

Waste as a Resource for Energy Generation in the Ga East and Awutu Senya East Municipalities: The Policy Discourse



A Policy Case Study

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1.0 Background

A pivotal aspect of SAMSET's knowledge exchange framework is the identification of sustainable energy transition paths in urban areas in conjunction with partner municipalities for policy consideration. Thus, upon considerable consultation with the partner municipalities in Ghana (Ga East and Awutu Senya East), municipal solid waste as a resource for clean energy generation emerged prominently for a policy case study.

According to the two Municipal Assemblies, thousands of tonnes of urban and industrial solid waste coupled with millions of liters of sewage are generated in the municipalities every year. As migration to these urban centers increases leading to rapid urbanization, consumption levels of different types of goods have increased over the years, with waste generation expected to increase rapidly in the future. The inadequacy of land for waste disposal purposes in the national capital, Accra, which is bordered by the two municipalities, makes city authorities face serious challenges with respect to waste management as the rate of waste generation in the municipalities increase. As Obour (2012) noted, the city of Accra is almost engulfed in filth. Accra alone generates approximately 1000 tonnes of waste per day and an annual generation rate of 3.7×10^4 Tons/year (Fobil, 2000). Existing collection capacity can only keep up with about 55% of this figure, meaning an excess of 1.7×10^4 Tons/year was left to accumulate in the core areas of the city for several months, with all its attendant consequences -mosquito and fly breeding, emission of obnoxious odours and methane, and causing flooding through choked drainage (Armah, 2001; EPA-Ghana, 1997; Fobil, 2000, 2002).. Any organic waste from urban and rural areas as well as industries is a resource due to its ability to get degraded, resulting in energy generation. The problems caused by solid and liquid wastes can be significantly mitigated through the adoption of environment-friendly waste-to-energy technologies that will allow treatment and processing of wastes before their disposal. These measures would reduce the quantity of wastes, generate a substantial quantity of clean energy from them, and greatly reduce environmental pollution if the right policies are adopted based on sound feasibility studies. Waste-to-energy technologies that have been utilized in Ghana in the past include, anaerobic fermentation of municipal waste and industrial liquid wastes to produce biogas for heating; combustion of solid wastes to produce electricity in Combined Heat and Power (CHP) systems in wood and oil palm industries; and biomass-fired co-generation, as shown in Table 1 below.

Table 1: Biomass-fired co-generation plants in Ghana

Name of Industry	Location	Industry Type	Capacity(MW)	Current Status
Mim Tiimbers	Sefwi-Wiaso	Sawmill	0.40	Abandoned
STP Ltd	Kumasi	Sawmill	1.20	Operational
Samatex Ltd	Samreboi	Sawmill	0.55	Operational
Benso Oil Palm	Benso	Oil palm	0.50	Operational
Twifo Oil Palm	Twifo Heman	Oil palm	0.70	Operational
Kwae Oil Palm	Kwae	Oil palm	2.10	Stopped in 1998

Source Energy Commission (2010)

According to the Energy Commission (2010), two key factors have hindered the exploitation of biomass-fired co-generation over the years especially in the wood processing industry even though there seems to be some potential for it. First, most of the potential co-generators have access to cheaper power supply from the grid. Second, there are virtually no financial or fiscal incentives neither are there regulatory requirements that would encourage them to generate and sell electricity to the grid.

1.1 Objective of the case study report

The main objective of this case study is to establish an understanding of the features of a common energy policy issue that is imperative for sustainable energy transition in the two SAMSET municipal partners in Ghana. The identified key characteristics of this policy will undoubtedly inform the future energy transition paths of these municipalities. Given the focus of this policy discourse document, account is given of the state of waste generation and management in the selected municipalities as well as the national policies regarding waste to energy in the subsequent sections.

2.0 Wastes-to-Energy Potential in the Municipalities

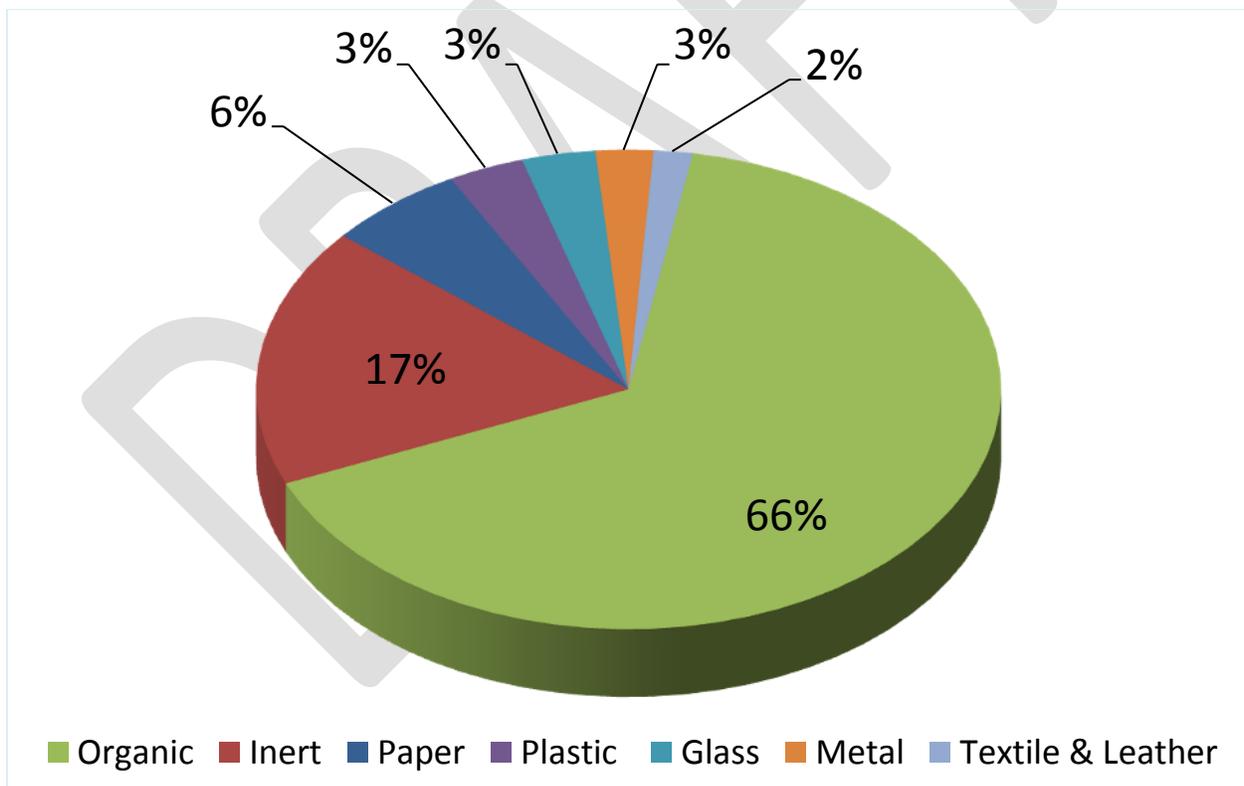
2.1 State of Waste Generation vis-à-vis population

The Ga East and Awutu Senya East municipalities have witnessed rapid increases in population due to rural-urban and urban to urban migrations. While the national population growth rate as at 2010 was 2.7% the population growth rates of the Ga East Municipality and Awutu Senya stood at 3.8% and 3.0% respectively. However, basic housing and sanitation facilities development are not moving at par with these population growth rates. These have therefore resulted in high population densities and low income settlements, with large waste generation streams. Constituting the core of these municipalities are the urban poor who erect structures haphazardly, generate large quantities of waste, with only a handful making arrangements for waste service

payments. Predominantly, wastes are generated from domestic and production/agricultural activities. The commonest types of domestic waste within these municipalities include food waste, garden waste, sweepings, ash, parking materials, textile waste, electric and electronic waste. Waste from production sources include metals, wood, plastic, animal waste from slaughter houses, and grain mills.

It is estimated that while 2500 to 2700 tonnes of solid waste is generated monthly in the Ga East and Awutu Senya East Municipalities respectively since 2010, only about 1700-1900 tonnes (representing about 65%-70%) are collected (Zoomlion Ghana Limited, 2013). These solid wastes are composed of organic materials (food and plants), paper, textile & leather, plastic, glass, metal, and inert. The organic component, which is an important raw material for waste-to-energy generation is highest while the textile and leather component is the smallest as shown in Figure 1 below.

Figure 1: Waste type and composition in the municipalities

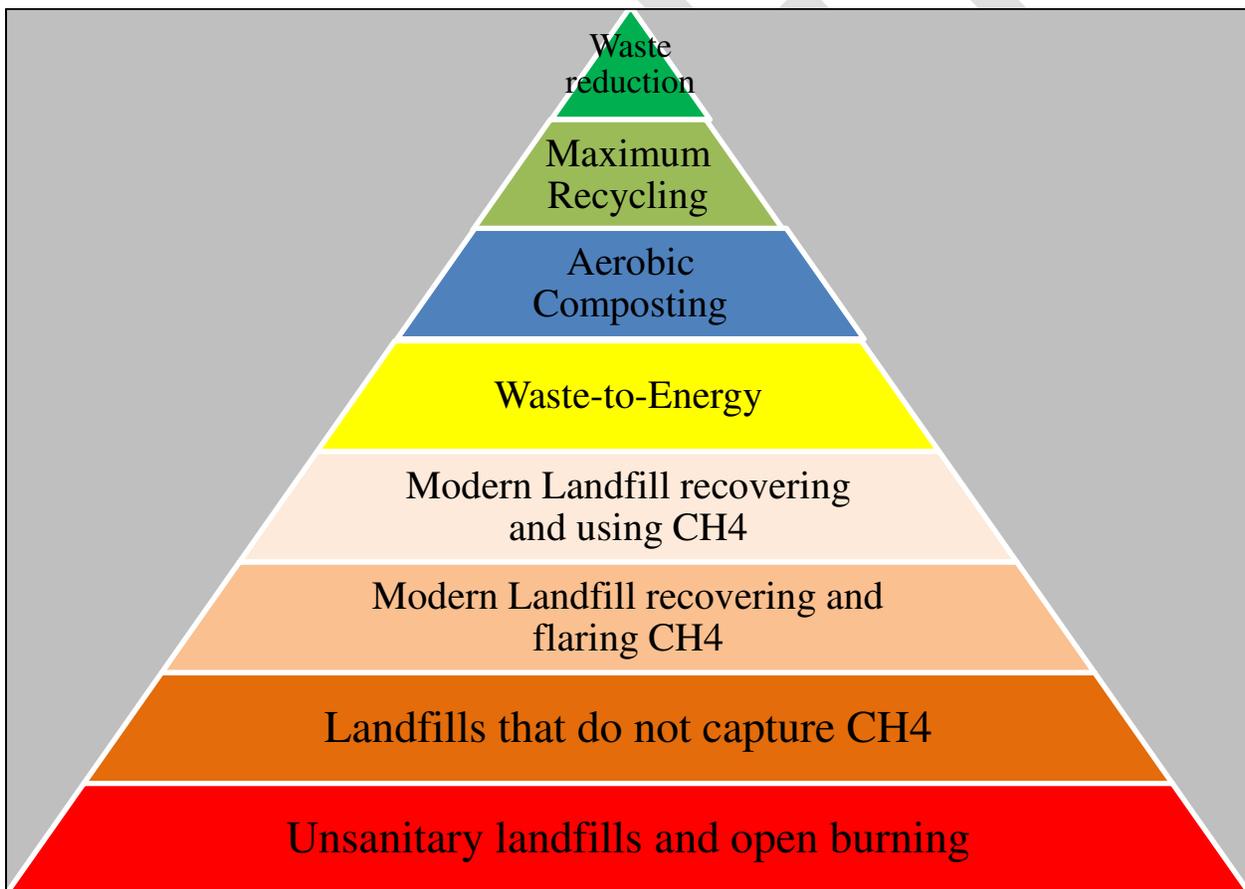


Source: Zoomlion Ghana Limited (2013)

2.2 Waste Management in the Municipalities

Waste collection and disposal are the responsibility of the Waste Management Departments in the Ga East and Awutu Senya East Municipal Assemblies. The departments oversee the collection, transportation, treatment and disposal of waste in the municipalities. Although there is some level of waste treatment (at industrial level) and recycling especially at localized level (scavenging of metal and other materials for recycling), waste management in these municipalities is mainly placed in the second rung from the bottom of the hierarchy of sustainable waste management (Figure 2). The focus of this document is to compile and analyse information on the current waste generation, collection and management in these municipalities so as to make a case for moving up the hierarchy to waste-to-energy as a sustainable waste management for policy consideration.

Figure 2: Hierarchy of sustainable waste management



Source: Adapted from Rodriguez, 2011

2.2.1 Solid Waste Collection in the Municipalities

Waste collection in the municipalities is done on a franchise and contractual basis. On the franchise basis, individuals are charged and the wastes are collected on house-to-house basis weakly especially in residential areas with good access roads. On the contract basis, waste contractors are paid by the Municipal Assemblies to perform communal container collection at periodic times. This often occurs in low income and highly populated areas, which lack proper residential planning, good access roads and other amenities. Very often, market places for commercial activities are also covered under this arrangement. Waste generators who use the communal containers do not pay any user charges.

There are a number of companies that have been contracted to collect and dispose of generated wastes in the two municipalities. In the Ga East Municipality, Zoomlion Ghana Limited, a private waste collection company is the dominant company responsible for waste collection in the area. Similarly in the Awutu Senya East Municipality, Zoomlion Ghana Limited and the Assembly through the Environmental Health Unit collect public solid waste from containers that are placed at vantage points for the public use. Individuals and households who can afford private collections, however, usually register with one of the over 8 private registered waste companies in the municipality.

Plate 1: Means of solid waste collection in the municipalities



Despite the arrangements in place for waste collection in the municipalities, only about 65% to 70% of the total waste generated is collected every day (Zoomlion Ghana Limited, 2013). Individuals who cannot afford the waste collection services often times resort to burning their waste. Table 2 below shows the monthly tonnage of waste generated in the Ga East Municipality and the proportion that is collected and deposited at the Abokobi Landfill site. Out of the 2760 tonnes of waste generated in 2013, only about 1931 tonnes are collected and deposited at the landfill site. While the average tonnage of waste collected and deposited since 2010 have been constant, the growth rate of waste generated per month has been growing steadily.

Table 2: Volume of monthly tonnage of waste generated and collected in the Ga East Municipality

Year	Average tonnage generated/month	Growth rate of waste generated/month (%)	Average tonnage deposited/month
2010	2580	-	1750-1820
2011	2600	0.77	1750-1820
2012	2640	1.54	1848
2013	2760	4.55	1931

Source: Zoomlion Ghana Ltd (2013)

Although the Abokobi landfill site is situated in the Ga East Municipality, it nonetheless receives waste from two other municipalities, La Nkwantanang and Adenta.. By the end of 2013, an estimated 115,902.957 tonnes of waste was recorded to have been deposited at the landfill site (see Table 3)

Table 3: Waste Disposal at Abokobi Landfill Site in 2013

Month	Estimate Weight (tones)
January	17,649.084
February	3,255.558
March	9,293.479
April	13,243.400
May	15,387.083
June	12,091.423
July	8,546.510
August	7,552.080
September	7,052.213
October	6,786.424
November	6,545.163
December	8,500.540
Total	115,902.957

Source: Zoomlion Ghana Limited (2013)

Table 4: Estimated Waste generated and collected in the Awutu Senya East Municipality

Year	Average Estimate tonnage generated/month	Growth rate of waste generated (%)	Average Estimate tonnage collected/month
2012	1352	-	879
2013	1414	4.59	990

Source: Zoomlion Ghana Limited (2013)

From Table 4, about 1414 tonnes of waste is estimated to have been generated in the Awutu Senya East Municipality every month in 2013. Of this figure only 990 tonnes were collected every month, representing about 70% just like that of Ga East Municipality. Comparing 2012 and 2013 waste generation figures, it is evident that waste generation grew at 4.6% from the 2012 estimated value, an indication of the rapid pace of waste generation in the municipality without a corresponding pace in the collection rate. According to the two municipalities, major problems faced with effective waste collection in the municipalities include the following:

Inadequate Logistics: Logistics such as facilities for storage (containers), collection and transportation facilities are in high shortage. Accordingly, the available facilities are poorly maintained while inappropriate technologies are employed in the collection process. The Ghana Statistical Service reckons that only 41% of households in these municipalities have solid waste disposal facilities in or around their houses (GSS 2008).

Inadequate Funding: Lack of adequate funds for waste collection especially, in the low income areas is a key challenge. The Waste Management Departments in the two municipalities are not involved in income generation as part of their mandates, hence, operational funds for waste collection and disposal come from the consolidated funds. It has led to a situation whereby broken down containers are rarely replaced and most tools not well maintained.

Difficulty in applying service charges: It is difficult to apply waste management charges such as waste taxes in these municipalities due to the unavailability of a database on income groups, birth and death records among others. The fear of free riding if waste taxes are imposed and the difficulty in identifying those on individual collection services make it somehow impossible to apply such charges in the municipalities.

Poor access roads in the communities: Most motorable roads in the municipalities connecting various settlements are third class and in deplorable states. Such bad roads in the communities contribute to frequent breakdowns of vehicles. The situation often results in back-lock of uncollected for prolonged periods. Some other areas are simply inaccessible by waste collection vehicles, hence, residents in such areas can only disposed of waste by burning.

2.2.2 Solid waste disposal in the municipalities

The Ga East Municipality harbours one of the biggest landfill sites in the Greater Accra Region, that is, the Abokobi Lanfill site. This site was created in 2008 and has been used as a waste dump site by municipalities in the catchment area and beyond. However, the use of the dump site has been restricted to only catchment municipalities including Ga East, La Nkwantanang and Adenta since 2013 due to limited space at the Abokobi Landfill site to accommodate the ever-increasing volume of solid wastes generated, . The Abokobi Landfill is being managed by Zoomlion Ghana Ltd, but other waste contractors dump waste at the site as well. The total waste deposited at the Landfill site by the end of 2013 was estimated around 115,903 tonnes (Zoomlion Ghana Ltd, 2013). This figure is far less compared to when more than three municipalities use the landfill site. Since the formal collection and disposal system could only take in about 70% of total waste generated, uncollected waste is often disposed of indiscriminately especially, in water courses and drainage channels around the municipalities (sea Plate 2).

Plate 2: Forms of waste disposal in the municipalities



Wastes collected from the Awutu Senya East Municipality through the public collection system or by door-to-door collection system are deposited at nearby landfill sites such as the Oblogo Landfill site in Accra and Capped Landfill site in the Ga South Assembly. Much like the Ga East, only about 65%-70% of the total waste generated is collected by the formal system in the Awutu Senya East Municipality (see Table 4). Uncollected wastes are often burnt by some residents whiles majority are disposed of into water channels.

2.2.3 Recycling of waste in the municipalities

There are a lot of scavengers that roam the streets and corners of various communities within the Ga East and Awutu Senya East Municipalities, in search of waste for recycling companies. Table 5 below gives a snapshot of recycling in the Greater Accra region and the percentage out of the total waste generated, which companies are able to recycle.

Table 5: Waste recycling in Accra

Waste Type	Metal	Paper	Organic	plastic	Glass
% Recycled	90	40	15	2	5

Source: Ghana Statistical Service (GSS) 2008

Metal: Recovered metals by *scrap dealers* are processed by the Tema Steel Works Company and some other local aluminium factories in the Greater Accra region.

Paper: The tissue factories such as the Super Paper Product Company process waste paper recovered daily.

Organic: There is a composting plant at Teshie in the greater Accra region, being managed Accra Metropolitan Assembly (AMA). Established in 1980, the plant has been used over the years in producing compost fertilizer from household waste primarily, organic. Certain types of the compost fertilizer have been used for re-grassing lawns, in parks and gardens and by estate developers. Unfortunately, vegetable growers have not patronized these composed fertilizers very well, partly attributable to their poor quality. In recent times, the plant has been operating irregularly and far below capacity due to the breakdown of the machines. The composting site has therefore almost turned into a waste dumping ground. Kadmus Limited is a private company also engaged in composting in Accra with similar poor fertilizer quality as that of AMA at Teshie because they also lack the scientific and technical support needed to monitor their final products (AMA 2010). Accra Compost and Recycling Plant Limited is another company involved in recycling waste into fertilizers that are harmless to the soil.

Plastic: Creative Plastics and City Plastics based in Abose Okai and Pokuase respectively are plastic recycling companies in the Greater Accra region. They often collect and recycle plastic wastes into pellets that are sold to manufacturing companies involved in plastic products. Other

companies such as Duraplast, Interplast, Qualiplast and Amal Plastics are all involved in some level of recycling of plastic waste. In recent times, individuals and groups collect used water sachets and plastic bottles being collected from around the communities, bagged and transported to recycling companies in the Greater Accra Region

Glass: The glass and terrazzo companies/factories mostly located in Tema in the greater Accra region collect glass waste from scavengers for recycling.

2.2.4 Plans for improvement in waste management by the municipalities

The Abokobi Landfill site has almost reached full capacity and could not take in more waste than a certain threshold despite the fact that more waste are being generated daily in the catchment areas. This resulted in restricting waste collection to only three municipalities since 2013. The Ga East municipality in conjunction with Zoomlion Ghana Limited is making plans to close the Abokobi Landfill site and relocate to a different place. The problem however is securing a suitable location as no community is ready to accept waste into its environment.

2.3 Wastes-to-Energy Feasibility in the Ga East and Awutu Senya East Municipalities

It is often recommended to improve the waste management system one step at a time according to the hierarchical waste management system (see Figure 2) that is, going from unsanitary landfills and open burning onto landfills that do not capture CH₄ followed by modern landfills recovering and flaring CH₄ and so forth up the hierarchy.

While many waste-to-energy technologies are mature and widely applied in other parts of the world, they are relatively more expensive compared to conventional technologies applied in most developing countries particularly due to the high cost of waste collection and management. Nonetheless, there is incomparable long-term benefits of generating energy from the bulk of municipal wastes such as; means of sustainable management of waste to ensure environmentally clean, hygienic and habitable municipalities; climate change mitigation strategy in the form of providing clean energy; vector-borne diseases control; job creation and employment for the youths, provided the wastes-to-energy potentials can be well harnessed by appropriate policy directives. Below is a summary of the waste-to-energy feasibility in the municipalities;

Resource Feasibility

There is abundance of wastes generated in the municipalities which are the major inputs required for waste-to-energy technologies. Waste generated per month averaged 2600 tonnes since 2010 in the Ga East Municipality and 1400 tonnes since 2012 in the Awutu Senya East Municipality. In 2013, about 116,000 tonnes of waste was deposited at the Abokobi Landfill site situated in the

Ga East Municipality despite restricting dumping of waste at the site to only three municipalities. Out of this total tonnage, about 70,000 tonnes are organic component which is relevant for waste-to-energy purpose. These attest to the high volume of waste resources that are generated monthly in the Ga East Municipality and its catchment areas that can be tapped for waste to energy purposes.

Economic Feasibility

The Ga East and Awutu Senya East Municipal Assemblies currently lack strong financial outlays to single handedly finance waste-to-energy projects in the municipalities. However, other avenues exist in addition to the internally generated sources of revenue that the municipalities can exploit in financing waste-to-energy projects. Developmental Partners have long been important partners to these municipalities as external financiers on several developmental projects in the municipalities. Key among them are DANIDA and U.S. Agency for International Development (USAID) which have funded a number of projects in the municipalities. There are also avenues for Non Governmental Organizations (NGOs) as well as private partnership with the Assemblies for developmental purposes.

Technical Feasibility

Waste-to-energy as a waste management strategy is essential for the municipalities at this moment because Ghana lacks the technologies necessary to capture CH₄ from the available landfills coupled with the recent energy supply deficiencies in the country. However, there are no known available waste-to-energy technologies in the municipalities neither are there trained experts in waste-to-energy technologies. But there are opportunities for partnership with relevant Development Partners and private organizations in order to acquire the technologies appropriate for waste-to-energy projects in the municipalities. In addition, there are waste management companies in the municipalities which are engaged in waste collection, dumping and to some extent, compacting. A case in point is the Zoomlion Ghana Limited which currently manages the Abokobi Landfill site. This company and others can provide technical assistance as well as manpower to be used in the waste-to-energy projects in the municipalities.

3.0 Wastes-To-Energy Policies in Ghana

Few policies, plans and programmes were formulated before independence to ensure long term reliability and security of energy supply for sustainable social and economic development of the country. After independence in 1957, the energy sector was without a policy framework until the 1990s. Since the inception of the National Electrification Scheme in 1989, the energy sector in Ghana witnessed a number of stop-gap measures, projects, strategic plans and programmes until 2009-2010 when a comprehensive National Energy Policy (NEP) was formulated and approved by the government. They include the Energy Sector Development Programme (1996-2000); the Energy for Poverty alleviation and Economic Growth: Policy Framework, Programmes and Projects (2001-2009); Strategic National Energy Plan (2006-2020); Ghana Renewable Energy Policy (2009-2020); and Bioenergy Policy for Ghana (2010). Others are the National Charcoal, Woodfuel and LPG Promotion Programmes (1988-1990); the Energy for Poverty Reduction Action Plan (EPRAP); and the Ghana Energy Development and Access Project (GEDAP). With respect to Waste to energy, only Bioenergy Policy for Ghana (2010) and the National Energy Policy documents clearly defined strategic plans for converting waste to clean energy in Ghana.

Specified in the National Energy Policy document, waste-to-energy projects are deemed very important for the provision of clean energy and the management of the growing sanitation problems facing urban areas in Ghana. The overarching goal of the National Energy Policy as far as waste-to-energy is concerned is *to convert most of the waste generated in municipal activities, industrial operations and agricultural operations to energy*. Specifically, the policy actions seek to:

- Maximise energy production from waste
- Divert waste from landfills (prohibit burying of waste and landfills)
- Facilitate access to grid for waste to energy power plants
- Develop infrastructure for waste collection and supply to waste-to-energy facilities.

In the complementary document entitled “Energy Sector Strategy and Development Plan” (2010)¹, the various strategies to convert wastes to energy are clearly outlined as captured in Table 6.

¹ The Energy Sector Strategy and Development Plan is a complementary document to the National Energy Policy

Table 6: Strategies to convert waste to energy

Objectives to be achieved	Key Programme and Projects	Possible Financing Source	Time frame	Verifiable Indicators/Milestones	Responsible Agency
Management of municipal, industrial and agricultural wastes through energy production.	Metropolitan waste-to-power project	GoG/Private Sector/DPs	2010-2015	Frame work for Metropolitan waste-to-power project ready by January 2011	MoEn/EC
	Institutional biogas project (Universities, Polytechnics and Senior High School)	GoG/Private Sector	2010-2015	Framework for Institutional biogas project ready by January 2011	MoEn/MoE/Private Sector
	Combined heat and Power System for industries	GoG/Private Sector	2010-2015	Framework for combined heat and power systems ready by January 2011	MoEn/MoTI/Private Sector

Source: Ministry of Energy (2010)

Definition of Acronyms

GoG – Government of Ghana, DPs – Development Partners MoEn – Ministry of Energy
 MoE – Ministry of Education MoTI – Ministry of Trade and Industry

The Bioenergy Policy of Ghana (2010) acknowledges the need to continue to make efforts at exploiting wastes for energy purposes due to the growing production of wastes in Ghana and, this can be achieved through effective policies and strategies. The Policy directives and strategies include:

- **Effective collection and management of waste**

Policy Strategies

- *Ministries of Food and Agriculture and the Local Government as well as the municipal authorities should establish central collection and milling points for paddy rice.*
- *Compel, by legislation, to dispose of the logging off-cuts and wood processing residues.*
- *Create incentives for logging off-cuts and wood processing residues to be used for energy purposes.*
- *Legislate and create incentives for the use of municipal wastes for energy purposes.*
- *Create incentives for the use of industrial waste for energy purposes.*
- *Introduce or expand the existing centralized sewage system.*

- **Efficient and Low Cost Conversion technologies**

- Policy Strategies*

- *Promote affordable and more efficient conversion technologies including stoves.*
 - *Legislate and create incentives for separation of waste for energy purposes.*
 - *Create incentives for the use of industrial waste for energy purposes.*

- **Electricity from Waste**

- Policy Strategies*

- *Legislate against unplanned disposal of industrial and municipal waste*
 - *Develop feed-in-tariffs favourable for electricity generated from waste*

- **Pricing of Energy Produced from Waste**

- Policy Strategies*

- *Institute discriminatory pricing in favour of energy produced from waste.*
 - *Develop feed-in-tariffs for electrical energy produced from waste.*

- **Establishment and Enforcement of Regulations**

- Policy Strategies*

- *Compel, by legislation, to dispose of the logging off-cuts and wood processing residues*
 - *Create incentives for logging off-cuts and wood processing residues, municipal and industrial waste to be used for energy purposes.*

To provide a strong pedestal for the implementation of the Bioenergy Policy, the following specific activities outlined in Table 7, have been earmarked to be undertaken in the medium term.

Table 7: Road Map for Implementation of Bio-energy policy (Waste-to-energy in focus)

Year	Activities	Results	Responsibility
September, 2010	Establish Bioenergy Unit within the Energy Commission to organize stakeholder consultation and develop implementation programme	This will provide enhanced institutional focus on bioenergy	Energy Commission
December, 2010	Allocate a portion of the Energy Fund each year to be used for technical assistance to bioenergy producers/equipment manufactures and R&D	Sustainable funding source for the bio-energy industry created	Energy Commission
Jan-Mar, 2011	Obtain cabinet Approval for bioenergy policy recommendation	Bioenergy policy for Ghana adopted by the Government	Ministry of Energy
June, 2011	Establish a Technical Committee within the Energy Commission to address issues relating to coordination between relevant agencies like MOFA, EPA, NPA, etc	A dedicated technical committee on bio-energy available	Energy Commission

Source: Energy Commission (2010)

3.1 Policy Response

Towards the end of 2013, the Ministry of Energy published a document on the energy sector's achievements and challenges in respect of 2013. In the document, no mention was made of the progress made regarding waste transformation into clean or renewable energy. This demonstrates the low attention this renewable energy sub-sector receives despite the abundance of raw materials (waste) bedeviling city dwellers in various communities.

Having highlighted the little recognition given to this important sub sector, some remarkable waste-to-energy projects are underway or at least, grounds preparations are ongoing for their commencement. For instance, Blue Sphere Corporation, a company in the Cleantech sector, has signed a binding memorandum of understanding (MoU) with the Government of Ghana in respect of a 10 MW organic waste-to-energy project in Accra, Ghana. The MoU gives Blue Sphere the right to receive, and anaerobically digest up to 1,000 tonnes a day of pre-sorted organic waste from the new transfer station to be opened in Accra in 2014.

In January 2013, the Ministry of Energy announced government's intention of constructing waste-to-energy projects in Kumasi and Cape Coast at the cost of US\$300 million which will generate electricity from waste. The projects which were scheduled to be completed in October, 2013, intended to generate electricity from refuse for a number of communities in the Ashanti and Central Regions. Partnering with the SWT Company of Malaysia, the projects were

supposed to strengthen the public-private partnership in innovation and commercialization of waste management to meet the demand of the 21st century (Ministry of Energy, 2013). However, the projects are yet to realistically commence. Presently, some engineered landfills constructions are still going on in the country including, five in Accra (Kwabanya), Tema, Kumasi, Sekondi-Takoradi and Tamale. The expected power extraction from the landfill is 1MW on the average and expected to serve a number of off-grid communities².

4.0 The niche for SAMSET

African municipalities are horizontally expanding with rapid pace owing to growing urbanization and urban sprawl. In consequence, they are faced with numerous developmental challenges including, massive waste generation without proper management and deficiency in energy supply to satisfy the growing demand. In the midst of these challenges though, lies a great opportunity to manage waste sustainably by generating clean energy out of it. Waste-to-energy is just one of many ways to manage waste in a society. In the absence of appropriate technologies to manage waste sustainably, the conversion of waste to energy presents the best alternative two-in-one solution for developing municipalities like the Ga East and the Awutu Senya East Municipalities.

SAMSET through its framework sets out to share knowledge with city authorities on the possibilities and merits of obtaining a clean energy out of the pool of waste that has bedeviled Ghanaian cities. Thus, having explored the nature of waste and the potential for energy generation in the the Ga East and Awutu Senya East Municipalities, it is clear that currently, waste has not been put in the right perspective in readiness for generating energy at the municipalities. Documentation of waste generated and collected in the municipalities is a major challenge facing the waste management systems in the country. Education on waste separation has not gained enough ground in the communities as people utterly ignore or disregard instructions on separating different types of waste into different bins provided in different colours in the communities. Mixing all types of waste, from organic to plastic together makes separation into various classifications such a daunting task.

SAMSET is therefore well placed to help shore up the knowledge base, institutional capacity and strategies of these two municipalities regarding the waste-to-energy agenda so as to build a resilient clean energy transition. Playing advisory roles and sharing knowledge from other municipalities in other African countries shall prove worthy of considering waste-to-energy as a viable policy option for sustainable energy transition in Ghana.

² Ministry of Energy official website, www.energymin.gov.gh

References

- Armah, N. A. (2001) Private Sector Participation in Waste Management in Accra, a Case Study. Technical Report for Carl Bro Intl, Accra
- EPA-Ghana, (1997) Guidelines for the Construction and Implementation of Sanitary Landfills, EPA of Ghana Quarterly Publication, Accra
- Fobil, J. N. (2000) Municipal Solid Waste Characterization for Integrated Management in the Accra Metropolis, A Master's Thesis. University of Ghana, Legon, Accra
- Fobil, J. N. (2002). Proceedings of International Symposium on Environmental Pollution Control and Waste Management 7-10 January 2002, Tunis (EPCOWM'2002), p.193-205.
- Energy Commission, Ghana, 2006; Strategic National Energy Plan 2006-2020. Annex II of IV Energy Supply to the Economy- Woodfuels and Renewables. July 2006.
- Energy Commission Ghana, 2009. Ghana Renewable Energy Policy 2009-2020.
- Energy Commission (2010); Bioenergy Policy for Ghana (Draft)
- Ghana Statistical service (GSS) 2008. Ghana Living Standard Survey: Report of the Fifth round (GLSS 5)
- Ghana Statistical Service (2012) 2010 Population and Housing Census Report
- Ministry of Energy, 2010; National Energy Policy. Accra: Republic of Ghana.
- Obour, S.K. (2012). "Accra Sinks under Filth". The Mirror, Saturday, September 15, 2012, pp.24.
- Rodriguez M.E.D. (2011). Cost-Benefit analysis of Waste to Energy plant for Montevideo; And Waste to Energy in small islands. (Thesis).
- Zoomlion Ghana Limited (2013). Landfills Department. 2013 Annual report. Ghana