# SOLCO Partnership **Baseline Report**

Baseline studies for transition from biomass to solar electric cookstoves
**Kenya, Nigeria and Uganda** • 2025

All data has been processed and validated by leonardo. impact

Developed in Partnership with the IKEA Foundation

# Introduction

**Local partners**

**African Youth Action Network (AYAN)**
AYAN was established in 2015 by refugee youth for refugee youth across South Sudan and Uganda. “Our Mission is to harness and nurture refugees and young people’s personal, community and national aspirations and potential to promote peace and development through informed, innovative and value-driven approaches.”

**Community Empowerment for Creative Innovation (CECI Uganda)**
CECI is a refugee-led organisation promoting peace, self-reliance, and dignity in refugee communities in Northern Uganda since 2017. “We work directly with youth, women, and girls from refugee and host communities to prevent, reduce, and transform violent conflicts. Our peacebuilding, education, livelihood, and environment programs are rooted in local innovations and driven by local needs. They create an enabling environment for healing, reconciliation, and peaceful coexistence in refugee settlements while empowering individuals and communities to participate actively in their own development.”

**Grassroot Initiative for Strengthening Community Resilience (GISCOR)**
GISCOR is a Non-governmental, Nonprofit, and Non-political national humanitarian and developmental organization with head office base in Maiduguri, Borno state.

**M&E partner**

**leonardo. impact**
leonardo is an impact-driven software company that supports impact organisations and their capital providers to measure, verify and report their impact. More info on leonardo-impact.com.

## Table of contents

# About this report

This survey-based baseline study gives insights into the work of the Solar Electric Cooking Partnership for Humanitarian Contexts (SOLCO) in Kenya, Nigeria and Uganda. SOLCO is a multi-stakeholder initiative aimed at catalysing the transition from biomass-based cooking methods to solar-powered electric cooking in displacement communities across the globe.

This report summarises insights from 2008 household baseline surveys conducted in Nigeria, Uganda and Kenya in April, September and October 2025. Data was collected from refugees, Internally Displaced Persons (IDP) as well as from host community members.

In Nigeria and Uganda enumerators from the local partner organisations GISCOR, AYAN, CECI were trained by leonardo to collect data. In Kenya, data collection was carried out independently by Faulu. All data was processed using the leonardo Impact management Platform to validate and visualise results for impact monitoring, management and reporting. This report is a summary of the baseline study findings.

Unless otherwise stated, all charts in this report display data aggregated across all data collections. Site-level results can be explored in greater depth through leonardo's interactive dashboards.

SOLCO
SOLAR ELECTRIC COOKING

## April 2025

**Survey data collection Nigeria**
340 households surveyed by GISCOR with the help of leonardo impact. The surveys took place in Monguno. Type of assessments:

- Baseline assessment for solar electric cookstoves

## September 2025

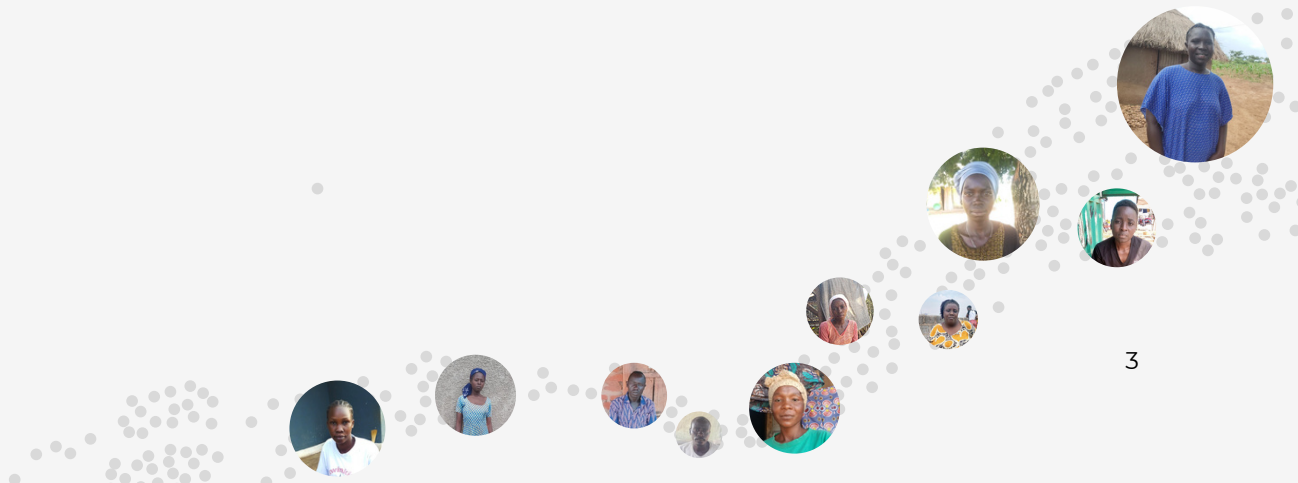
**Survey data collection Uganda**
1137 households surveyed by AYAN & CECI with the help of leonardo impact. The surveys took place in Kiranyandongo, Kyaka II, Rhino Camp and Bidibidi Refugee Settlement. Type of assessments:

- Baseline assessment for solar electric cookstoves

## October 2025

**Survey data collection Kenya**
531 households surveyed by Faulu with the help of LMC. The surveys took place in the Nairobi City Metropolitan Area and the Kakuma Refugee Camp. Types of assessment:

- Baseline assessment for solar electric cookstoves



## We listened to 2008 individual stories and perspectives in 8 different sites.

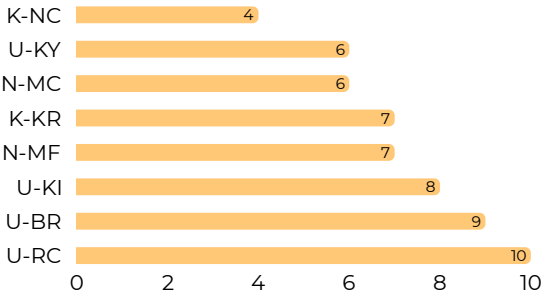
| | |
|---|---|
| **Kenya** | |
| **K-KR** | Kakuma Refugee Camp |
| **K-NC** | Nairobi City Metropolitan Area |
| **Nigeria** | |
| **N-MC** | Monguno (Control group) |
| **N-MF** | Monguno (Future Customers) |
| **Uganda** | |
| **U-BR** | Bidibidi Refugee Settlement |
| **U-KI** | Kiranyandongo |
| **U-KY** | Kyaka II |
| **U-RC** | Rhino Camp |


## 88% of respondents cook with firewood or charcoal.

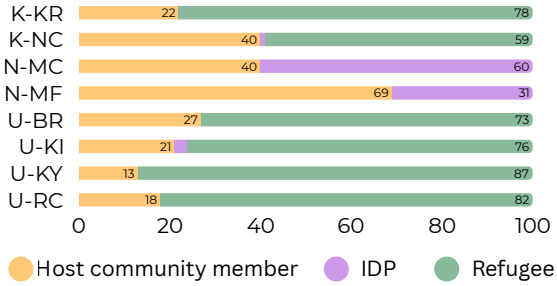
# Findings at a glance

Household characteristics vary substantially across sites. Average household sizes range from 4 in Nairobi to 10 in Rhino Camp. Residence status varies widely across sites, with Ugandan settlements dominated by refugees, Nairobi mostly host-community residents, and Monguno composed entirely of host-community members and IDPs. Material well-being also differs widely, with IWI scores ranging from very low levels in Ugandan settlements to higher values in urban Nairobi, yet all sites remain below national benchmarks. Across all survey sites besides Nairobi, clean cooking access rates are minimal, between 0% and 2%. Traditional cooking devices remain predominant across all locations. Firewood (54%) and charcoal (34%) are the dominant cooking fuels, reflecting widespread reliance on biomass energy. Households face persistent challenges linked to biomass-based cooking, including high fuel costs, time spent collecting firewood, health burdens and safety risks.

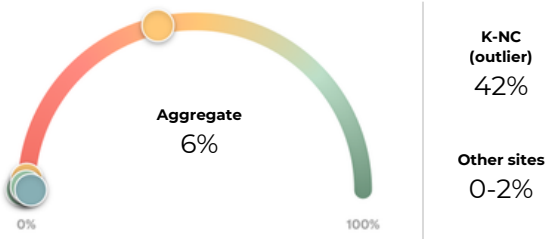
### Average household size of respondent



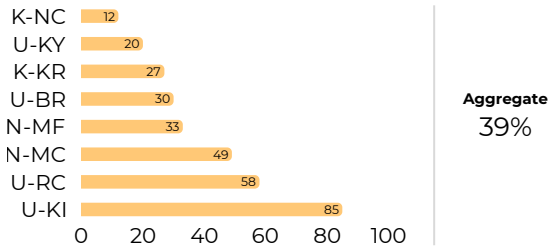

### Residence status (percentage)



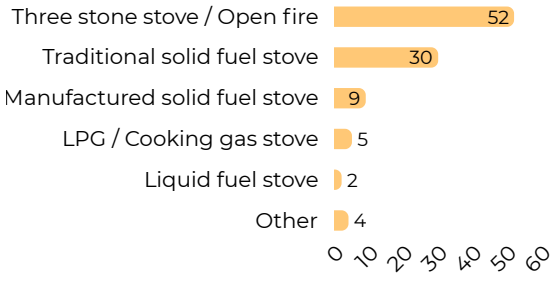

### Clean cooking access rate



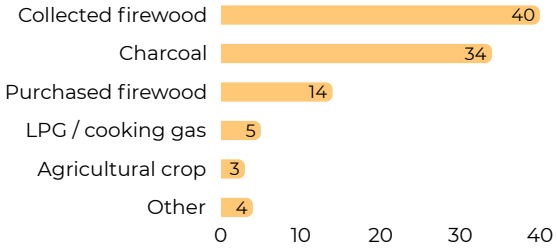

### Experience of illness related to cooking fuel (percentage)




### Primary cooking devices (percentage)




### Primary cooking fuel (percentage)



# Methodology

**Assessment**
This baseline study is based on household surveys conducted in communities where SOLCO partners plan to offer solar electric cookstoves. The survey design follows recognised scientific best practices, with indicators and questions aligned to globally accepted standards such as the Sustainable Development Goals (SDGs), the Gold Standard, and other evidence-based frameworks used to construct measures of topics like poverty, energy access, and clean cooking.

The aggregated results presented in this report are unweighted by country and may therefore reflect a stronger influence from Uganda, which represents the largest share of the total sample.

**Type, length, sites**

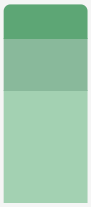
**Household survey**

**69 questions**

**Kenya, Nigeria & Uganda**

**Number of respondents**

**2008 households total**



340 Nigeria

531 Kenya

1137 Uganda

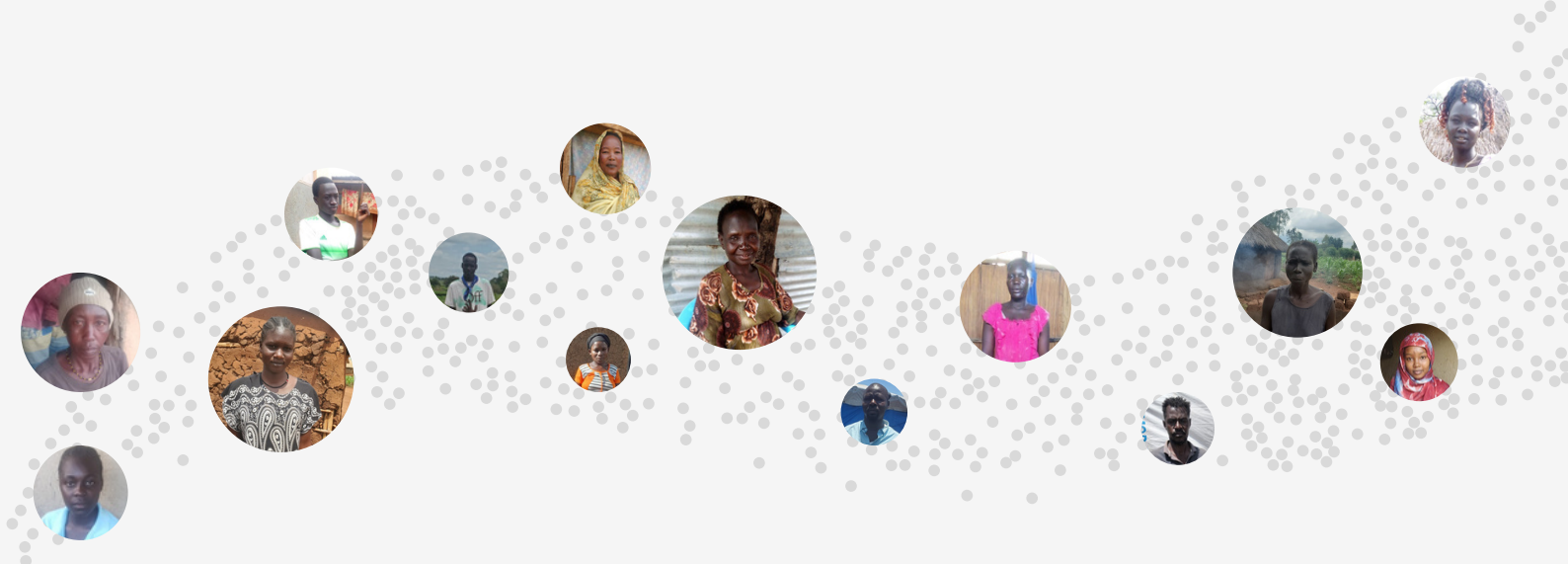
**Data collection**
Data collection in Nigeria and Uganda was carried out by staff or hired enumerators from the local partner organisations GISCOR, AYAN and CECI, all of whom were trained by leonardo to administer the survey. In Monguno (Nigeria), data collection was split between two groups: Monguno (Future Customer), households intending to adopt solar electric cookstoves, and Monguno (Control), a comparison group not targeted for adoption. This split was not implemented in all locations due to resource and time constraints. In Kenya, data collection was conducted independently by Faulu, whose enumerators were not trained by leonardo. Supervision was provided by Victor Alex Ladu (AYAN, Monitoring and Evaluation Lead), Mike Sabo (CECI, MEAL Officer), Muvunyi Consolee (LMC, Partnership Officer), and Pogu Maina (GISCOR, Lead Monitoring, Evaluation, Accountability and Learning Officer), with overall coordination by leonardo. Enumerators received survey guidelines and tools from leonardo and conducted face-to-face household interviews. Interviews were carried out with households planning to adopt solar electric cookstoves or residing in communities where SOLCO partners will offer these cookstoves. A total of 2,008 interviews were conducted in English or translated into the relevant local dialects by the enumerators. Respondents were randomly selected.

**Data privacy and security**
We deeply value hearing from respondents of diverse cultural backgrounds. To honour their privacy, all respondents were asked to consent to the collection and use of their personal data. We fully respect those who chose not to consent and ensured their personal data was deleted. Dedicated local enumerators conducted the interviews using their cultural knowledge to assess and omit any questions they felt were too sensitive. We strictly adhere to the data privacy guidelines set forth by the GDPR. All data is securely stored on European servers.

leonardo. **data quality audit**

leonardo's AI-powered data quality audit consists of a data representativity, consistency and integrity assessments. Representativity is evaluated based on a target confidence level and margin of error. Consistency is assessed through statistical and logical tests. Integrity is verified by ensuring that responses are authentic, unbiased, and plausible across multiple behavioural and validation checks. leonardo leverages state-of-the-art large language models in addition to human-based sense-checking to make case-by-case decisions after contextualising the data. It is also run early in the process to detect issues and refine data collection in real time.

In the data collections at hand, no significant issues were discovered. Minor observations have been discussed with the teams on the ground and data was cleaned if needed.

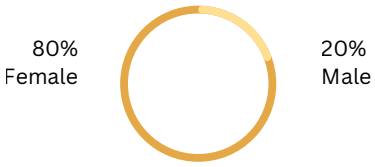


# Demographics

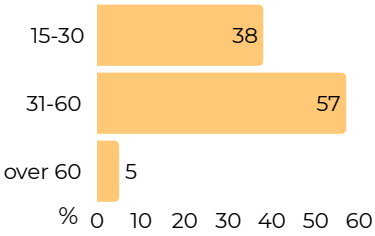
Aggregated demographic data across all survey sites, followed by site-specific demographic breakdowns on the next page.

## Respondents

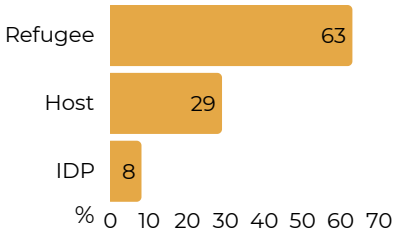
**Gender** (n=2007)




**Age** (n=2007)
Percentage

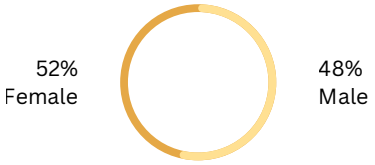



**Residence status** (n=2005)
Percentage

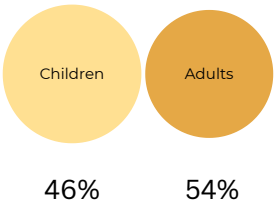



## Households

**Household gender distribution** (n=1962)




**Average adult/child household distribution** (n=1962)




**Average household size** (n=2008)


**International Wealth Index (IWI)** (n=2007)


The IWI is a comparable, asset-based wealth index that can be used to measure the level of material well-being or standard of living of households, ranging from 0 (lowest) to 100 (highest).

The overall IWI score across all surveyed households is 31, though results vary across countries: Kenya scores 42 compared with a national benchmark of 48; Uganda scores 27 compared with 30.1; and Nigeria scores 29 compared with 47.2 (benchmarks based on 2021–2023 data).

# Disaggregated by site

| | K-KR | K-NC | N-MC | N-MF | U-BR | U-KI | U-KY | U-RC |
|---|---|---|---|---|---|---|---|---|
| **Country** | Kenya | Kenya | Nigeria | Nigeria | Uganda | Uganda | Uganda | Uganda |
| **Female respondents** | 68% | 75% | 82% | 99% | 67% | 90% | 76% | 89% |
| **Average age group** | 31-60 | 31-60 | 31-60 | 31-60 | 31-60 | 31-60 | 31-60 | 31-60 |
| **Household size** | 7 | 4 | 6 | 7 | 9 | 8 | 6 | 10 |
| **Gender of household members** | F:53% M:47% | F:51% M:49% | F:50% M:50% | F:51% M:49% | F:52% M:48% | F:54% M:46% | F:54% M:46% | F:49% M:51% |
| **Age of household members** | Adults:52% Children:48% | Adults:53% Children:47% | Adults:38% Children:62% | Adults:43% Children:57% | Adults:47% Children:53% | Adults:43% Children:57% | Adults:45% Children:55% | Adults:44% Children:56% |
| **Residence status** | Host:22% Ref:78% | Host:40% IDP:1% Ref:59% | Host:40% IDP:60% | Host:69% IDP:31% | Host:27% Ref:73% | Host:21% IDP:3% Ref:76% | Host:18% Ref:82% | Host:13% Ref:87% |
| **IWI Score (0 to 100)** | 33 | 51 | 25 | 32 | 32 | 24 | 26 | 27 |

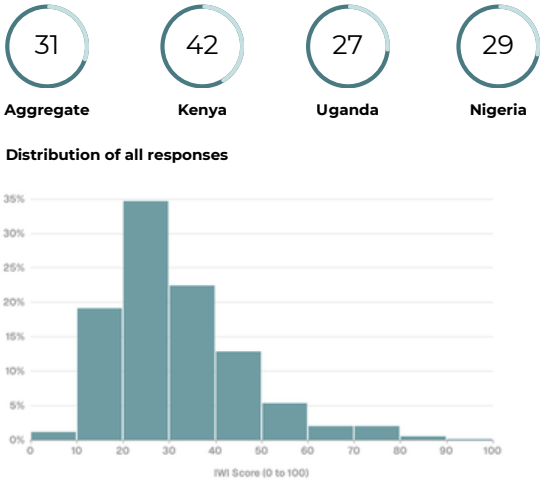
# Results

Aligned to the Sustainable Development Goals and their indicators, developed by the United Nations.

## SDG 1: No poverty

**International Wealth Index (IWI)** (n=2007)

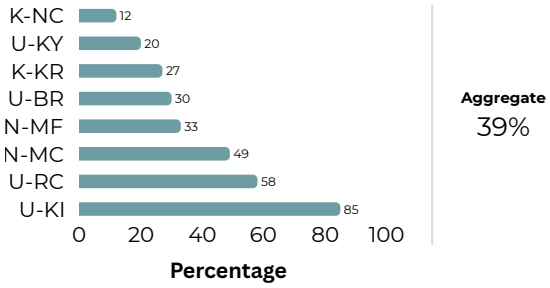
The IWI is a comparable, asset-based wealth index that can be used to measure the level of material well-being or standard of living of households, ranging from 0 (lowest) to 100 (highest). The overall IWI score across all surveyed households is 31, though results vary across countries: Kenya scores 42 compared with a national benchmark of 48; Uganda scores 27 compared with 30.1; and Nigeria scores 29 compared with 47.2 (benchmarks based on 2021–2023 data)




## SDG 3: Good health and well-being

**Experience of illness related to cooking fuel** (n=1928)

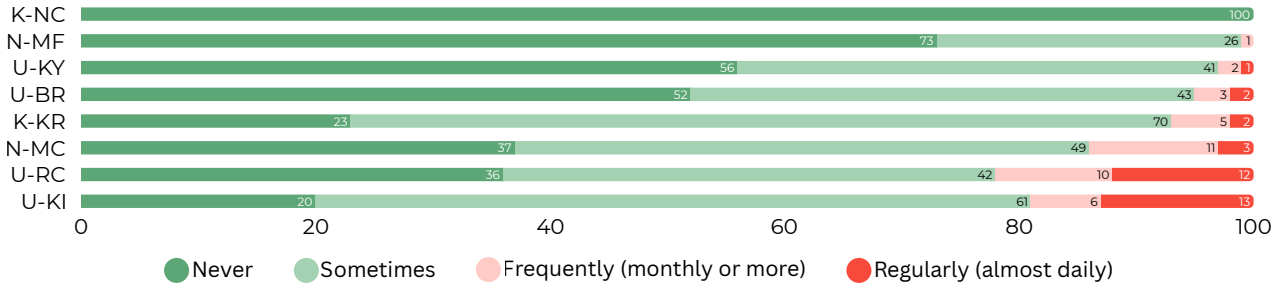
Health issues linked to cooking fuel are reported most frequently in Kiranyandongo (85%) and Rhino Camp (58%) Urban and improved-energy sites, such as Nairobi (12%) and Kyaka II (20%), show substantially lower rates, suggesting benefits from cleaner fuels and improved access.



# SDG 5: Gender Equality

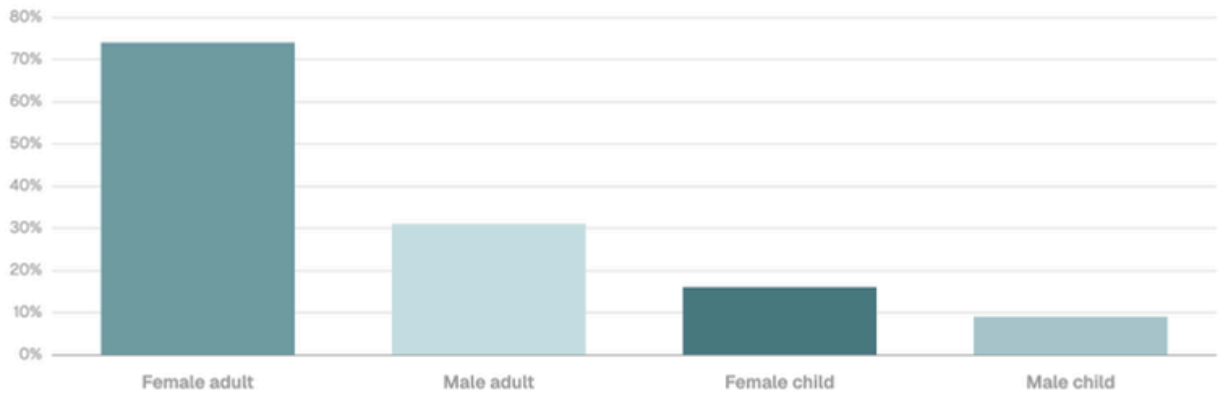
### Experiences of physical/sexual/verbal abuse while collecting or procuring cooking fuel
(n = 1923)

Experiences of abuse while collecting cooking fuel vary widely across sites. In Kirandongo, 61% of respondents reported sometimes experiencing abuse, with 19% facing it frequently or regularly. Monguno (Control) showed similar concerns, with 63% reporting at least occasional incidents. In comparison, Monguno (Future Customers) reported only 27%, and Nairobi had 0% of respondents indicating any abuse. These figures highlight significant safety risks in certain displacement contexts.




### Labour delegation for household chores (collecting or procuring cooking fuel)
(n = 1950)

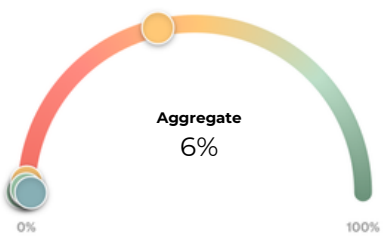
The collection or procurement of firewood and other cooking fuels is predominantly the responsibility of adult women across most sites. With the exception of Monguno, where only 28% of adult women are reported to be responsible for collecting firewood, female responsibility in other locations ranges from 77% to 97%, indicating a clear gendered division of labor in this household task.

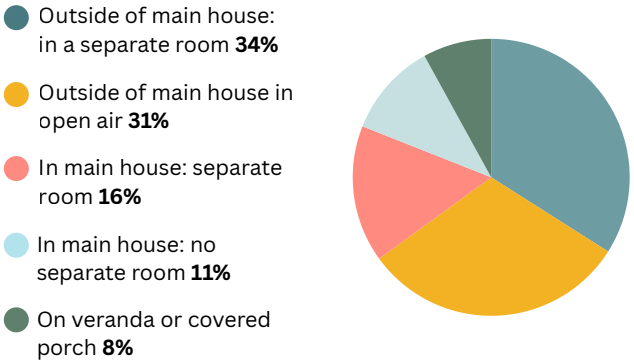


# SDG 7: Affordable and clean energy

## Clean cooking access rate
(n = 2002)

While the average over all sites is 6%, access to clean fuels and technologies for cooking is uneven across surveyed sites. While urban households in Nairobi City Metropolitan Area report the highest clean cooking access rate at 43%, all other sites like Kiranyandongo, Kakuma, and Rhino Camp show minimal rates between 0% and 2%.



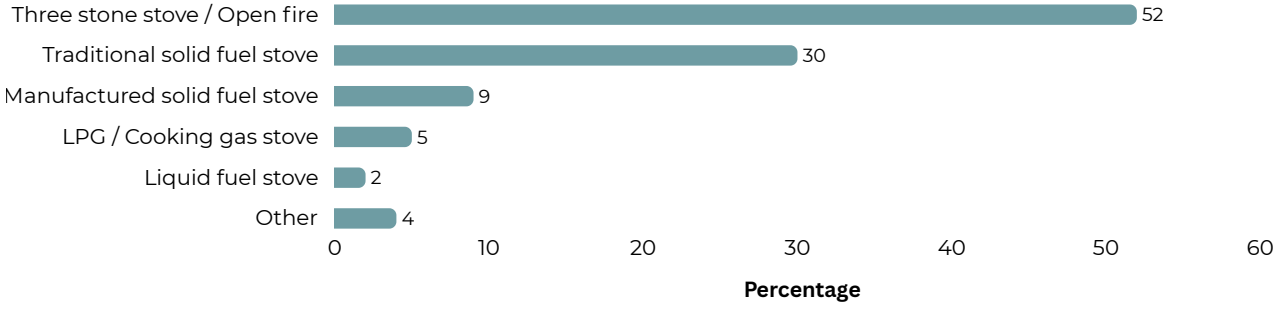




## Cooking location
(n = 1665)

Cooking most often takes place outside the main house or in a separate structure overall. Approximately two third cook outside the main house in a separate room or in open air. Urban households, notably in Nairobi City Metropolitan Area, are more likely to cook indoors, supported by cleaner fuels.

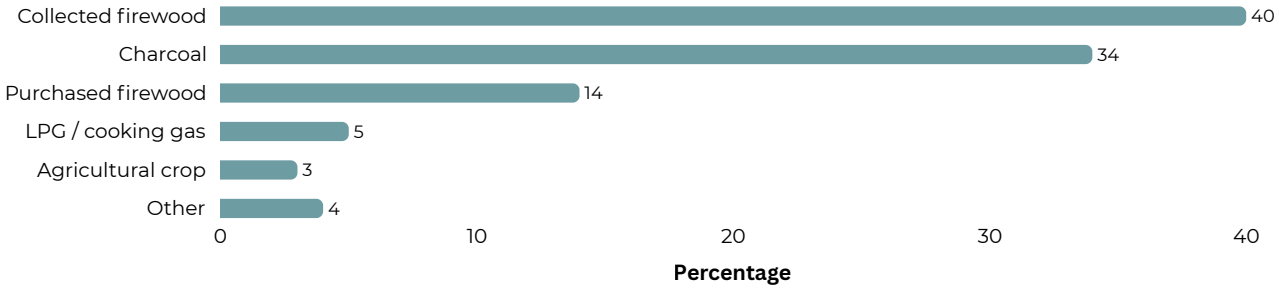
## Primary cooking devices
(n = 2004)

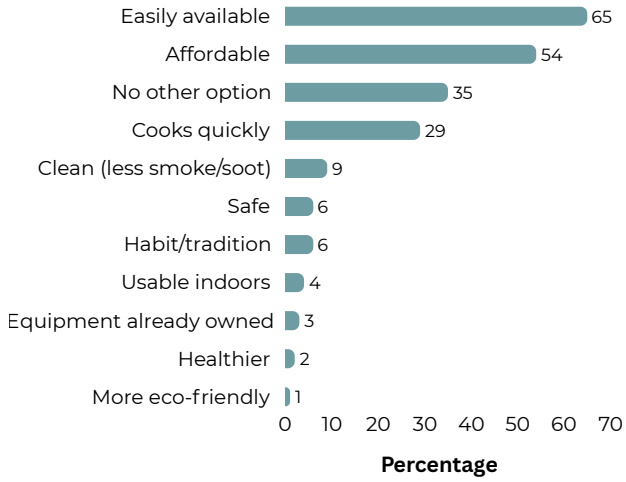
Traditional cooking devices remain predominant across all sites. Besides in Nairobi City Metropolitan, where LPG-based devices are used by 43%, all other sides use either the three-stone stove / open fire and other solid-fuel technologies with shares of 84% (Bidibidi Refugee Settlement) until 100% (Kakuma Refugee Camp & Kiranyandongo)



## Primary cooking fuel
(n = 2004)

Firewood (54%) and charcoal (34%) are the dominant cooking fuels across all sites, reflecting widespread reliance on biomass energy. LPG and liquid fuels are more common in Nairobi City Metropolitan Area, aligned with the improved energy access. The contrast highlights the persistent energy access gap between urban and rural environments.



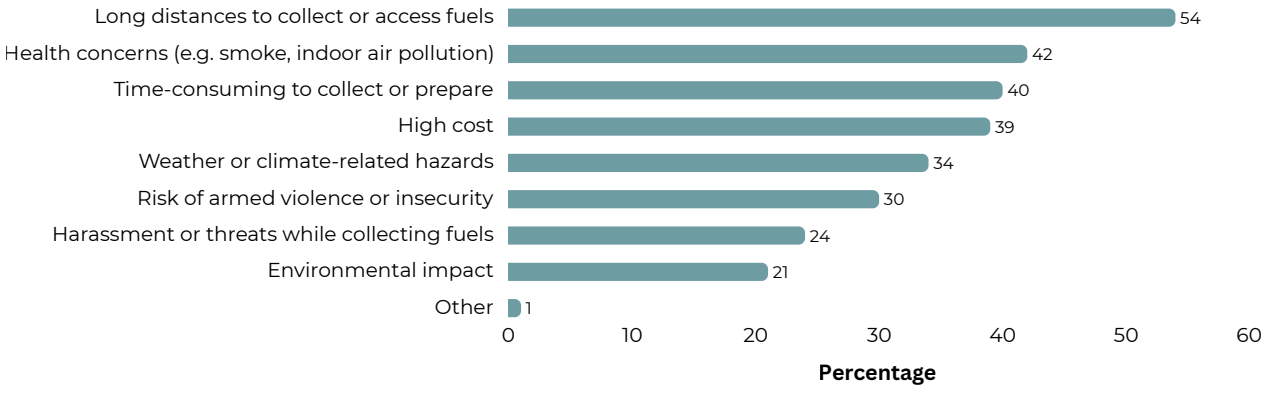




## Reasons for the primary cooking fuel type
(n = 2004)

Availability (65%) and affordability (54%) are the most frequently cited reasons for fuel selection across all sites. No other options (35%) and cooks quickly (29%) vary by site, reflecting contextual differences in fuel access and usage patterns. Cleanliness, safety, and health are mentioned less frequently, indicating that economic and practical factors remain the dominant drivers of fuel selection.

## Concerns for the primary cooking fuel type
(n = 2004)

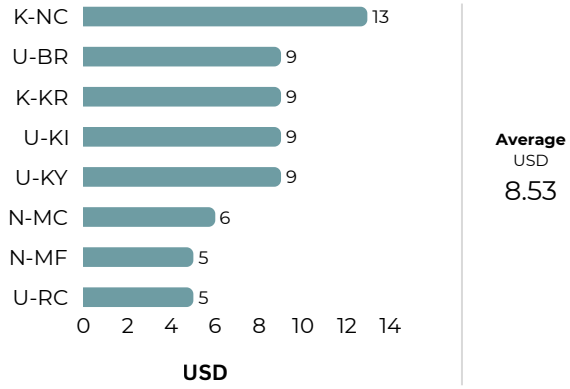
The most frequently reported concern regarding primary cooking fuel is long collection distances (54%), followed by health-related issues such as smoke and indoor air pollution (42%).



## Cooking fuel expenditures per household (monthly)

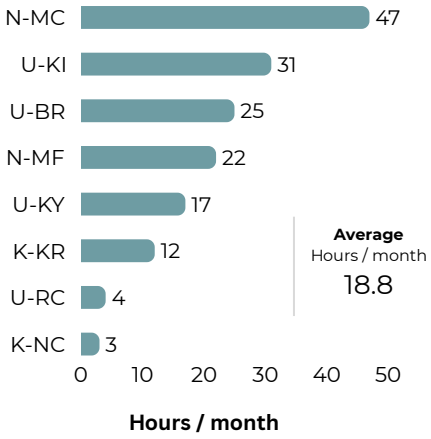
(n = 1692)

Across all sites, households spend an average of USD 8.53 per month on cooking fuel. Expenditures are lowest in Monguno (Control group and Future Customers) (5.8 and 5.2 USD) and Rhino Camp (4.89 USD), while households in Nairobi City Metropolitan Area (12.94 USD) spend more than twice as much. These differences reflect both the type of fuel used and the extent to which households rely on purchased versus collected firewood.




## Time to collect cooking fuels (monthly)

(n = 1723)

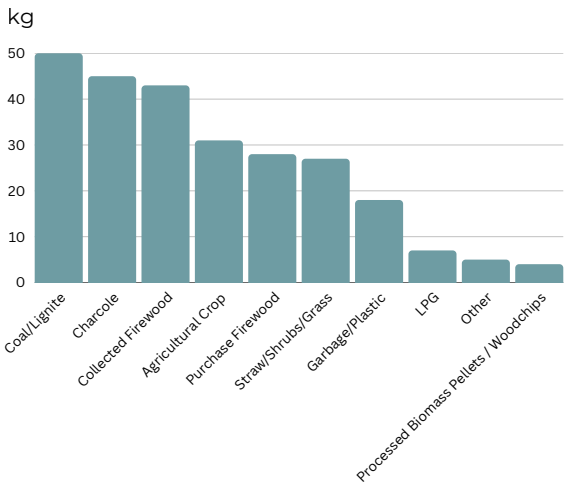



Across all sites, households spend an average of 18.8 hours per month collecting cooking fuel, though this varies widely depending on fuel accessibility and availability. Fuel collection times are longest in Monguno (Control group) (46.56 hours) and Kiranyandongo (31.09 hours), indicating significant challenges in obtaining cooking fuel. Much shorter collection times are reported in Nairobi City Metropolitan Area (2.54 hours) and Rhino Camp (3.44 hours). In Nairobi, this is largely due to households purchasing rather than collecting fuels, while in Rhino Camp it may reflect closer access to firewood sources within or near the settlement.

## Quantity of cooking fuels used (kilogrammes per month)

(n = 1344)

Respondents who reported using specific fuels provided the following average quantities per month: agricultural crop (30.78 kg), charcoal (44.57 kg), coal/lignite (50 kg), collected firewood (42.97 kg), garbage/plastic (18 kg), LPG (7.38 kg), other fuels (5 kg), processed biomass pellets or woodchips (4 kg), purchased firewood (27.69 kg), and straw, shrubs, or grass (26.92 kg). Only respondents using each particular fuel were asked to report the amount used.



**Next steps**

The baseline results reveal meaningful differences across sites that can guide the next steps of implementation of projects by SOLCO Partners. Variations in household size, residence status, wealth levels and fuel use point to the need for tailored approaches in each context. Refugee settlements and low-wealth rural areas may require stronger support mechanisms, while urban sites such as Nairobi offer lower-hanging opportunities for market-based strategies. The findings also provide useful direction for companies with regard to pricing and product design, as the ability to pay differs significantly across locations.

At the same time, the data highlights where the potential for impact is greatest. High fuel costs, burning carbon-intensive fuels, long hours spent collecting firewood, health problems linked to smoke exposure and safety risks during fuel collection remain widespread. These are exactly the challenges that solar electric cookstoves are designed to address, suggesting strong opportunities for meaningful improvements in daily life. Hopefully the evidence of significant socio-economic impact can add value to carbon credits being sold by SOLCO Partners and drive down the end-user costs of switching to e-cooking.

As this study establishes the baseline, future assessments will monitor how these conditions evolve over time and how the introduction of solar electric cookstoves influences household well-being.

**Acknowledgments**

We thank AYAN, represented by Victor Alex Ladu (Monitoring and Evaluation Lead); CECI, represented by Mike Sabo (MEAL Officer); LMC, represented by Muvunyi Consolee (Partnership Officer); and GISCOR, represented by Pogu Maina (Lead Monitoring, Evaluation, Accountability and Learning Officer), for leading the local data collection. This work was coordinated, validated, processed, and analysed by leonardo impact.

We also thank the 2008 participating households for their time and valuable insights. The following images present a selection of these households.

More data as well as gender, site, organisation, and age comparisons and disaggregations can be found on Last Mile Climate's leonardo dashboard.