sector in most cases fills in the niches created by government inefficiencies. In that perspective, the creation of dual and parallel urban systems—the "formal" and "informal"—should give way for an appropriate mix. This is in line with the current advocacy for endogenizing formal institutions to reconcile them to local conditions, and give them greater social legitimacy. In the words of Mabogunje, African cities still look like houses built from the roof down:

> All the institutions of modern urbanization are in place—the banks, the factories, the legal system, the unions, etc., but all these appear to be suspended over societies that have no firm connections to them, and whose indigenous institutions, even when oriented in the right direction, lack the necessary scaffolding to connect to their modern surrogates.[55]

The government also has a legitimate duty to explore more actively, national policies in order to slow down the rate of population growth in the cities and elsewhere through programs for reproductive health and family planning, which, together with purposeful urbanization policies, could help to lower fertility, and not overburden but ease pressure on the cities and urban services.[56] Ultimately, the informal sector also has a role to play in terms of organizing and developing the much needed civic engagement skills to be able to engage more constructively with governments and other development partners, and to increase their power to lobby, negotiate and influence public policy in favour of their sector.[57]

Finally, this study supports the assertion by Owusu (2007) that planners who refuse to think creatively about the emerging challenges risk becoming irrelevant. Kazimbaya-Senkwe also rightly argues:

> If urban planners want to be relevant to the urban development agenda, then they should rethink their fixation with master planning ideas which hitherto has limited their role in the development of the informal sector. They must adopt approaches in which solutions do not come from master planning textbooks but rather are developed with the people concerned using planning tools that respect the economic reality of the city and the voices of other stakeholders.[58]

After all, the informal sector activities take advantage of the failures of the formal sector and use sweat equity instead of money to create a living environment, however marginal.

Conclusion

Under the limitation of this study the following can be concluded. First, e-waste scavenging as a livelihood strategy in Accra can be seen as a direct response to rapid urbanization, neoliberal globalization, and a lack of formal job opportunities. Second, based on the abundance of "cheap labor," the e-waste recycling economy has not only generated income earning opportunities for thousands of mostly extremely poor people but has also led to the emergence of dynamic entities with intense linkages between formal and informal economy. Third, significantly the findings show that participation in e-waste scavenging is not limited to the urban poor, but it also include other social classes (formal sector employees) who were previously assumed to be immune to the pressures of economic change. Next, though the practice remains a major source of livelihood for many deprived urban poor, the results indicate the likelihood of exposure to hazardous chemicals that locally can be severe and nationally costly. Finally, it is clear from these findings that there is the need for well-coordinated and deliberate technical and non-technical integration of the formal and informal sectors. The study thus concurs regarding the need to restore "the structural and functional disconnect between informal indigenous institutions rooted in a region's history and culture, and formal institutions mostly transplanted from outside."[59]

Notes

1 Owusu 2007; Ferguson 2007.
2 Grant 2009; Grant and Oteng-Ababio 2012.
3 Francis 2000; Rakodi 2002.
4 GLSS 2008.
5 Brigden et al. 2008; Oteng-Ababio 2010.
6 Kuper and Hojsik 2008.
7 Owusu 2007; Yankson 2007; ISSER 2009.
8 Oberhauser and Yeboah 2011.
9 Rakodi 2002.
10 Grown and Sebstaed 1989, p. 941.
11 Briggs and Yeboah 2001; Owusu 2007.
12 For effects of restructuring, see Jeffries 1992 and Rakodi 2002. For the government's response, see Owusu 2001.
13 Aryeetey and Ahortor 2005; Baa-Boateng and Turkson 2005; Aryeetey and Codjoe 2005.
14 Lourenço-Lindell 2004.
15 World Bank 2001; UN-Habitat 2003.
16 Wood and Salaway 2000; Hapke and Ayyankeril 2004.
17 Owusu 2007.
18 GSS 2008.
19 Ibid.
20 Awumbila and Ardayfio-Schandorf 2008.
21 Brigden et al. 2008; Prakesh and Manhart 2010; Oteng-Ababio 2010.
22 Brigden et al. 2008; Frontline 2009; Afrol News 2010.
23 Grant 2009; Oteng-Ababio 2010.
24 Housing the Masses 2010, p. 2.
25 See Grant and Oteng-Ababio 2011; Oteng-Ababio 2011.
26 See Grant and Oteng-Ababio 2011.
27 Ibid.
28 Skelton 2001.
29 Pinto 2008; Brigden et al. 2005.
30 Post 1999; Oteng-Ababio 2010.
31 Baud and Schenk 1994.
32 Afrol News 2010; Frontline 2009.
33 Prakash et al. 2010, p. 51.
34 GSS 2008.

35 For health implication, see UNEP 2005; Pinto 2008; Brigden et al 2008. Regarding the Odaw River, see Boadi et al. 2002.
36 Bridgen et al. 2008.
37 As of December 2010, 1 Ghanaian New Cedi (GHS) = 0.67425 US Dollar (USD) accessed on 26th Dec, 2010 http://www.oanda.com/convert/classic.
38 GSS 2007.
39 See GLSS, 2008; Oberhauser and Yeboah 2011.
40 GSS 2008.
41 Mustapha 1992, p. 201.
42 GSS 2008.
43 Ibid.
44 Ibid. In Ghana, poverty profile as the measure of the standard of living is based on household and consumption, expenditure, covering food and non-food (including housing). Hence, a lower poverty line focuses on what is needed to meet the nutritional requirements of household members. Individuals whose total expenditure fall below this line are considered to be in an extreme poverty position, since even if they allocated their entire budgets to food, they would not be able to meet their minimum nutritional requirements. Thus, there are two lines: a lower line of GH¢700 per adult equivalent per month, and an upper line of GH¢ 900 per adult equivalent per month.
45 Armah 2008, p. 8.
46 Martins 2004, p. 4.
47 GSS 2008.
48 Caravanos et al 2011; Widmer et al. 2005.
49 Ching-Hwa et al. 2002.
50 Caravanos et al. 2011.
51 Pinto 2008; Caravanos et al. 2011.
52 Sepulveda et al. 2010.
53 Oteng-Ababio 2011.
54 ILO 1995.
55 Mabogunje 2005.
56 Population Reports 2002.
57 World Bank 2003.
58 Kazimbaya-Senkwe 2004, p. 119.
59 Dia 1996, p. 25.

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