

Households Energy Use Combinations and Connectivity to the Electric Power Grid in Low Income Residential Estates in Kenyan Cities

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Characteristics of Low Income Residential Estates (and my Agenda)

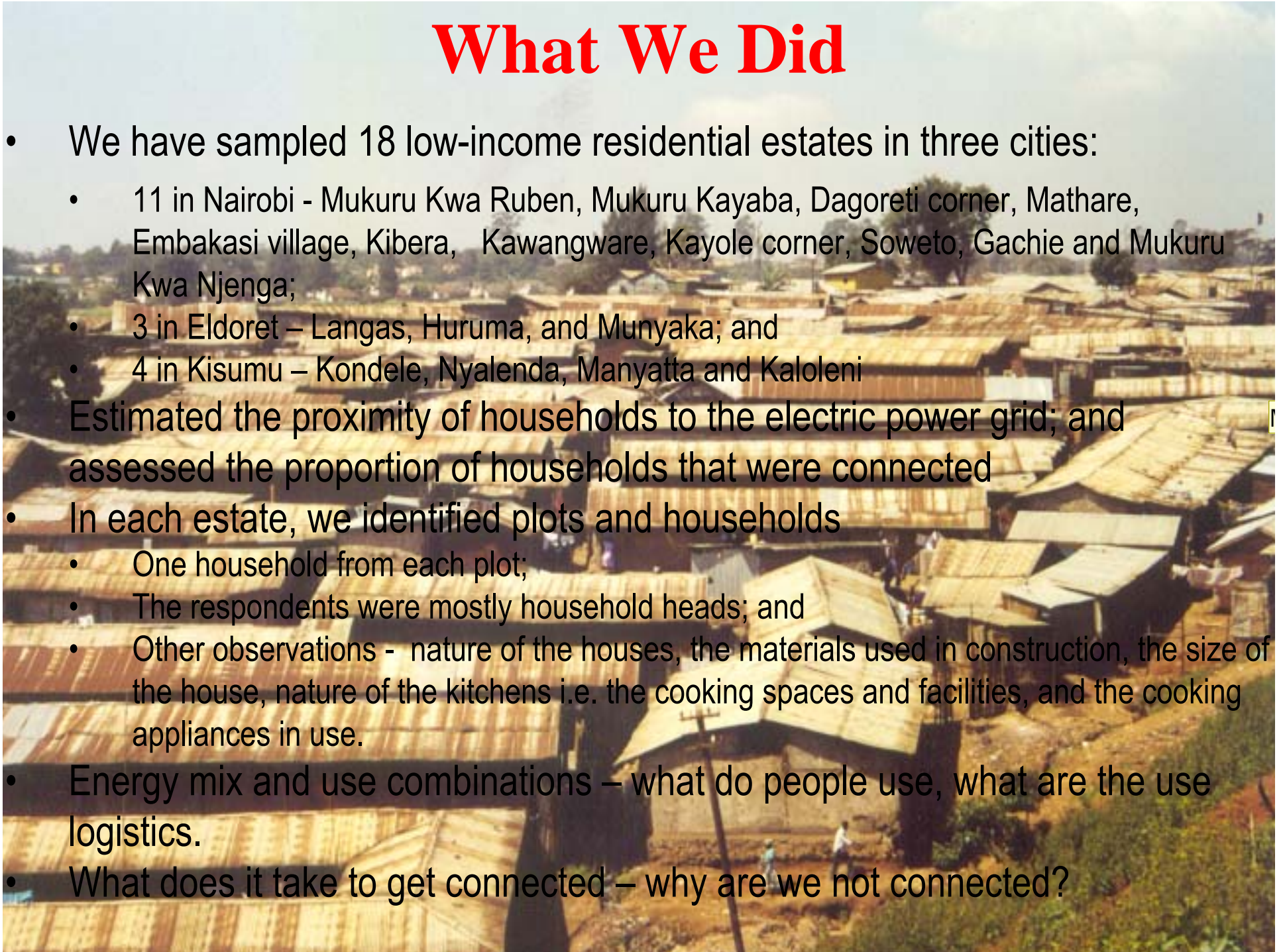
- ❖ For most part of the day, we have been hearing about the characteristics of Low Income Residential Estates
 - ✖ In summary, “INADEQUATE EVERYTHING except PEOPLE and PROBLEMS”
- ❖ I do not want to go through all that.
- ❖ I want to share the results of work we have been undertaking in “Low Income Residential Estates in Kenyan Cities
- ❖ My talk will include:
 - ❖ Objectives of the work
 - ❖ What we did
 - ❖ Household characteristics
 - ❖ What we found: Fuel/Energy types, mix and use combinations; expenditure on energy and energy services, willingness and ability to pay; and problems of

Objectives

- We have been assessing energy use patterns – energy/fuel types, quantities and quality, use mix and combinations, availability and accessibility, reliability, affordability, technology appliances, emissions and safety in use in low income residential estates in three Kenyan.
- In this discussion, the specific objectives were to:
 - Identify energy use and fuel mix in low income households and the associated socio-economics;
 - Assess the levels of, and the proportion of households that were connected; and
 - Identify factors influencing connectivity of households to the electric power grid.

What We Did

- We have sampled 18 low-income residential estates in three cities:
 - 11 in Nairobi - Mukuru Kwa Ruben, Mukuru Kayaba, Dagoreti corner, Mathare, Embakasi village, Kibera, Kawangware, Kayole corner, Soweto, Gachie and Mukuru Kwa Njenga;
 - 3 in Eldoret – Langas, Huruma, and Munyaka; and
 - 4 in Kisumu – Kondele, Nyalenda, Manyatta and Kaloleni
- Estimated the proximity of households to the electric power grid; and assessed the proportion of households that were connected
- In each estate, we identified plots and households
 - One household from each plot;
 - The respondents were mostly household heads; and
 - Other observations - nature of the houses, the materials used in construction, the size of the house, nature of the kitchens i.e. the cooking spaces and facilities, and the cooking appliances in use.
- Energy mix and use combinations – what do people use, what are the use logistics.
- What does it take to get connected – why are we not connected?



Slide 4

MSOffice1 Arrange to undertake these studies this week
K. Senelwa, 17/10/2009

Characteristics of Household in Low Income Residential Estates

- Housing structures were varied - permanent (brick/motor), semi-permanent, tin walled, wooden, to grass thatched in Munyaka, Eldoret
- More households were connected to the grid in Eldoret (36%) & Kisumu (38%) than in Nairobi (21%). Most constructions in Nairobi were “illegal squatters”
- Average household size was 3 in Nairobi, 3.5 in Eldoret, and 4 in Kisumu
- 2005 mean monthly per capita income of KShs 1747 in Nairobi was higher than in Eldoret (1697) and Kisumu (1723)

- There were variations in household incomes:

- Up to 25% of residents did not have a steady income – casuals or not employed

Household Income Bracket (KShs)	Eldoret	Kisumu
< 3,000	3.30%	0.00%
3,000 - 6,000	29.60%	30.80%
6,001 - 9,000	21.60%	15.40%
> 9,000	45.50%	53.80%

Fuel / Energy Types

- Different types of fuels (energy) were used in all the estates:

Energy / Fuel Type	Percent Households (%)		
	Nairobi	Eldoret	Kisumu
Kerosene	99	96	80
Charcoal	74	75	84
Dry Cells	95	78	54
Electricity	21	36	38
Firewood	12	25	14
LPG / Gas	2	18	24
Car Battery	12	20	10
Solar / PV	-	0.2	0.5

- Kerosene (lighting/heating) and charcoal (heating) most common fuels
- Dry cells used in electronic gadgets (e.g. radios) and hand held spotlights
- Electricity use (for lighting and electronics) was lowest in Nairobi estates
- Limited LPG use blamed on costs
- Limited firewood use attributed to landlord restrictions and ease of availability
- Rechargeable old (used) car batteries powered radios and TV sets
- Some households had installed solar panels to operate TVs and radios

Energy mix and use combinations

- Residents used different fuel / energy combinations

Energy / Fuel combinations	Percent Households (%)		
	Nairobi	Eldoret	Kisumu
Kerosene / Charcoal / Dry Cells	51.0	2.0	6.0
Kerosene / Charcoal / Electricity / Dry cells	10.0	23.0	22.0
Kerosene / Charcoal / Dry Cells / Car Battery	2.0	10.0	32.0
Kerosene / Dry cells	18.0	8.0	-
Kerosene / Charcoal / Firewood / Dry Cells / Car Battery	9.0	10.0	4.0
Kerosene / Electricity / Dry Cells / Car Battery	5.0	12.0	4.0
Electricity / LPG / Dry Cells	-	2.0	12.0
Kerosene / Charcoal / Firewood / Dry Cells	-	4.0	6.0
Kerosene / Charcoal / Electricity / Firewood / Dry Cells	2.0	11.0	2.0
Kerosene / Electricity / LPG / Dry Cells / Car battery	-	4.0	-
Kerosene / Electricity / LPG / Dry Cells	-	4.0	-
Kerosene / Charcoal / Electricity / LPG / Dry Cells	2.0	6.0	4.0
Charcoal / Electricity / LPG / Dry Cells	-	2.0	4.0
Charcoal / Electricity	-	-	2.0
Kerosene / Charcoal / LPG / Dry Cells	1.0	2.0	2.0

- Popular combinations involved kerosene, charcoal and dry cells.

Expenditure on fuels

- Households spent 26% of total monthly income on energy

Estate	% of total income
Mukuru Kwa Ruben	15.89
Mukuru Kayaba	34.34
Dagoreti corner	33.19
Mathare	22.82
Embakasi village	29.74
Kibera	31.23
Kawangware	34.02
Kayole corner	23.57
Soweto	22.76
Gachie	27.62
Mukuru Kwa Njenga	15.33
Overall mean	26.08

- Decomposing expenditure by income groups reveals interesting results
 - Expenditure on energy increased with income

Household Income Bracket (KShs)	EXPENDITURE ON FUELS	
	Monthly Expenditure	% of Total Income
< 3,000	1,692	56
3,000 - 6,000	2,576	43
6,001 - 9,000	2,863	32
> 9,000	2,802	23

- The lowest earners spend up to 56% of their income on energy
- Energy is an indispensable budget component in households
 - Affordable energy availability and accessibility could have impacts on households living conditions.

Willingness and Ability to Pay

- Assessment of the willingness and ability to pay for electricity targeted those who use kerosene for lighting only, dry cells and car batteries for entertainment, and those who charge their mobile phone sets at shopping centres (at a fee)
 - We looked at expenditure on these items

Service	Frequency / Month	Rate (KShs)	Total / Month
Kerosene (litres)	6	55	330
Dry Cells (No.)	10	20	200
Batteries (Charging)	5	20	100
Telephone Charging	10	10	100
Total			730

- All respondents were eager and willing to switch to superior energy/fuels
- Residents spend disproportionately large amounts of money (KShs 730, ≈\$10 per month!!) on inferior lighting and charging phones and used car batteries for entertainment. Their capacity to pay for electricity exists!
 - The amounts would suffice to pay for electricity for lighting and electronic gadgets
- Why then do they insist on these lower quality options to electricity?


Problems of electricity Accessibility

- **Inaccessibility due to nature of settlement**
 - In some estates, buildings are far removed from the grid network
 - This has been changing rather rapidly
 - Landlord and tenant objectives often different.
 - Initial connectivity costs are very high and most landlord are often not ready to invest
 - Illegal nature of the structures (Squatters) is a major barrier to access, even with capacity
- **High upfront costs and the need for 'regular' periodic payments**
 - High cost of connections for electricity plus the cost of appliances is a hindrance;
 - Irregular incomes for the un-employed and casuals is a hindrance to connectivity to the grid which requires regular periodic payments – these groups resort to biomass, etc. which can be purchased in smaller quantities at a time-
- **Lack of awareness**
 - User attitudes – most people are not aware of their budget lines, and therefore do not even know the proportion of their incomes spent on energy
 - Use of old and inefficient appliances – discarded car batteries enhances the misery.
 - This gets us back to the initial problem – the initial investment costs. The battery is probably donated by a relative, etc, otherwise these fellows theoretically can not afford a new battery

To succeed, we must be ready to address these issues, whether at the policy level or not

Conclusion

1. Mix of modern and traditional fuels used for all applications in all the estates & households (Kerosene, charcoal, and dry cells)
2. Kerosene, charcoal (and dry cells) were the base energy / fuel types in all the estates / households:
 1. And these comes at a significantly high proportion of residents overall incomes
 2. Residents were not aware of the risks and safety aspects of all the energy types and their use combinations
3. Fuel substitution is a common desire for all residents
 - People want better BUT
 - High cost of connections for electricity and LPG plus the cost of appliances is a major hindrance to connectivity and accessibility;
 - The irregular nature of incomes for a proportion of residents (casuals, un-employed) is a hindrance;
 - Most residents resort to charcoal and kerosene which can be purchased in smaller quantities in close proximity of the households, and is often available at all times



Thank you for your attention