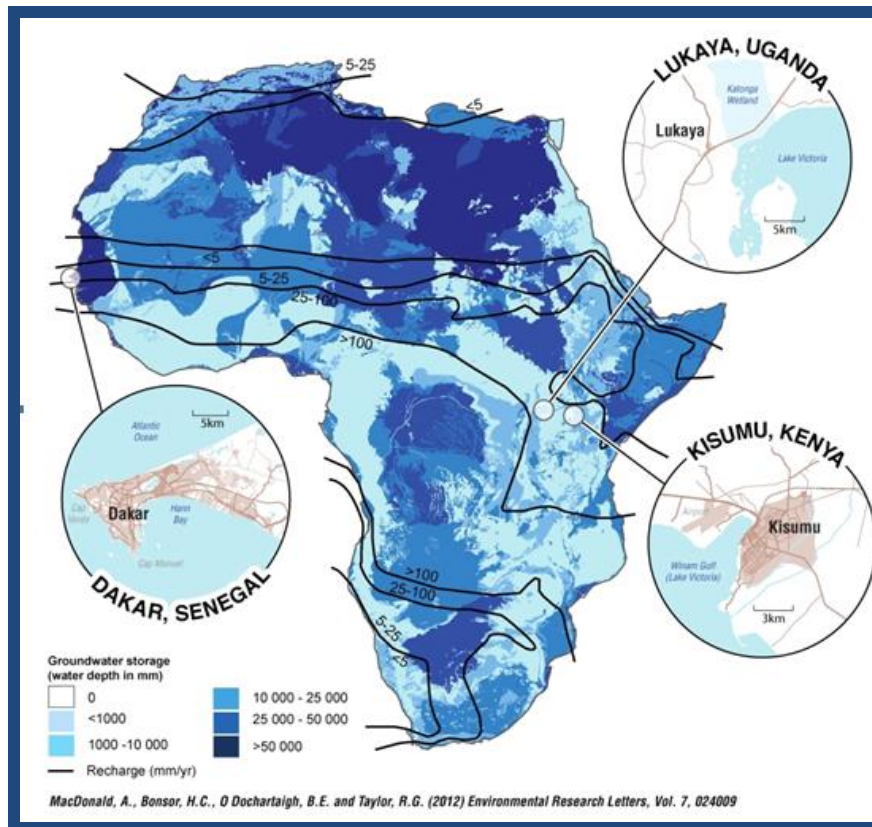


SUSTAINING URBAN GROUNDWATER-FED WATER SUPPLIES AND SANITATION SYSTEMS IN AFRICA

KISUMU FACT FINDING MISSION REPORT

A Report on Sensitization and Fact finding Mission in Kisumu from 2nd to 6th June 2015



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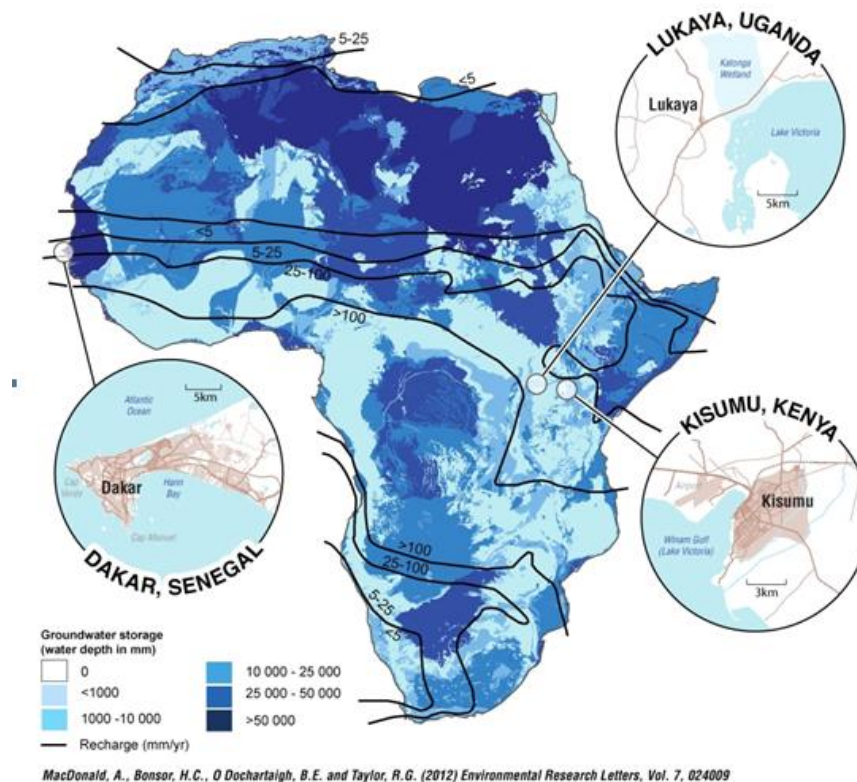
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SUSTAINING URBAN GROUNDWATER-FED WATER SUPPLIES AND SANITATION SYSTEMS IN AFRICA

1.1. Introduction to the Project

The urban/peri-urban Kisumu aquifer supplies water to areas not served by the urban water supply from Lake Victoria and Kajulu water intakes. The groundwater acts as a strategic reservoir during drought. It is of major economic importance to the region providing supplementary or emergency water for domestic and industrial use. The Kisumu aquifer lies south of the equator on the Nyanzian craton. The study area is bounded to the north by the Nyando fault-scarp running parallel to the Equator, in the east by the volcanic masses of Tinderet, and to the south by thick and deeply eroded lava flows that wedge out towards the Kendu Bay, Homa Bay and the lake.

The overall aim of the project is to develop the scientific evidence required to inform policies and practices that sustain the quantity and quality of urban, low-cost water supply and sanitation systems. The study involves a network of consortium that form a network of Urban Groundwater Observatories comprising a town (Lukaya, Uganda), a city (Kisumu, Kenya), and mega-city (Dakar, Sénégal) – figure below.



1.2. The common scientific objectives are:

1. To map and characterize urban aquifers, well catchments, sanitation facilities, and groundwater supply coverage and use for the respective cities;
2. To analyze aquifer dynamics, surface-groundwater interaction, and vulnerability of the aquifers to point and non-point source pollution; and

3. To quantitatively assess the impact of different low-cost, sanitation strategies on urban groundwater;
4. To build capacity to assess, manage, and sustain urban groundwater systems.

1.3. Facts finding mission

The main objective of this fieldwork was to identify the key stakeholder and collaborators, and to gather baseline information for sustaining urban groundwater-fed water and sanitation systems in Africa Project under the Royal Society – DFID capacity building initiative for Africa funding.

A sensitization and facts finding mission to Kisumu was undertaken to gather baseline information on the existing key stakeholders in the project and to create inventory of likely information and data that each stakeholder can provide. In addition, the following was undertaken during the reconnaissance survey:

- Introducing the project and explaining the objectives of the project to key collaborators on the ground.
- Consultation with the management of the County water offices, WRMA regional office and the LVSWB aimed identifying sources of relevant data and information.
- Getting to know the location of relevant field (regional) offices (if existing).
- Collecting first-level information on existing definition of Kisumu City and locations of peri-urban dwellings (including existing maps if available) and the definition of the slums.
- Collecting preliminary information on some issues pertaining to water and sanitation in Kisumu (surface and groundwater resources and suppliers).

The fact finding mission included the following personnel from the University of Nairobi:

1. Prof. Daniel Olago – Team Leader
2. Dr. Simeon Dulo
3. Mr. Japhet Kanoti
4. Mr Mike Mbugua - Driver

The key offices visited were:

1. Town Planning Department offices – To gather information on the existing boundaries of Kisumu Urban and Peri-urban areas. The team had a meeting with the Deputy Manager, Town Planning Department and she provided us with a map showing Kisumu administrative boundaries.
2. Kisumu Water and Sewerage Company (KIWASCO). This is the body mandated to supply water and offer sewerage services in the region. It also sub-contracts other water service providers in Kisumu.
3. Lake Victoria South Regional Offices of WRMA – Water Resources Management Authority. This body manages water resources and authorizes water abstraction and borehole drilling in the Lake Victoria Administrative region according to the Water Act 2002.
4. Lake Victoria South Water Services Board. This is body responsible for provision of water and sewerage infrastructure in the region, and licensing water service providers.
5. Kisumu County Director of Water. This is the office responsible for water policy formulation at county level.

6. Majidata website. MajiData is an initiative of the Kenyan Water Sector and provides information on water and sanitation issues in urban low income areas.

In addition to the above listed offices, the team visited surface water intake in Dunga and the newly constructed intake in Kajulu near the Nyando Escarpment.

1.4. List of Officers met

Below is a list of key officers visited during the fact finding mission

1. Mr. George Odera – KIWASCO – Production Manager, Kajulu Water Intake.
2. Ms. Muthoni Orlale – Town Planning Department – Deputy Manager, Town Planning Department.
3. Mr. Enock S. Wanyonyi – WRMA – Deputy Technical Coordination Manager.
4. Mr. Leonard Mashafu – WRMA – Assistant Technical Coordination Manager, Groundwater.
5. Mr. G. Koyier – County Water Office – Chief Officer.
6. Mr. Hesbon Opuko – County Water Office – Director, Infrastructure Development.
7. Mr. John Owenga – County Water Office – Director, Water Services.

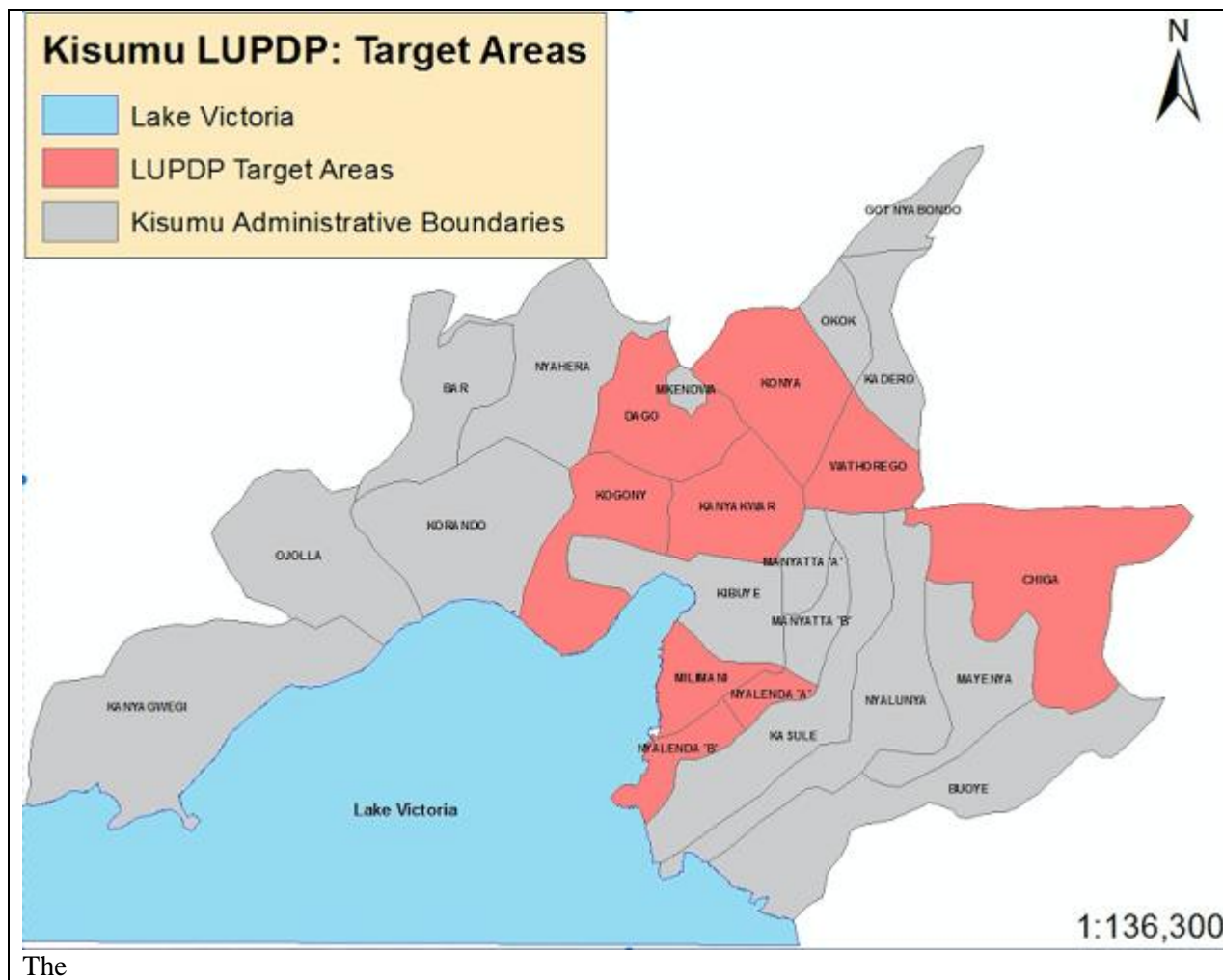
The above visited officers were given a brief introduction to the project that is scheduled for official launch in Dakar, Senegal in August/September, and the areas targeted in Kisumu by this project. These are the Urban and Peri-urban areas including Manyatta, Otongolo, Migosi and Nyalenda. It emerged during the meetings that there was need to formally provide the key stakeholders' with information about the Project and the likely role each would play to make the project a success.

1.5. Introduction to Kisumu County

Kisumu County is one of the 47 Counties in Kenya. It lies within longitudes 33° 20'E and 35° 20'E and latitudes 0° 20'South and 0° 50'South (KCIDP 2013). The County is bordered by Homa Bay County to the South, Nandi County to the North East, Kericho County to the East, Vihiga County to the North West and Siaya County to the West. The County covers a total land area of 2009.5 km² and another 567 km² is covered by water. The county has a large area of wetlands, i.e. the Singida Wetland in Nyando. The people who live around the wetlands are affected by regular flooding.

Politically, Kisumu County has seven sub-counties namely: Muhoroni, Nyakach, Nyando, Kisumu East, Kisumu Central, Kisumu West and Seme. These sub counties are also constituencies (IEBC 2013). The County can be divided broadly into the following categories: urban (town center), informal settlements (slums surrounding the town center), and peri-urban areas located on the outskirts of the Township. The settlement areas/estates include Bandani, Kamenya lower, Kibos, Lumumba, Makasembo, Mamboleo, Milimani, Migosi, Manyatta, Nyalenda, Nyamasaria, Nyawita, Obunga, Ondiek and Robert Ouko estates.

Apart from the Kisumu City, the following have been categorized as urban areas within the County: Ahero, Maseno, Kombewa, Awasi, Holo, Chemilil, Muhoroni, Katito, Pap Onditi and Sondu (KCIDP 2013)



The
Map 1: The extent of Kisumu urban and Peri-urban areas (County Planning office 2015)

Table 1: Kisumu County surface area (UN-HABITAT, 2008)

County Area:	
Total area Km ²	2,085.90
Water mass Km ²	567
National Parks/Reserves	2
Arable land	1,342
Non-arable land	209
Total urban areas	40
No. of towns	8

1.6. Topography and climate

The county can be divided into three topographical zones namely: the Kano Plains, the upland area of Nyabondo Plateau and the midland areas of Maseno. The Kano Plains lie on the floor of the Rift Valley at

an altitude of about 1,100m and is a flat stretch bordered to the North and East by the Nyando escarpment, while the upland area comprise ridges which rise gently to an altitude of 1,835m above sea level.

The mean annual maximum temperature ranges between 25°C to 35°C and the mean annual minimum temperature ranges between 9°C to 18°C (KCIDP 2013). Kisumu has two rainy seasons and the long rains occur between March and May and the short rains between September and November. During the short rains the average annual rainfall ranges between 450mm and 600mm. Rainfall data indicates that the county largely receives substantial rainfall during long rains. For example, Maseno has a mean annual rainfall of 1,630mm, Kisumu 1,280 mm, Ahero 1,260 mm, Kibos 1,290 mm, Muhoroni 1,525 mm, and Koru 1,103 mm (UN-HABITANT, 2008).

Table 2: Altitude and climatic data for Kisumu (UN-HABITAT, 2008)

Topography and climate	
Lowest altitude (metres)	1,100
Highest	1,835
Temperature range (°C)	
High	25 - 35
Low	9 - 18
Rainfall (mm)	
High	1,800
Low	1,000

1.7. Soils

The soils in Kisumu are dominated by lake sediments that consist of sand and clay soils. In the Kano Plains, the soils are dark brown and grey, are poorly drained and are generally very deep and firm. In the western part of Kano Plains the soils are dark cotton soils commonly associated with the swamps (KCIDP 2013). These types constitute more than 70 per cent of all soil types found in Kisumu County. The soils are suitable for brick making and sand harvesting especially at Maseno and Nyakach.

1.8. Communication

The County has a total length of tarmac road of about 286km, gravel surface (about 725.6km) and earth surface (about 956.6km). The county is traversed by the main trunk road (B1) linking Nairobi to Kampala, Uganda through Busia. The Trans-African Highway (A1) links Kisumu to Tanzania through Kisii and an alternative route to Tanzania from Kisumu is through Homa Bay. There are several tarmacked roads linking the county to Western Kenya towns like Kakamega, Nandi Hill, Kapsabet, Eldoret, Bungoma and Kitale among others. The county has Kisumu International Airport that is the busiest airport in Western Kenya and the third busiest airport in the country (KCIDP, 2013). Kisumu is well served by postal, mail and telephony services with major service providers having offices and outlets within the city.

1.9. Land and land use

The mean land holding size in the county is 1.6 acres while the mean agricultural parcel is 1.0 acres (KCIDP, 2013). The main crops grown for subsistence include beans, maize, sorghum, finger millet, potatoes, groundnuts, kales and cotton. The main cash crop is sugarcane while some rice growing is practiced along Rivers Nyando, Awach, Chemelil, Miwani and Kibos.

1.10. Water resources

Three major rivers flow through the county into the Winam Gulf namely. These are the Nyando, Kibos and Sondu (KCIDP 2013) to the south and the Kisian, and Awach Seme to the north (WRMA). These rivers are heavily silted, resulting in the extensive formation of lakeside swamps. The Kano Plains is vulnerable to flooding during heavy rains especially the lower Kano Plains and in particular low lying areas of Nyando. The county has a long shoreline along Lake Victoria. This shoreline is 90 km long and has more than 17 beaches.

1.11. Demographics

The population of Kisumu County according to 2009 population and housing census was 968,879 comprising of 474,687 males and 494,222 females spread over the seven sub counties (Majidata

website). This population is estimated to increase to 1,264,661 by 2015 assuming an annual population growth of 2.7% as adopted by the World Bank.

Table 3: Population distribution and density by Constituency (KNBS, 2013; Majidata 2015)

Sub-county	2009 (Census)		2012 (Projected)		2015 (Projected)		2017 (Projected)	
	Population	Density	Population	Density	Population	Density	Population	Density
Kisumu East	150,124	1,105	159,895	1,177	170,293	1,253	177,608	1,307
Kisumu West	131,246	616	139,789	656	148,879	699	155,274	729
Kisumu Central	168,892	5,165	179,885	5,501	191,582	5,859	199,812	6,111
Seme	98,805	519	105,236	553	112,079	589	116,894	614
Nyando	141,037	341	150,217	363	159,985	387	166,857	403
Nyakach	133,041	372	141,700	396	150,915	422	157,397	440
Muhoroni	145,764	218	155,252	232	165,347	247	172,449	258
Total	968,879	482	1,031,973	513	1,099,079	547	1,146,290	570

1.12. Access to water

The water supply in the city is privatized in line with the requirements of the Water Act 2002, and the Kisumu Water and Sewerage Company (KIWASCO) is the sole water utility in the city. There are some CBO/NGO-instigated water projects that are sub-contracted by KIWASCO and supply water to the informal settlements. There are 16 active water based NGOs doing a number of projects in the county. These include: World Vision, Care Kenya, Practical Action, Plan International, Millennium Cities Initiatives, Umande Trust, Kisumu Urban Project, Cordaid Urban Matters, Kenya Red Cross, UNICEF, STIPA, CSO Network, SANA, ADS-Kenya, SNV and Living Water Service Centre.

Table 4: Main community water supplies in Kisumu (KCIDP 2013)

Name of Water Supply	Sub county	Service Area	Management
Asengo	Kisumu West	5km ²	C.B.O
Rabuor	Kisumu East	8km ²	C.B.O
Wandiege	Kisumu East	4km ²	C.B.O
Kolal	Kisumu East	4km ²	C.B.O /Govt
Kadete	Kisumu East	2km ²	C.B.O /Govt
Kawere	Nyakach	2km ²	C.B.O
Olembo	Nyakach	2km ²	C.B.O
St. Camilus	Nyando	1km ²	C.B.O /Govt
Sangoro	Nyakach	2km ²	C.B.O /Govt
Odino	Nyakach	2km ²	Private
Kowi	Seme	2km ²	C.B.O /Govt
Mbaka Oromo	Kisumu West	1km ²	C.B.O /Govt
Nyabera	Kisumu west	1km ²	C.B.O /Govt

Paga	Seme	1Km ²	C.B.O
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The City experiences acute water shortage and only about 40% of the population have access to piped water (Majidata). The water from Lake Victoria is treated at the Dunga Water treatment plant, located 0.6 km from the intake, and is then pumped to storage tanks in Kibuye, while the water from the Kibos River at Kajulu is treated and then flows by gravity to storage tanks in the city. The two intakes are managed by KIWASCO and serve the Kisumu Central sub-county. The second Water Service Provider is Gulf Water Services Company and has four operational water supplies, namely: Kisumu rural, Maseno Kombewa, Nyahera and Mkendwa Kanyakwar. The third Water Service Provider in Kisumu County is NYANAS Water and Sanitation Company Limited (NYANAS WASCO) and serves Muhoroni and Nyakach.

According to County strategic plan 2013-2017, the County has a total of 10 gazetted water supplies, 15 Community water supplies, 40 Boreholes, 70 Shallow wells and 7 water pans. The major gazetted water supplies serve a total area of 956Km² only, with a total production of about 5,010 m³/d. The total population served is 25,000 directly by these water supplies. The number of storage tanks in these water supplies range between 50m³ – 500m³. This gives the County a total storage Capacity of 3,752m³ with a total pipe network covering 763km (KCIDP, 2013). This report conflict with information gathered from the Lake Victoria South Water Services Board that indicates that the expanded Dunga Treatment Plant stabilized water supply to the city and the installed water capacity increased to 46,000m³/day from 22,000m³/day after installation of new water pumps. Water coverage currently includes Nyamasaria, Usoma, Manyatta, Dunga and Bandani with support from WTSF and other partners. The coverage is likely to be accelerated in the coming years with completion of Kajulu Water Works. The Kajulu project was funded by Government of Kenya and French Development Agency (AFD) and will increase the current water supply from 1,700m³/day to 48,000m³/day (LVSWSB 2015).

Table 5: Gazetted water supplies in Kisumu (KCIDP, 2013)

Name of Water Supply	Sub county	Status	WSP
Kisumu	Kisumu Central	Full	KIWASCO
Kisumu Rural	Seme	Full treatment	Gulf
Maseno Kombewa	Seme/Kisumu West	Full treatment	Gulf
Nyahera	Kisumu West	Partial treatment	Gulf
Mkendwa-kwar	Kisumu West	Partial	Gulf
Nyakach	Nyakach	Full	NYANAS
Muhoroni	Muhoroni	Full	NYANAS
Tamu	Muhoroni	Full	NYANAS
Koru Mnara	Muhoroni	Partial	NYANAS
Kibigori	Muhoroni	Partial	NYANAS

The service delivery within the county is compromised by several factors;

- High level of non- revenue water (NRW) of up to 47% for KIWASCO and higher for rural schemes
- High cost of electricity
- Old and dilapidated pipelines and distribution lines
- Low management capacity particularly of community managed water supply schemes

- Poor maintenance
- Inadequate financial allocation in the county budget
- Lack of skilled and adequate staff to manage rural water supplies
- Polluted water sources

Groundwater resources supplement surface water. The peri-urban dwellers in Kisumu suffer the most from inequitable water provision and over 60% of informal settlements obtain their water from unsafe sources, resulting in high rates of water- and sanitation-related disease and morbidity (UN-HABITAT, 2006).

The water problem is ironic as Kisumu is located on the shores of Lake Victoria, one of the largest fresh water lakes in the world. Many slum dwellers are forced to buy water from vendors and normally pay higher prices than in middle- and high income areas. As an alternative, many informal settlements residents rely on shallow wells, which are often contaminated because of a high density of pit latrines in the vicinity of the wells.

In recent years, several projects have been initiated to improve the water supply and sanitation in Kisumu City. These include projects funded by the French Agency for Development (AFD or *Agence Française de Développement*) and the World Bank, as well as by such non-governmental organizations as World Vision, Sustainable Aid in Africa (SANA) and Undugu Society. Some of the proposed new water supplies include Simbi Springs in Kajulu East and Ogongo Springs in Central Kisumu, Holo in Kisumu West, Gita-Kajulu and Kadete in Kisumu East, Ayier Gweng' in Nyando, Kipsamwe and Chemelil supplies in Muhoroni (Kisumu County Water and Sanitation Strategic Plan, 2015).

The main water sources in the county include; Lake Victoria, shallow wells, unprotected springs, water pans, dam, boreholes and roof catchment systems and over 40% of households spend about 20 minutes to access safe and portable water. During the dry spell some of the water sources run dry forcing people to travel even longer distances to fetch water. Women and children especially spend more time in search of water. This consumes a lot of productive time and schooling hours leading to poor educational for girls and reduced family income.

Table 6: Water access in Kisumu County and time taken to fetch water (KCIDP, 2013: Majidata 2015)

Access to water	
Households with access to piped water	166,061
HH with access to potable water	67,067
Number of permanent rivers	11
No. of protected springs	14
No. of un-protected springs	10
No. of water pans	27
No. of Dams	1
No. of Bore holes	212
HH with roof catchment systems	2,362
Mean distance to nearest water point	1
Households' distribution by time taken (minutes, one way) to fetch drinking water (%)	
0	19.6

1 – 4	27.5
5 – 14	29.3
15 – 29	12.9
30 – 59	9.1
60+	1.6

Table 7: Distribution of Households by main water sources (%) (KCIDP 2013; Majidata 2015)

Distribution of Households by Main Water sources (%)	
Piped into dwelling	3.4
Piped	21.9
Rain/harvested	0.9
Borehole	18.3
Protected well	8.3
Protected spring	2.3
Unprotected well	3.3
Unprotected spring	1.8
Stream	24.5
Jabias	0.1
Water Vendor	8.8
Pond	3.4
Dam	0.9
Lake	2.3
Others	0

A survey carried out by Majidata project (Kenyan online water and sanitation database on urban low income areas) covering 10,556 dwellings with a population of about 186,436 in Kisumu shows that the main source of drinking water used by the dwellings (42.5%) is piped water with connection of someone else outside the plot and dwellings treating water for drinking was about 70%. According to WSTF definition, the percentage of the urban population residing in low area with access to safe water in Kisumu is about 19%.

1.13. Water quality

Water from sources such as Lake Victoria and the nearby rivers is of acceptable quality, but it requires treatment before it is piped to consumers. Water from Lake Victoria is treated at the Dunga Water Treatment Plant, while the water from the Kibos River is treated at Kajulu Water Treatment Plant. In the informal settlements, although some residents have access to piped water, most residents rely on water kiosks, handcart vendors and boreholes for their water supply. The reliance on shallow wells and boreholes in these neighborhoods is problematic because water from these sources is of poor quality. Kisumu City has high water tables; consequently, shallow wells are easily contaminated by overflowing pit latrines, poor wastewater management and inadequate drainage systems. Many residents in peri-urban areas also use water from shallow wells situated in close proximity to the pit latrines, thereby increasing the chances of cross-contamination, especially during the rainy season, when dependency on such readily contaminable water sources contributes to dangerous outbreaks of such diseases as diarrhea, cholera, typhoid, dysentery and malaria (LVSWSB, 2008).

1.14. Liquid and solid waste disposal

The waste disposal in Kisumu is not well organised – the refuse collection efficiency is less than 20%. Wealthier estates have their refuse collected whereas slums are largely neglected and rely on on-site burning and open public dumping site along the streets. The city has about 10% sewerage coverage and the slum dwellers rely on pit latrines that are overused and not adequately maintained (UN-HABITAT, 2006: Majidata 2015). Areas with access to the public sewer network include Lumumba, Makasembo, Milimani, Ondiek and Robert Ouko. The low lying areas of Manyatta and Nyalenda have no sewer system as they are lower than the conventional sewer.

Many dumpsites are next to residential and commercial houses and cause health problems and intolerable living conditions. Plastic waste is a particular nuisance and blocks storm water drains during heavy rains. Slums are the hardest hit as they have no access to safe drinking water, sanitation or sewerage facilities, and waste collection is almost non-existent.

The main sewage treatment plant in Kisumu is the Kisat Conventional Sewage Treatment Plant that was built in 1958. There are in addition three main private industrial wastewater treatment plants, two of which are pre-treatment facilities only, with just one a full treatment plant. The three are Kisumu molasses, Kisumu cotton mills and the Kenya breweries. Kisumu molasses is a full treatment plant. Nyalenda Waste Stabilization Pond serves the eastern part of the city and is located adjacent to the Nyalenda low-income area. This plant has not been properly maintained and is not fully operational (LVSWSB, 2008).

Table 8: community distribution by type of main toilet and waste disposal facilities (KCIDP 2013)

Community distribution by type of main toilet facility (per cent)	
Flush toilet	7.40%
Households with Latrines	80.1%
VIP PIT Latrine	3.10%
Covered/Uncovered Pit Latrine	77.00%
Bucket	0.10%
Other	12.40%
Community distribution by type of waste/garbage disposal (%)	
Collected by local Authority	1%
Burning	25.30%
Collected by Private firm	3.90%
Garbage pit	41.40%
Public garbage heap	2.60%
Farm Garden	24.90%
Neighborhood Community group	0.20%

The most common diseases in Kisumu are HIV/AIDS, malaria, upper respiratory tract infections, water-borne illnesses and diarrhea (Majidata 2015). HIV/AIDS prevalence rates are amongst the highest in Kenya (15%), making HIV/AIDS the biggest health threat in the city. The reasons for Kisumu's high infection rates include high levels of poverty, and traditional beliefs and practices.

Table 9: Prevalence of main diseases in Kisumu (KCIDP 2013)

Five most prevalent diseases (per cent):	
Malaria/fever	44.7
Diarrhoea	2.4
Stomach-ache Headache	5.3
Headache	11.2
Respiratory Diseases	
Upper	0.6
Lower	3.2
Flu	5.2

1.15. Conclusion

The water sector in Kenya lacks a fully clear sector-specific policy and legal framework to operationalize the devolution as stipulated in the Constitution. The draft Water Policy and Water Bill contain a number of aspects that are relevant for future development of the water sector: promotion of the right to water; ensuring sustainable provision of water services; and an enabling environment for involvement of the private sector.

About 60 per cent of the county population lives in the informal settlements of Manyatta, Nyalenda and Obunga where most housing facilities lack basic amenities. As a result, some household use inappropriate waste disposal methods such as use of open spaces or polythene bags that are disposed of at night (flying toilets). Where households use septic tanks ground water contamination has been a challenge.

Reduce on disease incidences caused by unsafe drinking water through reduction the mean distances to water points for convenience of households. The Kisumu County has ambitious plans to improve sanitation coverage within the rural and urban centres from the current 20% to 60% by 2017 through connection to main sewer lines and identification and construction of common septic tanks.

The county water office is also very optimistic that the new water Bill and Act under formulation will empower the counties in provision of water and sanitation services through decentralization of service and direct funding through the county governments. The proposed Bill and Act recognizes the following:

- **Right to water:** The constitutional right to water is recognized.
- **Allocation of responsibility:** County governments will be responsible for establishing water service providers or alternative provision arrangements for urban and rural areas for both the development and management of water services.
- **Definitions:** The draft Bill distinguishes between “national public works” (water infrastructure of national or strategic importance and cross-county infrastructure) and county water infrastructure.
- **Transfers:** Provision for the transfer of assets, rights, liabilities, obligations, agreements and other arrangements from Water Services Boards to either the County Service Providers (county infrastructure) or the proposed Water Works Development Boards (national public works infrastructure).
- **Licensing:** Provision for the licensing of water service providers by a national regulator
- **Cost-recovery and ring-fencing:** Provision of water services on a cost-recovery basis wherever feasible and for ring-fencing of water revenues for purposes of operating and maintaining assets and contributing to capital costs.
- **County water services providers:** Formation of county-level water services providers, set up as companies under the Companies Act and the merging of multiply water companies in a county into a single county water services provider.

Skewed and sometimes unrealistic investments in water have further led to inequalities especially from the geographical perspective. Whereas some areas have abundance of water or water points, others have hardly any at all. This is as a result of many reasons, but perhaps the biggest influence has been the political influence. And therefore County Governments have a moral obligation to address these inequalities.

Kisumu County Water Supply and Urban Sewerage Strategic Plan (KWSUSSP) 2015 – 2019 recognises that access to safe and sufficient water is considered a basic human right by the Constitution of Kenya and the devolved system of governance tasks the counties to provide this service. This plan uses the Life Cycle Cost Approach (LCCA) in planning focusing on the impact and sustainability, equity and inclusion for services. Safe sanitation and hygiene behavior are linked to access to safe and sufficient water. The plan also recognizes that water services are better managed at community, town or even at county level, sanitation is the responsibility of the household.

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ANEX 1 LIST OF SOME BOREHOLES IN KISUMU (Source: NAWARD DATABASE)

No.	OWNER	LOCALITY	LONGI	LAT	GRIDX	GRIDY	ALT	TDEPTH	YIELD
1	MASENO UNIVERSITY	SIRIBA CAMPUS			679041	9999669	1500	49	4.5
2	KIBOS SCH.BLIND	KIBOS SCH.	344853	623			1150	94	8.64
3	MASENO UNIVERSITY	MASENO UNIVER.			677636	9999502	1520	39	12
4	OYUGI H	CHEMELIL	360820	140				70	6
5	KORU GIRLS SEC.SCH.	KORU GIRLS' SCH	351550	201157			1420	66	6.5
6	G.T.Z. WORKSHOP	NYANZA HOSP.KISUMU					1180	169	
7	LATANNERS LTD	KIBOS	344803	410			1160	35	2.46
8	PANDALL, HARTIT	KIBOS	344944	420			1140	30	2.4
9	JAGAT, SINGH	MIWANI	350008	312			1180	30	1.98
10	AMOLO, S.N	MIWANI	344246	42			1220	34	2.1
11	BRAR, SARWAN	NYANGETA	345354	238			1200	30	1.02
12	BRAR, HAJIT	KIBOS	345033	247			1180	23	1.08
13	L.B.D.A.	OMBEYI MKT.			888300	9718000	1286	150	1.8
14	L.B.D.A.	NYANDEMA SCHOOL						60	
15	HOMA LIME LTD	KORU	351542	1012			1520	141	0.66
16	D.W.D	KISUMU TOWN			696623	9992625	1219	128	0.48
17	MIWANI SUGAR MILLS	MIWANI			717031	9994471	1219	145	7.56
18	WALKER R.H	MUHORONI			748576	9983409	1425	34	11.34
19	MIWANI SUGAR MILLS	MIWANI			717031	9996317	1219	91	22.26
20	MIWANI SUGAR MILLS	MIWANI			733732	9990787	1280	83	15.9
21	TANNET C.D	CHEMILIL			739300	9992623	1285	55	2.7
22	C.M.S MISSION	YALA			652096	5528	1311	122	0.48
23	D.W.D	KIBOS			702189	9992624	1219	153	8.58
24	KIPTURI ESTATE	MUHORONI			748576	9987092	1417	122	0.04
25	HOMA LINE CO.LTD	KORU			754144	9983408	1829	41	
26	MIWANI SUGAR ESTATE	MIWANI SUGAR MILLS			720738	9992624	1219	107	20.1
27	MIWANI SUGAR MILLS	MIWANI			718890	9994471	1219	152	17.28
28	MIWANI SUGAR MILLS	MIWANI MILLS CPD			720738	9992624	1219	78	18.18
29	MIWANI SUGAR	MIWANI MILLS			718890	9994471	1217	137	10.38

	MILLS	CPD							
30	MIWANI SUGAR MILLS	MIWANI MILLS CPD			720738	9994471	1067	37	40.92
31	MIWANI SUGAR MILLS	MIWANI			715171	9998153	1220	91	4.08
32	MIWANI SUGAR MILLS	MIWANI			720738	9994471	1220	36	38.16
33	MIWANI SUGAR MILLS	MIWANI SITE 21			718888	9974200	1219	76	4.56
34	MIWANI SUGAR MILLS	MIWANI			720738	9990788	1219	39	27.3
35	MIWANI SUGAR MILLS	MIWANI			717030	9985259	1219	46	6.36
36	MIWANI SUGAR MILLS	MIWANI			713322	9977883	1219	91	22.74
37	UKWALA ADMIN.SUB.STA	UKWALA			633540	22109	1220	128	11.34
38	MIWANI SUGAR MILLS	CHEMILIL			731873	9990787	1212	113	12.78
39	MIWANI SUGAR MILLS	CHEMILIL			737440	9988940	1234	52	12.78
40	SHEMJI HART	CHEMILIL			735592	9992623	1204	92	14.4
41	MIWANI SUGAR MILLS	MIWANI			717030	9990788	1220	64	
42	NEMCHAD PUNJA	KIBOS			711464	9992624	1215	92	10.44
43	SHEMJI HARJI	MUHORONI			746727	9983409	1334	52	45.6
44	SHEMJI HARJI	MUHORONI			744867	9983409	1302	43	9.06
45	ABBEN C.O	MUHORONI			748576	9983409	1377	111	11.34
46	MIWANI SUGAR MILLS	MIWANI			717031	9996317	1219	92	9.06
47	MIWANI SUGAR MILLS	MIWANI			717031	9996317	1219	76	11.28
48	MIWANI SUGAR MILLS	MIWANI			718890	9994471	1219	46	
49	MIWANI SUGAR MILLS	MIWANI			715171	9996317	1220	55	
50	NEMCHAD PUNJA SHAH	SHAH ESTATE KIBOS			711464	9992624	1215	69	9.12
51	NAGAN MALDE	NAGETA ESTATE			713323	9992624	1213	65	24.54
52	NAGAN MALDE	NAGETA ESTATE			711464	9992624	1213	61	24.54
53	MIWANI SUGAR MILLS	MIWANI			713323	9992624	1180	69	9.54
54	MIWANI SUGAR MILLS	MIWANI			713323	9992624	1219	55	7.26

55	MIWANI SUGAR MILLS	MIWANI			715171	9992624	1219	46	23.4
56	MIWANI SUGAR MILLS	MIWANI			715171	9994471	1219	61	25.56
57	SHAMJI HARJI BROS	MUHORONI			737441	9992623	1250	75	7.98
58	TURTON T.A.K	SINGHOR			744868	9988939	1433	160	0.84
59	NJANGIR SINGH ESQ	MUHORONI			709604	9996318	1217	104	9.12
60	CONTRACTOR RD PROJE	AWASI SITE NO 9A			731872	9979728	1289	73	2.04
61	CONTRACTOR RD PROJE	AWASI SITE NO 7			739297	9966820	1676	154	0.24
62	CONTRACTOR RD PROJE	AWASI			739298	9972350	1676	136	6.78
63	CONTRACTOR RD PROJE	AWASI SITE NO 9C			730024	9983411	1289	187	5.88
64	MUHORONI S.FACTORY	MUHORONI SITE NO 2			743008	9983409	1287	133	8.64
65	D.W.D	CHEMILIL S.FACTORY			737440	9990787	1265	327	45.48
66	D.W.D	BHANJI FARM			735592	9990787	1219	246	8.64
67	ONJIKO SEC SCHOOL	AHERO			715170	9981565	1265	64	9.06
68	AHERO SEC SCHOOL	AHERO			713322	9979730	351	109	11.34
69	D.W.D	TAMU TOWNSHIP			744868	9990787	1371	128	7.2
70	KISUMU COTTON MILLS	KISUMU FACTORY			694764	9988943	1160	34	3.36
71	D.W.D	MUHORONI			737440	9988940	1463	91	13.56
72	REHMAT KHANKHERDIN	CHEMILIL ESTATE			737441	9994470	1265	91	16.26
73	KIBOS INDUSTRIES	KIBOS			702189	9990789	356	100	3.6
74					731873	9998153	1320	244	0.24
75	BOYA TEC.SCHOOL	AHERO			717030	9979729	1160	180	11.58
76	D.W.D	PAPONDIT			715168	9963142	1173	90	3.66
77	REV.JOHN KUNTNER	WEST KANO			705897	9998153	1140	47	6.72
78	REV.JOHN KUNTNER	ORENI NYAKONGO			722597	9977882		174	2.52
79	R.R ODERO	CHEMILIL			735592	9994470		30	18
80	GEM RAE W.PROJECT	KAIRO CENTRE			717029	9974200	1160	152	6.54

81	EAST IND.	A.SUGAR MUHORONI			741159	9987093	1415	139	13.92
82	L.B.D.A	AYWYOLUORA			709603	9976037	1297	90	5.76
83	L.B.D.A	OKEYO OGORO			702187	9970509	1689	147	
84	L.B.D.A	KANJORIEKO W.GROUP			722595	9968670	1492	83	2.4
85	L.B.D.A	KOBUNDI SCHOOL			702187	9966826	1328	85	2.7
86	L.B.D.A	URUDI SCHOOL			709602	9968672	1312	153	3.6
87	L.B.D.A	NDUNGA SCHOOL			718887	9966823	1304	75	0.72
88	L.B.D.A	ST.ALLOYS SEC SCHOOL			700328	9970509	1279	83	0.96
89	L.B.D.A				715169	9970507	1271	150	4.32
90	L.B.D.A	BUGO SCHOOL			715168	9964977	1279	84	0.72
91	L.B.D.A	CHERWA SCHOLL			726303	9966822	1348	150	2.52
92	OJWANG KOBUNDO	KATITO			722595	9966823	1328	78	0.72
93	L.B.D.A	LOLA SCHOOL			711463	9981566	1246	6	1.08
94	L.B.D.A	RABUOR			704037	9983413	1287	100	12
95	L.B.D.A				704037	9983413	1287	92	4.8
96	L.B.D.A				702189	9981566	1246	53	0.84
97	L.B.D.A				713322	9981565	1254	83	5.4
98	L.B.D.A				711463	9979730	1271	83	4.8
99	L.B.D.A				713323	9990788	1179	53	1.08
100	L.B.D.A	OBIAYO SCHOOL			713322	9981565	1296	45	18
101	L.B.D.A	NYALENDA SCHOOL			722597	9983411	1327	88	12
102	L.B.D.A	MBEME VILLAGE			700328	9972356	1279	68	14.4
103	L.B.D.A	ALENDU VILLAGE			702189	9983413	1312	46	18
104	L.B.D.A	KATITU BAPTIST CHUR.			720736	9970506	1312	83	9
105	L.B.D.A	AHERO GIRLS SCH.			711463	9981566	1312	90	12
106	L.B.D.A	AHERO MULTIPURPUS			713322	9981565	1295	143	3.6
107	L.B.D.A	NYANGOMA VILLAGE			713322	9981565	1312	197	0
108	PROF.OGADA	OTHOO MARKET			722597	9983411	1304	150	
109	MWAKANGA COMM.	UKUNDA DIANI			748575	9979726	1476	70	
110	MKOMAZUNGA	DIANI MKOMAZUNGA			741159	9985257	1443	163	
111	L.B.D.A	MUHULONI			743007	9981562	1739	105	12
112	OGANGO WOMEN GROUP	WAWIDHI	345818	1219				41	
113	ISINE WOMEN	WAWIDHI	345804	1148				25	

	GROUP								
114	ADEDE NYOKELO W/GR.	NYANDO	345800	1222				36	
115	SIANY WOMEN GROUP	NYANDO	345804	1148				25	
116	NYALBIEGO W/GROUP	NYANDO	345750	1142				32	
117	AYWEYO COMM.DEV.GR.	NYANDO	345820	1213			1170	34	
118	KOTIENO SAMAKI W/GR.	NYANDO	350337	1000			1300	36	
119	KAWA WOMEN GROUP	NYANDO	345903	1320			1160	33	
120	KACHIENG WOMEN GR.	NYANDO	350213	1213			1170	30	
121	KOWINO WOMEN GROUP	NYANDO	345820	853			1160	31	
122	AGUMBA WOMEN GROUP	NYANDO	345853	927			1160	36	
123	KODERO WOMEN GROUP	NYANDO	345902	1453			1160	32	
124	KOWAGA WOMEN GROUP	NYANDO	345855	1452				30	
125	AYWEYO WOMEN GROUP	NYANDO	355812	1303			1160	35	
126	NYAMUNGA WOMEN GR.	WAWIDHI	350030	1140			1300	60	
127	SWAN INDUSTRIES	INDUST. AREA/ KSM.	344502	458			1150	54	
128	ONURA WOMEN GROUP	WAWIDHI	345911	11353				32	
129	GAME WOMEN GROUP	WAWIDHI	345840	11347				45	
130	NDOLO AYAH	W.SEME						64	
131	E.AFRICAN SEA FOOD	INDUST AREA	344550	457			1150	60	
132	PECHE FOOD	AIRPORT/KSM	344452	456			1140	54	
133	FISH PROCESSOR	INDUST AREA	344430	458			1150	50	
134	UNITED MILLERS	AIRPORT/KSM	344430	458			1140	64	
135	AFRO MEAT	INDUST AREA	344609	415			1150	60	
136	MODERN FISH IND.	INDUST AREA	344600	458			1150	72	
137	K.P.A	KIBOS	344800	428			1165	80	
138	MAMBOLEO SHOW GROUND	MAMBOLEO	344638	402				60	

139	KAGORO WOMEN GROUP	WAWIDHI	345814	1337				39	
140	ALENDU WOMEN GROUP	WAWIDHI	345836	1308				37	
141	KOWITI WOMEN GROUP	WAWIDHI	345830	1336				25	
142	KAKELO WOMEN GROUP	WAWIDHI	345823	1258				28	
143	CHEMELIL SUGAR CO.	CHEMELIL	350840	458				100	
144	CATHOLIC D OF KISUMU	CATHOLIC DEV.CENTRE					1320	100	2
145	RATTA COMMUNITY	RATTA	343036	30			1460	60	1
146	MBUGRA COMMUNITY	WEST KOGUTA	340512	1945			1204	78	1.5
147	KONYANGO MAINGA	WEST KOGUTA	345200	2045				79	2.78
148	PMEU/RDWSSP	SAREMBA	340443	4105			1180	43	24
149	PMEU/RDWSSP	NYAMAREMBE	340427	4230			1180	46	10
150	PMEU/RDWSSP	KOBONGO B	345250	2220			1340	48	3.9
151	MIWANI SUGAR MILLS	MIWANI MILLS CPD			717031	9996317	1219	78	6.36
152	PATEL A.N	MUHORONI			744867	9983409	1306	52	9.06
153	CHRISTIE C.K	SINGHOR			739300	9994470	1326	78	4.98
154	NYANZA OIL COMPANY	KISUMU TOWN			692904	9990789	1219	68	0.9
155	HOME LIME LTD	KORU/MUHORONI			750435	9983409	1676	183	0.78
156	MIWANI SUGAR MILLS	MIWANI			713323	9994471	1215	46	
157	MIWANI SUGAR MILLS	MIWANI			676206	9994472	1219	61	9.54
158	CONTRACTOR RD PROJE	AWASI SITE NO 9B			730024	9981564	1287	183	8.1
159	MUHORONI S.FACTORY	MUHORONI SITE NO 1			743008	9983409	1287	104	8.64
160	KIBOS REMAND PRISON	KIBOS					1189	113	9.54
161	S.SINGH&J.SINGH	MIWANI			704038	0	1172	100	9
162	RADIER N.P	KIBIGORI					1235	63	10.86
163	A.S.K	KISUMU SHOW GROUND						80	
164	L.B.D.A	KIBOGO MARKET			724454	9966822	1312	68	1.44
165	L.B.D.A	RAGEN KASHEM			709601	9964978	1304	90	0.72
166	L.B.D.A	OBAGO SCHOOL			720738	9985258	1304	75	12

167	L.B.D.A	KAMAGA VILLAGE			720738	9990788	1304	75	18
168	L.B.D.A	OSEMBE SCHOOL			717030	9983412	1260	46	4.8
169	L.B.D.A	KUSA VILLAGE			705894	9964979	1164	75	12
170	L.B.D.A	LWALA SCHOOL			741160	9994470	1443	90	1.98
171	L.B.D.A	MAGUNGA SCHOOL			702186	9961297	1263	114	4.8