

DESIGNATHON

KIBERIA: ADDITIONAL READING

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INTRODUCITON

Kibera was settled in 1904. At the time, Kenya was under British rule. Nairobi had been established in 1899 as a central point for administration and a key stop on the Uganda Railway linking Nairobi to the port of Mombasa. Kibera's first residents were retired Nubian soldiers from Sudan who had served in the British East Africa army, known as the King's African Rifles (KAR). The soldiers were set up in barracks to the south west of Nairobi close enough to the centre to reach it at short notice. The British colonialists also allocated them a large forested area which they named 'Kibra', meaning 'forest' in the Nubian language. As the soldiers grew older and unable to continue service they began to set up permanent residence on the land. Sudanese soldiers had no 'native reserve' in Kenya where they could retire and the majority did not want to return to their homeland. In 1912 the KAR allowed 300 soldiers to set up permanent residence on the forest land rent free as a reward for 12 years of military service.

After allowing the soldiers to settle, Kibera quickly became a problem for the colonial government. Crime started to rise and living conditions deteriorated. The land was seen as extremely valuable and the colonial government of the time deemed it too valuable to be left to Africans. Attempts were made to organise Kibera or demolish it completely but these attempts ultimately failed and confusion grew as to who had rights to the land.

Kenyan independence in 1963 saw a dramatic change in the ethnic mix of people living in Nairobi. Many Kikuyus, the largest ethnic group in Kenya, left the city and were replaced with a stream of new migrants. A large majority of these new migrants came from western Kenya and many ended up settling in Kibera. After independence the Kenyan government declared the land in Kibera as state property and over the following decade made attempts to eliminate the informal settlements in Nairobi, including Kibera, with very little success. During this period Nairobi's population rapidly expanded and so too did Kibera's, rising from 3,000 in 1960 to 17,000 in 1972 as many Kenyans from rural locations moved into the city seeking new economic opportunities.

In the last few decades, residents of Kibera have become less reliant upon and trusting of the state. Land ownership continues to be a complex and contested issue. In Kibera, an informal economy has grown which supports a settlement-scale 'Kibera economy' and opens up employment opportunities. The residents of Kibera are also integral to the informal and formal economies of Nairobi and this has been recognised with a change in government policy in the last few years to invest in Kibera's infrastructure, such as paved roads and improved housing.

WHAT IS THE CURRENT SITUATION IN KIBERA?

Kibera is considered Kenya's largest informal urban settlement and fulfils an important housing need in Nairobi. Nairobi is an international city, with the East African Headquarters of many global companies and multilateral agencies, but poverty and inequality persist. The perceived economic opportunities offered by cities around the world are no less attractive to the people of Kenya and many see moving out of rural locations into cities as the only way to secure employment and raise their income level. As a result, there is an ongoing migration from rural Kenya into large cities like Nairobi. Kibera has become home to many of the people moving into Nairobi as it is an affordable place to live. For Nairobi, Kibera has therefore become an integral part of the city, housing cheap skilled and unskilled labour for the industries and services operating in the city.

Kibera is located across two administrative areas of Nairobi; Kibra and Lang'ata and is made up of 14 villages. The area covers 225 hectares (2/3 the size of Central Park in New York, or 1.6 times larger than Hyde Park in London). The 2009 Kenyan census recorded Kibera's population as 170,000 but many other sources including UN organisations, international NGOs and local

organisations challenge this number. Some estimates of Kibera's population reach 1 million people but most sources agree on a figure between 300,000 to 600,000. However, this lack of clarity around the size of the population living in Kibera leads to many problems, in particular government estimates of adequate infrastructure fall short of the actual demand and fail to meet residents' needs. In addition the population of Kibera is expected to expand in the coming years placing further demand on limited resources.

Kibera is a multi-ethnic community with all of the major Kenyan ethnic backgrounds represented. Whilst this multi-ethnicity is celebrated, the tribalism of Kenyan politics has led to Kibera witnessing a number of small ethnic conflicts in its century long history and this still happens today. Despite attempts to improve the situation in Kibera in recent years, the government's track record of corruption and deception has made residents less than eager to participate.

Kibera is one of the most famous informal settlements in the world and has received significant media, government, NGO and academic attention in recent decades, so the future of Kibera is one of intense interest for many. The annual growth rates of Kenya's informal settlements are the highest in the world, in 2007 the growth rate was 5% with the high possibility of doubling over the next 30 years if no interventions are implemented. In 2009 the Kenyan government announced such an intervention to rehouse the people that live in Kibera and clear the slum. It was expected to take nine years to rehome everyone but the initiative quickly slowed to a stop following legal challenges over land rights.

With the current total population of Kibera unknown, future population numbers are difficult to project but it is highly likely that Kibera will continue to exist and continue to grow. So, time will tell what will happen to Kibera. It is likely that improvements will be community driven but these can be internationally inspired and the people of Kibera are keen to engage in the global community

WHO OWNS THE LAND WITHIN KIBERA?

Land ownership remains a complicated issue in Kibera with the opportunity for ownership often changing when new administrations come into power. In part the claims are driven by historical connections but, in particular from the government's perspective, the increasing value of the land Kibera is situated on is creating tension. Kibera is located close to the Central Business District and the industrial areas of Nairobi which rely upon cheap labour and, therefore, affordable housing. With the significant traffic issues in Nairobi extending 20 minute journeys to as much as 3 hours, it is important that these workers live close enough to easily access these industries. But, this proximity also means Kibera is attractive to middle income workers and so property investors are interested in buying and developing the land, raising revenue for the landowner, whoever that might be. As a result of the uncertain land ownership situation, it is considered 'illegal' to build permanent structures in Kibera except for clinics and health facilities, schools and churches.

WATER

People living in Kibera are reliant on water supplied twice a week by the local government. This water is distributed through an extensive network of small plastic pipes running at ground level, with the pipes very susceptible to damage and running at ground level there is a high risk of contamination. During the months of January to April and July to August there is possibility of extended drought and significant water shortages.

WHAT IS THE CURRENT SITUATION?

Water is pumped into Kibera twice a week by the Nairobi City Water and Sewerage Company at

three main points based in Langata, Woodley and Ngumo. This water comes from outside Nairobi, almost exclusively from the Tana River and collected by the Thika Dam, Sasumua Dam and the Chania-B Dam. Once it reaches Kibera, multiple plastic pipes distribute the water to locations, such as water kiosks, throughout the settlement. These pipes are typically those used for laying fibre optic cables. Very few people have water piped into their homes so the majority of Kibera's residents purchase water from one of the local water kiosks by filling up 20 litre jerry cans and carrying them home. On average, there are water kiosks within 40m of most households, it costs around 5 KES and takes around 20 minutes to fill a 20 litre jerry can during acute water shortages and 5 -10 minutes on typical occasions.

Residents in Kibera can often end up paying more for their water than their richer neighbours in Nairobi because they have to use private vendors. Nairobi City Water and Sewerage Company charge a flat rate of 0.5 KES per cubic metre, private water operators/vendors in Kibera charge 5 KES per cubic metre even when legally supplied by official sources.

In times of water shortage the cost of water can vary, sometimes increasing to as much as 10-20 KES per 20 litre jerry can, a 400% increase. On average these shortages can occur for weeks to upwards of 2 months. During these periods there are increases in waiting times to 30 minutes or more to get to the water tap due to queues. To deal with the water shortages, Nairobi City Water and Sewerage Company implement water rationing between January to April but this is not always well communicated. During these times, some water vendors also increase their dependency on the delivery of water from private vendors who deliver water supplies with water trucks or small handcarts.

In order to maintain a consistent water supply, despite the frequent shortages, most people store water. Storage at the household level is usually in the form of jerry cans, buckets and other containers which are filled manually. Water kiosks and larger buildings like schools have water tanks. Most water kiosks own 10,000 litre tanks which are kept at ground level, while others sit on a raised concrete or timber platform. Some buildings have a roof mounted tank but this setup requires a pump to fill the tank. At one of KDI's sanitation blocks they have two 10,000 litre water tanks which are filled by Nairobi City Sewerage Company three times a week for a monthly charge of 3,000 KES. However, around one week in every four no water is provided this way and they pay a private vendor 2,000 KES to fill each tank.

Water collected for household use is used for drinking, cleaning, cooking and doing the laundry. As standard practice residents use a treatment solution known as 'Waterguard', a dilute sodium hypochlorite used to disinfect water, before drinking their water. If there have been a high number of cases of waterborne diseases residents will also boil their water before use. A bottle of Waterguard costs 15 KES. Some toilets also use water for flushing. Showers are accessed at sanitation blocks throughout Kibera and cost 10 KES per use and the amount of water per person is limited.

Local businesses such as car and motorbike washes also rely on water. A car wash costs 200 KES and a motorbike wash costs 50 KES, these businesses are unable to operate during periods of water shortage.

There are a few instances of urban agriculture in Kibera and most occurs along the river where there is more space to have a small 'shamba' (a cultivated plot of land) or gardens and people can use the river water to irrigate their crops. There are also some sack gardens / vertical gardens but they are rare as they need more water to irrigate them. The food grown in this way is for personal consumption. Those with relatively bigger plots are able to sell to the local neighbourhood/

community, they are named 'mama Mboga', which literally translates to 'women with vegetables'.

After use, dirty water is disposed of in the open drainage channels that run through Kibera and eventually ends up in Nairobi River and the Nairobi Dam (link to sanitation / waste design area).

Due to the nature of how water is distributed throughout Kibera there is a high risk of water contamination. The small plastic pipes that wind their way through the settlement are at ground level, running along the narrow alleyways where they are often trodden on by people and motorbikes and cars. There are no official statistics on the incidence of waterborne diseases in Kibera but outbreaks of cholera are known to occur, with heightened risk during rainy season.

There are two rainy seasons during the year, between April and May and again between October and December, these respective periods are referred to locally as the 'long rains' and 'short rains'. As a result of climate change the variability and intensity of the rains are increasing, this trend is expected to continue for the foreseeable future. During the rains flooding occurs as the amount of rain that falls is not sufficient to wash away all of the trash down to Ngong River. This creates blockages throughout Kibera causing localised flooding. Flooding also occurs due to the sheer volume of water, raising the river level up to reach many of the poorer houses that are located along the river's edge.

As Kibera densifies, new residents are setting up homes that sit ever closer to the river's edge which is exacerbating the situation and placing more people at risk. Flooding in either situation moves both waste and sewerage around, taking it into people's homes causing damage and unsanitary living environments and creating dangerous muddy walkways. This situation highlights two underlying and linked issues in Kibera. Firstly, the flooding is being caused by poor flood defence and water management. Secondly the poor sanitation and waste management in the settlement is resulting in waste and sewerage being moved around during periods of flooding.

WHAT INITIATIVES ALREADY EXIST?

The Water Act 2002 introduced a pro-poor focus for the delivery of water in Kenya for the first time. Recognising that the provision of water services in settlements like Kibera was decentralised, the Act enabled funding mechanisms to be set up to support increasing connections by water providers rather than focusing on providing services solely from a centralised national system.

Informal providers of water are still the main source of water for residents of Kibera. KDI have 9 sites throughout Kibera with 4 of those sites operating as toilet and shower blocks and water kiosks, many of which Engineers Without Borders UK volunteers have helped to develop. People pay a small amount to use these facilities.

There are also some similar facilities provided by Nairobi Youth Service, other facilities known as 'biocentres' and a large facility on the western edge of Kibera known as the Human Needs Project. The Human Needs Project retrieves its water from a borehole 270m deep underneath the facility and treats wastewater using plastic bottles and slow sand filters so that it can be reused in toilets and for irrigation. There is also an ongoing initiative to distribute potable, clean water from the Human Needs facility using overhead pipes fastened with cables using a gravity based system to distribute the water. They have the only example of solar thermal technology in Kibera which provides hot water for showers. Other facilities use electricity to heat water.

There are a few schools treating water for drinking by filling up clear plastic bottles and laying them in the sun, but this has not been implemented widely or at the household level.

As covered in the waste and sanitation sections. There are a number of residents who volunteer their time to dig out the drainage channels to allow wastewater to flow freely and get out of Kibera.

WHAT ARE THE KEY ISSUES?

Listed below are some suggestions for the issues you could address, however, you are encouraged to explore the information provided and identify any other issues you may wish to tackle. The main requirement is that you can justify why the issue you have chosen is important.

- Scarcity and inconsistency of the piped water supply is a serious and often expensive problem for the people of Kibera. Can you suggest ideas that better collect, store and distribute water; reduce the demand; or reduce the cost of water provision?
 - There are harmful bacteria in the water supply. Can you come up with ideas to improve the quality of the water supplied, or better protect the water distribution infrastructure?
 - There is little to no treatment of wastewater in Kibera, as a result there is a significant risk of disease outbreak particularly during the rainy seasons. Can you think of better ways to deal with wastewater in Kibera?
 - There is very little urban agriculture in Kibera, but for many it could provide a cheap source of good food. To achieve this, precious water is required. Can you propose any ideas to address the water demands of urban agriculture so that more people could make use of it?
 - Flooding in the rainy season is a huge issue for people living in Kibera, can you propose solutions to prevent/lower the risk of flooding or to reduce the impact of the surface water when flooding occurs?

SANITATION

In Kibera, there are significant issues related to the provision of sanitation infrastructure. The quantity and quality of facilities varies and the practice of 'flying toilets' has developed whereby people relieve themselves in plastic bags or newspaper and throw it into the footpaths, roads and waterways/drainage channels that run through Kibera. This has a significant impact on both the environment and the health of Kibera's residents and can contribute to the spread of disease and waterborne illness. What ideas can you suggest to improve the situation?

WHAT IS THE CURRENT SITUATION?

Sanitation infrastructure is very poor and is in need of development. An Action Research Report produced in 2007 reports that between 50% and 90% of households do not have access to adequate sanitation. Most households rely on shared facilities which often consist of poorly constructed pit latrines with no vents to reduce the smell and offer little privacy. Up to 60% of the population share facilities with approximately 50 others and around 70% of the pit latrines in Kibera do not have a formal or informal connection to the sewerage system. The facilities are not emptied regularly or consistently resulting in overflows of sewage into the surrounding environment and into the open drains running through Kibera which link to the river and waterways.

There are several communal sanitation blocks in Kibera which include showering or washing facilities alongside toilets. The sanitation blocks are operated in a variety of ways, with some owned and run by the community. Others are built by residents and run as businesses and there are also blocks that have been constructed by non governmental organisations (NGOs) and charities. The condition of these facilities varies, with the toilets ranging from pit latrines to flushing toilets.

The cost of using these facilities is 5 KES to use the toilet and 10 KES to take a shower. Many of the facilities are closed from around 8-9pm and as a result, the incidence of 'flying toilets' occurs when no other options are available. There have been reports of muggings and theft from people going out to use the toilets in the dark as people carry money to use the toilet and often also carry their mobile phones.

Three sewer lines, including a new line in recent years, run through Kibera. Whilst not all sanitation facilities in Kibera are connected, the sewer lines are already operating above their capacity and blockages and leakages occur. This is exacerbated by the entry of household waste into the sewer system causing blockages, household waste currently enters the sewer system by being flushed down toilets and also through people removing manhole covers and disposing of waste directly into the sewer lines. The sewers are often located along the waterways leading to further pollution of the rivers and streams in the settlement when overflows and leakages occur. The sewer lines running through Kibera are connected to the wider city infrastructure where it is treated at a city sewage facility.

Sanitation facilities that are not connected to the sewer line and rely on a pit need to be emptied before they get too full as there is very little land to cover the pit over and dig a new one. However, due to the narrow alleyways and uneven terrain of these paths it is very difficult to empty them and they are often abandoned once full. When it is possible to empty the pit latrines the waste is pumped into the local sewer line, however, there have also been some occasions where the waste from pit latrines is released directly into the local environment. The inability for waste trucks to reach many of the latrines in Kibera due to the terrain is a major factor in many not getting emptied.

The issues of sanitation in Kibera are closely linked to the management of waste and water in the settlement. When the open drainage channels and sewers become blocked with waste, then water runoff, household wastewater and sewerage find other routes downhill to the river. During the rainy season this issue is worsened and significant flooding occurs, often infiltrating people's homes. There are attempts to dig out the waste from the drainage channels however these efforts are often to no avail as waste from upstream continues to cause blockages and major localised flooding causing damage to people's homes and businesses.

WHAT INITIATIVES ALREADY EXIST?

As part of KDI's productive public space initiatives several sanitation blocks have been constructed through Kibera at key points along the rivers and waterways. These sanitation blocks provide access to clean, flushing toilets that are either connected to the sewer line or use dry sanitation (EcoSan toilet) to deal with the waste. The compost that is produced as a result of dry sanitation methods has the potential to be sold but is currently just used for small scale agricultural projects. The KDI sanitation facilities also provide a place for people to shower and wash using clean, and sometimes hot, water (link to water section). There are nine KDI sites throughout Kibera.

Water and sanitation for the urban poor (WSUP) and Nairobi Youth Service (NYS) are also undertaking a series of projects to bring clean water and sanitation facilities to the residents of Kibera. There are also many other informal activities being undertaken across Kibera to clear the drainage of waste before the rainy season to try and prevent flooding.

WHAT ARE THE KEY ISSUES?

Listed below are some suggestions for the issues you could address, however, you are

encouraged to explore the information provided and identify any other issues you may wish to tackle. The main requirement is that you can justify why the issue you have chosen is important.

- The disposal of human waste across the settlement is a health risk to the residents of Kibera and is damaging the local environment. Can you propose a solution that would improve the management of human waste?
- Most people living in Kibera share one sanitation facility with up to 50 other people. Can you think of a solution to provide more adequate sanitation facilities across the settlement?
- Many of the connections to the sewer lines are inadequate, can you propose solutions to ensure that both formal and informal connections are adequate and reduce the instance of the sewers becoming blocked, backing up or leaking?

ENERGY

Reliable access to energy, in particular electricity, often reduces the time people spend on everyday tasks. This means that they can engage in other activities such as education, employment and entertainment, thereby improving their quality of life. Energy is an essential requirement for human development and the eradication of poverty. However, most of our energy comes from finite fossil fuels and there is a significant global challenge to balance our energy demands against the associated environmental impacts.

Energy is used for many activities that we take for granted including cooking, lighting, heating, cooling and powering appliances like washing machines. It is also important in driving industrial and economic activities. For example, a clothes manufacturer can produce more clothes with electrically powered machines than hand-stitches alone. It comes from multiple sources such as fossil fuels and renewable sources which harness the power of wind, water and the sun. In Kibera, access to electricity is expensive and often unreliable, some forms of energy such as burning charcoal indoors for cooking are also having an impact on human health.

WHAT IS THE CURRENT SITUATION?

Like people all over the world, people in Kibera have differing energy demands. Use of electricity is widespread but other forms of energy are also used for domestic lighting and cooking, for local industrial processes and small businesses.

The majority of households in Kibera have an electricity connection to the national grid which supplies electricity at the domestic level at 240V, 50Hz. Electricity at the household level is mostly used for lighting, watching television, charging mobile phones, listening to the radio, ironing and heating water with electric coils. However, it is estimated that around 60% of households in Kibera are illegally connected to the grid with only 40% having been legally connected by the government. Of those legally connected to the grid, many also have an illegal connection as there is a perception that illegal connections are cheaper and more reliable than the legal connection, a perception disputed by the government.

Government connections are metered by 'token machines' installed in each connected house. Token machines come with 30 units for free, after this there is then a 200 KES monthly service charge plus a fee associated with electricity usage. The monthly service charge applies regardless of usage and if it has not been paid then the next time the machine is topped up it is often perceived to 'gobble up' the tokens as it accounts for a backlog of monthly payments. Illegal connections are provided by private vendors and a typical charge is 300 KES for the whole month for as much electricity as the household can use.

There are reports that vendors providing illegal connections tamper with the government token machines to make them unreliable and unsafe, in some cases this can cause injury to

household members. The government believe this is the reason there is a perception that the legal connections are unsafe and unreliable. In addition, as the illegal connections are tapped from the legal connections they offer significantly less power to households than the legal connection. This means that whilst the charge for an illegal connection offers unlimited electricity use, in reality, because of the reduced supply the usable amount of electricity at any one time is limited and people are unable to do things such as charge their phone and iron shirts simultaneously.

According to the government, the average household electricity usage would cost less using a legally connected token machine than the flat rate charged by the vendors providing illegal connections. The pricing structure of the legal connection and lack of understanding about how much electricity households themselves use is what the government believe is giving rise to the perception that the legal connection is more expensive as well as a preference for paying a fixed amount per month.

Illegal connections to the grid create instability in the electricity supply and lead to frequent power cuts. They are also extremely dangerous and there have been many reports of serious injury or death due to electrocution in Kibera. Some of these illegal connections are routed through cables running along the ground, which risks electrifying the ground when it is wet. Others are routed through cables at head height which poses risks of direct electrocution.

Aside from electricity use, households also use other forms of energy to meet their needs. Whilst there is a social stigma against admitting the use of candles, kerosene lamps and paraffin stoves for status reasons, it is known that most families still use these. Small amounts of LPG are also used in Kibera, mainly for lighting and business purposes.

For cooking, many households are not permitted to use gas by the 'structure owners' (see Built Environment Challenge Area for explanation) as it is a fire hazard and electric cookers are not widely in use, partly due to the reduced amount of power available through illegal electricity connections. Charcoal is the primary fuel source used for cooking throughout Kibera despite charcoal production being made illegal by the Kenyan government as it causes deforestation. People typically spend 50 KES on charcoal for cooking per day and there are many vendors selling charcoal throughout the settlement. Charcoal is brought into Kibera on big trucks carrying 200 sacks about once a week from production sites sourcing wood from the forests outside of Nairobi. There are also shops selling cheaper charcoal briquettes for those unable to afford normal charcoal. People light the charcoal outside and bring it in once the smoke has died down to reduce the amount of smoke released within the house, however, health issues still arise, such as from the release of carbon monoxide.

The construction of the houses in Kibera means that inside they are dark and not well ventilated, making them hot and stuffy when it is hot outside and whilst food is being cooked. Lighting throughout Kibera is limited at night and currently there are several large floodlights located throughout the settlement attempting to light up multiple paths and alleyways.

However these are not powerful enough to light all areas resulting in many areas feeling and becoming unsafe after dark, in particular for women and children. As Kenya is near the equator the sun sets close to 6pm everyday so darkness is an issue affecting work, school and socialising.

Businesses typically use the same mix of energy as households but with a heavier reliance on electricity, this depends on the business type.

WHAT INITIATIVES ALREADY EXIST?

In 2006 the Kenyan government approved the National Energy Policy for Kenya which includes many policies supporting energy access for Kenya's urban poor. This initiative included increasing electrification to the urban poor by 10% every year, reducing the effects of excessive logging for firewood and charcoal by banning household level charcoal production and promoting the use of kerosene and LPG, subsidising domestic electricity consumption for households consuming less than 50kWh per month and supporting the promotion of alternative and renewable energy technologies. However, progress against these policies is mixed. The banning of household level charcoal production has not prevented deforestation as instead, in Kibera, charcoal usage has increased following aggregation of the production process outside of the city. The majority of Kibera's residents are still not legally connected to the electricity grid and very few examples of renewable energy use exist in the settlement.

The examples of renewable energy technologies that exist in Kibera include some small biogas projects to provide cooking gas generated from the waste in sanitation blocks, solar thermal units to provide hot water to shower facilities and the use of solar PV lamps. These examples are not in mainstream use; the biogas project was not in operation at the time of writing and the solar thermal energy is restricted to a small centre operated as part of a Human Needs Project.

WHAT ARE THE KEY ISSUES?

Listed below are some suggestions for the issues you could address, however, you are encouraged to explore the information provided and identify any other issues you may wish to tackle. The main requirement is that you can justify why the issue you have chosen is important.

- Burning charcoal is the main fuel source for cooking, but charcoal production causes deforestation, is a large household expense, has been made illegal by the Kenyan government and is linked to detrimental health impacts. Can you propose solutions that offer an alternative to charcoal or reduce its impacts?
- Electricity is a major household expense for people living in Kibera and it is often considered to be unreliable, unsafe and inadequate by Kibera's residents. Can you propose alternative methods of electricity provision that address these issues?
- Many of the current connections to the grid in Kibera are dangerous and present a risk of electrocution, can you propose solutions to reduce the potential dangers from live cables running along the ground or at low levels?
- Lighting is a challenge for the residents of Kibera, currently there are several large floodlights throughout the settlement, however these are not powerful enough to light all areas. Can you propose localised solutions to light the various villages that make up Kibera?
- The mud and tin houses can become very hot during the day or whilst people are cooking. Fumes from cooking with charcoal indoors also cause health issues. Can you propose retrofit solutions that can improve the ventilation or lighting of houses in Kibera?
- Use of LPG for cooking is perceived to be expensive yet convenient. There are efforts by suppliers to package into the small cylinders affordable to the low income earners. However, in Kibera, structure owners often restrict use of LPG as it poses a fire risk. Can you propose a safer, more sustainable cooking alternative?

WASTE

Human activity produces waste. It is vital to address and properly manage waste to prevent environmental damage, health risks and the development of unsightly and undesirable areas. Reducing, reusing and recycling waste are key priorities for sustainable human development.

Waste is produced daily by people going about their day-to-day activities. It is also produced from

industrial and economic activities. Waste comes in many forms, it can be organic such as food and garden waste but can also be in the form of chemicals, plastics and metals which can be toxic to the environment. The scale and rate at which waste is produced can overload the natural environment making it uninhabitable. That is why waste must either be reduced or technologies must be used to process it. In Kibera, waste is a significant issue as a result of very little waste management throughout the city of Nairobi.

WHAT IS THE CURRENT SITUATION?

Waste has become an increasingly significant problem in Kibera and the issue is not isolated to the settlement. Dealing with waste is a city wide problem across Nairobi as there are presently no adequate large scale waste treatment facilities.

Nairobi has one landfill site, Dandora, which was opened in 1975 and declared full in 2001. However, Dandora is still in use today and now covers a 30 acre area that receives 850 tonnes of waste every day. 200 large trucks bring waste of all kinds, including industrial, agricultural and medical waste, to the facility on a daily basis.

There is a community of people who make their living at Dandora by sorting through this waste to identify anything of value, including items that can be recycled such as paper, glass, cardboard, plastics and metals. 5,000 people work directly on the landfill sorting the waste, many wearing little personal protective equipment as they sort through hazardous and toxic substances, exposes themselves to serious health implications. The people sorting the waste can earn 2-3 KES per kg of cardboard, 10 KES per kg of plastic and 90-100 KES per kilogram of metal, however metals are rarely found. They sell this onto vendors based at the edge of Dandora who aggregate specific recyclables or valuables and in turn they sell them onto large companies.

Waste is frequently burnt, releasing toxins into the air which affects the workers directly as well as nearby communities. Whilst there are no official studies to understand the level of illness and death as a result of working on Dandora, heavy metals linked to serious illness and death such as lead, mercury, cadmium and toxic chemicals are present throughout the site. There is also human, animal and biomedical waste, which pose a separate hazard.

A large number of people are said to be benefitting from the value that can be gained from Dandora, most of these are operating through cartels. The City Council of Nairobi had intended to decommission Dandora in 2012 after 8 years of planning. However they were unable to resolve issues with entities near the planned new site who were fearful of a similar situation to Dandora evolving so this has not happened. Any resolution also has to account for the loss of livelihood for the many people who work at Dandora and have very little education to help them transition to alternative work opportunities. Resolving the citywide issues of waste management are therefore challenging and with this situation at city level, Kibera also struggles to deal with the growing amount of waste produced by an expanding population. Even if waste is collected in Kibera it is difficult to get it taken away and dealt with, as a result the settlement is congested with waste.

Kibera is located along the Ngong River, upstream of Nairobi's industrial areas but downstream of richer residential neighbourhoods who produce more waste per person than in Kibera and often this waste is not collected for transportation to Dandora and frequently ends up in the river. Kibera is situated just before the Nairobi Dam so all the waste from both Kibera and the upstream neighbourhoods ends up trapped in Kibera blocking the dam, the river and the drainage channels that run through the settlement. Waste from locations upstream of Kibera is evident from the amount of plastic water bottles littered about in Kibera despite the fact that no one in Kibera drinks from these bottles. It is estimated that 150 to 200 tonnes of waste is produced per day in Kibera,

three quarters of which is organic waste, the rest is mostly plastic bags (known locally as 'paper bags'), other plastic packaging and some metals and glass. There is no formalised collection of waste within or from Kibera so Kibera's residents have to deal with the waste themselves. Many people collect up their own waste and then dispose of it away from their houses, either in the open drains, in another part of the settlement or in the river.

Waste disposed of into the open drains or into the river eventually finds its way to Nairobi Dam causing environmental degradation to this once valuable water source. Many residents in Kibera can recall what a beautiful location the dam was, the area was very green, people fished, swam and sailed on the water and it was a place for reflection and contemplation. The dam was also intended to provide the drinking water supply for Nairobi. In the early 1990's this began to change as water hyacinths proliferated, choked the water source and the waste that was carried there created further blockage and pollution. Today, whilst people are now growing some crops on top of accumulated/compacted waste deposits and silt, the area is heavily polluted. There is a risk of these pollutants entering the food chain and there is no opportunity for water use, aquatic life or recreation, something of significant value in the congested, dense urban settlement.

The presence of waste in Kibera also exacerbates flooding and the impact of flooding during the two rainy seasons that occur during the year, known as the short rains and the long rains. During the short rains flooding occurs as the amount of rain that falls is not sufficient to wash away all of the waste down to Ngong River and other tributaries, so the waste creates blockages throughout Kibera causing localised flooding. During the long rains, flooding occurs due to the sheer volume of water, raising the river level up to reach many of the poorer houses that are located along the river's edge. In both this situation and during the short rains, the flooding moves both waste and sewerage around, taking it into people's homes causing damage and unsanitary living environments and creating dangerous muddy walkways. This situation results in vermin carrying diseases, nasty smells, waterborne diseases and vector-borne diseases carried by mosquitoes that congregate around stagnant water.

WHAT INITIATIVES ALREADY EXIST?

The people of Kibera have taken it upon themselves to resolve their waste issues and there are a number of local initiatives to try to solve the problem. Volunteers dig out waste from the open drainage channels on a regular basis to try to alleviate drainage and flooding issues. This tends to happen more frequently when people know the rains are about to start. Many of the local youths are now coalescing into groups to provide more regular waste services to the residents of Kibera for a small fee. These services include digging out the open drains, collecting waste directly from people's houses and collecting organic waste to feed to pigs for farming. However, these groups often face issues when it comes to disposing of the waste.

Collection by the City Council is occasionally organised and the youth groups attempt to arrange this collection, unfortunately there are some coordination issues. Waste collection by the youths is mostly done on Sundays when people tend to be at home and can hand over their waste and pay the youths for the services. The piles of waste can be left for days before collection. Sometimes, they are not collected at all and attract animals and vermin which spread the waste throughout Kibera, often back into the drains and waterways that it has been dug out of. Not only does this create a health hazard, but it also diminishes the value people see in paying the youths to collect their waste as they see it is no better than disposing of it themselves as they had been doing before.

The options for recycling and reusing waste in Kibera include 'trash for cash' initiatives where

small vendors who clean up items found in waste sell them secondhand. There is also an initiative to make use of the multiple plastic bags found in Kibera by cleaning them up and weaving them into baskets and bigger, stronger bags. Another youth group has founded an initiative known as 'Kleanbera'. They collect and aggregate plastic containers and bottles to sell onto larger companies that can recycle them. In 2016 they acquired a plastic shredder as selling shredded plastic attracts a higher fee for the same volume than selling the containers whole. The shredder is electrically powered and requires a permit for use. Whilst they have the permit the shredder is very noisy so it disturbs their neighbours and electricity is expensive.

WHAT ARE THE KEY ISSUES?

Listed below are some suggestions for the issues you could address, however, you are encouraged to explore the information provided and identify any other issues you may wish to tackle. The main requirement is that you can justify why the issue you have chosen is important.

- Organic waste accounts for the majority of the waste produced by the residents of Kibera. There are some households using this waste to feed pigs for farming purposes but can you come up with any other ways organic waste can be turned into something valuable?
- Plastics, including plastic bags, plastic containers and plastic bottles are causing significant disruption to the open drainage system of Kibera and the Nairobi River and Nairobi Dam. Can you come up with ideas for either reusing or recycling these items, or to improve the facilities that groups like Kleanbera already have, to turn plastic trash into cash?
- Even if items of potential value can be sorted from the waste, there is still a residual waste issue which will either impact the residents of Kibera or add to the situation at Dandora. Can you propose any ideas for treating this residual waste so that these impacts are reduced?
- The Nairobi River and Nairobi Dam used to be beautiful places for recreation and to connect with nature but unfortunately are now blighted by waste build ups. Can you propose any ideas for improving the situation?

BUILT ENVIRONMENT

Kibera is a densely packed environment with buildings of varying construction quality. There are only two main public spaces but many streets are filled with vibrant businesses. What ideas can you come up with to improve the existing buildings and public spaces or inspire how new buildings could be constructed?

WHAT IS THE CURRENT SITUATION?

Kibera is made up of densely packed, mostly single storey, buildings with narrow alleyways allowing pedestrian access between them. These narrow alleyways provide links with the paved roads and the railway that runs through Kibera. Due to the way that Kibera has developed over time there is no planned urban design behind the layout.

The predominant construction materials are mud and wattle, with corrugated iron used for the roof. Local builders begin by marking out the walls of the building using timber poles which are dug into the ground, sometimes concrete is used to secure them in place. Smaller timbers are then woven between the timber poles and filled with a mixture of aggregate and red mud before a final layer of mortar screed is applied to the outside if a smoother finish is desired. Whilst mud used to be sourced from the local area, due to the high infiltration of waste over the years into the ground, mud now has to be bought from outside the settlement for construction. The floor is sometimes concreted or matting is laid onto the earth. Due to the increase in demand for housing some people are now adding second storeys with walls made out of corrugated iron. A family of five to

eight people might live in one of these houses.

When Kenya was a British colony, Africans living in Nairobi were restricted to live in single room, single storey houses 10m by 10m in size with no water or sanitation facilities. As a result, the majority of houses in Kibera are still built in this way although some newer houses are being built entirely out of corrugated iron. The majority of houses are built back to back with very little privacy or outside space. Houses of mud construction are not uncomfortably hot during the day but are stuffy due to limited ventilation and retain heat at night, houses of corrugated iron construction get hot during the day and cold at night.

Most residents of Kibera are tenants renting from 'structure-owners', so-called due to the lack of clarity around land ownership (i.e. it would be difficult to call them 'landlords'). Structure-owners may own a couple of 'structures' (houses, or buildings for businesses) or they may own dozens. Where a structure-owner owns a number of houses in close proximity they may be formed into compounds which is a small gated community where a number of houses share a small courtyard and potentially also a communal toilet or washing facility. Rent varies across Kibera, tenants pay between 2-3,000 KES per month for a structure near to the main road with poorer families paying between 1-1,500 KES per month for a structure near the river which is less desirable due to lack of access and the risk of flooding. The construction of the structures also varies significantly with some of very poor quality. In particular, houses built by the river have been known to collapse as they have often been built very quickly to claim the land and sometimes on top of waste which is unstable ground.

Along the main roads, the railway and other significant movement routes are where buildings are used for businesses and these are constructed much in the same way as houses although they will mostly be open fronted. Along the railway, a higher proportion are constructed using corrugated iron only. Businesses tend to be kiosks selling food, craftsmen like welders and carpenters, second-hand clothes, gadgets, recycled goods, m-pesa services, tv/cinema halls for entertainment, sanitation blocks and restaurants, cafes and bars.

There are many schools in Kibera, however most of them are primary schools. There are no government medical clinics or hospitals and all medical treatment provided in Kibera is through NGOs such as Médecin Sans Frontières (MSF) and AMREF Health Africa and these facilities can provide treatments for malaria and cholera, maternity care and minor and serious injuries although there are no x-ray machines.

Public space is scarce in Kibera due to the density of the buildings, however, there are two well-recognised spaces used by the local youths for playing football and collectively they protect the spaces from being built on as there have been occasions in the past where these precious spaces have been encroached upon.

Safety in Kibera is fragile. The residents are mostly protected by the strong sense of community as the layout and the uneven narrow footpaths that are prohibitive to vehicles make policing extremely difficult. Despite the tight-knit communities in Kibera that protect one another there are still significant concerns with crime, in particular due to the high rate of unemployment and especially after dark where women and children are particularly vulnerable.

WHAT INITIATIVES ALREADY EXIST?

Improving the quality of the built environment in Kibera is tricky, the initiatives that appear to be working well, such as those of KDI, engage the local community from start to finish to ensure there

is a strong sense of ownership and longer term sustainability. However, this takes time and is often at a small scale. Due to the fluctuating political situation around land ownership and land value there are also mixed incentives to invest in improvements and uncertainty about the future.

There are some larger scale programmes administered by international organisations focusing on upgrading the building provision in Kibera. The Kenya Slum Upgrading Programme (KENSUP) is one such programme delivered in partnership with UN Habitat. Started in 2002, a number of multi-storey buildings with formalised water, sanitation and energy services have been constructed at the edge of Kibera. Residents of Kibera have been offered subsidised rents to move out of Kibera into these blocks but many have since moved back.

Cited reasons include services being less reliable than those in Kibera with weeks of no water being provided for example, seeing income generation opportunities by renting out the flats to middle class tenants at four to five times the subsidised rate and missing the vibrant Kibera communities, neighbourhoods, networks and friends. Nairobi's middle class is now moving into these blocks in the search for affordable housing in a city with rapidly increasing rents.

Smaller scale initiatives in Kibera include those run by KDI, whose philosophy is to make use of the 'waste spaces' and turn them into productive public spaces valued by the local community. Working in close association with the local community, KDI's projects in Kibera include a school, several sanitation blocks, waste recycling sites and flood protection infrastructure and by working together they can build community ownership of these spaces and upgrade the vicinity.

There is also an interesting example in Huruma, not far from the Dandora waste site. Muungano wa Kambi Moto, Huruma is an upgrading project started by the community in 1996 and the improvements were made 'in-situ' so that they did not relocate themselves. The community grouped together to set up a savings scheme, which along with some additional financial support from the Pamoja Trust, enabled them to secure a bank loan and start building the first 34 'starter house' units known as phase 1 in 2003. The starter houses were single storey with a toilet on the roof, complete with proper sewerage and drainage, piped water supplies and electricity connections. The community drew up their own master plan of their new settlement and acquired the necessary skills to construct the houses themselves. Households can then save more money over time and build up another one or two storeys to add bedrooms and bathrooms to their units. The community have now completed four phases of construction delivering homes to 146 families. Phase 1 took two years to complete and cost 4.9m KES, Phase 2 took 10 months at a cost of 4.2m KES. On average the starter housing units cost 156,000 KES each.

WHAT ARE THE KEY ISSUES?

Listed below are some suggestions for the issues you could address, however, you are encouraged to explore the information provided and identify any other issues you may wish to tackle. The main requirement is that you can justify why the issue you have chosen is important.

- Due to Kibera's population growth, new houses are being constructed all the time. Can you propose ideas for how these houses could be designed differently to provide more privacy/ utility, better thermal performance and safer construction?
- There are also many existing houses. Can you propose ideas for how these houses could be improved to provide more privacy/utility, better thermal performance and safer construction?
- Kibera's public spaces are vitally important to allow people access to open space, in particular the youths who play sports on them. However, they are dusty in the dry season and muddy during the rainy season. Can you propose any ideas for how to improve these public spaces so they better cope with the seasons and provide attractive spaces for people to convene in?

- Safety and security are issues in Kibera, particularly at night. Can you propose any ideas that might help people feel safer as they move throughout the settlement?

TRANSPORT

Kibera covers a large area with a growing population and many people need to move about to get to work. Transport links are limited, so access into and throughout Kibera is restricted and unaffordable for some residents. However, the people of Kibera are incredibly resourceful and large quantities of goods still make their way throughout the settlement. Can you think of ways to improve the movement of goods and people throughout the settlement and wider city?

WHAT IS THE CURRENT SITUATION?

The journey to get to the city from Kibera is just a couple of kilometers and takes around 20 minutes when the traffic is good. Getting to the city is important for many people living in Kibera to access work and education opportunities, as well as other healthcare facilities and goods and services not available within Kibera itself. However, Nairobi has a huge amount of traffic and during peak hours, such as the morning and evening work commute, what should be a short journey can take up to four hours. As a result, Nairobi also suffers from considerable air pollution created by the idling engines of many vehicles, a significant proportion of which are old and highly polluting. To get to and from the city people walk, use the train, take 'matatus' (small minibuses), the bus or cycle.

The train line runs east-west through Kibera and is managed by the Kenya Railways Corporation. The line operates as a subsidised commuter service running to the North West by about 24km. The service runs twice daily, taking commuters into Nairobi at 6am and coming back at 6pm. Trains are mostly made up of third class carriages and the fare is around 30 KES per journey. Many residents of Kibera use the train to get to and from the city centre. There have been many issues with the train in recent years as people have homes or businesses right next to, or in some cases on the tracks. People have died or been injured by passing trains and on occasion a train has derailed, or a container fallen off, causing injury and property damage. There are currently moves to upgrade the area around the tracks to move people away from the railway line.

Matatus, which are small minibuses, are privately owned vehicles regulated by the government. They are able to transport between 14 and 24 people and are the most common form of transport in Nairobi. The name matatu translates to 'three cents for a ride' and is derived from Swahili however, it is much more expensive nowadays. The fare is not fixed and depends on the distance travelled and whether it is during peak or off-peak hours. The fare can range from 20 to 100 KES for short and long journeys respectively and peak hours are during the morning and evening work commute. Although the most popular form of transport in Nairobi there are issues with harassment, pickpocketing and overloading of the matatus.

Kibera is served by one bus route into the city which leaves from only one point on the Ayanyani estate. The service times are not fixed but will leave as soon as a bus is full. The fare is 20 to 50 KES during off-peak and peak hours respectively.

Due to the very rough terrain and limited road network in Kibera, moving about within the settlement is also difficult. People tend to walk, use 'boda bodas' (motorcycles), take tuk tuks or cycle. The use of 'boda bodas' is growing in Kibera as they can operate in areas where other vehicles cannot. They are very flexible and reliable operating from early in the morning until very late at night. However, the use of motorcycles is fairly expensive with a journey to the city centre

costing 400 KES compared with just 30 KES to take a matatu, meaning they are rarely used to get into the city. Tuk tuks, which are small motorised vehicles which can take two passengers in the rear, are also popular as they are also flexible and able to reach parts of Kibera where other forms of transport can not.

To move goods around people either carry them if the items are light enough or they use wheelbarrows or 'mkokoteni' (small wooden handcarts). These forms of goods transportation are privately owned and run as small businesses. Owners charge a small fee to move goods around the settlement, this fee depends upon the weight of the goods and the distance transported. The wheelbarrows and handcarts can handle loads of up to 400kg. They also assist with transporting water around the settlement during times of shortage.

The footpaths that make up Kibera are typically dirt tracks and can be very steep and uneven, this can make it extremely difficult to get goods to certain locations and vehicles into the settlement to perform services such as latrine emptying. During the rainy season these footpaths can become flooded and completely impassable. It has even been noted that some people offer to carry others through the flooded areas during these periods for a small fee.

WHAT INITIATIVES ALREADY EXIST?

Apart from the existing transport options there are few projects underway to improve transportation within Kibera. The links with the wider city are good but the traffic makes these journeys very slow.

Within Kibera there are small saving and credit cooperative organisations (SACCO's) formed to save for entrepreneurial activities around the settlement. One small youth group have formed a SACCO to develop transportation in Kibera using tuk tuks. The groups have contributed equal amounts and bought a number of tuk tuks which now charge to transport people around Kibera. This is improving the socio-economic circumstances of members of the group and improving transportation within Kibera.

KDI have been worked on improving safe access across the Ngong River at one of the main entry points to Langata and the Kibera South Hospital (MSF), which provides free health services to residents. In the design of this bridge, the KDI team with the help of Arup engineers took into account the need for permanent more resilient access while putting into consideration the change in levels of the river and volumes of rubbish floating in the river than normally would sweep away the foot bridges downstream, hence the moonbridge-like design solution. Prior to implementing this intervention, a temporary bridge was the main infrastructure used for access in and out of Kibera. The bridge has now become formally adopted by Nairobi City.

WHAT ARE THE KEY ISSUES?

Listed below are some suggestions for the issues you could address, however, you are encouraged to explore the information provided and identify any other issues you may wish to tackle. The main requirement is that you can justify why the issue you have chosen is important.

- There is a serious challenge with traffic getting in and out of Kibera and more generally around the city of Nairobi. Can you propose solutions that could reduce the amount of traffic on the roads, alleviate some of the pressure placed on existing infrastructure and/or deal with the air pollution problems?
- The footpaths and alleyways within Kibera often fall across difficult terrain and can become impassable by flooding during the rainy season. Can you propose solutions to upgrade these

footpaths and reduce the effects of flooding and surface water?

- Bridges have been known to float away during the periods of flooding in Kibera, can you propose alternative structures that could withstand the effects of flooding?
- Movement of goods over the rough terrain poses a challenge for the residents in Kibera, can you propose solutions that would improve the transportation of goods through the settlement?
- The layout of the settlement poses challenges for service vehicles such as latrine emptying, garbage collection, emergency services and water tankers from accessing areas of the settlement. Can you think of new designs for these vehicles so they can access the more restricted parts of the settlement?

DIGITAL

The world is becoming increasingly interconnected. Whilst many of us benefit hugely from modern advances in information communications technology some of us have not had the same opportunities. Enabling access to technologies which allow information to flow and people to communicate is recognised globally as an important factor in reducing the inequality gap.

Information communication technologies (ICT) facilitate educational, social and economic opportunities for people. ICT comes in many forms such as radios, televisions, computers, internet networks, mobiles and mobile platforms, data loggers and sensors, small data and big data. In Kibera, mobile phone usage is high and has transformed the lives of many. However internet access is limited and relatively expensive. What innovations can you conceive that could catalyse change?

WHAT IS THE CURRENT SITUATION?

Within Kibera there is widespread use of mobile phones. Most people in Kibera own a mobile phone capable of calling and texting and a growing proportion have internet enabled phones ('smart phones') allowing them to also access the internet, social media platforms and a range of apps. This has opened up a large number of opportunities for the people of Kibera and enabled access to the global community. Kenya is well covered by 3G and there are now upgrades to 4G taking place. A number of operators offer different data bundles and deals to mobile phone customers, but mobile internet data is expensive. Prices from one of the major providers Safaricom range from purchasing 7 day bundles of 400 SMS for 30 KES to 700 SMS at 50 KES and 5MB of data for 5 KES to 200MB of data for 99 KES. Mobile users can also choose to pay for daily packages including both such as 7MB + 7 SMS for 5 KES to 150MB + 150 SMS for 50 KES.

There is good internet access in Nairobi and fibre optic cable is currently being laid to continue to make improvements. This is not the case in Kibera as there are no wired connections so all internet is accessed via the mobile networks. There are no wired phone line connections so residents are heavily reliant on the mobile network for all their communication needs.

In Kibera, there is a locally run radio station, Pamoja FM. The station transmits local news, plays music and broadcasts some religious messages. Many households in Kibera also have a television which is used to watch programmes broadcast on Kenya's terrestrial channels.

Mobile-phone based banking has created a change in the transfer (frequency and method), saving and spending of money in Kenya. The system known as M-Pesa launched in Kenya in 2007 and has been phenomenally successful. Inspired by the instances of people using mobile phone airtime as a proxy for money transfer to relatives or friends in other parts of the country, M-Pesa was developed to allow money to be sent, received and withdrawn from mobile

devices. Today its functionality has been expanded to include the paying of bills, paying for food in shops and in markets and purchasing airtime. People also use it less formally to withdraw cash from their friends or others, e.g. someone M-Pesas their friend 1,000 KES and their friend gives them 1,000 KES in cash.

M-Pesa has made it much easier and safer to pay for things. As long as you have your phone on you, you can access money, whereas in the past if you had run out of cash and there were no nearby ATMs you could end up in a difficult situation. Many people no longer carry cash in significant quantities or at all so there are fewer crimes related to mugging. It has also been instrumental in increasing the safety of SACCO's (Savings and Credit Cooperative Organisations) and the ability of people to save as many people do not have enough money to afford a bank account. In a SACCO, a group of people save together towards purchasing items of collective value or people within the group can take money out of the savings to purchase items of a value greater than they may otherwise be able to afford and pay it back to the SACCO with interest increasing the pot for everyone. Historically someone would have collected the money on a daily, weekly or monthly basis and hidden it within their household, for example under the bed, making them into a prime target for robbery.

WHAT INITIATIVES ALREADY EXIST?

Kibera has been the focus of an enterprising telecoms company interested in widening access to poorer communities and making use of the market gap that exists there. Argon Telecom wants to provide Kibera with wifi hotspot coverage and since September 2016 has installed 56 access points around Kibera with wifi hotspots now known as 'poa! Internet'. These access points have been located on community locations such as schools, churches, mosques and NGO offices to reduce vandalism and these locations are offered a certain amount of free internet access for hosting the equipment. Other people can access the internet by purchasing bundles that range in price from 10 KES for 25MB to 3,000 KES for 20GB although to date the majority have been in the 10-100 KES range. There is also free content available to users with or without bundles, including sports, news, entertainment, education, healthcare and much more.

However, the majority of people only have access to mobile phones and only a few households have a computer. Throughout Kibera there are a number of cybercafes offering people the opportunity to make use of computing facilities for a fee. There are an increasing number of people interested in remote working with skills in most types of software, from the Microsoft Office suite to Adobe packages, computer programming and web development. The Human Needs Centre located near the Olympic entrance to Kibera offers training and also houses a cybercafe. Unfortunately, many of the cybercafes have limited internet capacity and also use old machines often received secondhand from richer countries. So whilst many people have the skills, the equipment they have available is old, slow and inefficient.

Another local initiative making use of internet connectivity is 'MapKibera'. Set up in 2009 by a group of local youths, MapKibera makes use of OpenStreetMap to enable citizen mapping of Kibera and it's main pathways, water points, markets, health clinics, security issues and highlight opening hours, availability of services and local news. The programme demonstrates the ingenuity of the young people of Kibera and how much they want to empower the people of Kibera to own and identify the settlement. Whereas Kibera was previously only an area on the map, now it has brought visibility to the infrastructure and people that live there.

WHAT ARE THE KEY ISSUES?

Listed below are some suggestions for the issues you could address, however, you are

encouraged to explore the information provided and identify any other issues you may wish to tackle. The main requirement is that you can justify why the issue you have chosen is important.

However, the majority of people only have access to mobile phones and only a few households have a computer. Throughout Kibera there are a number of cybercafes offering people the opportunity to make use of computing facilities for a fee. There are an increasing number of people interested in remote working with skills in most types of software, from the Microsoft Office suite, to Adobe packages, computer programming and web development. The Human Needs Centre located near the Olympic entrance to Kibera offers training and also houses a cybercafe. Unfortunately, many of the cybercafes have limited internet capacity and also use old machines often received secondhand from richer countries. So whilst many people have the skills, the equipment they have available is old, slow and inefficient. • Despite recent efforts to increase internet access in Kibera, access is still limited and relatively expensive to use. This limits access to the news, information, communication options and educational aspects of the internet. Can you propose a way to improve internet access in Kibera so that the people living there can benefit?

- Much of the computing equipment in Kibera is old, slow and inefficient. For people able to make a living using sophisticated software packages this is incredibly frustrating. Can you propose a way to address this situation?
- There is a huge wealth of information and data that could be communicated to the people of Kibera, or by the people to Kibera to the outside world. Map Kibera is one example of how the local community are doing this. Can you propose any other ways, or apps, that could be useful to improve residents' lives?
- Unemployment is a significant issue in Kibera, can you think of ways that improved digital infrastructure, or apps, can help improve existing business performance or create new opportunities?