KENYA ENERGY PRODUCTION AND CONSUMPTION

KENYA

4'931 mio kwh production per year

3589 mio kwh consumption per year

117 kwh consumption per capita per year

20.5% system loss

*1

*4

NAIROBI

*3

BASEL

18 064 TJ/a consumption per year

26 MWh consumption per capita per year

x 14.4

PERCENTAGE OF KENYAN HOUSEHOLDS CONNECTED TO ELECTRICITY GRID

NATIONAL *6.12%*

URBAN *22.68%*

RURAL *0.94%*

*1

ACTORS IN KENYA ELECTRICITY SUPPLY

Restructuring of Kenya's power sector started in 1997 with guidance of the Electric Power Act (EPA, 1997). It separated the functions of generation from those of transmission and distribution. With these reforms, the roles in the power sector are as follows:

- The Kenya Power and Lighting company (**KPLC**) owns all transmission and distribution assets. It buys electricity from generating companies for transmission, distribution and retail.

- The Kenya Electricity Generating Company (**KenGen**) manages and develops all public power electricity generating facilities. It sells electricity to KPLC.

- Independent Power Producers (**IPPs**) build, own and operate power stations and sell the power to KPLC.

- The Electricity Regulatory Board (**ERB**) reviews electricity tariffs and enforces safety and environmental regulations in the power sector. It is also safeguarding the interests of electricity consumers.

- The **Ministry of Energy** formulates policies for the energy sector, in addition to administering the Rural Electrification Scheme.

*4

COMPOSITION OF ENERGY PRODUCTION

TOTAL ENERGY PRODUCTION

COAL SOURCES *0%*

HYDROELECTRIC SOURCES *54.7%*

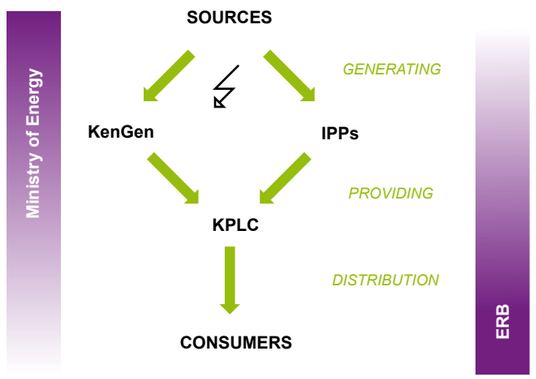
NUCLEAR SOURCES *0%*

OIL SOURCES *34%*

NATURAL GAS SOURCES *0%*

OTHER *11%*

*2



MAIN TYPE LIGHTING FUEL IN NAIROBI

ELECTRICITY PARAFFIN LAMPS OTHER

MAIN TYPE COOKING FUEL IN NAIROBI

KEROSENE ELECTRICITY CHARCOAL OTHER

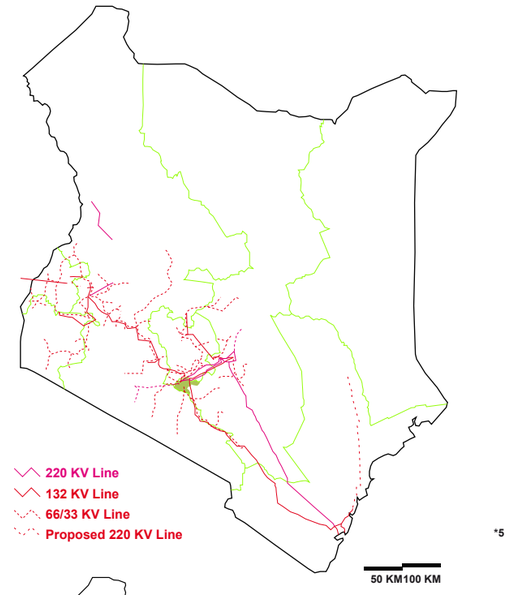
*1

*3

KENGEN AND IPPs

KPLC/KENGEN TSAVO WEST IBERAFRICA WESTMONT ORPOWER4

*4



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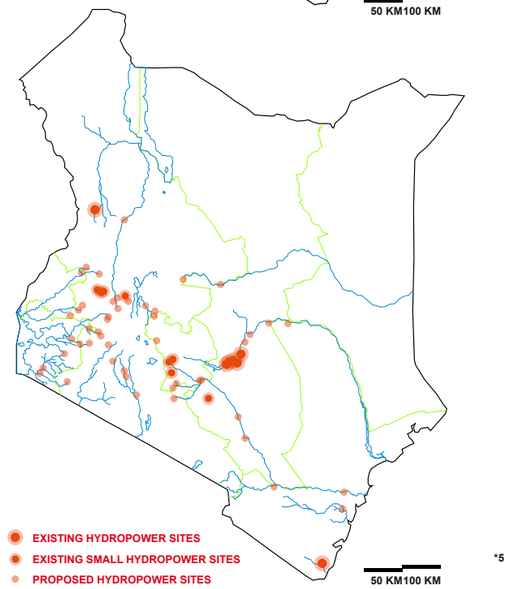


*5

KENYA MAIN ENERGY SOURCES

In 2003 Kenya generated 1090 MW of electricity and imported about 20 MW. The main sources of electricity production are hydro-power and oil sources. Hydro-power is the leading source.

HYDRO-POWER

Hydro-Power is the largest source of electricity in Kenya, providing approximately 680 MW (55% of the grid capacity installed in total).

Much of the hydropower comes from large-scale stations and dams on the upper Tana River and the Turkwel River.
About 570 MW (84% of Kenya's existing hydropower capacity) comes from a succession of dams called the Seven Forks Power Stations and are located along the upper Tana River.

The proposed dams at Muntonaga and Grand Falls, just downstream from the existing upper Tana River dams, will likely be the next dams built under Kenya's least cost development plans.
The Sondru-Miriu hydropower project is currently being constructed to the east of Lake Victoria.
Small hydropower systems (generating less than 10 MW each) often provide electricity for off-grid or isolated rural areas. The most important small hydropower sites are in the upper Tana River area and a few sites in Western Kenya.

OIL SOURCES

Kenya has no known oil or gas reserves. The Kenyan government is encouraging foreign interest in oil exploration. With over 40% of its foreign exchange earnings spent on imported crude oil and refined petroleum products, the Kenyan downstream oil industry (petrol stations) is therefore an important sector of the country's economy.
Refined products are also being exported to neighbouring landlocked countries. This makes Kenya very sensitive towards increasing prices for oil.

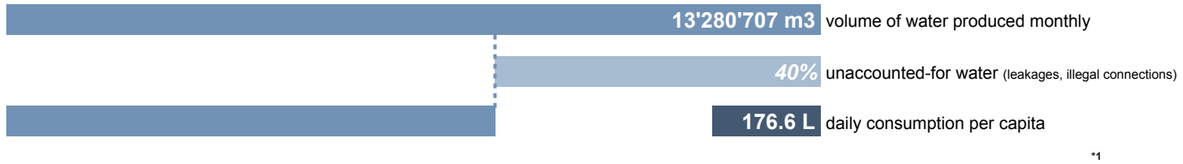
*1 Central Bureau of Statistics, Kenya, 2004 (All Data are from 1999)
*2 World Bank, Environment Department, 2004 (All Data are from 2001)

*3 UN Habitat, 2006: Nairobi, Urban Sector Profile, United Nations Human Settlements Programme (UN HABITAT), Nairobi, Kenya
*4 AFREPREN/FWD, 2004: Energy Access Team Result, Energy Services for the Poor in Eastern Africa. AFREPREN/FWD, Kenya

*5 United Nations Development Programs (UNDP), 2005 :Kenya, Energy Atlas. United Nations Development Programs (UNDP), Nairobi, Kenya
*6 Baudepartement Kanton Basel Stadt, Amt für Umwelt und Energie, 2006

NAIROBI INFRASTRUCTURE - WATER SUPPLY

NAIROBI



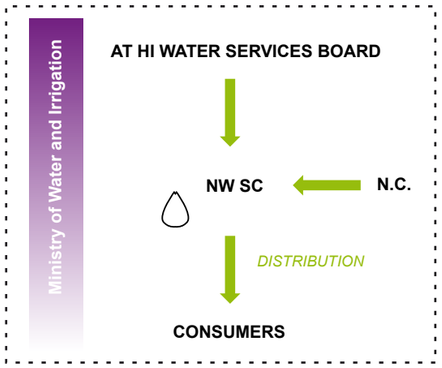
*1

DOMESTIC WATER DIVISION

*2

ACTORS

The annual quantity of renewable fresh water resources of Kenya is estimated at 20.2 billion me
The country's population is about 29 million people, per capita supply is approximately 696 me per person per year, which makes Kenya a water scarce country (the global benchmark is at 1'000 me per person per year).
Kenya is among the countries likely to run short of water in the next 25 years.
The water supply of Nairobi is very dependent from water supply from rural areas. The two largest sources of water for the city are the Ngethu and the Sasumwa dams.
In Nairobi, it is estimated that only 25 percent of the consumers are properly metered and these are mainly industrial and large commercial consumers.



SOURCES OUTSIDE THE RESIDENTIAL PREMISES

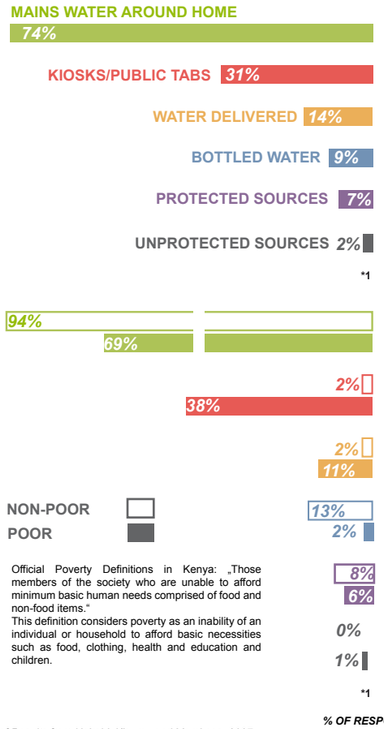
Fetching water from kiosks and other outside sources is stressful and unpleasant. Poor families spend at least 50 minutes a day in water collection during normal times and up to 120 minutes in times of water scarcity.
Most of the time women are the ones who are fetching water. If women from poor families are spending a lot of time fetching water, they are losing out on wage earning activities, have less time to take part in community activities, to get an education or to care for other family members, and will also be suffering from exhaustion.

DIFFERENT TYPES OF WATER ACCESS

There are distinct inequalities in access to network connections between the poor and the non-poor. Poor households are much more likely than the non-poor to use kiosks as their primary source of water.
The poor pay higher prices for lower level services than the non-poor. (Total per month for 1'000 liters from network: 17 KES/ from kiosk:100 KES)

Many households are experiencing periods of scarcity and the poor are more likely to face scarcity than the non-poor.
Scarcity is defined as low or lack of water supply lasting five days or longer.

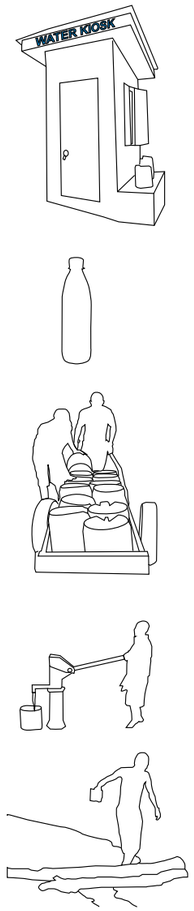
*1



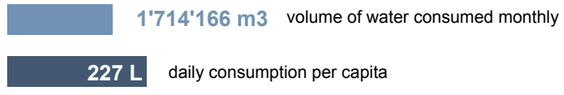
Official Poverty Definitions in Kenya: „Those members of the society who are unable to afford minimum basic human needs comprised of food and non-food items."
This definition considers poverty as an inability of an individual or household to afford basic necessities such as food, clothing, health and education and children.

*1

% OF RESPONDENTS



BASEL



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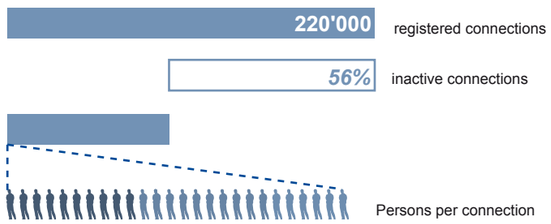
CONNECTIONS



*1

MAIN CONNECTIONS

The connection network consists of private connections inside the home and shared connections in the compound. These connections are served by NWSC.

WATER KIOSKS

Kiosks are helping the water companies to achieve their benchmarks for coverage, even though kiosks are a lower level of service.
Water kiosks can be supplied by main or independent sources and can be managed privately, by the water companies or by NGOs.
Kiosk-users are vulnerable especially during periods of scarcity, as they shift to more expensive or unsafe sources of water like ponds and rivers.
According to UN-Habitat only 22% of Slum dwellers have water connections. 75% have to buy water from water kiosks at a far higher price.

BOTTLED WATER

Bottled water is much more expensive and mainly consumed by higher income levels.

WATER DELIVERED

Water can be delivered by mobile vendors or tankers.

PROTECTED SOURCES

Protected sources can be rainwater collecting points or covered wells with hand pumps.

UNPROTECTED SOURCES

Open wells and surface water such as streams and ponds are unprotected sources and can be a health risk.

*1

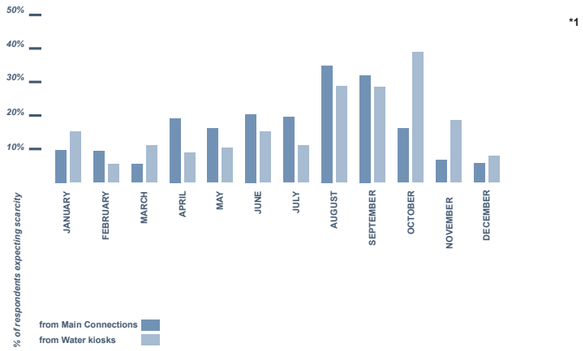
LOS ANGELES

*4

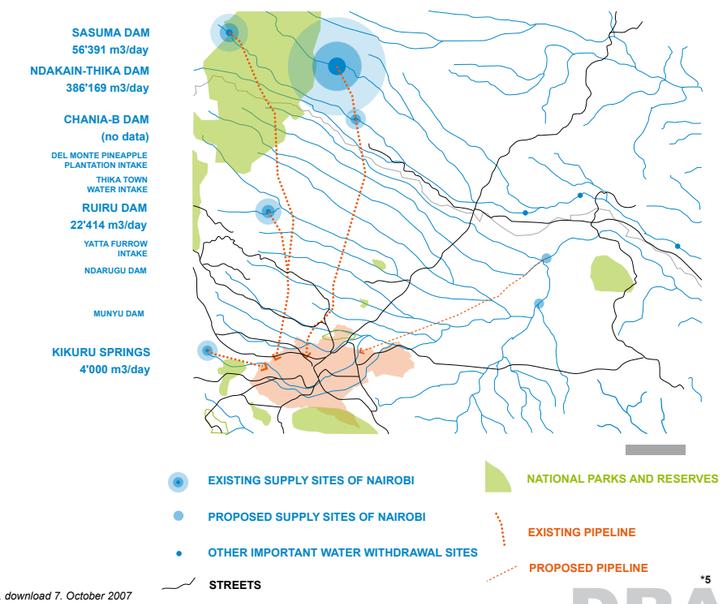
SCARCITY

Times of scarcity, which are defined as low or lack of water supply lasting five days or longer, are experienced by many households in Nairobi. The chances of suffering from water scarcity are depending on the type of water access and the season.
As most kiosks are served by main connections, the scarcity pattern is similar for kiosk-users and users with a connection to the network.
In the survey used for the chart below, the percentage of kiosk users reporting scarcity was higher than the one of users of main connections, suggesting that in times of scarcity kiosks are less likely to receive water than domestic connections.

*1



WATER SOURCES OF NAIROBI

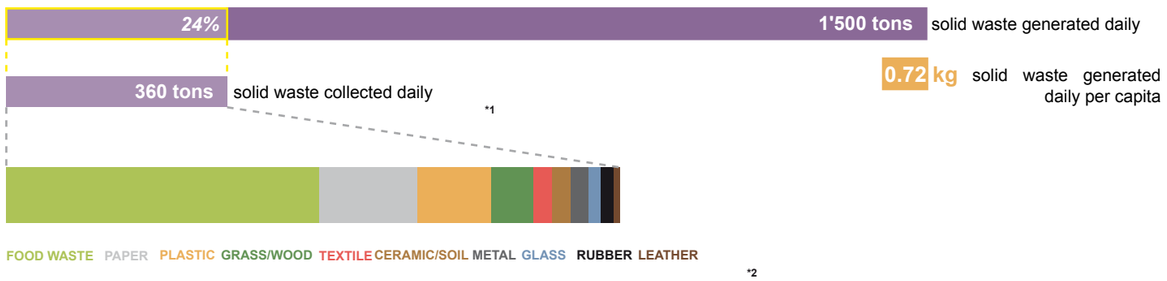


*5

1 WSP, Citizens Report Card on Urban Water, Sanitation and Solid Waste Services in Kenya, Summary of Results from Nairobi, Kisumu and Mombasa, 2007
2 UN Habitat, 2005: Nairobi, Urban Sector Profile, United Nations Human Settlements Programme (UN HABITAT), Nairobi, Kenya
3 Statistik zum Trinkwasserverbrauch, Industrielle Werke Basel, http//:www.umweltberichtbeiderbasel.ch/, download 10. October 2007
4 Internet: EDN Urban Environment Report, hap://warranted/USER/report/coldheartedly/, download 7. October 2007
5 World Resources Institute; Department of Resource Surveys and Remote Sensing, Ministry of Environment and Natural Resources, Kenya; Central Bureau of Statistics, Ministry of Planning and National Development, Kenya; and International Livestock Research Institute. 2007. Nature's Benefits in Kenya, An Atlas of Ecosystems and Human Well-Being. Washington, DC and Nairobi: World Resources Institut

NAIROBI INFRASTRUCTURE - SOLID WASTE

NAIROBI



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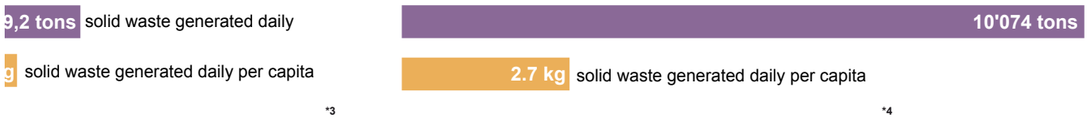
LOS ANGELES



*3

*4

SOLID WASTE COLLECTION IN NAIROBI

Of the 1'500 tons of solid waste that are estimated to be generated daily in Nairobi, roughly a quarter gets collected.
Poor **NCC** performance stimulated the entry of **private** and **community actors** into the solid waste collection sector, such as *BINS Nairobi* (private company) and *Mukuru Recycling Center* (Community Based Organisation, CBO).
There is a spatial difference in service distribution. High-income and some middle-income residential areas together with commercial areas are well serviced by private companies and even the NCC. Small private firms are also increasingly servicing some of the relatively better low-income areas.
In some low-income areas and informal settlements Community Based Organisations try to solve the solid waste problem by collecting garbage and composting organic waste. *1

FORMAL ACTORS IN SOLID WASTE COLLECTION

MUNICIPAL

NCC

PRIVATE

BINS, NAIROBI (ca. 5'000 clients)
DRDS Ltd. (ca. 1'400 clients), ...

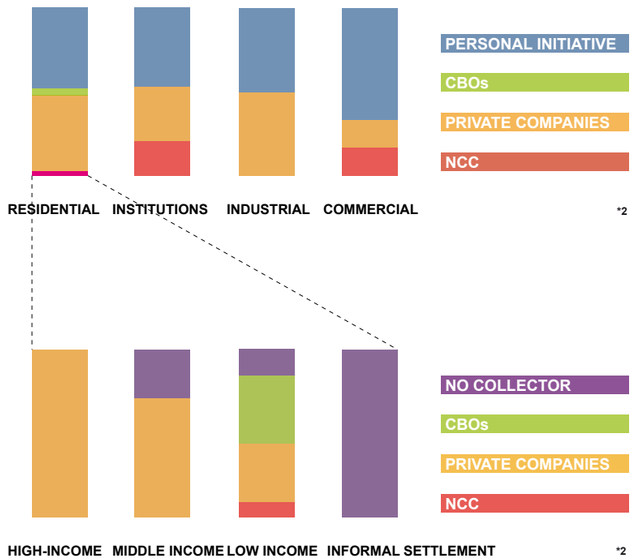
CBOs

MUKURU PROJECT
AFYA BORA GROUP
KIBERA SIRANAGA
...

PERSONAL INITIATIVE

INDIVIDUALS

PARTICIPATION OF ACTORS IN SOLID WASTE COLLECTION



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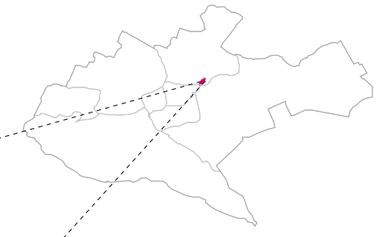
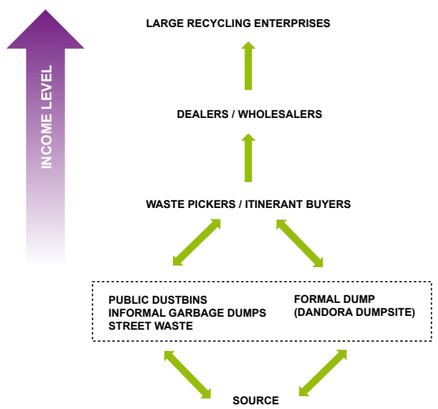


DANDORA DUMPSITE

Dandora is the only official dumpsite in Nairobi city. It is owned and operated by the NCC, who has sole responsibility of waste disposal. The dumpsite is an open landfill. It covers an area of about 26.5 hectares and is filled by approximately 1.3 million cubic meters of garbage after 14 years of use (JICA, 1998).
The NCC charges a dumping fee ranging from Kshs 30 to Kshs 100 (US$ 0.4 -1.35).
The dumpsite is gang type controlled by groups of waste dealers and divided into several territories.
Truck drivers, including NCC drivers, usually pay for police escort to the dump.

Because of this insecurity illegal dumps (used even by NCC) have sprouted in many places.

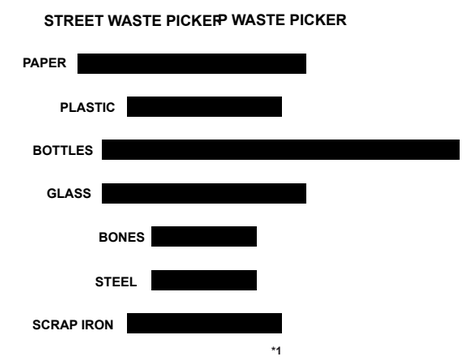
The Dandora dumpsite is located next to densely inhabited low-income residential areas. The risk of contamination, spread of diseases and water and air pollution is high, especially because toxic and hazardous materials get into the waste stream. Open waste burning on the dumpsite increases the risk. *1



INFORMAL RECYCLING

INFORMAL RECYCLING OF INORGANIC WASTE

Recovery, reuse and recycling of solid waste in Nairobi is not perceived as a municipal concern or of any relevance to NCC's mandate for SWM. The city neither sponsors nor spouses the recycling, recovery or separation of inorganic waste in policy or practice.
Waste picking activities in Nairobi remain officially unrecognised, socially unaccepted and highly stigmatised. To the NCC and city dwellers, waste pickers are a nuisance group of criminals.
There are many actors taking part in the recycling of inorganic waste in Nairobi: From waste pickers, to dealers and traders, to small-and large scale recycling companies.
Waste pickers and itinerant buyers operate at the lower-income end of the chain and large recycling enterprises at the highest income end. *1



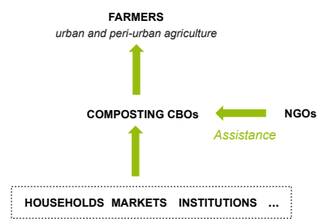
*1

FORMAL AND INFORMAL RECYCLING

FORMAL AND INFORMAL RECYCLING OF ORGANIC WASTE

Organic waste makes up over 60 percent of the total load of municipal solid waste generated in Nairobi. (Organic waste includes green waste, meat, bone and fish remains from markets, hotels, schools, hospitals and other institutions.)
There are also serious health risks deriving from uncollected inorganic waste.
Initiatives have been taken by formal and informal institutions, including local authorities, NGOs and CBOs.
Some of the larger hotels and restaurants in Nairobi also sell their food scraps to farmers for use as pig feed. Organic wastes are important to the urban agricultural sector for all sorts of livestock farming (goats, chickens, cows).

Contrary to the inorganic solid waste recycling circle, the recovering of organic waste has an established institutional framework. *1



*1 Baud, Isa/Post, Johan/Furedy, Christine (Kluwer Academic Publishers) (2004): Solid Waste Management and Recycling. Actors, Partnerships and Policies in Hyderabad, India and Nairobi, Kenya. Kluwer Academic Publishers, The Netherlands.
*2 Muchiane, Grace/Muchane, Eunice, 2006: Solid Waste Management in Nairobi City and the town of Limuru, in Kenya. Tampere Polytechnic University of Applied Sciences, Tampere
*3 Internet: Basel Stadt, Statistik, Abfall; http://www.statistik-bs.ch/kennzahlen/nachhaltigkeit/umwelt/u13/, download: 7. October 2007
*4 Internet: EDN Urban Environment Report, http://www.earthday.net/U ER/report/ca_la_detail.html/, download 7. October 2007
*5 Satellite Image: Google Earth, 5. October 2007