SAMSET – SUPPORTING SUB-SAHARAN AFRICAN MUNICIPALITIES WITH SUSTAINABLE ENERGY TRANSITIONS

ENERGY AND URBANISATION IN SAMSET COUNTRIES: A SYNTHESIS OF THREE REVIEWS OF CONTEXT AND LITERATURE

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1 INTRODUCTION

This paper seeks to synthesise three country-level literature review reports for the SAMSET project:

- 'Energy and Urbanisation in South Africa' (Sustainable Energy Africa 2014),
- 'The Nexus between Urbanisation and Energy in Ghana: A Literature Review' (Bawakyillenuo and Agbelie 2014), and
- 'Energy and Urbanisation in Uganda: Context report and literature review' (Mann, Namukisa and Ndibwami 2014).

Material from these reports has been re-organised by the key questions addressed by the literature reviews:

- Urban Institutional Context: What are the relevant government departments and urban administrative units?
- Energy Context: What is the overall urban energy situation?
- Activities: What relevant plans are in place or approaches have been tried regarding sustainable urban energy, and to what effect?
- Lessons for SAMSET: What are appropriate approaches going forward around sustainable energy transitions at local government level?

Within these sections, material is organised when possible by key themes. This synthesis paper does not include the entirety of each country-level paper, but instead aims to focus on key themes and issues.

The purpose of the synthesis is to enable comparison of key factors between the countries, and to form a foundation for any knowledge sharing activities within the SAMSET project. By having a contextual overview it is hoped that stakeholders will be enabled to position new information and co-construct ideas about clean energy transitions.

The paper starts by describing the mandates of key levels of authority, followed by a landscape view of the energy situation. It attempts to outline the plans of key stakeholders on energy transitions in urban settings, and concludes with some common observations and lessons that may be relevant to the next stages of SAMSET.

Figure 1-1 Graphic showing common 'action issues' for clean energy transitions

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2 URBAN INSTITUTIONAL CONTEXT: WHAT ARE THE RELEVANT GOVERNMENT DEPARTMENTS AND URBAN ADMINISTRATIVE UNITS?

2.1 INSTITUTIONAL CONTEXT AND MANDATES

This section gives an overview of the urban institutional context for each country, with a focus on the government departments and urban administrative units that are relevant for the SAMSET project.

2.1.1 SOUTH AFRICA

South Africa has three separate spheres of government – national, provincial and local or municipal government. Each has their own mandates which are largely derived from the Constitution. They are required to cooperate with each other, but are not functionally responsible for the mandates of the others, although national and provincial government is required to support local government in carrying out its role (COGTA 2013). Within national government, the Department of Cooperative Governance and Traditional Affairs (COGTA) provides this support function. The South African Local Government Association (SALGA) provides a coordinating function amongst local government, and represents local government to national government and elsewhere on issues of relevance to them. In spite of a clear separation of most mandates and functions, policies across the three spheres of government, or even in any one sphere, are often are poorly coordinated or conflicting.

In the Constitution of South Africa (1996), three categories of municipalities were established: a) Category A: A municipality that has exclusive municipal executive and legislative authority in its area; B) Category B: A municipality that shares municipal executive and legislative authority in its area with a category C municipality within whose area it falls; and c) Category C: A municipality that has municipal executive and legislative authority in an area that includes more than one municipality.

Municipalities are the seat of service delivery, and their mandate includes the following in terms of the Constitution (1996):

Table 2-1 Service Delivery responsibilities of Municipalities in South Africa

air pollution	building regulations	municipal roads
electricity reticulation	municipal planning	traffic and parking
municipal public transport	stormwater management	street lighting
water and sanitation services	refuse removal and solid waste disposal	

The overarching planning framework in each local government is their Integrated Development Plan (IDP) which covers a 5 year period. This is supported by key planning documents such as the Spatial Development Framework and the Medium-Term Income and Expenditure Framework. The Integrated Urban Development Framework discussion document (IUDF 2013) notes that local government planning is too short-term, and advocated an overarching 30 year planning framework. Local government is able to raise revenue from property rates and service delivery payments, amongst other sources. They are also the recipient of various conditional and unconditional grants from national government, including the Equitable Share Grant (which includes the Free Basic Electricity grant) and the Municipal Infrastructure Grant. Municipalities are also able to raise loans.

There is great concern regarding the capacity of local government to address their service delivery mandates, particularly in the face of rapid urbanization occurring in many towns and cities. In addition, municipal finances are often under stress, both because of capacity and management issues as well as revenue shortfalls (FCC 2013). This exacerbates service delivery backlogs and results in inadequate attention to the maintenance and upgrading of key infrastructure such as electricity distribution systems. In South Africa about 179 municipalities are licensed electricity distributors, although the national utility, Eskom, also distributes directly to small and large customers in many urban areas. The lack of attention to municipal electricity infrastructure is of great concern, as electricity sales are a critical source of revenue for many municipal distributors as it cross-subsidises other important municipal functions. A degradation in the electricity distribution system,

while not necessarily urgent in any particular financial year, will have serious consequences for municipal finances in the medium-term.

2.1.2 UGANDA

Uganda is a presidential republic, in which the President of Uganda is both head of state and head of government. Several political parties are active, but the ruling National Resistance Movement has been in power since 1986. Executive power is exercised by the government through line ministries. Legislative power is vested in both the government and the National Assembly to which the members are elected by votes from all citizens over 18 of years of age.

Uganda technically has three separate spheres of government – national, district and local or municipal government each with its own mandate, which is largely derived from the Constitution. They are not functionally responsible for the mandates of the others, although national and district government is required to support local government in carrying out its role. Within national government, the Ministry of Local Government manages the funding to districts and Local Councils of various levels; most district and local governments derive the vast majority of their operating revenues and infrastructure investments through grants from national government. Technical support to urban governments is the responsibility of the Ministry of Lands, Housing, and Urban Development (MLHUD). The non-governmental Urban Authorities Association of Uganda (UAAU) and the Ugandan Local Government Association (ULGA) provide a coordinating function amongst local government and represent local government to national government and elsewhere on issues of relevance to them. UAAU aims to serve town and municipality governments, whereas ULGA works mostly with district and lower non-urban government offices (see hierarchies below). Financial support to these associations comes in the form of membership fees and various international development funding.

Uganda is currently divided into 111 districts, plus the city of Kampala. Each district is led by both an elected Local Council Five (V) chairperson and a Resident District Coordinator who is appointed by the president of the republic. The case of Kampala is unique in that there is a State Minister in charge who oversees an Executive Director of the parastatal Kampala Capital City Authority.

Urban government structures are complex and involve several layers of elected and appointed officials. For now, population size and geographic extent determine whether an urban area is to be governed as a town board, town council, municipal council or city council. Each of these has varying levels of autonomy and responsibility. Figure 02 attempts to explain some of this hierarchy. The Mayor is the elected political leader of a town council or municipal council; however, the day-to-day business is carried out by the Town Clerk who is appointed by the President. The categories and parameters are currently being reviewed and a new National Urban Policy has been drafted with the support of World Bank/ Cities Alliance.

According to the Local Government Act 1997, Section 9, Local Government Councils “shall be the highest political authority within the area of jurisdiction of a local government and shall have legislative and executive powers to be exercised in accordance with the Constitution and this Act. And Section 4 of the same, states that “a municipal or a town council shall be a lower local government of the district in which it is situated.” Kampala, as the only “city” in the country, has the status of district and as of late 2012 is governed by the parastatal Kampala Capital City Authority, which is responsible for all revenue collection, all service delivery within the central division of the city, and budget control over the remaining four divisions.

Physical plans have been written for over 60 town councils and other urban jurisdictions over the past 15 years with support from MLHUD. Some of these plans would need updating to be relevant to the current situation of rapid growth in many towns and municipalities. Most often, the plans do not take into account the financing necessary for the implementation of the planned infrastructure or the fiscal consequences of the actions. The implementation of more strategic planning frameworks is essential.

Local governments are able to raise revenue from property rates and service delivery payments, amongst other sources. They are also the recipients of various conditional and unconditional grants from national government, though these are famously inconsistent in quantity and date of arrival. Municipalities are not currently able to raise loans; however KCCA has been given a mandate to do so.

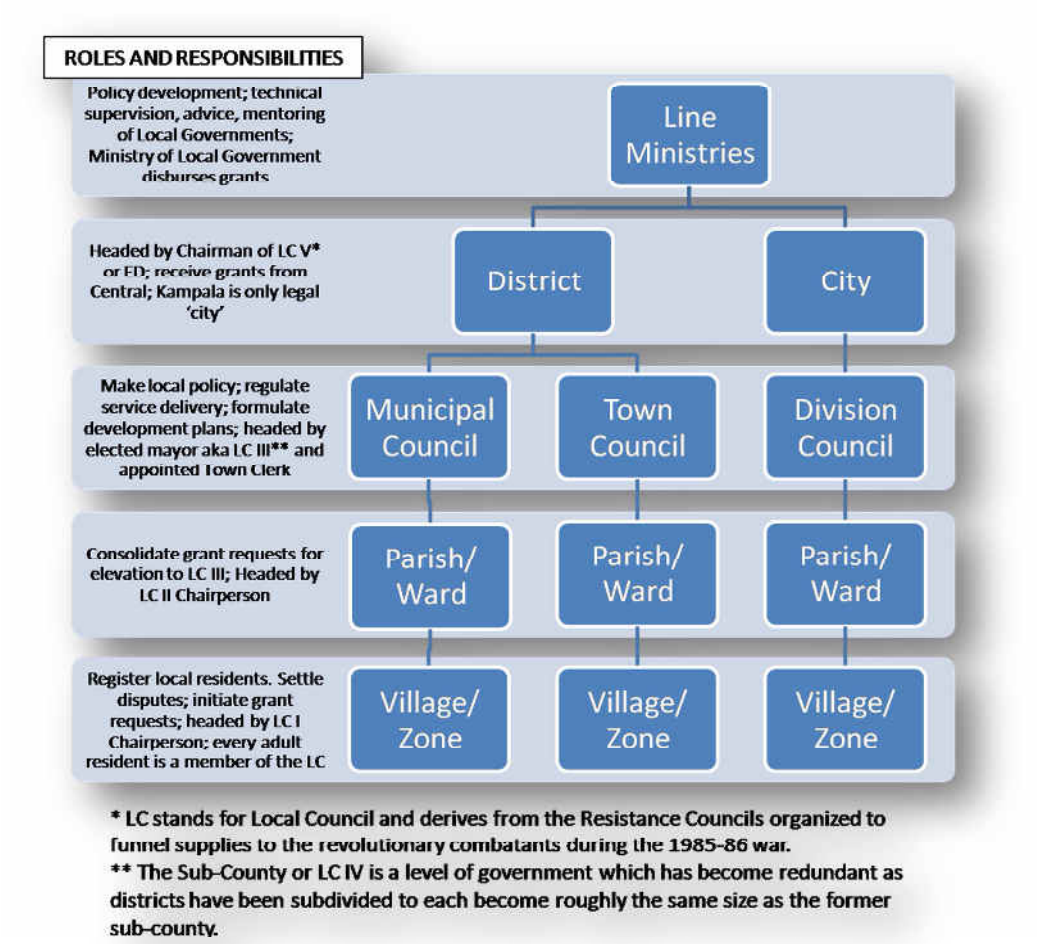


Figure 2-1 Local governance hierarchies in urban areas of Uganda; Various sources

As noted in earlier sections, there is great concern regarding the capacity of local government to address their service delivery mandates, particularly in the face of rapid urbanization occurring in many towns and cities. In addition, municipal finances are often under stress, both because of capacity and management issues as well as revenue shortfalls, including those linked to the inconsistency of central government grants. This exacerbates service delivery backlogs and results in inadequate attention to the maintenance and upgrading of key infrastructure such as electricity distribution systems.

2.1.3 GHANA

Ghana is a notable example of fiscal decentralisation, particularly in the area of political decentralisation and revenue generation. Ghana's decentralisation began in the 1988, when the Local Government Law created 110 districts within the 10 regions of the country. Each region has a non-partisan District Assembly (DA), with elections held every four years. The 1992 Constitution created Regional Co-ordinating Councils (10), District Assemblies (170) and urban, zonal, town and area councils (1,300), plus unit committees (16,000) (Crawford, 2004). The District Assembly system includes grievance and complaints procedures where members of the public can hold individual DA members and officers to account and theoretically have the officer recalled. Crawford (2009) assesses the decentralised system as having high levels of citizen participation, but finds a number of barriers to making the decentralised system accountable. The main barrier is that central government still controls much of the decision-making power, thus rendering citizens' attempts to hold local government accountable limited by their capacity to respond to needs. Councils and unity committees hold limited legislative or rating powers, and have no clearly-designated formal competencies. Instead, they are delegated tasks by their respective assembly.

Another notable characteristic of decentralisation in Ghana is the system for local revenue generation. The District Assemblies are also tasked with raising taxes. As this system has not resulted in adequate collection of taxes, the District Assemblies Common Fund (DACF) was setup to ensure funding from the central government to each district based on a revenue-sharing formula approved by Parliament. Embedded in the Constitution, this fund ensures transfers to the district assemblies of "not less than 5% of the total revenues for Ghana" (CLGF 2014). While providing only 37% of district income, this system ensures that local government receives a guaranteed amount of income which can be used at its discretion, providing some amount of financial independence. It is likely if this system were expanded that some of the problems of accountability and effectiveness could be addressed, as a guaranteed amount of funding to be spent locally could enable more attention to local problems and greater accountability to local actors (Dickovick and Reidl, 2010).

2.2 INSTITUTIONAL CONTEXT: IMPLICATIONS FOR ENERGY

The urban institutional context regarding energy is sometimes complicated and has various shortfalls. This sub-section outlines key challenges posed by the institutional context to providing clean decentralised energy.

2.2.1 SOUTH AFRICA

Transport-related mandates are spread across different spheres of government. Urban rail is a national government function and most bus services are provincially controlled, making integrated transport planning difficult and inefficient. In addition different categories of roads are the responsibility of different spheres of government, even within an urban boundary. There is a move to create Transport Authorities in the large cities to assist in coordinated planning and implementation, but experience in eThekwini suggests that these authorities are not effective as they do not control the budgets – which still sit under the different government spheres.

Low-income housing delivery is primarily a national government function, which limits the ability of municipalities to develop and manage energy policies and practices for urban construction.

Some municipal areas have electricity distribution rights divided between both municipal Electricity Departments and Eskom for historical reasons, causing some confusion, planning inefficiencies and tariff differences in areas within one municipal jurisdiction.

Implementation of sustainable energy-related interventions touches on all of these areas in some way, which provides a challenge to local governments wanting to pursue a sustainable energy future in a way that may not align with, or may be more progressive than existing national or provincial plans. These challenges are currently being grappled with as cities with Energy Strategies work at furthering these agendas. The recent process of developing an Integrated Urban Development Framework (IUDF 2013) for the country is also likely to promote more effective urban governance and may reduce such institutional inefficiency.

2.2.2 UGANDA

The electricity supply chain has been mandated to a number of public, private and parastatal organizations (see **Error! Reference source not found.**). Retail distribution is the responsibility of the private company UMEME with oversight and price caps set by the National Electricity Regulation Authority.

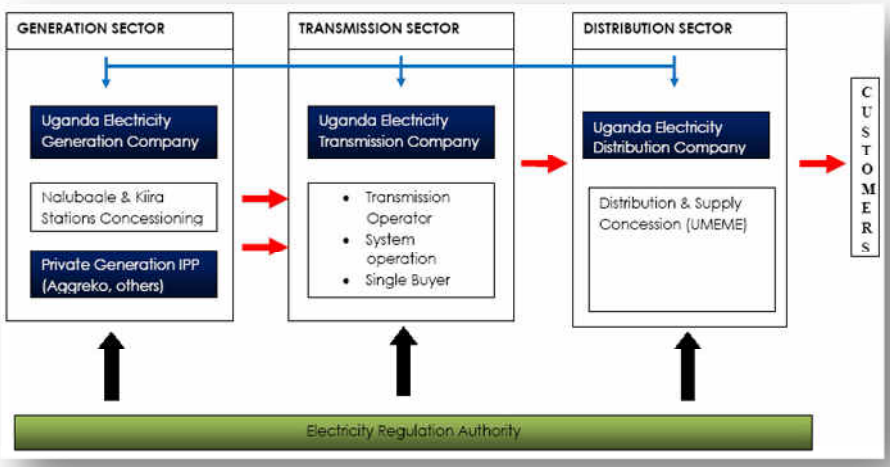


Figure 2-2 Actors in the Electricity Supply Chain in Uganda (Source: MEMD 2011)

A key challenge is the fact that UMEME has a near monopoly on direct electricity distribution, which prevents the entrance of new actors such as small- and medium-scale renewable energy providers. Implementation of sustainable energy-related interventions touches on all of these areas in some way, which provides a challenge to local governments wanting to pursue a sustainable energy future in a way that may not align with, or may be more progressive than existing national or provincial plans.

In the area of transport, new public service vehicles must be licensed by the Transport Licensing Board, an agency of the Ministry of Works. The minibuses based in Kampala are either supposed to be licensed for urban or inter-urban routes. There are, however, no limits imposed on the number of vehicles which can operate on either route and in practice vehicles seem to switch between urban and interurban services, particularly at weekends and holidays (World Bank 2005). Larger intercity buses are also ubiquitous and are often criticized for their safety record and the tendency to cause increased congestion in city centres. Efforts to even regulate highway speeds have been met with resistance and eventually abandoned.

Growing family sizes and migrations to cities have led to the subdivision of plots both within the more formal serviced urban areas as well as on the periphery in traditionally agricultural areas. This, in turn, has changed the character of the settlement form and, in the absence of any planning controls, has led to many plots lacking access to roads and other infrastructure. The official rules governing the subdivision of land are vague and vary based on the type of tenure (leasehold, freehold, or varying types of customary) and the particular point in Uganda's history in which the subdivision was made. With the passage of the Physical Planning Act in 2010, the entire national territory has been declared a national planning area, in essence, giving wider powers to control land use to the national, district, and – to some extent - local government offices. The practical effect of these new powers has yet to be fully evaluated, though some civil society organizations claim that the government has used, or will use this to evict households to make way for public or private sector investment initiatives.

2.2.2.1 GHANA

Oversight over the electricity sector in Ghana is organised through centralised Government bodies. The Energy Commission (Energy Commission Act 1997 (act 541)) regulates and manages the utilisation of energy resources in the country. As part of this role, the commission is the main technical regulator, responsible for granting licenses for gas and electricity distribution within the country. A separate Public Utilities and Regulatory Commission is responsible for overseeing the price development in the energy sector, ensure competition and monitor the operation standards of public utility provision. Additionally, the environmental protection agency (EPA) must assess the environmental impact of all new electricity generation projects before approval is given.

Whilst the Ghana energy sector has traditionally been dominated by the nationally owned Volta River Authority (VRA) and largely remains so today, steps have been taken to increase competition and private sector participation. The Volta River Development Act, 2005 (Act 692) loosened the monopoly on electricity transmission by allowing private companies to bid on public tenders to manage the national power grid. The current operator of the national transmission is GRIDCo. GRIDCo originated as part of VRA, but is now incorporated as an independent limited liability company. The national grid extends across the country, and is connected to those run by neighbouring SONABEL in Burkina Faso, and CEB in Togo and Benin. Together these grids comprise segments of the regional West African Power Pool (WAPP), facilitating a regional electricity market.

VRA continues to be the primary electricity generator in Ghana, responsible for nearly 75% of total installed capacity. However, several independent power producers have started introducing new generation facilities. Notable actors include domestic CENIT Energy Ltd, currently contributing 120MWh, and American General Electrics, who has presented plans for a 1000MWh plant to be ready by 2016. The rise of independent power producers has been encouraged by feed-in-tariffs for cogeneration plants, as well as various fiscal incentives offered as part of the recently introduced Renewable Energy Act. To further strengthen the role of independent power producers, efforts need to go into securing competitive pricing mechanisms on a central level, and reduce the inefficiencies of the transportations and distribution side.

New actors have emerged on both the generation and distribution side. Three different distributors now operate in the country: the Electricity Company of Ghana (publicly owned), The Northern Electricity Company, (a wholly owned subsidiary of the VRA) and Enclave Power Company. However, since these companies target distinct geographic markets, little direct competition is occurring. While hope persists that increased competition may lead to increased investments in distribution infrastructure, considerable losses are currently occurring due to outdated or poorly maintained equipment. The Energy Development and Access Programme, funded by the World Bank, is making some progress towards increasing the efficiency of ECGs distribution. However, the latest project reports reveal that as much as 25% of total generated electricity may never reach consumers, causing annual losses of almost $100 million and contributing to considerable waste of natural resources.

2.3 CROSS COUNTRY COMPARATIVE SUMMARY

Table 2-2 Summary and comparison of institutional context based on above literature

	South Africa	Uganda	Ghana
Institutional Frame			
	Three tiers of Government	Three tiers of Government	Two formal, three in practice
	Functionally separate but asked to support	Functionally separate but asked to support	Functionally separate; local tier mandated by MMDAs
	Coordinated by SALGA	Coordinated by ULGA	Coordinated by MLGRD
	Reality poor coordination		
Municipal Mandate			
	Municipalities are a seat of delivery	Municipalities are a seat of delivery	Municipalities are a seat of delivery
	Integrated plan should be available at municipal level	Integrated plans not quite available	Integrated plans not quite available
	Too short term – advocated a 30 year plan	Call for more coherent plans	
Finance			
	Raises revenue from rates and service delivery payments	Raises revenue from rates and service delivery payments	Raises revenue from rates and service delivery payments
	Receive grants	Receive grants	Receive grants
	Receive loans	Not able to receive loans (exception KCCA)	Receive loans (Subject to approval by Minister of Finance)
	Many have finances under stress	Many have finances under stress	Many have finances under stress
Key Challenges			
	Rapid urbanisation	Rapid urbanisation	Rapid urbanisation
	Lack of capacity to undertake service delivery	Lack of capacity to undertake service delivery	Lack of capacity to undertake service delivery
	Licenced electricity distributors		
Energy Mandates			
Transport	Rail National, Buses Provincial, Roads Various	Buses National, Vehicles National	Buses National, Vehicles National
Housing	Low-income housing National focus	Various, slightly uncertain	Various, slightly uncertain
Electricity	Municipal	National actor controlled	National actor controlled
Sustainable (or Renewable) energy	Dissonance between national and local plans		
	Institutional inefficiencies		

3 ENERGY CONTEXT: WHAT IS THE OVERALL URBAN ENERGY SITUATION?

3.1 URBANISATION SITUATION

3.1.1 SOUTH AFRICA

The total population in South Africa is growing at around 1% p.a., and the urbanisation rate in South Africa is 1.2% p.a. The population is predominantly urban, and currently 64% of the approximately 52 million total population live in towns or cities, of which 40% are located in the large metros. This is expected to increase to 70% by 2030 (StatSA 2011, IUDF 2013).

Cities and large towns produce 80% of South Africa's Gross Value Added (a measure of economic productivity), and home to around two-thirds of the population, but have some of the lowest densities in the developing world. South Africa is classified as an upper-middle income country but contains deep socio-economic inequalities (IUDF 2013). This is reflected in the rural-urban divide as well as within cities, as indicated by the significant informal housing sector (comprising 13% of the urban population) and lack of access by poor populations to city amenities. The apartheid urban form with all its disadvantages for the poor, as well as the negative implications for resource efficiency due to low overall densities, has changed little over the past decades.

There are a total of 286 municipalities in the country. From the point of view of identifying the most significant urbanization challenges in the country, it is useful to look at the urban settlements with both significant populations and high growth rates. National statistics indicate that amongst those that have around 100 000 population or above, growth rates in 26 of them are above 2% p.a., and 12 of them are growing at over 3% p.a. for the 2001-2011 period (see Appendix B). Only two are growing at over 4% p.a. for this period. To illustrate the implications of such growth rates, a 3.5% p.a. growth will lead to a doubling of population in 20 years. Given the lack of capacity in local government (see next section), unless major efforts are made to improve the situation it can be expected that such challenging urbanization rates will far exceed the municipality's ability to deal with the issue, with resulting stagnation or decline in welfare.

3.1.2 UGANDA

The current national population is approximately 36 million out of which 18.1% reside in urban areas (Uganda Bureau of Statistics, 2013). The population living in urban areas is increasing at a more rapid pace than the national average, at between 4-5 per cent a year, leading to a projected urban population in the year 2020 of 7 million, out of an expected total of 40 million. This increase in urbanization represents both a challenge and an opportunity for policy makers and the energy sector. The population density countrywide is roughly 137 per square kilometre (versus 101 in Ghana and 42 in South Africa). Though the capital city Kampala has the highest population of any city in the country, the area within the official city boundaries (189 km2) is large and the vast majority of structures are single story. However, informal low-income settlements in Kampala can house as many as 30,000 within a square kilometre. For comparison, Lira in northern Uganda has an average of 11,335 per square kilometre in its built-up areas.

Uganda is classified as a Least Developed Country with a Gross National Income per capita of US$ 420 p.a. (UN FAO, 2013). The capital Kampala, and many secondary cities, are experiencing a cumulative population growth of more than 4 per cent per year, with much new development occurring in sensitive environmental areas such as wetlands and fragile slopes or sprawling along the roadways out of town. By some estimates, over 60 per cent of capital city residents live in informal settlements lacking electricity, road access, drainage, or safe water sources (MLHUD, 2008). Individuals and families of up to eight live and often work in simple corrugated steel shacks with no ventilation, sanitation facilities, or lighting.

Political stability under the current government and the cessation of hostilities in the north have led to a marked improvement in macroeconomic indicators. However, poverty rates in urban areas have remained relatively constant over the last decade, at an official 14 per cent (MLHUD 2008). Although the story of urbanisation and poverty in Uganda is far from positive, the fact that only 13 per cent of Ugandans currently live in cities (UN HABITAT 2010) means that, unlike its more urbanised neighbours, Uganda still has a high

potential for setting itself on the road to sustainable urbanisation - including its efficient use of energy - if appropriate technologies and timely policies are put in place.

The form of Ugandan cities is often linear, especially in settlements that have developed since independence (1962). Many colonial town centres have changed little in their form, building stock and infrastructure and tend to feature rectilinear street patterns with single story structures making up a relatively small (1 – 2 km2) central business district (CBD). The only multi-story buildings tend to house banks or hotels, though the central axes of some towns do include rows of two-story structures combining retail with residential. In secondary towns, land use is often limited to commercial structures along central arterial roads, a small industrial quarter on the outskirts near an intercity road intersection, and residential districts with small retail filling the spaces between. Most homesteads outside of both the grid of the CBD and the informal squatter settlements have some portion of the plots engaged in agriculture or animal husbandry.

With the exception of some mountainous areas in the southwest and west of the country (Kasese included), the gentle sloping topography and clayey soils lead to a high incidence of swampy areas unsuitable for most construction. These present a problem for civil engineers in their attempts to provide infrastructure such as roads, piped water supply, sanitary and storm sewerage systems, and even electricity. On the other hand, unmonitored wetland areas are prime territory for squatter settlements which develop in the absence of any planning, clear tenure, or service provision. Conversely, the more valuable and better serviced real estate tends to be on the tops and sides of hills.

3.1.3 GHANA

The face of most Ghanaian towns has changed since independence and some of the underlying reasons identified by Adarkwa (2012) and Adarkwa and Poku-Boansi (2011) include increased population, enhanced economic circumstances, rapid expansion in the area extent of most towns, better distribution of employment opportunities than existed in the past and increase in vehicle ownerships. With the increase in population and unprecedented increase in demand for the limited housing units within the urban areas, most people displaced by the housing market have sought to move outside towards the peri-urban communities where land prices and property values as well as rents are relatively cheap. However, for those who cannot afford to pay rents nor acquire plots of land, they end up 'squatting' in uncompleted buildings or living in unathorised areas without basic amenities, eventually creating slums.

UN-habitat (2003) observes that today's true builders and planners of cities in developing countries are the urban poor who build houses and establish legal or illegal settlements where they can to make life comfortable at all cost. Accordingly, slums have been a major source of shelter for low-income people in most cities as it is less expensive to live there and very accessible to the poor (UN-habitat, 2003). The development of slums such as Old Fadama, AmuiDzor and Akwatia Line in various cities in Ghana attest to this assertion. Other city folks are compelled to live in particular areas because of recurrent forced actions such as demolition of unauthorized structures at unauthorized locations by the city authorities (Yeboah and Obeng-Odoom, 2010). Considering that the spatial structure of towns has remained essentially the same, most Ghanaian towns now experience congestion on virtually all their roadways (Adarkwa, 2012). Okyere (2012) and Adarkwa and Poku-Boansi (2011) for instance, have warned that if the private means of travel is not discouraged, the transportation system will be unsustainable in the future.

Due to the increase in overall demand for urban land uses especially, for offices and residential facilities, vertical development of structures should now be the norm to ensure optimum utilisation of the scarce land in most large cities in Ghana. However, lateral development is still dominating, resulting in the creation of the urban sprawl phenomenon in most metropolitan and municipalities in the country. This situation is partly attributable to the inability of planning authorities to successfully control physical development in the country. The environmental sanitation (cleanliness) in most Ghanaian towns has also declined tremendously in the wake of rapid increases in population and the inability of local governments to manage the situation adequately (Awortwi 2006, Oteng-Ababio, 2010). Aside the prevalence of heaps of solid waste across most residential areas, there is now a widely held view that Ghanaian cities particularly Accra, is engulfed in filth (Obour, 2012). Unfortunately, the Local Government Reforms since the 1980s, including the creation of many Metropolitan, Municipal and District Assemblies, appear to lack the potency in tackling these urban challenges

partly due to lack of professional personnel, financial resources and political commitments necessary to empower these structures adequately (Adarkwa 2012).

3.2 CURRENT ENERGY SITUATION

This section looks at the current energy situation for SAMSET countries, with a focus on overall energy consumption and supply. For a more detailed analysis on the non-residential and industrial sectors in Ghana, see 'The Nexus between Urbanisation and Energy in Ghana: A Literature Review' (Bawakyillenuo and Agbelie, 2014).

3.2.1 SOUTH AFRICA

Access to electricity in South Africa is determined by two important factors: 1) the number of households connected to electricity, either through the national grid or alternative sources such as solar panels and 2) the affordability of that electricity – poor households need to afford electricity to benefit from its use. Below is a breakdown of the current situation and an outline of policies attempting to address these two factors.

In 1994, a key objective of the newly elected government was universal access to electricity for all of its citizens by 2012. To this end the government embarked on an accelerated national electrification programme, targeted at low-income households under the Integrated National Electrification Programme grants (INEP). Household electrification dramatically increased from 36% in 1994 to 87% (an additional 5.7 million households and mostly in urban centres) in 2012 (DoE, 2012), a significant milestone for South Africa and unprecedented internationally. Household electrification was increased from 36 % in 1994 to 87 % in 2012.

The government recognised that due to infrastructure and electricity generation constraints, rural/urban migration and increasing growth rates the electricity demand of households meant that the goal of universal access would be difficult to achieve within the initial timeframe. The Department of Energy (DoE) subsequently developed a new Electrification Roadmap which sets a new target of 97% access by 2025. The intention is to electrify about 3 million more formal households via the grid (accounting for 90% of backlogs) and about 300,000 households with high-quality non-grid solar home systems to address current backlogs (DoE, 2013).

Household energy use patterns emerging over the last 10 years show an increased uptake in electricity to fulfil basic household energy needs over time particularly with respect to lighting and cooking– see Tables 3.1 and 3.2 below. The use of electricity for cooking has shown the largest increase (23%) relative to other end uses. According to the 2011 national census data, 85% of households have access to electricity. This figure is based on those using electricity for lighting and includes approximately 1.1 million households that are not metered. If this figure is added to the 2.2 million households not receiving electricity according to the national census, then proportion of electrified households declines from 85% to 77%. In attempting to enable poor households to afford the use of electricity once they are connected, the government introduced Free Basic Electricity, which allows indigent households 50kWh of free electricity per month in order to meet basic energy needs. However, access to FBE does not reach all indigent households.

A number of structural and institutional challenges continue to prevail. There is a divergence in the implementation approach of FBE between Eskom and municipalities. Poorer municipalities experience limited technical and human resource capacity to implement FBE. With the introduction of the new equitable share formula, these constraints may to some extent be alleviated if LGES is implemented in practice. The lack of adequate electricity distribution infrastructure predominantly in rural areas gives rise to many households not benefitting from FBE. The lack of compatible and coordinated billing, collection and vending infrastructure in the administration of FBE hampers the success of the FBE as a pro-poor instrument. High levels of electricity theft in some areas render FBE irrelevant.

Another challenge is that poor households are burdened with relatively high energy costs. On average poor South Africans spend 14% of total monthly household income on energy needs (DoE, 2012). According to the survey undertaken by the DoE in 2012 (which explores energy related behaviour and perceptions in South Africa with a focus on energy poverty), 47% of South Africans are energy poor as they spend more than 10% of their income on energy needs. Energy poverty also manifests itself in the persistent multiple fuel use patterns displayed by poor households across South Africa despite being electrified. This means that almost 7 million

households continue to largely rely on unsafe, unhealthy forms of energy such as paraffin, coal and biomass, when they cannot afford to buy electricity.

3.2.2 UGANDA

Uganda's energy supply consists mainly (90 per cent) of biomass fuels with hydroelectricity and petroleum accounting for the remainder. The burning of wood for cooking is the most common in rural areas, whereas charcoal represents a larger share of the biomass used in cities. Wholesale charcoal prices vary from city to city depending, most likely, on the distance to the nearest stand of forest: in northern cities (Gulu, Lira, Masindi), a 50kg sack of charcoal sells for UGX 25,000 (USD 0.20 per kg), whereas in cities around Lake Victoria (Kampala, Mbarara) a sack sells for UGX 45,000 to 55,000 (USD 0.36 to 0.44 per kg). Due partly to the high consumption of charcoal throughout the country (but highest in urban areas), forest cover in many rural areas of the country has been reduced to as low as 5 per cent (National Forest Authority of Uganda 2007).All petroleum products are currently imported, but this could change within the next five years as domestic oil supplies are planned to be tapped and refined in-country. Three foreign companies have completed oil exploration, estimated the Ugandan reserves at 1.7b barrels, and are negotiating with the government for the approval to commence production. One point of contention between the parties surrounds the construction of an oil pipeline and refinery with a daily capacity of 200,000 barrels. The time required to bring these online implies that oil production cannot begin until at least 2018 (Tullow 2013, interviews with stakeholders). Using current global oil prices, the government of Uganda stands to earn roughly USD 50 billion over the course of production. Comparing this to the national GDP in 2011 of USD 17 billion and the annual average foreign aid of USD 2 billion, it is easy to see that the oil in the Lake Albert region could have significant impacts on the Ugandan economy. It is important to note, however, that the oil fields are not the easiest to access and considering the landlocked location of Uganda there is a significant cost associated with delivering oil (crude or refined) to international markets. The calculations of financial viability of the entire project were based on 2008-2009 oil prices (over USD 120/ barrel). As these prices begin to descend, the promise of profitability of the venture begins to dim and investors may either a) look for less expensive exploitation and conversion solutions, or b) focus on oil fields in other countries. Electricity accounts for only 1.4 per cent of the national energy supply. As of 2009, electricity consumption per capita in Uganda was estimated at 69.5 kWh, significantly lower than Africa's average of 578kWh (MEMD 2011). Nationwide, the few residences (less than 7 per cent of population) and businesses that are connected to the electrical grid create a peak demand of 528MW out of which 74 per cent is used for commercial and industrial purposes. The installed capacity is reported to be 595MW, but load shedding is very common throughout Uganda resulting in large urban and rural areas remaining without power for many hours of the day. The daily shortfall is estimated to be between 130 and 190 MW (ibid).

As stated above the electricity supply chain has been mandated to a number of public, private and parastatal organizations (see figure 2.2 above). Retail distribution is the responsibility of the private company UMEME with oversight and price caps set by the National Electricity Regulation Authority. The high reliance on diesel power generation is blamed for the relatively high electricity tariffs. After government subsidies, customers currently pay USD 0.25/ kWh and as government reduces the subsidy as intended, this could rise to USD 0.32/kWh in the near future. If Uganda were to reach the continental average electricity consumption per capita, a household of five persons would have an annual unsubsidized electricity bill of USD 925. When compared to the current average annual household expenditure of USD 1,118, it is clear that stable access to grid electricity will be reserved for industry, commerce, and the higher income (urban) households for the foreseeable future.

Plans and initiatives are underway to bring small and large new hydroelectric plants online over the next decade. Other proposals exist to create a solar thermal plant (200MW), though details are still emerging (see forthcoming Policy Case Study) and an oil thermal plant (700MW) which would receive the partially refined crude from the Lake Albert region.

With funding from GEF, Uganda carried out a Green House Gas inventory of sources and sinks in 1993. The study was implemented by UNEP and coordinated by the Department of Meteorology. The inventory also included general recommendations including enhancing the framework of GHG emission measurement. Due to a lack of funds, the inventory has not been updated annually, as was originally planned. In mid-2014, the United Nations Development Programme made initial steps to the updating of the inventory.

3.2.3 GHANA

It is empirically evident from the literature that different forms of energy exist across the various energy sectors of the economy ranging from woodfuel to LPG and candles to electricity for cooking and lighting among urban residents. Petroleum products are dominant in the non-residential sector with the transport sub-sector consuming the bulk while woodfuels, charcoal and electricity are widespread in the residential sector of urban Ghana. The empirical pattern of changes in preferred fuels and fuel use transition shows that Ghana is gradually moving from woodfuel to charcoal and gas energy sources for domestic activities such as cooking and heating water in urban areas of Ghana. Some institutions in the urban centres such as schools and hospitals are also adopting renewable energy technologies such as solar energy to complement their electricity consumption and biogas energy technology to supplement the cooking energy sources.

Ardayfio (1986) identified that since the 1980s energy needs in the residential sector of Ghana have been mainly domestic particularly regarding lighting and cooking. A technical paper by the Energy Sector Management Assistance Programme (ESMAP) in 2006 covering four countries including Botswana, Ghana, Honduras and Senegal revealed that households in Ghana use a great variety of fuels and energy sources ranging from candles, car batteries and crop residue. However, fuelwood is the dominant energy (constituting about 84.4%) being used in the rural areas for cooking and water heating, whiles charcoal dominates in the urban areas for cooking and water heating; a result also confirmed by Rupp (2013) after studying the politics of energy in some urban centres of Ghana. Deforestation is estimated at around 65,000 ha/year and results in an annual cost of degradation of about 3.5 percent of Ghana's GDP due to over-exploitation of the trees for timber and wood fuel; illegal logging in reserve forests; mining activities; and rampant bushfires (World Bank, 2006).

A survey conducted by Brew-Hammond *et al*. (2011) within three slums in Ghana including, Old Fadama, AmuiDzor and Akwatia Line identified that slum dwellers in the urban centres use a wide range of energy resources for several purposes including, lighting and cooking. The study unveiled that charcoal use accounted for 73.9% of households' total energy consumption for cooking at the domestic level in the slum and the use of firewood and sawdust accounted for 10.6% and 0.5%, respectively of the total energy-mix for domestic cooking. The survey identified only charcoal pots of different types as the technology used by households for the conversion of charcoal to heat energy for cooking at home while firewood was used in the traditional three-stone stoves (92%) and "improvised stoves" made from iron rods (8%) in the three slums. Despite the Ghana Government's goal to encourage the use of modern cooking fuels such as Liquefied Petroleum Gas (LPG), the contribution of LPG to the total household cooking fuel mix was just 4.6% in the three slums. The situation is further compounded by the preference, which households have for charcoal relative to the modern forms of cooking fuel such as LPG and electricity, due to the high cost associated with them. However, a higher proportion of households which use various forms of energy fuels for cooking in the three slums revealed in the survey that they would prefer to use electricity and LPG as fuels for cooking if their affordability is enhanced. This conforms with the pattern of preferred fuels and fuel transition choices revealed by the ESMAP (2006) report, which showed that Ghana is gradually moving from woodfuel to charcoal and gas energy sources for domestic activities such as cooking and heating water.

The ESMAP report (2006) and the Ghana Statistical Service (2008) identified that electricity is the main source of lighting for close to 79 per cent of urban households in Ghana. Brew-Hammond *et al*'s (2011) work in the three slums lends support to this assertion. Further analyses of the study showed that an average of 56.4% of the households acquired their electricity connection from the Electricity Company of Ghana (ECG) and thus had electric meters. Though 'illegal', the remaining households (43.6%) acquired their electricity connections from their neighbours, and sometimes directly from electricity poles erected in the slums resulting in some estimated GHS888, 858 annual losses in revenue to ECG. The study further identified that about 9.5% and 2.3% of the households in the slums used kerosene and candles, respectively, as their main forms of energy for lighting because they did not have electricity connection in their dwellings.

Electricity, though highly consumed for domestic lighting purposes especially in urban Ghana, is barely sufficient in supply for the growing demand. The 2011 annual installed capacity of energy generation (i.e. 1960 MW) must be increased to 9,405.59 MW, assuming 85% plant availability, to be able to cope with the growing demand and to ensure countrywide access as well as support commercial and industrial activities for the growth of the economy (Essah, 2011). Currently, hydro and thermal facilities generate about 67% and 33%

respectively of the electricity in the country to meet the estimated 66% electricity demand (Energy Commission, 2012), with marked persistent rolling blackouts (Rupp, 2013). Quartey (2010) analysed the welfare effect of alternative energy sources used during the 2007 power crises by computing income lost by having to spend on alternative energy for lighting by households from two cities; Kumasi and Wa in Ghana. There was a decline in the welfare of households as a result of the power outages and the poor were the worst affected losing about 10% of their average monthly incomes as a result of alternative arrangements for lighting. The "*better-off*" by Ghanaian standards were the least affected losing only 0.33% of their average monthly incomes.

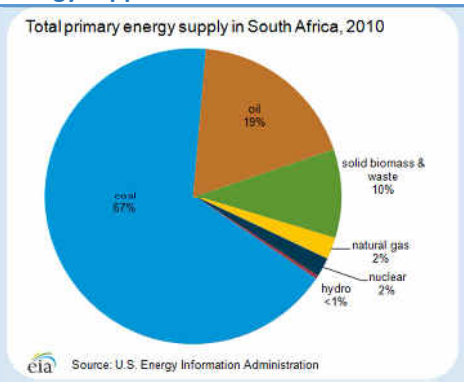
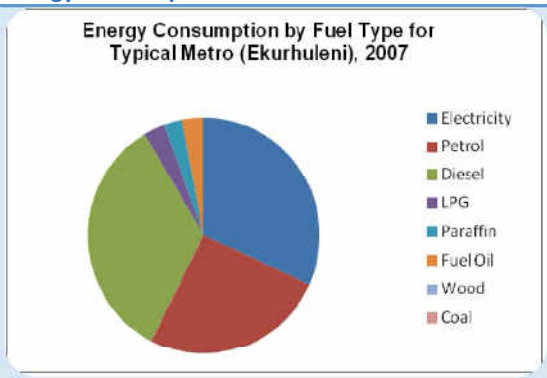
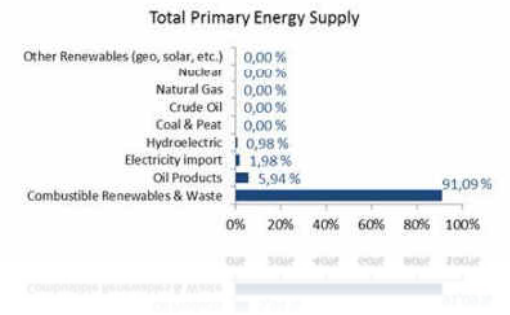
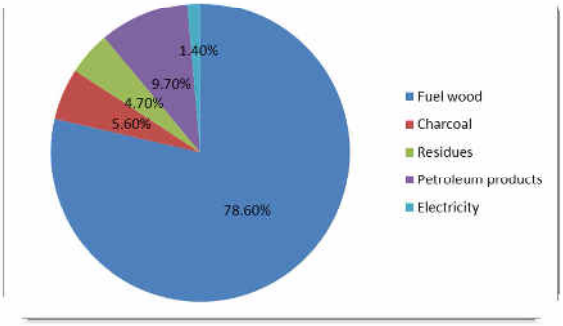
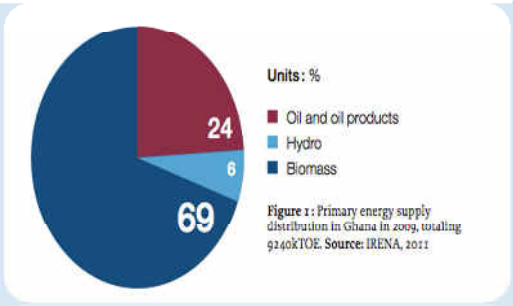
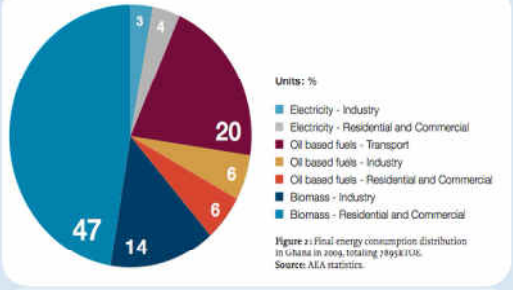
Despite the overarching potential of renewable energy in the country, this source of energy remains one of the least tapped energy resources in Ghana (Energy Commission, 2010; 2012). Painuly and Fenhann (2002) identified some barriers associated with the installation and usage of solar water pumps (SWP) and biogas in some urban households in Ghana. According to their study, the most important barriers identified for solar technology in general and SWP in particular are the high initial cost and a general lack of information. Resource (dung and water) unavailability, the absence of favourable promotion policies and financial schemes and the unwillingness of people to use biogas for cooking remain the main barriers to biogas implementation in urban Ghana. Lack of technical know-how in the various bioenergy companies, economic conditions and supply chain coordination were identified by Gabienu (2012) as the factors affecting the bioenergy industry in Ghana. Nevertheless, Dafrallah et al. (2010) noted that, with respect to the development of biofuel as an alternative energy source in Ghana, an estimated 2.7 million hectares of land are either under cultivation or have been earmarked for jatropha cultivation, representing 11% of total land area and 19% of total agriculture land respectively.

3.3 CROSS COUNTRY COMPARATIVE SUMMARY

Table 3-1 Population and urbanisation data

	South Africa	Uganda	Ghana
Population	53 Million	36 Million	23 million
Urban population	64%	18%	53%
Population Density (People per sq. Km)	42	137	101
Countryside population Growth	0.1%	3%	1%
General city growth	2-3%	4-5%	3,8%
Key city growth	Over 4%	Over 4%	3,1% (Accra)
Key City Population Density (People per sq. Km)		7-9000	10000 (Accra)
Proportion living in Key city in informal settlement		60%	

Table 3-2 Energy supplies and Energy consumption for each country

	Energy supplies	Energy consumption
South Africa		
Uganda		
Ghana	 Figure 1: Primary energy supply distribution in Ghana in 2009, totalling 9240kTOE. Source: IRENA, 2011	 Figure 2: Final energy consumption distribution in Ghana in 2009, totaling 7895kTOE. Source: AEA statistics.

4 ISSUES: WHAT ARE THE KEY ISSUES (I.E. PROBLEMS AND OPPORTUNITIES) AROUND SUSTAINABLE ENERGY IN SASMET COUNTRIES?

This section identifies key issues around sustainable energy in the three SAMSET countries. Because each context is different, issues are only applied to the countries where they are more relevant or most discussed in the literature available.

4.1 CITY PLANNING AND PROBLEMS OF URBAN SPRAWL

The town and county planning authorities in Ghana, aside being poorly resourced, also lack the political will to efficiently plan and develop the cities. This has given way to the development of urban sprawls and slums that are actually defining the shape of Ghanaian cities.

Informal settlements also affect South Africa where Apartheid-based urban layout led to poorer historically black communities located on marginal land. Although service delivery programmes have prioritised these areas since the advent of democracy in 1994, the spatial aspects of the apartheid urban form change slowly and still prevail. In fact some argue that it is now harder to change this inequity due to its being entrenched by the infrastructure investment programmes which targeted these areas (IUDP 2013 p16). Currently 13.6% of the population live in informal housing, with around 1.96 million informal households living in about 2 700 informal settlements across South Africa.

Uganda has slightly different forces working on its urban layout. Growing family sizes and migrations to cities have led to the subdivision of plots both within the more formal serviced urban areas as well as on the periphery in traditionally agricultural areas. This, in turn, has changed the character of the settlement form and, in the absence of any planning controls, has led to many plots lacking access to roads, water, sanitation, and other infrastructure. The official rules governing the subdivision of land are vague and vary based on the type of tenure (leasehold, freehold, or varying types of customary) and the particular point in Uganda's history in which the subdivision was made. In practice, any rule that may prohibit subdivision, a particular land use, or require extension of services can be contravened with little or no resistance from authorities either because they lack the capacity to enforce these or are willing to turn a blind eye.

4.2 TRANSPORT – UNREGULATED AND UNDERSERVED PUBLIC TRANSPORT

Given the urban sprawl mentioned above, transport becomes a key issue in energy consumption. In South Africa, its sprawling, low density cities have been inherited from days when transport costs were low, land more freely available, and the interests of the wealthier white car-owning population were being served above the majority of the population. This has resulted in energy inefficient cities where transport energy demands, and thus expenditure, are high, where dependence on private vehicle use is widespread, and where infrastructure costs to provide adequate public transport are prohibitive.

In order to address these challenges transport-related mandates are spread across different spheres of government. Urban rail is a national government function and most bus services are provincially controlled, making integrated transport planning difficult and inefficient. In addition different categories of roads are the responsibility of different spheres of government, even within an urban boundary. There is a move to create Transport Authorities in the large cities to assist in coordinated planning and implementation, but experience in eThekwini suggests that these authorities are not effective as they do not control the budgets – which still sit under the different government spheres. A similar situation persists in Uganda, where there is no clear, coordinated effort in Ugandan cities to regulate freight road transport. Inconsistent application of minor traffic regulations (e.g. missing tail light) is left to police officials. It is difficult to imagine the success of any energy consumption reduction-based regulations without proper financial incentives for the officers tasked with enforcing them.

The management of transportation systems is also an important issue. In Ghana, congestion on virtually all the roadways due to the increasing number of private cars has put immense pressure on the exiting transport facilities in the country. In both Ghana and Uganda intercity public transportation is dominated by 14-seat minibuses (*matatu* or *taxi*) whose coverage, routes, pricing, and emissions lack any oversight or coordination

from central authorities. Municipalities also lack the mandate or resources to provide public transportation within urban jurisdictions leaving most residents to rely on almost unregulated minibus taxis. In Uganda and Ghana there is significant use of commercial motorcycles or, for those with the means, private cars. Attempts to regulate the number and operation of minibuses and motorcycles is consistently met with organised resistance from influential vehicle owners.

Improving transport efficiency and travel avoidance is needed, which includes:

- densification or corridor densification of urban areas
- provision of public transport
- more efficient modes of transport (e.g. elec vehicles)
- demand-side measures such as private vehicle occupancy increases
- mixed use zoning to reduce travel needs

4.3 ENERGY EFFICIENCY – NOT HIGH ON 'PRACTICAL' AGENDA

Energy efficiency is generally recognised as important, but it often ranks below other energy issues in SAMSET countries. In Ghana Apeaning (2012) revealed that the Government of Ghana has over the years made significant efforts to improve energy efficiency and management in Ghana through formulating policy instruments and initiating energy efficiency schemes and programs. However, there still remains a huge 'efficiency gap' in the industrial sector as government's efforts to improve energy efficiency has been directed towards residential and commercial sectors of the economy. Access to electricity has increased significantly since the National Electrification Programme in 1989, from 28% in 1988 to 43.7% in 2000 and about 66% in 2010. However, while household access in urban areas is 81% rural households' access is 24.9% (Energy Commission, 2012). Similarly in Uganda we find programmes such as the Promotion of Renewable Energy and Energy Efficiency Programme – managed by GTZ (now GIZ) which included Energy Audits of government buildings, training of staff, subsidising solar systems and energy efficient charcoal stoves. And 'Energy Efficiency Week' an event held annually since 2006. The Energy Efficiency weeks are organised by the Ministry of Energy and Mineral development for all stakeholders.

In South Africa energy efficiency is a lower priority due to an abundance of low cost energy in the country largely because of significant cheap coal availability and a historic electricity generation oversupply. This lack of interest in energy efficiency continues to spill over into the construction industry. Large-scale state sponsored low-income housing programmes have delivered almost 3 million houses in the past decades. However because the success of the programme was measured by delivery numbers, the houses were generally poorly built structures with no ceilings, and were located on the urban margins where land is cheaply available. As a consequence these houses often have poor thermal performance and perpetuate the low density urban characteristic. Poor residents therefore remain far from economic opportunities, benefit little from urban amenities and have high transport costs.

Improving electrical energy efficiency is needed in the building sector (commercial and residential), which involves ensuring that new buildings are energy efficient and retrofit programmes to address existing stock (e.g. solar water heaters and LED lighting).

4.4 RENEWABLE ENERGY – WILLINGNESS TO ENCOURAGE QUESTIONABLE PRACTICES

Another challenge lies in the willingness of governments to encourage (or not actively discourage) questionable energy practices. Households and enterprises in Ghanaian urban areas have shown high willingness to pay for alternative power sources irrespective of their pollution status. This is evident from how quickly most enterprises and some households switch onto diesel powered generators in case of power outages in the cities. Notwithstanding the high willingness to pay for alternative power sources especially, renewable energy technologies, this potential has not been maximised. Government has made little attempt in terms of appropriate policies and institutions to provide supplementary "greener" energy sources in order to take advantage of the willingness of Ghanaians to adapt to more reliable energy sources.

In South Africa due partly to the culture of centralised energy decision-making, decentralised small-scale embedded generation is developing slower than optimal – such as rooftop solar PV. Low adoption of energy

alternatives such as renewable energy because of historically low energy prices. This has started to shift because of higher local energy prices and steadily decreasing renewable energy prices internationally, and national government has recently launched a large scale renewable energy programme targeting several '000 MW of primarily wind and solar electricity generation.

In Ghana this issue is noted in the development of biogas and biomass plants. Bensah and Brew-Hammond (2010) reviewed biogas installations in Ghana and investigated the challenges facing their design, construction and operation. According to their findings after surveying 50 biogas installations, 58% belonged institutions, 28% were household installations in various urban centers and the remaining 14% were community plants. 44% of the 50 plants were found to be functioning properly whiles 32% were not functioning or abandoned. Having revealed that sanitation was the main motivational reason for people using biogas plants, the study recommended the development of a national biogas programme with focus on three major areas: sanitation, energy, and agricultural fertilizer production and also support the development of standardized digester models. The study of Arthur *et al.* (2011) concluded that, there are vast biomass resources including organic waste in Ghana that have the potential for use as feedstock for biogas production to reduce the over reliance on woodfuel and fossil fuel.

What is needed in all three countries is a greater share of renewable electricity generation in the mix, including smaller decentralized electricity generation options such as rooftop solar PV and landfill gas generation

4.5 ENERGY ACCESS AND POVERTY – AN OPPORTUNITY?

The detrimental effects of energy poverty makes increasing energy access a clear need. For example, the situation in Ghana poses three challenges to addressing energy poverty. First, modern forms of cooking energy are available in the urban areas of Ghana, but are inaccessible to majority of urban poor who live in slum areas and peri-urban areas. Government promotion of modern cooking energy including, LPG, biogas and improved cookstoves in the urban areas seems to be yielding little result among these people, even though they wish to transition to such forms of cooking energy. Second, energy for lighting in urban Ghana is predominantly electricity dependent. It is available to almost all urban dwellers, but is inaccessible to the urban poor who still depend on candles for lighting or get connected illegally from their neighbours. Third, the choice of cooking energy in urban Ghana depends on a number of factors including household income, supporting the energy ladder hypothesis. The literature confirms that access to modern forms of energy increases as income levels increase. Other determinants include developmental processes in the country, educational level of the household head, income-earning activities of the household members, the frequency and the types of food cooked in the household and the prices of the modern forms of energy.

The way that energy access is increased for the poor can also be an opportunity for cleaner energy use countrywide. In South Africa some of the initiatives to address the challenge of energy poverty are also relevant to other SAMSET countries:

- thermally efficient housing
- use of efficient technologies such as solar water heaters
- reducing the travel cost burden through better located land, improved public transport and mixed-use zoning to reduce travel needs
- Ensuring universal access to electricity
- Managing affordability of electricity for the poor to reduce the poor turning to of less safe and efficient energy sources

4.6 SUPPLY OF ELECTRICITY - DECENTRALISATION

The decentralised supply of electricity remains a key challenge and opportunity for all three SAMSET countries.

In Uganda, the electrical grid reaches an estimated 15% of Ugandan households. The percentage in urban areas such as Jinja and Kasese is significantly higher. However, load shedding is very common throughout Uganda resulting in large urban and rural areas remaining without power for many hours of the day. The daily shortfall is estimated to be between 130 and 190 MW (MEMD 2011). Similarly in Ghana though available in the urban centres, the supply of electric power is also very unreliable, marked by persistent power fluctuations

and black-outs. As a result, many people have resorted to the use of diesel generators, with high pollution levels, to satisfy their energy electricity needs.

Just like households, enterprises also suffer from persistent power cuts in many urban areas of Ghana. According to Quartey (2010) enterprises in Kumasi and Wa suffered welfare losses in varying degrees during the 2007 power crises. The total payments for electricity by Micro, Small and Medium Enterprises (MSMEs) when there were no power outages was GH¢1,554 while the expenditure on alternative electricity sources was GH¢1,734 for lighting purposes. This left a deficit of GH¢180 per month for MSMEs. The results further indicated that the Total Willingness to Pay (TWTP) for the 2.4 million urban households in Ghana (GSS, 2008) stood at GH¢1,006,320 (US$628,950) for a 24 hour consumption of electricity from a reliable alternative source of electricity. Despite the significant progress, both the Volta River Authority (VRA) and the Electricity Company of Ghana (ECG) have been burdened by under-investment in their power distribution system, overloaded transformers and distribution networks, and the continued use of obsolete equipment, all of which resulted in high distribution system losses, poor electricity supply, and unreliability issues (World Bank & MIGA, 2004; Energy Commission of Ghana, 2006). The poor fiscal management is evidenced by the 144.9 million USD debt relief that was granted to the VRA and 95.06 million USD to ECG in 2004 (World Bank & MIGA, 2004).

South Africa meanwhile has a strong developed national network of electricity supply. Municipalities are responsible for sales of electricity, and historically, one of the barriers to implementing energy efficiency and some renewable energy options has been the reduced municipal electricity sales that would result, and the corresponding reduction in revenue generated by municipal electricity distributors. Because electricity revenue is such a key source of revenue for many municipalities, and there is increasing pressure on these finances for infrastructure upgrades and service delivery, these threats resulted in little headway being made for many years. However, today pressures are such that municipalities are obliged to proceed with sustainable energy interventions in spite of such concerns. A study undertaken in 2012 (and currently being refined), showed the extent of revenue loss that could be expected. While they are significant (typically between 2 and 5% of revenue within 10 years) , municipalities are at least now able to put plans in place to ensure that their revenue is protected while still promoting such sustainable energy interventions (SEA 1012a). Some municipal areas have electricity distribution rights divided between both municipal Electricity Departments and Eskom for historical reasons, causing some confusion, planning inefficiencies and tariff differences in areas within one municipal jurisdiction.

4.7 POLICY – URBAN PLANNING AND ENERGY SUSTAINABILITY LINKED

The above areas of focus make it clear that urban planning and energy sustainability are closely related, and require an adequate policy and regulatory framework, and importantly, national and local capacity within government to implement them. As the National Development Plan points out, while South Arica has well considered policies and strategies in general, the capacity of government to take these forward is uneven, and often highly inadequate (NDP 2011). Detailed assessments of local government capacity confirm this (PDG 2012). In Ghana, institutional arrangements to promote clean energy technologies have improved over the years. What is perhaps missing is the lack of strong and sustainable institutional and policy support to enhance clean energy technology development. Education, awareness creation and provision of incentives for technologies such as solar PV and improved cook stoves are insufficient or non-existent, resulting in their low patronage.

Governments usually target energy policies to benefit the poor, yet the poor have failed to reap the benefit of these policies. In Ghana, Bawakyillenuo (2009) contextualized the link between inadequate government institutional and policy frameworks and the low level of Photovoltaic Solar Home System (PV/SHS) dissemination in rural Ghana. The study found that effective institutional, regulatory and policy structures act as ‘stimulants’ to solar PV/SHS dissemination. After reviewing energy institutional arrangements for Ghana, the study revealed the non-existence of a dedicated national institution solely for the development and promotion of solar PV and other Renewable Energy Technologies (RETs). Similar findings were obtained when Bawakyillenuo (2012) revealed that a gamut of socio-economic and political antecedents informed the varied dissemination outcomes of PV technology in Ghana, Kenya and Zimbabwe.

4.8 ENERGY MARKETS – BEGINNING TO AFECT BEHAVIOUR

Energy markets affect the behavior and construct of the use of electricity. In South Africa, a recent electricity supply crisis took place due to demand growth coupled with complacency of electricity planning decision-makers after a long history of oversupply. The resulting blackouts have promoted more prudent use of electricity. Recent fast rising electricity prices to fund the urgent new generation build programme, and steady liquid fuel price increases linked to international market prices. This has also promoted more efficient use of energy.

In Uganda due to lack of planning, long construction lag times, and few governmental resources to construct hydroelectric (or other) plants and transmission lines, severe electricity shortfalls have been experienced in the last decade. The central government policy is currently encouraging the entrance of private plant construction and operators into the market. In addition, the retail distribution market has been privatised. Though electricity supply has stabilised in the capital city, the above changes do not seem to have allowed consistent supply to upcountry towns nor reduced consumer prices.

In Ghana, Bawakyillenuo (2009) found the policy of stepped energy costs (whereby the unit cost of electricity is tied to the amount consumed), although intended to benefit low electricity consumers and thus the poor, at times had the opposite effect. This strategy fails to take into account the energy management strategy of the poor, many of whom share the cost of one electricity connection, in order to save money. This means that the combined electricity consumption quickly reaches the higher unit cost rate. The study concluded that households' long-term aspirations and investment were curtailed, in Ghana by the shock of energy price rises. Poor households adopted three main strategies to accommodate these energy changes: switching to cheaper energy options; reducing the overall consumption of energy and reducing their expenditure on non-energy goods (Meikle and Bannister, 2003).

4.9 CENTRALISED ENERGY PLANNING

Centralised energy planning is a key issue in clean energy production. South Africa has a history of centralised energy planning – historically such planning was undertaken de facto by Eskom – the national electricity utility - and the oil companies, and driven by the need for energy security in the face of apartheid sanctions. This has shifted and national government now has a stronger planning role, but the culture of centralized planning persists, and the strong role of municipalities in directing the country's energy future remains inadequately recognised. Despite this, energy planning capacity in a few South African cities has developed markedly in the past 5 years in particular, and such capacity is increasingly being institutionalized (SoE 2011).

In Uganda, the urban institutional context regarding energy is sometimes complicated and has various shortfalls. Amongst these is the fact that UMEME has a near monopoly on direct electricity distribution, which prevents the entrance of new actors such as small- and medium-scale decentralised renewable energy providers. Implementation of sustainable energy-related interventions touches on all of these areas in some way, which provides a challenge to local governments wanting to pursue a sustainable energy future in a way that may not align with, or may be more progressive than existing national or provincial plans.

4.10 CROSS COUNTRY COMPARATIVE SUMMARY

Table 4-1 Key issues around sustainable energy

	South Africa	Uganda	Ghana
City Planning			
	Sprawling historically spacious cities	Sprawling historically spacious cities	Sprawling historically spacious cities
	Apartheid based layout	High subdivision rates	
	High urbanisation rates	High urbanisation rates	High urbanisation rates
	Growth in informal housing	Growth in informal housing	Growth in informal housing
		Tenure systems complicate efforts to plan	
Transport			
	Public transport costs prohibitive – high use of cars	Public transport costs high, but few alternatives	Public transport costs high but few alternatives
		Congestion at peak times	Congestion all the time
Energy Efficiency			
	Low cost energy	High cost energy	High cost energy
	Poor thermal performance	HHs lack resources to invest in EE stoves	HHs lack resources to invest in EE stoves
	Centralized energy decision-making	Centralized energy decision-making	Centralized energy decision-making
Consumer Attitudes			
	Consumers very mobile between fuels	All income groups prefer biomass for cooking	High willingness to pay for alternative power sources
		Very conscious of electricity costs; CFLs ubiquitous	Low income consumers using Biomass and LPG
Policy insights			
	Has developed plans, but local capacity to implement questionable	Few implementable plans exist	Has general interest in clean energy but often in context of poverty
	High carbon footprint due to Coal	High use of Biomass	High use of Biomass
Municipal Revenues			
KEY DIFFERENCE	Municipal authorities gain income through electricity sales.	National Electricity	National Electricity

5 LESSONS FOR SAMSET: WHAT ARE APPROPRIATE APPROACHES GOING FORWARD AROUND SUSTAINABLE ENERGY TRANSITIONS AT LOCAL GOVERNMENT LEVEL?

This section reviews literature and suggests approaches that SAMSET could adopt. These are applied to countries where relevant. All nine approaches are depicted in Figure 5-1.

Figure 5-1 Graphic showing common 'action issues' for clean energy transitions

5.1 COORDINATING INITIATIVES

SAMSET will continue to search out new partners and synergies as the project progresses. From an initial assessment there are some clear opportunities for coordination. These range from coordination with initiatives such as Sustainable Energy Africa (South Africa), GIZ-led PREEEP programme (Uganda), UN-HABITAT's efficient buildings initiative at the Housing Directorate of MLHUD (Uganda), and marketing of household-level solar lighting throughout the Kasese District (Uganda). For more details on specific initiatives, see the individual country papers.

5.2 SHARING BEST PRACTICE

In each of the SAMSET countries, where one municipality has pioneered approaches in a particular area, others feel much more confident in moving forward in that field. Bureaucrats tend to be conservative by nature. Taking the lessons of the pioneering cities to the smaller cities and towns may present a worthwhile focus.

5.3 ENCOURAGING COORDINATION BETWEEN GOVERNMENT DEPARTMENTS

Transport and urban form change very slowly. The two are closely interrelated, yet sit in separate municipal departments which do not work together effectively in most cases. Given that shifts in urban form are a critical component of sustainable transport implementation, cooperation facilitation between these departments in an important future focus area. This may be most critical in smaller, fast growing towns, where capacity to engage with these issues is limited yet consequences of poor planning are serious and manifest quickly.

5.4 INCREASING CAPACITY OF MUNICIPALITIES

The capacity constraints of municipalities is unlikely to shift significantly in the medium-term. Ongoing support will be necessary and will be well used. Yet the SAMSET project needs to see that in 4 years when it is complete, the areas where it has been active are able to continue developing. Experience shows that in some areas, support is needed only to establish new ways of operating, and once this is in place there is limited need for extra capacity for them to continue on the new trajectory. SAMSET will need to keep this in mind.

Policy makers often cite the concept of Public-Private Partnerships for service delivery or reform as the best way to develop and manage public services traditionally. Central, district, and especially local government departments often have limited capacity to formulate and manage such agreements in a mutually beneficial way. SAMSET activities should bear in mind the trend and the limitations when proposing improvements or efficiencies in urban administration or public procurement.

This engagement should vary depending on the country. For example, although all municipalities in South Africa are capacity constrained, relatively speaking bigger cities are better resourced and more proactive regarding sustainable energy. There is a need to build the capacity of various institutions (particularly noted for urban Ghana) to help facilitate the pathways to sustainable energy transition in the growing municipalities of the country.

5.5 PROMOTING ENERGY EFFICIENCY IN SMALLER MUNICIPALITIES

In SAMSET countries (and particularly in South Africa) there has been a substantial focus on electricity efficiency in larger cities rather than smaller urban areas in order to maximize impact. While the efficiency opportunities in these cities are far from saturated, smaller cities and towns also have significant opportunities which remain unexploited. Support here may be useful.

5.6 ELECTRIFICATION INITIATIVES

Informal electrification appears to be accelerating at a reasonable rate in each country, and there may be little need for support here. But it is worth 'watching this space', because how different municipalities will engage with this challenge remains uncertain. Decentralised renewable electricity generation in municipalities is receiving support at present (in South Africa), although this focuses mainly on the cities. Support for smaller cities and towns may be appropriate.

5.7 DATA SOURCING

Energy data, demographic details and municipal/urban planning future directions are all a work in progress based on projections as far back as five years ago (In the case of Uganda). SAMSET's strategy may be to engage parallel (and/or mixed) methods as a way to validate some information in order to adequately influence policy.

5.8 POLICY INFLUENCE AND ADVOCACY

Because national government policies do not always support local sustainable energy and urbanization agendas, SAMSET will need to consider feeding emerging local needs into national government processes.

Community planning or planning at grassroots level does not clearly situate its focus: whether its aim is to achieve resource efficiency or build resilience, or both. SAMSET's challenge will be to identify and prioritise the gaps within governance and how far advocacy may contribute to sustainable energy transitions that integrate interventions towards resource efficiency and resilience.

It is evident that there are a number of players in this field, but what is vague is to what extent they collaborate and how far issues to do with energy are examined from an urban point of view or in the guise of municipal capacity to influence. As such, there is an opportunity for SAMSET to advocate at both national and local levels to disaggregate the sector so as to achieve more efficient public policies.

Influencing the densification of urban forms and land uses as long-term energy efficiency solutions will be challenging due to the fact that plans hold little sway, but SAMSET will be searching for entry points at both national policy and municipal levels. For instance in Uganda contacts at the World Bank country office are working on reforming physical planning standards and procedures. Meeting with these will certainly yield more information and perhaps avenues for SAMSET's intervention.

5.9 WORKING WITH THE PRIVATE SECTOR

As with many other parts of the economy, the government has chosen to reduce its role in the transport sector and instead encourage the private sector to build and operate the majority of the transport modes. For the SAMSET project, this implies a need to work at least partly with private transport operators in order to achieve energy savings in this sector.

6 REFERENCES

Abavana, C. G. (n.d); Renewable Energy for Rural Electrification: The Ghana Initiative. Renewable Energy Services Project (RESPRO), Accra-Ghana.

Adam, F. W., Brew-Hammond, A. and Essandoh, E.O, (2013).Relationships Between Energy Use and Income Levels, for Households in Ghana. Mechanical Engineering Department/The Energy Center Kwame Nkrumah University of Science and Technology (KNUST), Kumasi

Adarkwa, K. K. (2012). The changing face of Ghanaian towns.*African Review of Economics and Finance*, Vol. 4, No.1, Dec 2012.

Adarkwa, K.K. and M. Poku-Boansi(2011). "Rising vehicle ownership, roadway challenges and traffic congestion in Kumasi", University Printing Press (UPK), KNUST, Kumasi.

Akakpo, J. (2008). Rural Access: Options and Challenges for Connectivity and Energy in Ghana. International Institute for Communication and Development (IICD) and the Ghana Information Network for Knowledge Sharing (GINKS)

Apeaning, R. W. (2012). Energy Efficiency and Management in Industries – a case study of Ghana's largest industrial area.Master thesis-TQMT 30 LIU-IEI-TEK-A--12/01311 SE. Institute of Technology, Linkoping University.

Ardayfio, E. (1986). The Rural Energy Crisis In Ghana: It's Implications For Women's Work And Household Survival. World Employment Programme Research working Paper. Rural Employment P o l i c y Research Programme.WEP 10/WP. 39.

Arthur, R., Baidoo, F. M. and Antwi, E. (2011). Biogas as a potential renewable energy source: A Ghanaian case study. Renewable Energy.*An international journal. Volume 36 Issue 5 May 2011. Issue 0960-1481.*

Awortwi, N. (2006). "Technology and Institutional Arrangements in the Delivery of Public Sanitation and Solid Waste Services in Ghanaian Cities".*International Journal of Technology Management and SustainableDevelopment,* Vol. 5 (3), pp. 221-239.

Bawakyillenuo, S. (2009). Policy and Institutional Failure: The Bane of Photovoltaic Solar Household System (PV/SHS) Dissemination in Ghana. *Energy & Environment* · Vol. 20, No. 6, 2009.

Bawakyillenuo, S. (2012).Deconstructing the dichotomies of solar photovoltaic (PV) dissemination trajectories in Ghana, Kenya and Zimbabwe from the 1960s to 2007. Energy Policy 49 (2012) 410–421. Elsevier

Bensah, E. C. and Brew-Hammond, A. (2010).Biogas technology dissemination in Ghana: history, current status, future prospects, and policy significance. International Journal of Energy and Environment.*Volume 1, Issue 2, 2010 pp.277-294*

Brent A, undated.*Overview: Renewable and sustainable energy needs for the Southern African industry*. Centre for Renewable and Sustainable Energy Studies, Stellenbosch University, South Africa.

Brew-Hammond, A. and Kemausuor, F. (2007). Energy Crises in Ghana: Droughts, Technology or Policy? Kwame Nkrumah University of Science and Technology (KNUST) – College of Engineering, Kumasi, Ghana, 2007. ISBN #: 9988-8377-2-0

Brew-Hammond, A., Akuffo, F. O., King, R., Quansah, A., Dapaah, S. O., Amponsah, O., Eshun, D. and Antobere, A. (2011); Energy Access and Productive Uses for thr Urban Poor. Energy Sector Management Assistance Program (ESMAP), The World Bank; Final Report on the Ghana Scoping Study.

Buffalo City 2008.*Buffalo City Energy Strategy*. Buffalo City, South Africa.

Cape Town 2011. Cape Town State of Energy and Energy Futures Report.City of Cape Town.

Cape Town 2013. *Cape Town steps up drive to roll out Solar Water Heaters*. Press Release 4 November 2013. www.capetown.gov.za

Centre for Policy Analysis (CEPA) 2002; Energy Intensity Survey of Modern Sector, 2002

COGTA 2013.Dept of Cooperative Governance and Traditional Affairs website www.cogta.gov.za

CoJ 2008.Design Guidelines for Energy Efficient Buildings in Johannesburg. City of Johannesburg.

Constitution 1996.*The Constitution of South Africa*.Government of South Africa.

Dadzie, I. K. (2012) Nuclear Energy for Ghana: A must and Urgent need for the people.

Dafrallah, T., Edjekumhene, I., Edze P., Ngom A. and Ommer V. (2010). Bioenergy for Rural Development in West Africa: The case of Ghana, Mali and Senegal. ENDA Energy, Environment, Development.

DEA 2011.*National Climate Change Response White Paper*.Department of Environmental Affairs. Pretoria.

DoE 2002.White Paper on the Promotion of Renewable Energy and Clean Energy Development.Draft. Department of Energy, Pretoria

DoE 2008.*Energy Efficiency Strategy of South Africa*.First Review 2008.Department of Energy, Pretoria.

DoE 2012.A survey of energy-related behaviour and perceptions in South Africa: The Residential Sector. Department of Energy, Pretoria.
DoE 2013.*National Energy Efficiency Action Plan*. Draft for comment. Department of Energy, Pretoria.
DoE 2013b. Presentation on the Integrated National Electrification Programme made to the Parliamentary Portfolio Committee on Energy on 10th September 2013. South Africa.
DoT 2003.*National Household Travel Survey, 2003.*National Department of Transport, Pretoria.
DoT 2010.*National Transport Masterplan*.Department of Transport, Pretoria.
Ekurhuleni 2006.Ekurhuleni Metropolitan Municipality Energy and Climate Change Strategy. Ekurhuleni Metropolitan Municipality, South Africa.
Electricity Regulatory Authority (2009) *Developments and Investment Opportunities in Renewable Energy Resources in Uganda*, Electricity Regulatory Authority, Kampala.
Energy Commission , Ghana 2010. 2010 Energy (Supply and Demand) Outlook for Ghana. April 2010
Energy Commission , Ghana 2012. 2012 Energy (Supply and Demand) Outlook for Ghana. April 2012
Energy Commission, Ghana, 2006; Strategic National Energy Plan 2006-2020. Annex I of IV Energy Demand Sectors of the Economy
Energy Sector Management Assistance Program (ESMAP), (2006). Energy Sector Reform and the Pattern of the Poor: Energy Use and Supply, a Four Country Study: Botswana, Ghana, Honduras and Senegal. ESMAP Technical Paper. 095
Ennison, I. and Dzobo, M. (n.d).Nuclear Power and Ghana's Future Electricity Generation. IAEA-CN-164-1P01.
Eskom 2013.*The Solar Water Heating Programme*. Eskom website http://www.eskom.co.za/AboutElectricity/FactsFigures/Documents/The_Solar_Water_Heating_SWH_Programme.pdf
Essah, E. A. (2011). Energy generation and consumption in Ghana. West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, pp. 391 401. Available at http://centaur.reading.ac.uk/20973.
eThekwini 2008. *eThekwini Municipal Energy Strategy*. eThekwini, South Africa.
Euston-Brown M 2013. PersComm, Megan Euston-Brown, Project Manager. November 2013. Sustainable Energy Africa, Cape Town.
Ezor, Z. (2009) *Power to the People: Rural Electrification in Uganda*, School for International Training, Brattleboro, VT.
FFC 2013.Sustaining Local Government Finances: Review of the Local Government Fiscal Framework. Financial and Fiscal Commission, Pretoria.
Food and Agriculture Organisation (2012) *Growing greener cities in Africa*. First Status Report on Urban and Peri-urban horticulture in Africa. Rome: Food and Agriculture Organisation.
Gabienu, F. (2012).Critical Factors in Bioenergy Implementation in Ghana.Vaasan Ammattikorkeakoulu University of Applied Sciences KansainvälinenEnergiateknologia
Gauteng 2009. *Gauteng Integrated Energy Strategy*. Gauteng Provincial Government, South Africa.
Ghana Statistical Service, (2008).*Ghana Living Standards Survey Report of the Fifth Round (GLSS 5),* Accra, Ghana Statistical Service.
Global Finance (2010) *Uganda GDP Data & Country Report | Global Finance*, Available at <http://www.gfmag.com/ gdp-data-country-reports/155-uganda-gdp-country-report.html>, Last Accessed 26 May, 2010.
Govenment of Uganda (1997) *Local Government Act* Kampala
Government of Ghana (GOG) 2004. Ghana: Energy and Poverty Reduction Strategy. EU Energy Initiative. Facilitation Workshop and Policy Dialogue Ouagadougou, Burkina Faso.
Grey and Behrens 2013.A case for smarter city growth : a strategic analysis of Cape Town's Phase 1A BRT system and its supporting land use environment. Grey P, Behrens R. 32nd South African Transport Conference.
IDM 2013. Eskom Integrated Demand Management Programme website http://www.eskom.co.za/sites/idm/Pages/Performance%20Contracting.aspx
Inkoom, D.K.B. and Biney, B.S. (2010): The potential of Liquefied Petroleum Gas (LPG) as a viable energy option for the Industrial Sector in Ghana. Journal of Sustainable Development in Africa (Volume 12, No.6, 2010)
Insingoma, J.B. (2007) *Reduction of Energy Demand Through Energy Efficiency Interventions Uganda's Case*, Presentation at the Global Forum on Sustainable Energy (GFSE-7), Vienna.
IRP 2010.*Integrated Resource Plan 2010*.National integrated electricity planning document.Department of Energy, Pretoria.

IUDP 2013.*Towards an Integrated Urban Development Plan*. Department of Cooperative Governance and Traditional Affairs, South Africa.
Janisch A 2013. *Joe Slovo Lessons Learned Report*. For Department of Human Settlements. Sustainable Energy Africa, Cape Town.
Kamese, G. (2004) Renewable Energy Technologies in Uganda: The potential for Geothermal Energy Development, A Country Study Report under the AFREPREN/HBF Study, Nairobi.
Kane L 2011.Strategies for Reducing Energy Use (and Carbon Emissions) in the Cape Town Transport Sector. Sustainable Energy Africa, Cape Town.
Kasita, I. (2007) "Power cuts get worse," *New Vision*, Friday 29 June.
Kasozi, K. (2010) "Solar making business viable in Yumbe", *The Monitor*, Thursday 18 March.
Kimball, J. (2009), "Uganda budget sees GDP growth at 6 pct for 2009/10", Available at <http://www. finanznachrichten.de/nachrichten-2009-06/14147766-uganda-budget-sees-gdp-growth-at-6-pct-for-2009-10-020.htm>, Last Accessed 26 May 2010.
King, R. S., Amponsah, O. and Quansah, D. A. (2012).Productive Uses of Energy in Enterprises in Slums in Ghana.International Journal of Social Science Tomorrow Vol. 1 No. 5. ISSN: 2277-6168
Leach G. A. (1988). Residential Energy in the Third World.Annual Review Energy. 1988.13.47 65
Maphakela et al 2013. *Building a sustainable platform for low-cost mobility in South Africa.*Maphakela W, Mashiri M, Chakwizira J, Mpondo B. 32nd South African Transport Conference.
Mbabazi, V. (2003) *Housing the Urban Poor*, Paper presented at the Faculty of Building Technology and Architecture, Uganda Martyrs University, Nkozi, March 20.
Meikle, S. and Bannister, A. (2003).Energy, Poverty and Sustainable Urban Livelihoods. Working Paper No. 126 ISSN 1474-3280
Mensah, J. T. and Adu, G. (2013).An Empirical Analysis of Household Energy Choice in Ghana. Sverigeslantbruksuniversitet, Institutionenförekonomi.Swedish University of Agricultural Sciences, Department of Economics. ISSN 1401-4068. ISRN SLU-EKON WPS-13/06-SE
Ministry of Energy and Mineral Development (2001) *Rural Electrification Strategy and Plan Covering the Period 2001 to 2010*, Ministry of Energy and Mineral Development, Kampala
Ministry of Energy and Mineral Development (2009) *Uganda Energy Balance for 2008*, Ministry of Energy and Mineral Development, Kampala.
Ministry of Energy and Mineral Development (2011) Energy and Mineral Sector Performance Report 2008/09 - 2010/11 Kampala
Ministry of Energy and Mineral Development (2009) *Annual Report*, Ministry of Energy and Mineral Development, Kampala.
Ministry of Lands, Housing, and Urban Development (2008) *National Slum Upgrading Strategy* Kampala, UNDP
Ministry of Lands, Housing, and Urban Development (2013) *National Urban Policy (Draft 2).*Kampala: CME Consultants. December.
Ministry of Natural Resources (1996) *Sources And Sinks of Greenhouse Gases in Uganda.* Department of Metereology. UNEP/GEF funded.
Ministry of Works and Transport (2012) *Non-Motorised Transport Policy (Draft).* Kampala. November.
Mukwaya, I.P. (2004) "Urban change in Uganda: The challenge of managing urban areas in a global environment", *College of Urban Planning and Public Affairs (CUPPA) Conference*, University of Illinois, Chicago, 22–24 July.
Musasizi, S. (2009) "Germans Fund Uganda's Renewable Energy Efforts", *The Observer*, Thursday March 26.
Namutebi, J. (2010) "Uganda needs one million houses" *New Vision*, March 5.
National Environment Management Authority (2004) *Environmental Impact Assessment Guidelines for the Energy Sector*, NEMA, Kampala
National Forest Authority of Uganda (2007). Ruhiira Wood Supply Report.
NDP 2011.*National Development Plan* of the National Planning Commission of South Africa. Government of South Africa.
Ndzibah E. (2011), Robin Hood and Donkey Principles: renewable energy proposals for Ghana; Energy End-User Efficiency (EEE) Issue; World Renewable Energy Congress 2011 Sweden, 8-13 May 2011, Linkoping, Sweden.
Nnadikwe, K. (2007): High Oil Dependence in Ghana: To what extent is Ghana vulnerable to Oil Price Shocks? University of Dundee, Scotland.
Obeng, G. Y. and Evers, H-D. (2009). Solar PV Rural Electrification and Energy-Poverty: A Review and Conceptual Framework with reference to Ghana. ZEF Working Paper Series, ISSN 1864-6638 Department of Political and Cultural Change Center for Development Research, University of Bonn.

Obeng, G. Y., Kemausuor, F., Brew-Hammond, A. and Duker, A. (2009).GIS-Based Energy Access Pproject: A Review of Trends, Policies and Plans for Increasing Energy Access in Ghana. The Energy Centree, KNUST.
Obour, S.K. (2012). "Accra Sinks under Filth".*The Mirror,* Saturday, September 15, 2012, pp.24.
Okyere, D.K (2012). *Sustainability of the Urban Transport System of Kumasi*.M.Phil Thesis Submitted to the School of Graduate Studies, Kwame Nkrumah University of Science and Technology, KNUST, Kumasi Ghana.
Oluka, B. H. (2010) "Uganda's energy relief still a long way", *The Monitor*, 6 April.
Ortiz, Isabel and Cummins, Matthew (2011) "Global Inequality: Beyond the Bottom Billion". New York: UNICEF Policy and Practice Report. April.
Otage, S. and Izama, A. (2010) "Uganda: Common Stand on Country's Population Policy Still a Far Cry", *The Monitor*, 6 March.
Oteng-Ababio, M, (2010)."Private Sector Involvement in Solid Waste Management in the Greater Accra Metropolitan Area in Ghana".*Waste Management and Research*, Vol. 28(4), pp. 322-329.
Painuly, J. P. and Fenhann, J. V. (2002).Implementation of Renewable Energy Technologies Opportunities and Barriers. UN Collaboration Centre on Energy and Environment, Riso National laboratory, Denmark. ISBN: 87-550-3013-0
PDG 2012.*Final National Report on Trends in Municipal Capacity for the 2010/11 Municipal Financial Year*. By Palmer Development Group for the Municipal Demarcations Board, Govt of South Africa, Pretoria.
Polity 2013.The minibus taxi industry in South Africa: A servant for the urban poor?www.Polity.co.za .
Praher, C. (2008) Calculation of the Grid Emission Factor (GEF) of the electricity grid in Uganda according to the 'Tool to Calculate the Emission Factor For an Electricity System', Energy Changes Projektentwicklung GmbH, Vienna.
Quartey, J. D. (2010). The demand for Energy and Economic Welfare in Ghana.Department of Economics, Kwame Nkrumah University of Science and Technology Kumasi, Ghana.
Ramaya J 2013.Initial unpublished assessments as a part of the BHC-funded *Solar PV Embedded Generation Support Project* of Sustainable Energy Africa, Cape Town.
Rupp, S. (2013).Ghana, China, and the Politics of Energy.African Studies Review, Volume 56, Number 1, April 2013, pp. 103-130 (Article). Cambridge University Press *DOI: 10.1353/arw.2013.0015*
SACN 2013.*Literature review on public transport and mobility in municipalities*.For South African Cities Network. By Geoffrey Bickford, ARUP, Johannesburg.
Saundry, P. (Lead Author); Energy Information Administration and Library of Congress (Content source); Langdon D. Clough (Topic Editor);.(2009) "Energy profile of Uganda." In: *Encyclopedia of Earth*. Eds. Cutler J. Cleveland (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment). [First published in the Encyclopaedia of Earth July 12, 2009; Last revised July 15, 2009; Retrieved May 12, 2010]<http://www.eoearth.org/article/Energy_profile_of_Uganda>
Schramm, G. (1990). Electric Power in developing countries: Status, Problems, Prospects. Annual Review Energy 1990. 15:307-33
SEA 2003.*Energising South African Cities and Towns*. Sustainable Energy Africa, Cape Town.
SEA 2006.*State of Energy in South African Cities 2006*. Sustainable Energy Africa, Cape Town.
SEA 2008.*Energy Planning in South African Cities*.In Urban Energy Transitions, 2008.Droege P (ed). Elsevier, Newcastle, Australia.
SEA 2008a.The elusive 'nega-watt' - Why and how electrical energy efficiency needs to be scaled up in the next few years of power supply shortage in South Africa.A summary of a synthesis study. November 2008. Sustainable Energy Africa, Cape Town. November 2008.
SEA 2009.How to implement renewable energy and energy efficiency options: Support for South African local government. Sustainable Energy Africa, Cape Town.
SEA 2011.*State of Energy in South African Cities 2011*. Sustainable Energy Africa, Cape Town.
SEA 2011a.*Energy Scenarios for Cape Town.* Sustainable Energy Africa, Cape Town.
SEA 2012.*DORA funded DOE Municipal EEDSM Programme: Capacity Building and Job Creation case studies*. Sustainable Energy Africa City Energy Support website: www.cityenergy.org.za
SEA 2012a.The potential impact of efficiency measures and distributed generation on municipal electricity revenue: double whammies and death spirals. Presented at the 2012 AMEU Conference.By Sustainable Energy Africa, Cape Town.
SEA 2012b.Informal Electrification in South Africa: Experience, Opportunities and Challenges. Sustainable Energy Africa, Cape Town.
SEA 2013.Energy scenarios for eThekwini: Exploring the implications of different energy futures for eThekwini Municipality up to 2030. For eThekwini Energy Office. Sustainable Energy Africa, Cape Town.

SEA 2014.*Tackling Urban Energy Poverty in South Africa*.Sustainable Energy Africa, for Heinrich BöllStiftung Cape Town.
SI 2009.*Sustainable Neighborhood Design Manual*. Sustainability Institute. Stellenbosch, South Africa.
SoE 2011.*State of Energy in South African Cities 2011*. Sustainable Energy Africa, Cape Town.
Sol Plaatjie 2009. *Sol Plaatjie Energy and Climate Change Strategy*. Sol Plaatjie Municipality, South Africa.
StatsSA 2011.Statistics South Africa data from the 2011 census.www.statsa.gov.za. Pretoria.
Swart D and Bredenkamp B 2012.*The Challenge of addressing household energy poverty*.Presented at 'Towards Carnegie III' conference, September 2012, University of Cape Town.
Tshwane 2006.*City of Tshwane Energy Strategy*. Tshwane, South Africa.
Tullow Oil- Uganda (2013) "Tullow Uganda Country Report." November. Available at www.tullowoil.com/reports Last accessed 08 April 2014.
Uganda Bureau Of Statistics (2013) *Statistical Abstract* Kampala.
Uganda Bureau of Statistics (UBOS) (2010). "Projected Populations for Town Councils"
Uganda Government (1968) Town and Country Planning Act, (Cap 246). Uganda
Uganda Government (1969) Engineers Registration Act, (Cap 271). Uganda
Uganda Government (1969) Hotels Act, (Cap 90). Uganda
Uganda Government (1970) The Public Health Act, (Cap 281). Uganda.
Uganda Government (1974) National Housing and Construction Corporation Act, (Cap 313). Uganda
Uganda Government (1974) Surveyors Registration Act (Cap 275). Uganda
Uganda Government (1995) National Environment Act (Cap 153). Uganda
Uganda Government (1995) National Water and Sewerage Corporation Act (Cap 317). Uganda
Uganda Government (1996) The Architects Registration Statute (Cap. 269). Uganda.
Uganda Government (1999) *Electricity Act*(Cap 145). Uganda
Uganda Government (2002) *The Renewable Energy Policy for Uganda*, Ministry of Energy and Mineral Development, Kampala
Uganda Government (2004) *Poverty Eradication Action Plan (2004/5-2007/8)*, Ministry of Finance, Planning and Economic Development, Kampala
Uganda Government (2009) The Architects Registration (Conditions of Engagement and Scale of Fees) Bye-Laws, (Ch. 269). Uganda.
Uganda Investment Authority (2009) *Investment Potentials in Solar Sector*, Uganda Investment Authority, Kampala.
UN FAO (2013) Country STAT Uganda, Rome, Italy
UN-Habitat (2003): The Challenge of Slums; Global Report on Human Settlements 2003 (United Nations Human Settlement Programme)
UN-Habitat (2010) *The state of African cities 2010, Governance, Inequalities and Urban Land Markets*. United Nations Human Settlement Programme.Nairobi: UN-Habitat.
UN-HABITAT (2010) Uganda UrbanHousingSector Profile Nairobi UNON
United Nations Department of Economic and Social Affairs (2008) *Urban Agglomerations 2007*. [Online]., Population Division. Available at: http://www.un.org/esa/population/publications/wup2007/2007_urban_agglomarations_chart.pdf [Accessed: 27 Jun. 2013].
United Nations Department of Economic and Social Affairs (2010) *World Urbanisation Prospects: The 2009 Revision*.Highlights. New York: UnitedNations.
United Nations Department of Economic and Social Affairs (2012) *World Urbanisation Prospects: The 2011 Revision*.Highlights. New York: UnitedNations.
Venter et al 2013. *Analysis of modal shift in South Africa : a qualitative investigation*. Venter K, Mokonyana M, Letebele M, Dube S, Masondo N. 32nd South African Transport Conference.
Vermeiren, K., Van Rompaey, A., Loopmans, M., Serwajja, E. and Mukwaya, P. (2012) Urban growth of Kampala, Uganda: pattern analysis and scenario development.*Landscape and urban planning*. 106. pp. 199-206.
Vilar, (2012) "Renewable Energy in Western Africa: Situation, Experiences and Tendencies; Ecowas Centre for renewable Energy and Energy Efficiency (ECREEE)
Visagie E 2008.*The supply of clean energy services to the urban and peri-urban poor in South Africa*. In 'Energy for Sustainable Development' Volume XII No. 4 December 2008.
Volschenk J 2007.*The use of the ESCOs to facilitate sustainable energy interventions in the low income housing sector*.http://toolkits.reeep.org/file_upload/10307023_2.pdfJakoVolschenk, January 2007
Wafula, W. (2009) "Digital TV Broadcast Starts in Kampala", *The Monitor*, 18 November.
Waninda, J. (2010) "Family planning can slow our population growth", *The Monitor*, 15 May.

Wanja, B. (2010) “Economical use will help you cut utility bills” *The Monitor*, 4 March.
Ward S 2008. *New Energy Book for Urban Development in South Africa*. Sustainable Energy Africa, Cape Town.
Wasswa, J. And Schluep, M. (2008) e-Waste Assessment in Uganda: A situational analysis of e-waste management and generation with special emphasis on personal computers, Uganda Cleaner Production Centre, Kampala.
West, Henry W. (1965)*TheMailo System in Buganda: A Preliminary Case Study in African Land Tenure.* Government Printer.Available for download at http://www.wdl.org/en/item/7768/.
Western Cape (2008).*White Paper on Sustainable Energy for the Western Cape Province*.Department of Environmental Affairs and Development Planning, Western Cape Government, Cape Town.
Western Cape 2007. *Sustainable Energy Strategy for the Western Cape*.Dept of Environmental Affairs and Development Planning, Western Cape Government, Cape Town.
Western Cape 2008. *Western Cape Climate Change Strategy and Action Plan.*Western Cape Government, South Africa.
Wolpe P and Reddy Y 2010.*Alleviating urban energy poverty the informal sector: The role for local government*. Sustainable Energy Africa - Conference paper presented at ‘Inequality and structural poverty in South Africa: Towards inclusive growth and development’, Johannesburg, 20 September 2010
Wolpe P, Reddy Y and Euston-Brown M 2012.*Energising Urban South Africa: poverty, sustainability and future*.Presented at ‘Towards Carnegie III’ conference, September 2012, University of Cape Town.
World Bank (2004); Multilateral Investment Guarantee Agency (MIGA) Annual Report.
World Bank (2005) “A Study of Institutional, Financial, and Regulatory Frameworks of Urban Transport in Large Sub-Saharan African Cities”, SSATP Working Paper No. 82. July.
World Bank (2009) *Sustainable Rural and Urban Development*. Research Highlights 2008. [Online]. Available at: http://econ.worldbank.org
World Bank. 2006. Ghana country environmental analysis. Report No: 36985-GH. Available at: http://siteresources.worldbank.org/INTRANETENVIRONMENT/3635842-1175696087492/21919456/Ghana_CEA.pdf . [Accessed: 3 October 2011].
Worldwide Fund for Nature (WWF) (2012).“Kasese for Clean Energy”.Blog post describing the project. Available at: http://wwfuganda.wordpress.com/2012/10/11/kasese-for-clean-energy/ Accessed: 14/03/2014.
Yeboah, E. and F. Obeng-Odoom (2010). “We are not the only ones to blame': District Assemblies' perspectives on the state of planning in Ghana”, *Commonwealth Journal of Local Governance*, Vol. November (7), pp. 78-98.

7 ANNEX ACTIVITIES: SOME RELEVANT PLANS THAT ARE IN PLACE OR APPROACHES HAVE BEEN TRIED REGARDING SUSTAINABLE URBAN ENERGY, AND TO WHAT EFFECT?

7.1 TRANSPORT AND ENERGY

7.1.1 SOUTH AFRICA

Urban sustainable transport initiatives include interventions such as (See Kane (2011) for a more comprehensive list):

- Public transport improvement (e.g. Bus Rapid Transit, rail)
- Improved walkability of destinations to encourage public transport
- Non-motorised transport facilities and lanes
- Inter-modal public transport coordination and integrated ticketing
- Disincentives for private vehicle use
- Incentives to increase private vehicle occupancy (e.g special parking facilities)
- School bus promotion (school lift traffic is significant in many areas)

Examples of efforts and achievements of some cities are given below:

- In the City of Joburg sustainable spatial development is being promoted by mandatory criteria for new developments that lead to improved access to public transport and concentration of development in priority zones and corridors (e.g. see CoJ 2008).
- The cities of Joburg, eThekwini and Cape Town have Bus Rapid Transit schemes in place, and a number of other urban areas are planning such interventions as they are regarded as a success (although it is too early for comprehensive evaluations to have emerged (e.g. Grey and Behrens 2013)).
- Cape Town has a progressive SDF and supportive Densification and Urban Edge policies. However, not only is coordination with transport planning weak, but political decisions have blatantly frustrated the intentions of these documents several times in the past years.
- 'Park and Ride' facilities have been introduced by several urban areas around key public transport hubs.
- Gauteng province has a high-speed train (the 'Gautrain') linking the three metros of Joburg, Ekurhuleni and Tshwane.

Sustainable transport motivations are two-tracked. One emphasizes efficiency in transport systems with associated reduced costs and greenhouse gas emissions, the other seeks to improve the mobility of the poor (see Figure 3 for modes used by different income groups). The former often focuses on getting people out of private vehicles and onto public transport. The latter is particularly important given that poor settlements generally occupy land far from employment opportunities and urban amenities (Maphakela et al 2013). The minibus taxi industry in South Africa arose out of the lack of decent public transport for the poor, experienced huge growth from the mid-1980s to the mid-1990s, and is now a permanent part of the transport picture and formally integrated into transport planning in all urban areas. It is the most important form of public transport in the country, and carries 65% of urban passengers to their destinations (Polity 2013). Government has instituted regulations to promote safety and has incentivized vehicle efficiency in this industry, although much is still to be achieved in this area (DoT 2010).

It is informative to note that this minibus taxi mode of transport, which is recognized as addressing commuter needs relatively well in terms of routes, prices and speed, arose out of entrepreneurs responding to an obvious lack in their communities rather than through formalized planning and infrastructure investment.

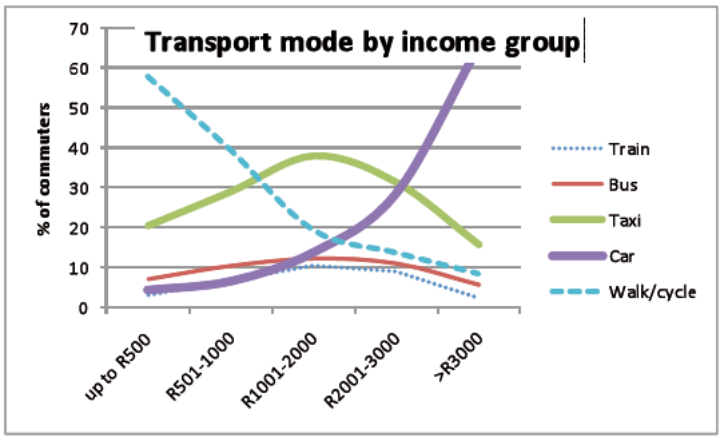


Figure 8-1 Showing dependence of the poor on non-motorised or public transport, and the use of private vehicles by the wealthy (DoT 2003)

Changing the transport and spatial profile of urban areas is a slow and often expensive undertaking, and achieving modal shifts to public transport is not straightforward (Venter et al 2013, SACN 2013). While urban areas have shifted significantly in approach over the past decade (SEA 2011), the overall impact on the energy and sustainability situation is limited and it remains far from efficient and sustainable (SACN 2013). Far greater political commitment to such transformation together with continued shifts in 'business as usual' approaches by officials, and significant financial support from national government to fund expensive public transport infrastructure are all necessary to accelerate the pace of transformation.

7.1.2 UGANDA

Some efforts are being made towards improving **transport** efficiency and travel avoidance in Kampala, which include:

- Provision of coordinated public transport systems have met with many challenges. Feasibility studies have been completed by World Bank to implement a Bus Rapid Transit system in certain parts of Kampala. Timeline for delivery of the first line of such a system has yet to be released publicly. Also in Kampala, the Engineering Directorate of KCCA has discussed giving concessions to various urban bus operators.
- A Non-Motorised Transport Policy was drafted with the support of UN Environment Programme (MWT 2012) and was approved by Ministry of Works and Transport in 2013. Organisations such as First African Bicycle Information Organization (FABIO) have been attempting to streamline this policy into development plans and infrastructure tenders in pilot urban areas (including Jinja).

7.2 RESIDENTIAL AND NON-RESIDENTIAL BUILDINGS

7.2.1 UGANDA

Real Estate Expo - First held in 2008, and touted as a, dedicated one-stop centre for key stakeholders in Uganda real estate industry, including showcase of local materials, and information about best practice in design and construction.

AHEAD Energy - Focuses on assisting established schools and medical facilities to improve their energy systems by tapping local energy resources for local use. Through these ventures, the wider community is exposed to viable energy systems, thereby spurring entrepreneurial energy development.

Planned initiatives include the **Connection Refinance Facility**: UECCC will pilot a connection refinance facility with WENRECo and CRDB. The facility is aimed at connecting businesses to the grid, by addressing the barrier of the upfront connection costs.

7.3 ELECTRICITY EFFICIENCY

7.3.1 SOUTH AFRICA

The recent power crisis of 2008, steep increases in electricity prices as well as carbon mitigation pressures (to a lesser extent) have led to electricity efficiency being given more attention. Historically electricity prices were very low in the country, and thus efficiency has been a low priority. However it has long been clear that saving electricity is far cheaper than generating it (SEA 2008a). For the past few years Eskom has been running a significant electricity efficiency subsidy programme funded by tariff revenue (IDM 2013). It has achieved savings costing under ZAR5 million per MW, compared with conventional generation cost of over ZAR10 million per MW (SEA 2008a). As a part of this programme Eskom rolled out a massive programme to replace inefficient incandescent lights with CFLs or LEDs in residential and commercial facilities. Because of this programme, efficient technologies are now becoming the norm. In addition, the Department of Energy has allocated significant money to selected municipalities for the implementation of electricity efficiency[1] and those granted the funds have successfully undertaken substantial streetlight and traffic light retrofits (sometimes with LED technology), as well as public building lighting retrofits. Experience with this programme indicates that municipalities require support to be able to engage with such programmes effectively – it is not enough to merely allocate funds to them. However, with support in the initial phases, municipalitites can run these programmes sustainably thereafter (Euston-Brown 2013).

Over the past three years National Treasury has also approved a range of rebate incentives for private electricity efficiency interventions.

A national solar water heater programme has been rolled out by the Department of Energy and Eskom (Eskom 2013), as the financial, economic and environmental benefits of this technology have long been known. The programme comprises a low-income household and high-income household component. The former is fully subsidized and uses low pressure technology, while the latter is only partly subsidized (around 20% of capital cost). Solar water heater penetration still remains far from widespread however, and the future of the subsidy schemes uncertain. Cape Town leads the country in mass solar water heater rollout, and has recently launched an accreditation scheme for suppliers to accelerate implementation (Cape Town 2013).

Although the use of ESCOs has been very slow in taking off in South Africa[2], a few municipalities have recently contracted ESCOs around building efficiency programmes. However the municipal legal frameworks make standard ESCO contracting relatively complicated. Several cities have run electricity efficiency awareness campaigns for residential and commercial sectors (the industrial sector is generally covered by the Eskom IDM programme).

Low-income housing constructed as part of the mass state housing drive of the past 20 years generally has very poor thermal performance. Most houses do not have ceilings, leading to excessive heat and cold in different seasons, and pushing up energy expenditure as residents try to keep warm in winter. It also exacerbates indoor air pollution and associated respiratory illnesses because residents often use coal, wood or paraffin for heating. While there are several efficient and sustainable pilot housing projects around the country, until recently this had little impact on the mass rollout programme, partly because of financial constraints. In 2013 national government announced the introduction of several efficiency interventions as mandatory for low income housing, including ceilings, insulation and other thermal design improvements, and allocated budget to cover the additional costs. This is a significant and very positive development for the country. Currently the National Department of Human Settlements is monitoring a sustainable, high-density housing programme in Joe Slovo settlement in Cape Town in order to assess the feasibility of further housing delivery policy changes along these lines (Janisch 2013).

[1] As part of the DORA (Division of Revenue Act) grant (SEA 2012)

[2] For an overview of ESCOs in South Africa see Volschenk (2007).

7.3.2 UGANDA

Promotion of Renewable Energy and Energy Efficiency Programme – The German Federal Ministry for Economic Development Cooperation (BMZ), the Ministry of Energy and Mineral Development (MoEMD): July 2008 – June 2011. Managed by GTZ (now GIZ).Includes Energy Audits of government buildings, training of staff, subsidising solar systems and energy efficient charcoal stoves.

Energy Efficiency Week - An annual event held annually since 2006. The Energy Efficiency weeks are organised by the Ministry of Energy and Mineral development for all stakeholders. The key activity is an exhibition for Government agencies, NGOs and companies involved in selling energy efficient appliances and other alternative power sources like Solar, LPG, and Biomass to get their message to the public.

A project is currently running with the Ministry of Lands, Housing and Urban Development with support from UN-HABITAT to improve **electrical energy efficiency** in the building sector (commercial and residential), which involves:

- Ensuring that the design of new residential and commercial structures are energy efficient
- Retrofit programmes to address existing stock (e.g. solar water heaters and LED lighting)

7.4 RENEWABLE ENERGY

7.4.1 SOUTH AFRICA

Renewable energy, and in particular renewable electricity generation, has generally not been a focus of local government in South Africa, partly because electricity planning has been centrally held with no specific allocation for local government included in national implementation plans[3]. With recent international renewable energy price decreases, local electricity price rises, and climate change pressures, as well as the confidence instilled by the major national renewable electricity programme (one of the biggest in the world currently), this situation is starting to shift. eThekwini municipality has implemented a landfill gas generation project (around 6MW), and other cities are planning to follow suite. A few cities are looking at run-of-pipe[4] hydro schemes, which may deliver up to 5MW of power each.

One of the most promising and fastest growing renewable electricity options is rooftop solar PV embedded generation, and most cities are scrambling to develop technical and business frameworks to accommodate the applications from private households and businesses wanting to install such systems. A number of private rooftop PV projects of over 0.5MW are already in existence in the country. Initial assessments indicate that this could grow to hundreds of megawatts around the country in the short-term. However it is acknowledged that the resulting impact on the municipal electricity load profile will need to be monitored as implementation accelerates (Ramaya 2013).

It is however mostly cities that are engaging in the area of renewable generation, as they tend to have some capacity to respond to these pressures and opportunities. Smaller towns are hard pushed to engage in these areas due to more severe capacity constraints.

7.4.2 UGANDA

Promotion of Renewable Energy and Energy Efficiency Programme – The German Federal Ministry for Economic Development Cooperation (BMZ), the Ministry of Energy and Mineral Development (MoEMD): July

[3] Notably the 2010 Integrated Resource Plan produced by the Department of Energy (IRP 2010).

[4] Hydro turbines installed in the large pipes of the municipal water distribution system

2008 – June 2011. Managed by GTZ (now GIZ).Includes Energy Audits of government buildings, training of staff, subsidising solar systems and energy efficient charcoal stoves.

Joint Energy and Environment Program (JEEP) - Have organised solar training workshops and seminars to acquaint communities and individuals with knowledge on solar technologies.

The Italian cooperation in collaboration with the Centre for Research in Energy and Energy Conservation (CREEC) - Have initiated **the promotion of solar energy in rural areas of Uganda**.

Uganda Photovoltaic Pilot Project for Rural Electrification (UPPPRE) - Designed as a three-year pilot project, funded by UNDP-GEF, with a goal of promoting the use of solar photovoltaic technology in Uganda (1997 to 2000)

Energy for Rural Transformation (ERT) - Focus on bringing awareness to communities and providing solar products at subsidised prices. The Ugandan project aims at removing market barriers for the development of renewable-energy installations in the private sector in the rural energy and information/communication technologies (ICT) sectors.

Awareness of renewable energy technology is fairly widespread, more so than energy efficiency, which is generally limited to lighting (CFL) rather than other technologies or appliances. The level of awareness and availability of information regarding EE and RE is increasing, and becoming more available as individuals increasingly seek this information, and demand it of designers, suppliers and the construction industry. EE and RE technologies are, however, still regarded as being too expensive to use in most projects due to the relatively high upfront costs.

There has been an increase in the awareness and incorporation of these technologies in a number of projects, such as the Bernard Onyango Registry Building (2008) at Uganda Martyrs University which uses compressed earth blocks as a key construction material. Solar water heating systems (SWH) have been incorporated in most hotels. New building projects are increasingly incorporating optimised shading devices among many other interventions. In 1998, the National Environmental Management Agency (NEMA) had noted that PVs were mainly found in large institutions and facilities managed by international Non-Governmental Organisations, however today the number of solar PV units is estimated to be well over 15,000 units, and are more in urban areas where previously this was an exception.

For the most part some of the technologies have been viewed as being for low income earners and not for the well off, as is the case with compressed earth blocks. There is also scepticism about the energy efficient charcoal stoves as they take a while to heat up, and it is perceived that it is difficult to control the cooking temperatures. Energy efficient gas and electrical stoves are not yet easily available on the market.

Planned Initiatives

In conjunction with the **German Government**, and under **Promotion of Renewable Energy and Energy Efficiency Programme (PREEEP)**, the **Uganda Government** has gone a long way in installing solar PV energy systems in over 50 Health Centres across the county.

- Solar refinance: Uganda Energy Credit Capitalisation Company (UECCC) will continue to support Solar Equipment acquisition through additional refinance facilities of US$1,000,000 through PFIs;
- Partial Risk Guarantee (PRG) for default risk on PFI loans to Solar Vendors:- This is a guarantee issued to PFIs to partially cover the default risk (up to a maximum of 50%) of the working capital loans offered to solar vendors.
- Solar Loan Product Development: Support PFIs to develop stand-alone Solar Loan product at an estimated cost of US$130,000
- ORIO Project: UECCC will carry out feasibility studies for 10 mini hydro power sites.
- CDM support: UECCC will establish a CDM Program of Activities for hydro power projects with support from BTC, and with funding support from GIZ, provide technical assistance to enable project developers access carbon financing under the CDM.
- Capitalise the UECCC: mobilise additional funding from donors and Government of Uganda to capitalise the above instruments which are inadequately capitalised.

7.4.3 GHANA

Accordingly, the Government of Ghana embarked on the Rural Kerosene Distribution Improvement Program (RDDIP) to improve on availability and accessibility of this fuel (ESMAP, 2006; Mensah and Adu, 2013). The Government of Ghana's LPG promotion as an alternative to woodfuel in 1990 has had significant impact on LPG consumption in Ghana and urban centres in particular. The consumption of LPG doubled by 1992 and was almost ten times higher by 2004, mostly in the urban centers (also confirmed by Mensah and Adu (2013).

7.5 POVERTY AND ACCESS TO ENERGY

7.5.1 SOUTH AFRICA

A national electrification drive to support poverty alleviation, which has reached almost all urban formal houses, and is being extended to urban informal areas. The state funds this electrification, and provides a Free Basic Electricity consumption subsidy for low income electricity consumers, although the subsidy only reaches 69% of the indigent population (DoE 2013b). The state has also attempted to introduce a subsidy for non-electrical energy (such as LPG) but implementation of this Free Basic Alternative Energy scheme has proven problematic (Wolpe& Reddy 2010). In spite of all the state's efforts, poverty remains rife and inequality in the country is extreme.

The National Electrification Programme has achieved impressive electrification levels throughout the country. National electrification levels are at 87 % (DoE 2012) compared to 36% in 1994. However, significant numbers of households remain without an electricity connection: the current electrification backlog is 1.2 million informal and 2.1 million formal households (DoE 2012). Some municipalities have approached the issue proactively and have electrified informal settlements by using appropriate technologies[5]. However many municipalities have not made a significant impact in this sector, although experience with appropriate approaches is growing and implementation is steadily increasing (Figure 4).

The Department of Energy attempted to implement a Free Basic Alternative Energy (FBAE) scheme so that unelectrified informal dwellers could benefit from state subsidies in the same way that poor electrified households do through the Free Basic Electricity grant, but the scheme was not effective. Observers hold out little hope that it will form a useful part of future sustainable energy efforts unless substantially reconceptualised (Wolpe and Reddy 2013). However energy supply networks do exist in informal areas, through small and micro traders selling paraffin, for example. These have been reliable and functional for decades. Government may be able to learn from, or link to such distribution networks if FBAE is to be continued into the future.

7.5.2 UGANDA

Several international donor initiatives have focused on extension of the electrical grid to underserved areas. Indeed, a Rural Electrification Agency (REA) exists within the Ministry of Energy and Mineral Development. The GIZ-funded PREEEP programme has focused on electrifying institutions and rural settlements within close proximity of high-voltage lines, but without nearby access to step-down transformers. Other donors have expressed interest in funding the activities of the REA. Low carbon initiatives

7.5.3 SOUTH AFRICA

Because South Africa is a significant per capita carbon emitter by international standards (Figure 5), several cities around the country pioneered the establishment of Energy and Climate Change Strategies, often with ambitious targets around carbon reductions (Figure 6). The earliest date back to 2003 (SEA 2008). This was

[5] Municipalities will not electrify informal settlements on private land – they consider that installing state assets on private land is not permissible, and such projects will also not receive state subsidies,

well ahead of national government's progression, which eventually released the National Climate Change Response White Paper eight years later in 2011, in time for COP17 being held in eThekwini.

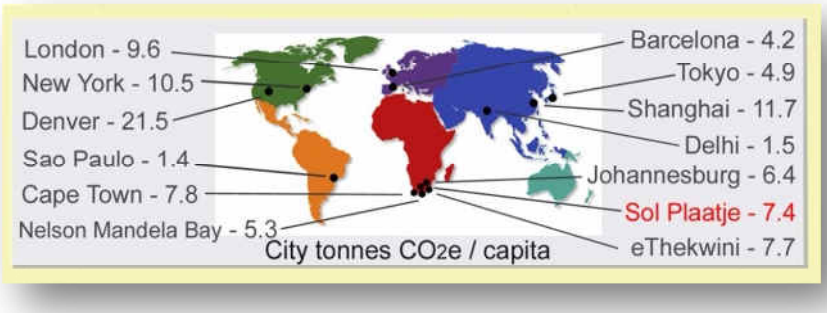


Figure 8-2 Carbon footprint of South African cities compared with international examples

Cities recognized that development agendas were the highest political priority in the country, not carbon emissions, and thus these strategies emphasized the resource and cost savings, security and disaster management advantages, and economic opportunities in embracing low carbon development, and they embedded strong welfare support initiatives in many activity areas.

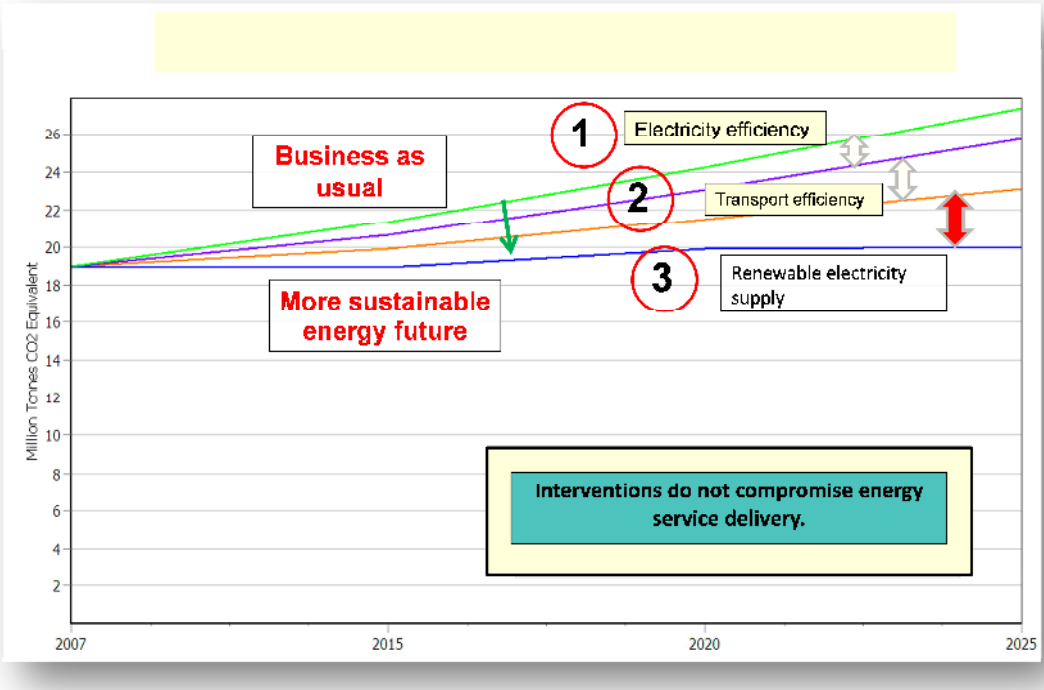


Figure 8-3 An example of city carbon futures modeling showing the impact of different sets of interventions on carbon emissions (Cape Town 2011)

In spite of such proactivity, it has taken time for cities to transform institutionally such that they are effectively implementing these strategies. Within cities, the electricity efficiency programmes have arguably been the most effective, and renewable energy options are now showing promise – such as the rooftop solar PV

systems. Sustainable, efficient building in the public and commercial sector is also steadily gaining ground[6]. Transport profile changes are slow however, partly because of the large infrastructure investments required to make significant changes to the modal use patterns, and partly because of the interdependence and poor coordination with urban spatial form. In any case, even in the most proactive of scenarios urban form changes very slowly.

7.6 SUPPORT FOR IMPLEMENTATION OF ENERGY PROJECTS

7.6.1 SOUTH AFRICA

Towns and cities lack the resources, institutional frameworks and capacity to engage in the emerging area of sustainable energy implementation, yet are under pressure to make headway – often in terms of the targets set in their Energy and Climate Change Strategies and Action Plans. Although there are several funding programmes available for sustainable energy in urban areas, the capacity in these areas to utilize the funds is often inadequate or non-existent. Sustainable Energy Africa has been running a City Energy Support Unit for the past decade to meet this need, and has developed and collected an array of resource documents, guides and support tools for municipalities embarking on a more sustainable energy trajectory (see Figure 4 and www.cityenergy.gov.za). In addition to these resources, Sustainable Energy Africa runs a learning network of cities and towns in order to facilitate mutual learning and build capacity of urban officials involved in this area. The particular partnership methodology for providing support has evolved over the years and has proven effective in facilitating implementation (SEA 2008).

The South African Local Government Association (SALGA) and the South African Cities Network (SACN) have also become involved in supporting urban areas with sustainable energy and climate change planning in recent years.

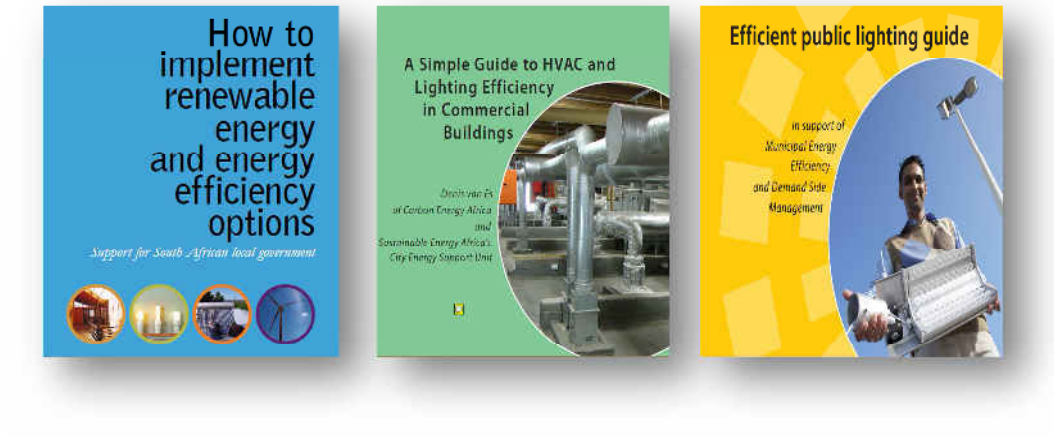


Figure 8-4: Some guides on electricity efficiency and renewable energy from www.cityenergy.gov.za

7.6.2 UGANDA

Energy Advisory Project - German Society for International Cooperation (GIZ) provides policy advice to Ministry of Energy and Mineral Development to promote energy efficiency, rural electrification (solar PV, pico- and micro- hydropower) and improved biomass technologies. GIZ has been working in the sector since 1999 and the current funding cycle runs until 2015.

[6] Linked to efforts by the Green Building Council of South Africa (www.gbcsa.org.za)

The German Development Service (DED) and the Centre for International Migration (CIM) send advisers to Uganda that are then attached to government institutions (including District and Local Governments), Research Organisations and Private Sector Companies.

With the support from the German Government, the Ugandan Ministry of Energy and Mineral Development (MEMD) initiated the Energy Advisory Project (EAP) in June 1999 which ran until May 2008. In June 2008, the project was transformed into the Promotion of Renewable Energy and Energy Efficiency Programme (PREEEP) implemented by the Ministry of Energy and Mineral Development with the support of KfW (German Development Bank) German Technical Cooperation (GTZ), and the German Development Service (DED), who later merged to become GIZ. The overall objective of PREEEP is to improve access to modern energy services and the efficient use of energy by households and the private sector, especially in Northern Uganda. The programme is working in four main components in order to achieve this objective, namely 1) Energy Policy Advice 2) Promotion of Improved Biomass Technologies 3) Rural Electrification and 4) Energy Efficiency.

Technical Assistance: Building Capacity of Independent Power producers and Financial Institutions through the organisation of skills transfer events

Transaction Advisory Services: UECCC will offer transaction advisory to independent power producers through the KfW support. The support will include; pre-feasibility studies, mile stone project studies validation, ESIA/RAP validation, Business plan preparation, Economic and Financial modelling, Market and risk assessment, marketing project to PFIs and investors and valuing of projects for sale.