



SUNNY

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DELIVERABLE D1.2

Community Mapping

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PAGE

TABLE OF CONTENTS

Table of contents	2
List of Figures	3
List of Tables	4
List of Acronyms	4
Executive Summary	5
1. Introduction	5
1.1 Contextual Background and Energy Situation	5
1.2 Lessons from past maladaptation in Energy interventions in Refugee camps	6
1.3 Social Inclusion in Energy Provision	7
1.4 Identification of Key Stakeholders	7
1.5 Key stakeholders in in Displacement Energy Projects	8
1.6 The Sunny Project and Objectives of the community mapping	11

aste





2. Methods.....	12
2.1 Preparatory Work.....	13
2.2 Composition of the Household Survey.....	14
2.3 Research preparations.....	15
2.4 Sampling and Recruitment.....	15
Rwanda.....	16
Uganda.....	17
2.5 The Survey.....	19
2.6 Data Collection Procedure.....	20
2.7 Ethical Considerations.....	21
3. Results.....	21
3.1 Results from Rwanda.....	21
3.1.1 Information on Support Networks.....	21
3.1.3 Group participation.....	31
3.2 Results from Uganda.....	33
3.2.1 Information on Support Networks.....	34
3.2.3 Group participation.....	43
Discussion.....	46
4. Outlook.....	52
References.....	54

PAGE

LIST OF FIGURES

Figure 1: Health support resources, Rwanda.....	22
Figure 2: Education support resources, Rwanda.....	23
Figure 3: Lighting, cooking and electricity support resources, Rwanda.....	24
Figure 4: Shelter support resources, Rwanda.....	25
Figure 5: Food support resources, Rwanda.....	26
Figure 6: Water support resources, Rwanda.....	27
Figure 7: Safety support resources, Rwanda.....	28
Figure 8: Advice resources for lighting, Rwanda.....	29
Figure 9: Advice resources for cooking, Rwanda.....	30
Figure 10: Advice resources for phone charging, internet and communication, Rwanda..	31





Figure 11: Health support resources, Uganda34

Figure 12: Education support resources, Uganda35

Figure 13: Electricity support resources, Uganda36

Figure 14: Shelter support resources, Uganda..... 37

Figure 15: Food support resources, Uganda38

Figure 16: Water support resources, Uganda.....39

Figure 17: Safety support resources, Uganda40

Figure 18: Advice resources for lighting, Uganda..... 41

Figure 19: Advice resources for cooking42

Figure 20: Advice resources for phone charging, internet, and communication43

LIST OF TABLES

Table 1: Household and village distribution in Bidi Bidi settlement.....17

Table 2: List of refugee villages included in the survey 18

Table 3: Field work schedule indicating refugee and host community villages to cover ...18

Table 4: Type of groups and number of respondents participating in them, Rwanda..... 32

LIST OF ACRONYMS

- EC – European Commission
- EU – European Union
- GPA – Global Platform for Action on Sustainable Energy in Displacement Settings
- IOM – International Organization for Migration
- LC – Local Council (Uganda local administrative structure)
- LPG – Liquefied Petroleum Gas
- MALL / MALLS – Multi-Actor Learning Lab(s)
- MINEMA – Ministry in Charge of Emergency Management (Rwanda)
- NGO – Non-Governmental Organization
- OPM – Office of the Prime Minister (Uganda)
- READS – Roadmap for Energy Access in Displacement Settings
- RW – Refugee Welfare (Council) structure (Uganda settlement governance)
- UN – United Nations
- UNHCR – United Nations High Commissioner for Refugees
- UNICEF – United Nations Children’s Fund
- UNITAR – United Nations Institute for Training and Research
- WASAC – Water and Sanitation Corporation (Rwanda)
- WFP – World Food Programme

PAGE



EXECUTIVE SUMMARY

This deliverable D1.2 provides the foundational community mapping and stakeholder engagement necessary for SUNNY’s participatory and inclusive design approach. Its objective is to generate a clear understanding of the social, cultural, and economic dynamics in the Mahama and Bidi Bidi demonstration sites, and to identify key actors, groups, and information networks that shape community life and influence energy-related decisions.

The findings of D1.2 directly support the preparation of co-creation activities by informing recruitment strategies, ensuring the inclusion of diverse community members and stakeholders, including those often underrepresented, and establishing transparent communication channels with both refugee and host populations. By offering a robust, evidence-based overview of community structures and support patterns, this deliverable contributes significantly to SUNNY’s goal of developing sustainable, user-centered renewable energy solutions. It also validates Milestone 2, confirming that the project is ready to initiate co-creation processes that reflect local needs, capacities, and priorities.

1. INTRODUCTION

1.1 CONTEXTUAL BACKGROUND AND ENERGY SITUATION

Access to clean, reliable, and affordable energy remains one of the most pressing challenges in humanitarian and displacement settings (Caniato et al., 2017; Rafa et al., 2022). Refugee camps and settlements in Africa, while designed as temporary solutions, often evolve into long-term living environments where millions of displaced people and their host communities face significant changes and challenges (Coniglio et al., 2023; Fajth et al., 2019; Nsababera, 2020; Salemi, 2021). In particular, energy poverty severely hampers livelihood opportunities, education, healthcare delivery, food security, and overall resilience (Rafa et al., 2022).

These challenges are evident in Mahama refugee camp in Rwanda and the Bidi Bidi refugee settlement in Uganda. The Mahama camp, established in 2015, is Rwanda’s largest refugee camp, currently hosting over 55.000 refugees alongside the surrounding host community. While Rwanda has advanced its national electrification agenda, refugees in Mahama largely remain excluded from reliable energy access. The camp’s infrastructure is limited, and households primarily rely on LPG, distributed by UNHCR for cooking, with limited access to reliable energy for lighting or productive uses (UNHCR, 2023). Additional solar systems have been deployed to power small businesses, contributing to a growing demand for solar energy connections. UNHCR has also supported improved cooking practices by distributing gas-powered stoves and LPG fuel.

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However, the ongoing provision of LPG poses a significant financial challenge for humanitarian agencies, and further investment and innovation in clean cooking solutions are urgently needed. Overall, access to reliable, sustainable, and affordable energy in Mahama remains highly constrained, with direct implications for livelihoods, safety, education, and broader socio-economic development.

Bidi Bidi is the world's second largest refugee settlement, accommodating more than a quarter million refugees and spreads across a vast, semi-arid region in northern Uganda (Strochlic, 2019). The surrounding area in which the host population lives is predominantly rural, organized in small towns and villages, and relies mainly on subsistence farming, livestock rearing, and agriculture. The camp is not connected to the national grid and electricity provision is highly constrained. Overall, both displaced and host populations lack access to affordable and reliable energy. In the camp, energy access remains minimal, while in the host communities, supply is mainly derived from heavy fuel oil and biomass like wood fuel. Women and children are disproportionately affected, as they spend considerable time collecting biomass fuels, are exposed to indoor air pollution, and face risks related to unsafe, poorly lit environments (Kyomuhendo et al., 2025). At the same time, host communities, who often face similar energy poverty, compete for the same limited resources, creating social and environmental pressures (Miura, 2022).

1.2 LESSONS FROM PAST MALADAPTATION IN ENERGY INTERVENTIONS IN REFUGEE CAMPS

Humanitarian action has long been shaped by the assumption that agencies can determine and provide the products and services that refugees need (Rosenberg-Jansen et al., 2019). However, uncertainty about the duration of displacement, chronic funding shortages, and limited technical capacity have hindered the development of sustainable energy solutions in these contexts (Baldi et al., 2022). The challenges are further compounded by complex national decision-making processes and an insufficient understanding of refugees' actual energy needs, making the deployment of appropriate energy infrastructures difficult.

Many examples, such as reported by Rafa et al. (2024) about the energy situation in the Rohingya camps, reveal non-recognition of refugees' energy needs and exclusion from governance leads to persistent and deep energy poverty and dependency, undermining education, health, and gender equality goals. Bureaucratic and humanitarian management systems often prioritize speed and uniformity over inclusion. This led to rigid camp designs and unsustainable systems that did not adapt to long-term residency realities, as observed in studies of camp design sustainability in Lebanon (Masad, 2009). Ignoring local cultural norms and governance structures led to energy systems that failed to integrate with community routines. As research on "political space" in camps reveals, that top-down governance by the UN and other humanitarian actors often suppresses refugee agency and self-organizing, leading to passive dependency rather than resilience (Olivius, 2017).

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Sustainable and equitable energy access in refugee camps requires co-design approaches that integrate refugees' lived experiences, governance participation, and long-term camp evolution. Inclusive energy strategies—where refugees are active stakeholders rather than passive recipients—have shown superior outcomes in both efficiency and social acceptance (Rosenberg-Jansen et al., 2019).

1.3 SOCIAL INCLUSION IN ENERGY PROVISION

In planning and implementing the transition to renewable energy technologies in humanitarian settings, social inclusion is a vital concept. Understood as the “process of improving the terms on which individuals and groups take part in society”, especially by “improving the ability, opportunity and dignity of those disadvantaged on the basis of their identity” (World Bank, 2013, p. 3-4), inclusion ideally extends beyond simple participation—it requires that diverse stakeholders are supported to influence decisions, co-create solutions, and benefit equitably from outcomes. As research highlights, inclusive processes are essential for achieving energy justice, sustainability, and long-term adoption in displacement contexts (Rafa, Khalid & Uddin, 2024). Technologies designed without meaningful user input often fail to meet cultural, social, or economic needs, leading to low adoption and limited impact. Studies on energy provision in refugee camps show that interventions designed through top-down approaches frequently result in mismatched solutions and rapid degradation of systems (Rosenberg-Jansen, 2022). By contrast, community engagement and co-design approaches help ensure that technologies are tailored to the daily realities, aspirations, and constraints of camp residents and host communities (Rosenberg-Jansen, Tunge & Kayumba, 2019). Marginalized groups—such as women, youth, minority ethnic groups, and people with disabilities—face intersectional barriers to accessing energy and having their needs recognized. These include limited representation in decision-making, constrained mobility, and unequal control over household resources. Integrating their perspectives is critical to designing equitable energy access strategies that promote fairness, dignity, and empowerment. Furthermore, local ownership and trust are prerequisites for long-term system maintenance and cost recovery. Inclusion builds a sense of responsibility, legitimacy, and shared benefit, which enhances sustainability and reduces dependency on external actors. In resource-constrained and politically sensitive contexts, energy interventions risk exacerbating inequalities or tensions between host and displaced populations. Inclusive and transparent approaches mitigate these risks by ensuring fair benefit distribution and promoting cooperation across communities (Masad, 2009).

PAGE

1.4 IDENTIFICATION OF KEY STAKEHOLDERS

Effective stakeholder involvement is a critical component of project implementation, as



the accurate identification, engagement, and influence of key actors directly shape the success of project outcomes (Chung & Crawford, 2016). In displacement contexts, stakeholders are diverse and embedded in complex social, institutional, and political structures. Importantly, camp residents themselves contribute to establishing forms of social order and micro-governance; they are not merely passive recipients of humanitarian interventions or national policies but actively participate in creating, maintaining, and reinforcing internal structures and community norms. Understanding the communication, interaction and power dynamics in social settings involves mapping both formal and informal actors within the social fabric, as well as the structures in which these operate. While formal stakeholders are organized, officially recognized structures, often created or hosted by humanitarian agencies or the host government, are informal groups organic, emergent structures based on pre-displacement ties, common language, ethnicity or shared needs. They often hold significant importance and can be crucial to project success or failure (Prell et al., 2010). Many initiatives fail because insufficient attention is paid to the interests, characteristics, and internal dynamics of stakeholders (Grimble & Wellard, 1997). As a result, stakeholder analysis has become increasingly central to participatory approaches (Mushove & Vogel, 2005). However, traditional methods face several limitations. Stakeholders are often identified and categorized through subjective assessments of power, influence, and legitimacy (Mitchell et al., 1997; Frooman, 1999). So far, many studies have overlooked how communication networks shape stakeholder relationships and social network analysis is one method that offers a valuable complement by revealing how information flows, whom community members trust, and where influence is situated within formal and informal systems (Prell et al., 2009). Selecting relevant stakeholders for participatory processes remains challenging. Historically marginalized groups may be difficult to identify or engage; existing tensions between community groups can hinder willingness to participate, and participatory activities often rely on smaller groups that may not be fully representative (Daniels & Walker, 2001; Stringer et al., 2006). In displacement settings, these challenges are amplified by layered governance systems, cultural diversity, and heterogeneous experiences of vulnerability. A common approach to answer these issues is to assess urgency, legitimacy, and power of stakeholders and groups in relation to the topic (Mitchell et al., 1997). However, such methods have been criticized for elevating more visible and already powerful actors while underrepresenting those with weaker voices (Grimble & Chan, 1995; Calton & Kurland, 1996; MacArthur, 1997). To counterbalance this bias, inclusive approaches deliberately incorporate stakeholders who may be remote, marginalized, loosely connected, or considered “non-legitimate” within formal governance structures.

PAGE

1.5 KEY STAKEHOLDERS IN IN DISPLACEMENT ENERGY PROJECTS

Participatory processes are foundational to effective and just energy interventions, aste



especially in complex environments such as refugee and host communities. Literature from humanitarian action, energy transitions, and living-lab research consistently emphasizes that meaningful participation requires the engagement of a diverse ecosystem of actors across social, institutional, and market domains. In displacement settings, where governance structures are hybrid and energy access is mediated by humanitarian actors and market forces, the need for inclusive, multi-actor participation is even more pronounced. This section synthesizes key insights from humanitarian energy guidelines, displacement-focused case studies, and European Union multi-actor and living-lab frameworks to identify which actors are said to be involved in participatory processes. The literature, combined with the following results in section 3, will provide grounding for the SUNNY project's Multi-Actor Learning Labs (MALLs) and its community-driven approach to co-designing energy solutions.

The literature identifies several categories of actors who are necessary for grounded, just, and inclusive participatory processes in displacement-energy initiatives. These actor groups interact within layered social systems and contribute distinct forms of knowledge, agency, legitimacy, and operational capacity. The groups synthesized for this deliverable are directly affected people, community level structures and informal leaders, humanitarian and development organizations, local and national government authorities, private-sector and market actors, knowledge, research, and innovation actors, and donors, policy stakeholders, and international coalitions.

PAGE

Across humanitarian and development frameworks, refugees, displaced communities, and host populations are described as directly affected people and are considered essential co-creators of energy interventions. The Global Plan of Action (2018) frames displaced and host communities as *equal partners*, emphasizing participatory design rather than top-down service delivery. Evidence from displacement-energy projects (e.g., RE4R in Rwanda and Jordan) shows that involvement of households leads to higher acceptance, better maintenance outcomes, and improved alignment with daily practices (Practical Action & UNHCR, 2020). Studies also show the importance of recognizing intra-community diversity, meaning to include women, youth, older persons, persons with disabilities, minority ethnic groups, single-headed households, and low-income host residents, because energy needs and vulnerabilities vary significantly across these social groups (Ashden, 2020). Inclusive participation at this level supports is said to lead to more procedural justice in energy transitions, ensuring historically marginalized groups are not excluded from decision-making and benefits (Chilvers & Pallett, 2018).

Community structures such as respected elders, village committees, refugee-led organizations, savings groups, women's groups, youth groups, religious leaders, traditional authorities, and neighborhood associations play a crucial role as intermediaries between humanitarian organizations and affected households (UNITAR,



2022). These actors often shape trust, legitimacy, information flows, and social cohesion.

Humanitarian agencies, such as UNHCR, WFP, UNICEF, and international and national NGOs, often serve as operational and coordination anchors in displacement settings. They provide the directly affected people, especially refugees, with on-demand aid and organize the camps. Often, they provide crucial infrastructure such as hospitals and schools from which host and refugee communities shall benefit (UNHCR, 2024). Furthermore, they contribute technical expertise, implement programs, manage protection frameworks, and often control site-level governance and service delivery (Global Plan of Action, 2018). Local and national government authorities, such as, village or district authorities, municipal councils, energy ministries, environmental agencies, refugee affairs departments, and regulatory bodies, shape the policy environment in which energy solutions operate. Therefore, successful energy interventions often depend on sustained engagement with county governments and utilities (UNITAR, 2022). Local and national bodies furthermore provide the framework in which international and national humanitarian agencies and NGOs can operate.

Private-sector and market actors, such as national energy utilities, solar companies, mini-grid operators, stove manufacturers, LPG and hydrogen suppliers, service technicians, phone-charging entrepreneurs, vendors, and microfinance institutions, play a critical role in the sustainability and scalability of energy interventions in displacement settings. They provide the technologies, services, and financial mechanisms necessary for long-term operation and can embed their activities sustainably within local markets when the business model is viable. As a result, private-sector engagement is often essential for ensuring that energy solutions extend beyond pilot phases and become durable components of the local socio-economic environment (Rouse, 2019).

The IOM Toolkit (Matthey-Junod, 2024) stresses that energy access in displacement settings cannot be delivered sustainably without market development and private-sector participation across supply chains, distribution networks, after-sales service, and financing. In addition, EU energy-community and living-lab research highlights the importance of including SMEs, utilities, DSOs, and technology providers to ensure that innovations are technically viable and economically realistic (Löfquist et al., 2025; Roberts et al., 2022).

Universities, research institutes, training centers, and innovation labs often provide evaluation capacity, modelling, socio-technical analysis, and skills development.

Their participation is said to strengthen evidence-based design and ensure rigorous monitoring and evaluation and help bridge the persistent gap between scientific knowledge and real-world implementation. Academic and training institutions act as key intermediaries, translating scientific insights into practical solutions and ensuring that participatory processes remain analytically robust and contextually grounded (Löfquist et al., 2025). International donors, national climate and energy bodies, and organizations such as the Global Plan for Action (GPA) play a strategic role in linking displacement-

energy work with global commitments such as the SDGs, the Global Compact on Refugees, and net-zero targets (Global Plan of Action, 2018). Their role in participatory processes ensures coherence between local innovation and global policy agendas.

Complex socio-technical energy solutions require diverse expertise. Including social, institutional, financial, and technical knowledge is therefore inevitable when aiming for sustainable and adequate energy solutions in displacement settings. Participation by affected populations and community-level structures enhances legitimacy, fairness, and trust, while the involvement of private-sector, government, and research actors ensures long-term sustainability and scalability beyond short humanitarian project cycles.

1.6 THE SUNNY PROJECT AND OBJECTIVES OF THE COMMUNITY MAPPING

The SUNNY project aims to develop inclusive, sustainable, and context-appropriate renewable energy solutions for displacement settings and their surrounding host communities. Responding to the dual challenge of the global green transition and the severe energy poverty faced by refugees, SUNNY integrates technical innovation with social, economic, and environmental considerations. Central to this approach is the meaningful involvement of communities and stakeholders throughout the design, implementation, and evaluation of energy solutions. The community mapping conducted under Task 1.2 supports these goals by generating a detailed understanding of local actors, social structures, information networks, and community priorities. This knowledge forms the foundation for participatory co-creation activities, ensuring that the energy solutions developed within SUNNY are not only technically sound but also socially inclusive, locally accepted, and responsive to the needs and capacities of both refugee and host populations.

To avoid design mismatches and prevent the exclusion of community members from decision-making processes, the SUNNY project adopts an inclusive, user-centered approach that places the lived realities of refugees and host communities at the core of energy solution development. A central objective of this approach is to strengthen the learning capacity of implementing partners, enabling them to tailor both technical solutions and collaboration frameworks to the specific social, cultural, and institutional contexts of the two demonstration sites.

In support of this goal, a community mapping and stakeholder analysis was conducted under Task 1.2 to develop a deeper understanding of social integration dynamics, local communication networks, and pathways through which information and influence circulate within and between community groups. This analysis provides the foundation for identifying key actors and groups—including those formally organized as well as individuals and groups not usually represented—who will play a role in later project activities. The focus is not on stakeholder power or their direct relationship to energy, but rather on their connectedness, their role in community life, and their potential to enable



more inclusive engagement. This approach helps ensure that those who are typically less visible or not organized in groups, and who might otherwise be excluded from important information flows, are actively included in SUNNY's participatory processes.

The results of this analysis directly contribute to the project's requirement to provide an "overview of local stakeholders and their connections in all demonstration sites, specifying the key actors that will be engaged in the MALLs, the regular participants in co-creation processes, and the end-users." They also align with the principle that community engagement must be continuous and widespread, not limited to initial assessment phases, in order to build sustainable outcomes that meaningfully support refugees in the long term.

By grounding SUNNY's activities in an in-depth understanding of stakeholder networks and community dynamics, the actor analysis strengthens the project's ability to design socially responsive, context-appropriate, and ultimately more sustainable energy interventions.

2. METHODS

Work Package 1 (WPI) focuses on preliminary work necessary to understand the local contexts, to completely define the use cases and technical requirements and to ensure that the further developments reach the highest possible impact. Under task 1.2 the aim is to understand community structures and communication pathways, including whom people from host and refugee community trust for advice on energy and other essential services, and how they engage in formal and informal groups. Therefore, a survey combining both quantitative and qualitative data was conducted. The survey is implemented in both locations: Mahama refugee camp in Rwanda and Bidi Bidi settlement in Uganda and in their respective host communities.

Through the survey and literature review, the following research questions will be answered:

RQ1: Which actors should be engaged in the participatory processes of the SUNNY project, and what roles do they play in the context of host and refugee community?

RQ2: Which existing social and institutional structures can be leveraged to support, embed, and sustain energy solutions in refugee and host communities?

The two research questions are addressed through a systematic analysis of survey data capturing information networks, support structures, group participation, and demographic characteristics across refugee and host communities. RQ1 is answered by examining which actors do individuals consult for support across essential services, allowing the project to identify key stakeholders and representative community structures



for participatory processes. RQ2 is answered by mapping social, institutional, and community structures that respondents rely on across domains, identifying which existing networks and organizations can serve as entry points for embedding and supporting energy solutions.

Together, the results provide SUNNY with an evidence-based understanding of who to engage, where communities get advice and information, and which structures can support co-creation, implementation, and long-term sustainability. This ensures that the formation of Multi-Actor Learning Labs (MALLs), community engagement strategies, and subsequent pilot activities are grounded in the social realities and organizational landscapes of both refugee and host communities.

2.1 PREPARATORY WORK

Workshop with SUNNY partners during the consortium meeting

Ahead of the data collection, two workshops were conducted in Rwanda during a consortium meeting in June 2025. The first workshop was held with project partners where stakeholder groups for future tasks in the project were identified. With the help of Mentimeter¹, project partners shared their interest in and task requirements for involving members of different social groups in their activities. As the SUNNY project works with great emphasis on understanding local contexts and working on co-creation of energy solutions, it is important to reach as many interest groups as possible.

The results of the workshop provided insight into which group we need to establish contact to and understand their needs and priorities when it comes to energy consumption and provision from the partners' perspective. Furthermore, it provided a starting point for participant recruitment for Work Package 2 "Local value chain, training and capacity building collaborative development", where Hudara is in the lead.

The results of the workshop show a wide range of stakeholders considered important for carrying out the participants' tasks. These include community members such as end users, households, refugees, host communities, and their representatives, including village leaders, community leaders, opinion leaders, and "local champions" like religious or charismatic figures. Technical actors were frequently mentioned, including informal repair technicians, local artisans, maintenance and recycling experts, informal waste collectors, market coordinators, transport operators, and the people responsible for operating infrastructure. A strong emphasis is also placed on entrepreneurs and private-sector actors, business owners, suppliers, retailers, technology providers, value-chain

¹ An online tool used for creating interactive presentations with live audience participation, used for meetings, classes, and training; <https://www.mentimeter.com/>

actors, market developers, and companies such as Solektra, along with refugee-led and community-based organizations.

Financial players such as microfinance institutions, financial institutions, local cooperatives, farmer-based organizations, and camp savings groups are also considered important. Government entities appear prominently, including MINEMA, local government authorities, district officials, policymakers, and executive committees. International bodies, especially UNHCR and other UN agencies, are seen as key partners. Finally, universities and research institutions are acknowledged for their role in knowledge generation and support. Overall, it is highlighted that a broad and interconnected ecosystem of community actors, technical specialists, private sector stakeholders, financial organizations, government bodies, and international institutions, are considered essential for the effective execution of tasks in the given context by project partners.

Enumerator Training and Workshop in Rwanda

A two-day preparatory workshop was held in Rwanda with the research assistants to introduce the objectives and methodology of the SUNNY community mapping and actor analysis. The workshop served to familiarize the team with the overall research endeavor, clarify the purpose of the survey, and review each question in detail. Together with the research assistants, the team discussed the relevance of the predefined actor categories, assessed whether additional local stakeholders should be included, and ensured that all questions were appropriate and non-sensitive within the camp context. The research assistants provided highly valuable contextual insights that helped refine the questionnaire and tailor it to local realities, contributing significantly to the quality and success of the data collection. The workshop also laid the foundation for a strong collaborative relationship and effective communication with the team, which proved essential for subsequent online coordination and the smooth continuation of project activities.

PAGE

2.2 COMPOSITION OF THE HOUSEHOLD SURVEY

To map community structures and understand pathways for stakeholder involvement in co-creation, a structured household survey was designed and implemented in the two demonstration sites: Mahama refugee camp (Rwanda) and Bidi Bidi refugee settlement (Uganda) and their respective host communities. The survey combined both closed-ended and open-ended questions, focusing on three main areas:

- 1) Information and support networks (e.g., whom respondents consult for health, education, energy, safety, or shelter issues),
- 2) Group participation (membership in formal and informal community groups, purpose and perceived importance of such groups),
- 3) Respondent characteristics (socio-demographic profile, including age, gender, education, language, income activity, health, disability, religion, and year of arrival)



for refugees).

2.3 RESEARCH PREPARATIONS

Face-to-face interviews were conducted, based on a structured questionnaire with closed- and open-ended mixed questions. The questionnaire was prepared in English language and then translated into relevant languages. In Rwanda, the survey was mainly conducted in Kinyarwanda. This language is spoken by the host community, and it is very similar to Kirundi, the language that is spoken by Burundians. With the provision of the survey in English and Kinyarwanda, almost all people from the refugee and host-community could be reached. All four research assistants are fluent in English and Kinyarwanda. The household survey in Bidi Bidi refugee settlement and the surrounding host community was translated and conducted in English, Aringati, and Arabic. These languages reflect the main linguistic groups present in the area: Aringati is widely spoken among the local host population, while Arabic serves as a common language among refugees originating from South Sudan and Sudan. English is Uganda's official language and is also spoken by various people from both, host and refugee community. Conducting the survey in these three languages ensured that all respondents could comfortably express their views, reduced potential misunderstandings, and enhanced the accuracy and reliability of responses. The multilingual approach also reflected SUNNY's commitment to inclusivity and cultural sensitivity, recognizing the linguistic diversity of both refugee and host communities.

PAGE

2.4 SAMPLING AND RECRUITMENT

The survey applied a cluster sampling method to ensure a representative and efficient data collection process across geographically dispersed populations. In this approach, the overall population is first divided into smaller, naturally occurring groups or "clusters", such as villages, neighborhoods, or administrative zones within the camp and host communities. A random selection of these clusters is then made to capture the diversity of living conditions and social contexts. Finally, data are collected from all individuals within the chosen clusters, or from a random sample of individuals within those clusters, depending on population size and accessibility. This method was particularly suitable for the SUNNY project's implementation sites, as it allowed the team to manage logistical constraints while still obtaining data that reflect the social and spatial diversity of both refugee and host communities. Cluster sampling also minimized travel time, reduced costs, and ensured balanced representation of community perspectives across different zones of the settlements.

A total of approximately 350 household interviews were conducted across each demonstration site to ensure a robust and statistically meaningful dataset. While there is



no single absolute rule for determining the ideal sample size, methodological literature and practical experience suggest that a sample between 160 and 300 valid observations is generally adequate for multivariate statistical analyses and for drawing reliable conclusions without substantial risk. By exceeding this range, the SUNNY survey achieves both statistical reliability and a balanced representation of the diverse subgroups within the refugee and host communities. This sample size was therefore considered appropriate to capture sufficient variation in socio-economic characteristics, information networks, and stakeholder relationships, while remaining feasible within the logistical and temporal constraints of fieldwork in humanitarian contexts.

The sampling ratio of one-third host community and two-thirds refugee community was chosen to reflect the demographic realities and the project's core focus. In both demonstration sites, the refugee population is significantly larger than that of the immediate host communities, and SUNNY's primary objective is to improve energy access and inclusivity within displacement settings. A higher proportion of refugee respondents therefore ensures adequate representation of diverse experiences, needs, and social structures within the camps and settlements.

At the same time, including one-third of respondents from surrounding host communities was essential to capture the interlinked social and economic dynamics between displaced and local populations. Host communities play a crucial role in local markets, resource sharing, and service provision, and their inclusion allows the project to better understand how energy access challenges and opportunities extend beyond camp boundaries. This balanced approach ensures that the dataset is both representative and comparative, enabling SUNNY to design renewable energy solutions that are contextually appropriate, socially cohesive, and beneficial to both refugees and host communities.

Participants were recruited randomly by the research assistants. Only persons over the age of 18 could be interviewed and they had to live there (no visitors).

Participation was voluntary, and respondents were informed about the purpose of the survey.

Rwanda

In Rwanda, the villages of the refugee and host community were considered as the research clusters. Each village in Mahama refugee camp consists of 10 communities and each community consists of 10 households. The number of interviews for the refugee community (n=230) was divided by the numbers of villages. By applying this method, it was assured that every village was covered evenly. For the host community, a list from Practical Action, indicating the villages of the host community was used to identify the



sample. Here again, the sample size of n=112 surveys was divided by the numbers of villages and all villages were covered evenly.

Uganda

As in the case of Mahama, villages were the organizational unit used as clusters. The Bidi Bidi refugee settlement is organized into five administrative zones, each comprising multiple villages. The zones differ in geographic extent and total population (Figure 1).

With a total intended sample size of n=350, including a small buffer for potential data loss, and following the established ratio of two-thirds refugee respondents and one-third host community respondents, the targeted distribution was n=240 interviews in the refugee community and n = 128 in the host community. To ensure gender balance, 50% of the interviews were conducted with women and 50% with men. This was facilitated by assigning two male and two female research assistants, with each interviewer engaging only participants of the same gender, thereby respecting cultural norms and supporting open communication.

For geographical representativeness, respondents were selected from all five zones of the Bidi Bidi settlement. To maintain consistency, manage fieldwork efficiently and maintain a good distribution, it was decided to conduct eight interviews per village. Using the available household statistics for each zone, the research team calculated the relative distribution of households and, on this basis, determined the number of villages to be included per zone. A random selection of villages was performed using Microsoft Excel to generate the final list of sampling locations. This approach ensured both statistical representativeness and logistical feasibility, allowing for the inclusion of diverse perspectives across the settlement while maintaining methodological rigour.

PAGE

Zone	Total Nr. of house holds	Total Nr. of villages	Total Nr. of villages included
Zone 1	7455	14	5
Zone 2	8455	11	6
Zone 3	11216	16	8
Zone 4	6074	10	4
Zone 5	9583	24	7

Table 1: Household and village distribution in Bidi Bidi settlement



Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
1	4	1	3	2
4	5	2	4	7
8	6	3	5	9
13	7	5	8	10
14	10	6		15
	11	10		16
		12		18
		15		

Table 2: List of refugee villages included in the survey

To determine an appropriate sampling method for the host community, the research team relied on a reference table provided by the Office of the Prime Minister (OPM), which identifies the specific villages considered part of the host community and their corresponding refugee villages. Based on this information, the number of host community villages to be included in the survey was set at half the number of refugee community villages, in line with the intended ratio of two-thirds refugee and one-third host community respondents. A random sample of refugee community villages was first selected, after which the corresponding host community villages listed in the OPM table were chosen for inclusion.

PAGE

Day	Zone	Village in refugee community: (minimum 8 per village)	Village in host community: (minimum 8 per village)
1	Zone 1		1 Bidibidi
2			13 Twajiji West
3			14 Geturu
4	Zone 2		6 Nyunru
5			7 Mulondo
6			4 Invimvi
7	Zone 3		1 Para
8			3 Ojurukonga
9			5 Mengo
10			15 Limu
11	Zone 4		4 Malanga
12			8 Bolomoni
13	Zone 5		7 Yangani
14			15 Ayivu
15			20 Ochinga
16			23 Okubani
17	Zone 1		4
18			8
19	Zone 2		5
20			10
21			11
22	Zone 3		2
23			6
24			10
25			12
26	Zone 4		3
27			5
28	Zone 5		2
29			16
30			18

Table 3: Field work schedule indicating refugee and host community villages to cover





2.5 THE SURVEY

The survey consisted of 25 questions, covering information for support in crucial areas of life, group participation and descriptive data of the sample.

The questions asked in the first section (Information and support networks) were:

1. If you have an issue with your health, who do you reach out to for information or support?
2. If you have an issue with education or learning possibilities for you or your children or family members, who do you reach out to for information or support?
3. If you have an issue with lighting, cooking, or anything with electricity, who do you reach out to for information or support?
4. If you have an issue with shelter, who do you reach out to for information or support?
5. If you have an issue with food, who do you reach out to for information or support?
6. If you have an issue with water, who do you reach out to for information or support?
7. If you have an issue with your safety including physical harm, legal status or access to justice, who do you reach out to for information or support?
8. Who would you rely on for advice to make a decision on what energy source to use for lighting?
9. Who would you rely on for advice to make a decision on what energy source to use for cooking or what cookstove to use?
10. Who would you rely on for advice to make a decision on what energy source to use for phone charging, internet and communication?

The second section deals with group participation and contains the following questions:

11. Are you involved in any formal or informal groups or organized social activities outside of your household, in person or online?
 - a. What kind of group is that?
 - b. Group's name
 - c. How often do you meet?
 - d. Since when have you been a member of this group?
 - e. What is the purpose or main activity of this group?
 - f. Are there key individuals in this group such as leaders or organizers?
 - g. Role / Position of the person(s):
 - h. Name of the person(s):
 - i. From 1 (not important) to 5 (very important) – How important is the group to you personally or to your household?



Participants were able to state up to three groups they participate in and the respective group information.

The third section collects socio-demographic information and covers the questions:

14. What is your age?
15. What is your gender?
16. What is your country of origin and your region of origin?
17. Which languages do you speak?
18. What is your religion?
19. In what year did you arrive at the camp? (if refugee)
20. Can you read and write?
21. What is the highest level of education that you have?
22. What is your income activity?
23. Do you have a disability?
24. Do you have severe health issues?
25. Would you like to add something?

The questionnaire combined both open and closed questions. While predefined response categories were included to support systematic data entry, participants were encouraged to answer freely in their own words. The research assistants then selected the corresponding category or, when necessary, recorded the response under “other,” ensuring both structure and flexibility in capturing locally relevant information.

PAGE

2.6 DATA COLLECTION PROCEDURE

Surveys were conducted through face-to-face interviews in respondents’ preferred language, facilitated by trained local enumerators. The tool was programmed into KoBo Toolbox (EU server) for digital data entry, enabling standardized answer recording and minimizing data entry errors. Each interview lasted approximately 30 minutes. In Rwanda, 342 interviews were conducted, of which 230 were conducted in the refugee community and 112 in the host community. In Uganda, 381 interviews were conducted with 125 in the host community and 256 in the refugee community.

Informed consent was obtained verbally and in writing. People who cannot write gave their consent with a fingerprint. Respondents were assured that participation would not affect their assistance status and that they could decline to answer any question or withdraw at any time without consequence. To protect privacy, personal identifiers were replaced with unique codes.



2.7 ETHICAL CONSIDERATIONS

All activities carried out under task 1.2 adhered to strict ethical standards to ensure the safety, dignity, and rights of participants and research assistants. Ethical approval has been obtained from Makerere University, Uganda. Prior to data collection, HUD organized workshops with all research assistants to provide training on ethical interviewing practices, including guidance on avoiding any situation that could compromise their own safety and protocols for disengaging immediately if they felt threatened or uncomfortable. Enumerators were also trained to recognize signs of participant distress and to pause, redirect, or terminate interviews as needed to prevent discomfort.

All participants were informed about the purpose of the research, the voluntary nature of their involvement, and their right to withdraw at any moment during the interview and for up to two weeks after participation. They were also assured that participation was independent from humanitarian assistance and would not affect their access to services. To protect confidentiality, a two-step data protection procedure was applied: during the two-week withdrawal window, names were securely stored only to allow participants to retract their data; after this period, the participant list was destroyed and identifying information could no longer be linked to survey codes. The questionnaire was designed to avoid sensitive or potentially harmful topics, limiting the risk of psychological discomfort. These measures ensured that data collection complied with ethical research standards and respected the rights and well-being of all involved.

PAGE

3. RESULTS

3.1 RESULTS FROM RWANDA

In total, 342 surveys were conducted, of which 230 were done in the refugee camp and 112 in the host community villages.

3.1.1 INFORMATION ON SUPPORT NETWORKS

Understanding who community members turn to for support across different domains is essential for identifying the key actors who should be included in the SUNNY project's participatory processes. The survey assessed support networks for a range of needs—including health, education, energy, water, safety, and food, capturing both formal structures (such as NGOs, UN agencies, government authorities, and camp representatives) and informal networks (such as family, friends, neighbors, and community leaders). The results reveal distinct patterns of reliance on support actors between refugee and host communities, as well as differences across demographic groups. These patterns provide important insights into which actors hold influence, which

aste





networks are trusted, and where gaps in support or representation may exist. Together, these findings help identify prominent and marginalized stakeholders.

In the following, the results for the different areas of support will be demonstrated and the results for host and refugee community will be compared, showing the differences of these two groups and their different channels of support.

Health-related support networks

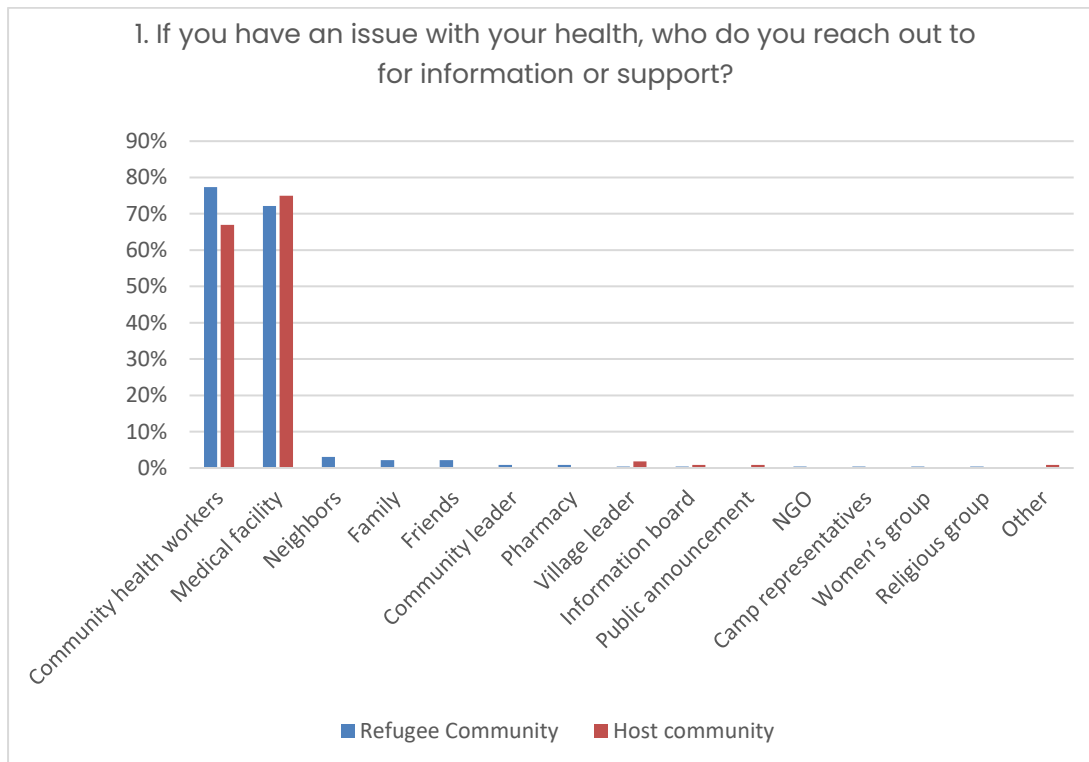


Figure 1: Health support resources, Rwanda

Health-related support networks show a strong reliance on formal health structures in both refugee and host communities. Refugee respondents most frequently sought assistance from community health workers (77%) and medical facilities (72%), with very limited reliance on informal networks such as neighbors (3%) or family and friends (2% each). Host community members displayed a comparable pattern, with 75% turning to medical facilities and 67% to community health workers. Informal or community-based actors—such as village leaders (2%), public announcements (1%), or other sources (1%)—played only a marginal role for hosts and were almost absent for refugees. Across both groups, humanitarian or civil-society structures such as NGOs, religious groups, and women’s groups were not significant sources of health-related support.





Education-related support networks

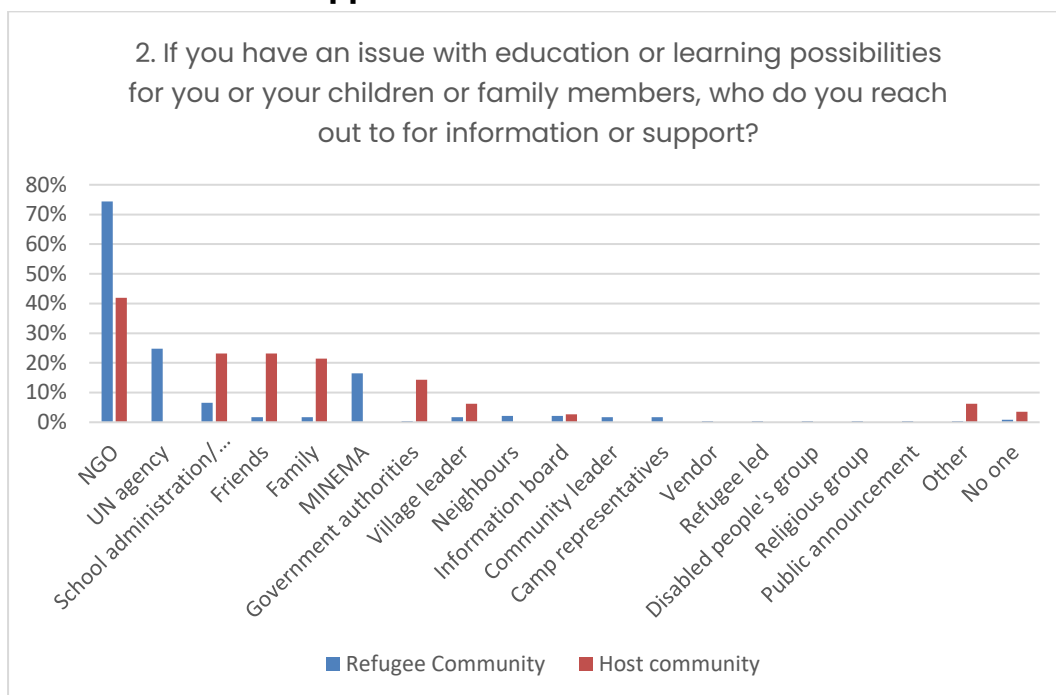


Figure 2: Education support resources, Rwanda

Clear differences emerged between refugee and host communities in terms of where individuals seek support for education-related issues. Refugee respondents overwhelmingly relied on NGOs (74%), followed by UN agencies (25%) and MINEMA (17%), indicating a strong dependence on formal humanitarian structures. In contrast, the host community showed a more diversified and locally grounded pattern: only 42% relied on NGOs, while substantial proportions turned to family (21%), friends (23%), school administration/teachers (23%), and government authorities (14%).

Among the NGOs, that were mentioned, three dominant actors were identified: World Vision, Maison Shalom and Hope Impact Rwanda. In the refugee community, World Vision was the most prominently mentioned (139 times), followed by Maison Shalom (66 times and Hope Impact Rwanda (45 times). Other NGOs appeared only occasionally, including ADRA, the Red Cross, and Caritas Rwanda (each with one mention). Among UN agencies, UNICEF was identified as the primary actor consulted for education matters, with UNHCR mentioned less frequently. In the host community, World Vision was mentioned 30 times and Maison Shalom 17 times, Hope Impact Rwanda was not mentioned.





Lighting, cooking, and other electricity services-related support networks

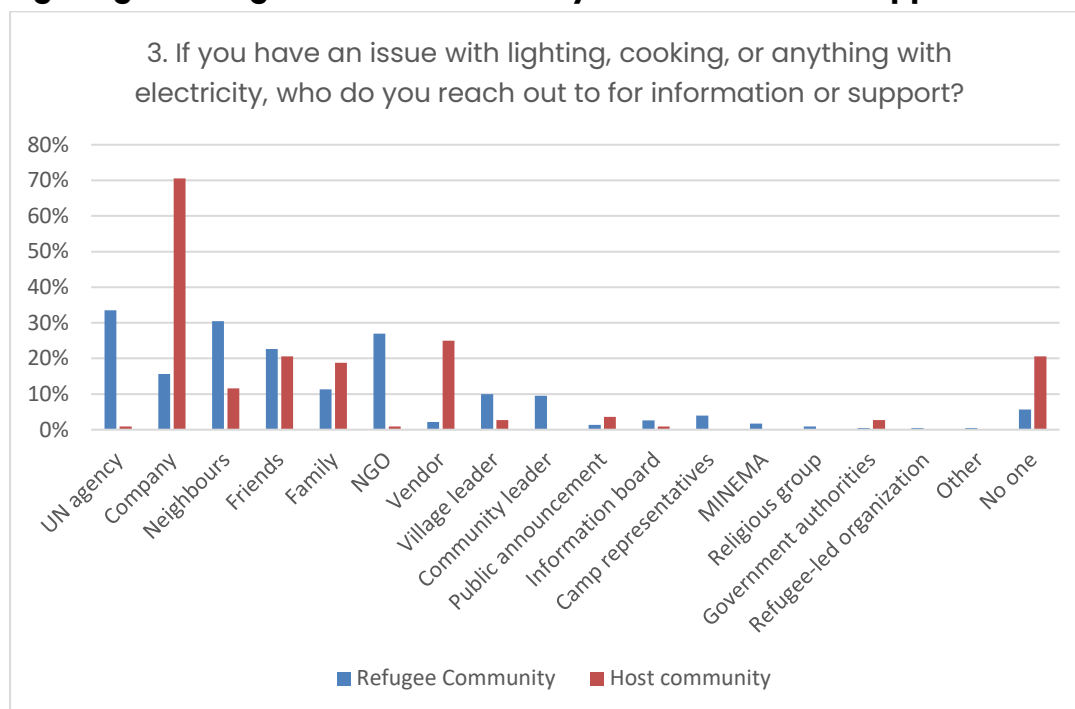


Figure 3: Lighting, cooking and electricity support resources, Rwanda

Support-seeking patterns for energy-related issues show pronounced differences between refugee and host communities. Refugee respondents relied most frequently on UN agencies (33%), NGOs (27%), neighbors (30%), and friends (23%), indicating a mix of humanitarian and informal social support. Family members also played a notable role (11%), while village and community leaders (10% each) were secondary sources of advice. Only very small proportions turned to vendors (2%), MINEMA (2%), information boards (3%), or religious groups (1%). In contrast, the host community displayed a strikingly different pattern: private companies were by far the dominant source of support (71%), followed by vendors (25%), friends (21%), and family (19%). Reliance on UN agencies (1%) and NGOs (1%) was minimal among hosts. Notably, 21% of hosts and 6% of refugees reported having no support source at all. The actors most frequently identified by respondents for energy-related support were Solektra, primarily in relation to lighting, and Practical Action, particularly for cooking solutions. In addition, the Belecom company was also mentioned numerous times for energy provision.





Shelter-related support networks

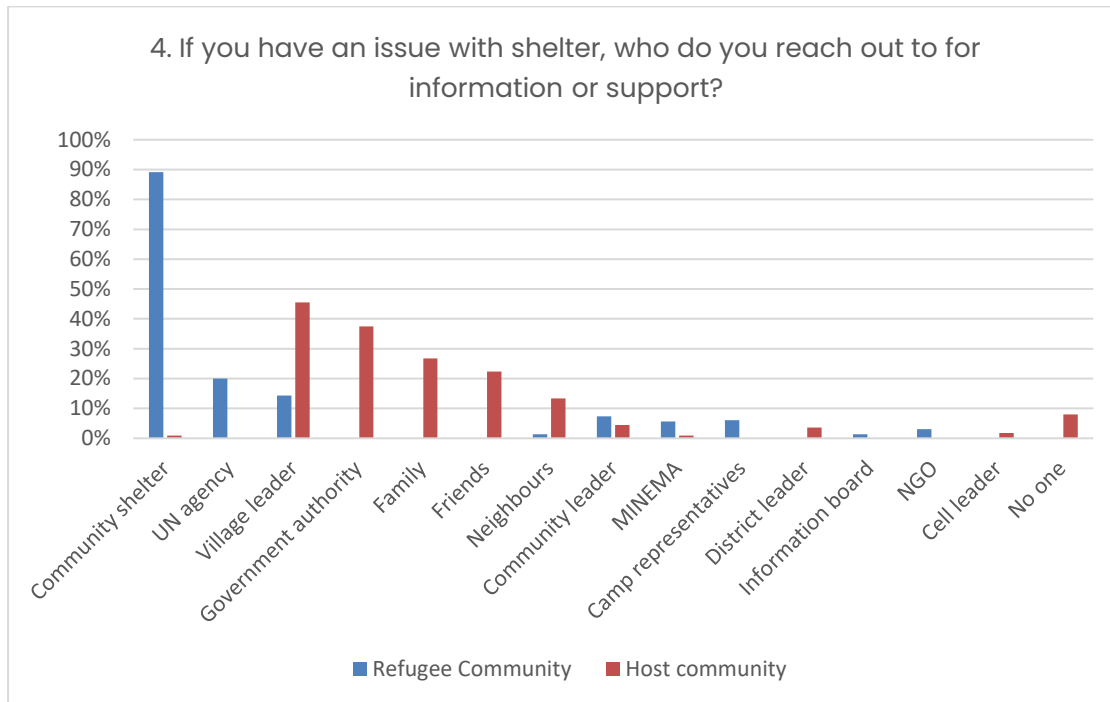


Figure 4: Shelter support resources, Rwanda

Support-seeking patterns for shelter needs show a stark divergence between refugee and host communities. Refugee respondents depended overwhelmingly on community shelters (89%), reflecting the camp-based infrastructure. A smaller proportion also relied on UN agencies (20%), village leaders (14%), and community leaders (7%), while MINEMA and camp representatives each accounted for 6%. Informal networks, such as family, friends, or neighbors, played no significant role for refugees (0–1%).

In contrast, the host community relied primarily on local governance and social networks. The most frequently consulted actors were village leaders (46%), government authorities (38%), family (27%), friends (22%), and neighbors (13%). Only 1% sought help from MINEMA, and none reported support from UN agencies or NGOs. Notably, 8% of hosts and 0% of refugees reported having no support at all.





Food-related support networks

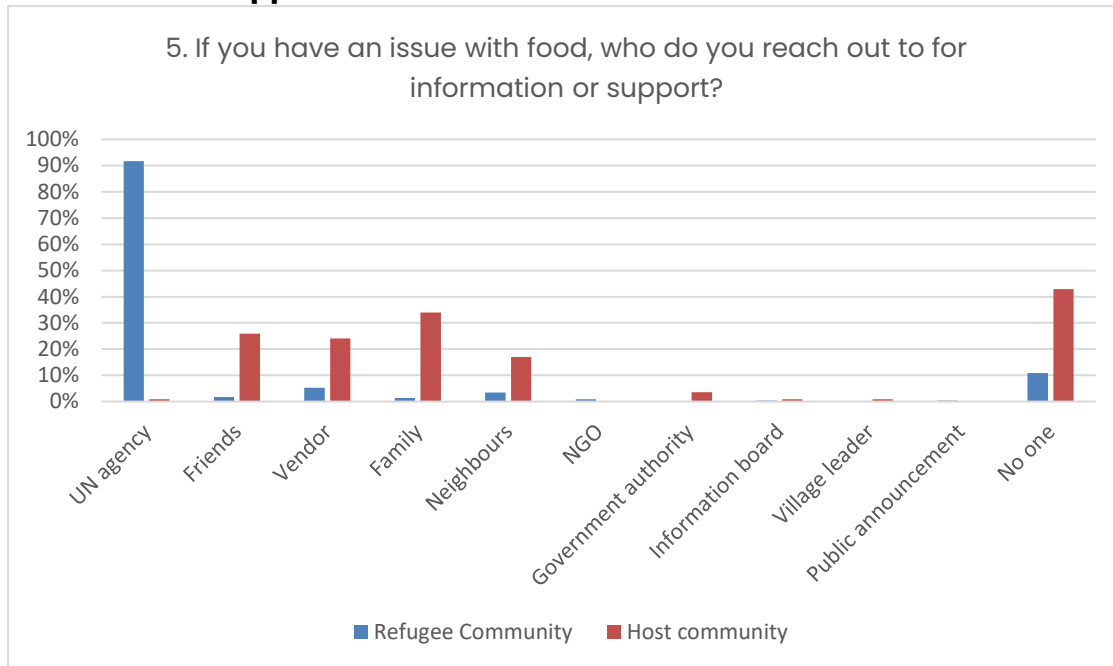


Figure 5: Food support resources, Rwanda

For food-related needs, 92% of refugee respondents reported receiving support from a UN agency—predominantly the World Food Programme (WFP). Additional sources included vendors (5%), neighbors (3%), friends (2%), and NGOs (1%). Very few refugees indicated relying on family (1%), and none reported seeking support from government authorities, village leaders, information boards, or public announcements. 11% of refugee respondents reported having no support source for food.

Among host community respondents, support was distributed across several informal and local actors. The most frequently mentioned sources were family (34%), friends (26%), vendors (24%), and neighbors (17%). Smaller proportions reported consulting government authorities (4%) or information boards and village leaders (1% each). Only 1% reported support from a UN agency, while 43% indicated having no support source for food-related issues.

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Water-related support networks

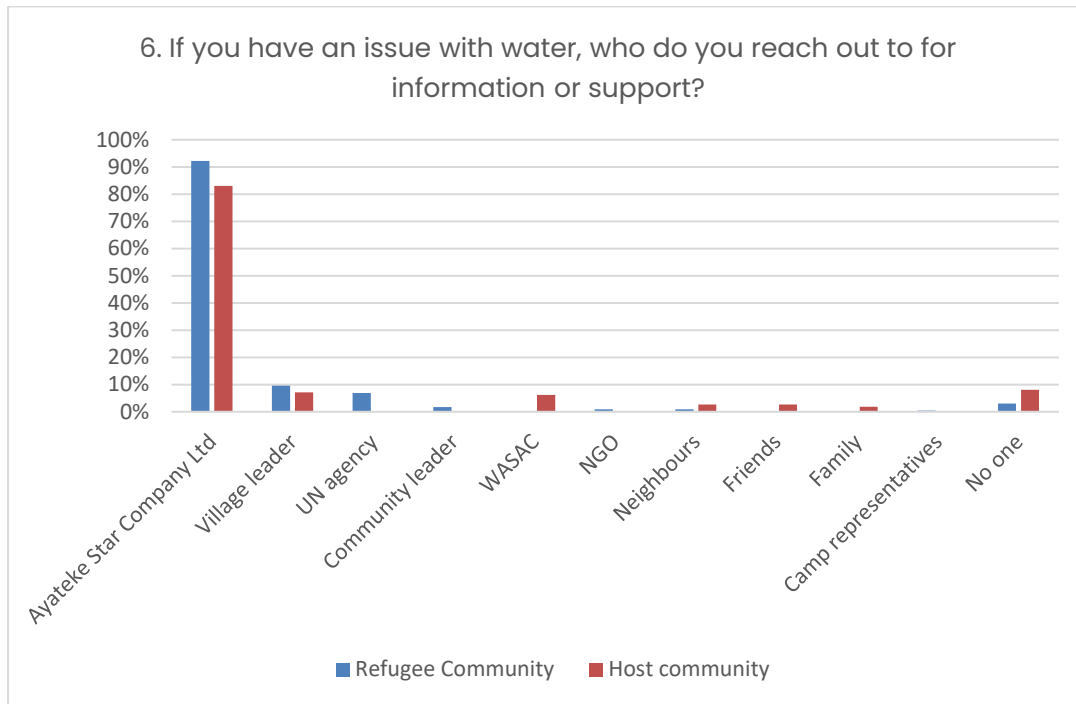


Figure 6: Water support resources, Rwanda

For water-related issues, 92% of refugee respondents reported seeking support from Ayateke Star Company Ltd, followed by 10% who consulted village leaders and 7% who turned to UN agencies. Smaller proportions reported approaching community leaders (2%), NGOs (1%), neighbors (1%), or friends (0%). No respondents indicated seeking support from WASAC, family, or camp representatives, while 3% reported having no support source. Among host community respondents, 83% sought support from Ayateke Star Company Ltd, 7% from village leaders, and 6% from WASAC. Additional sources included neighbors (3%), friends (3%), and family (2%). No respondents reported consulting UN agencies, NGOs, community leaders, or camp representatives. 8% of host respondents indicated having no support source for water-related needs.





Safety-related support networks

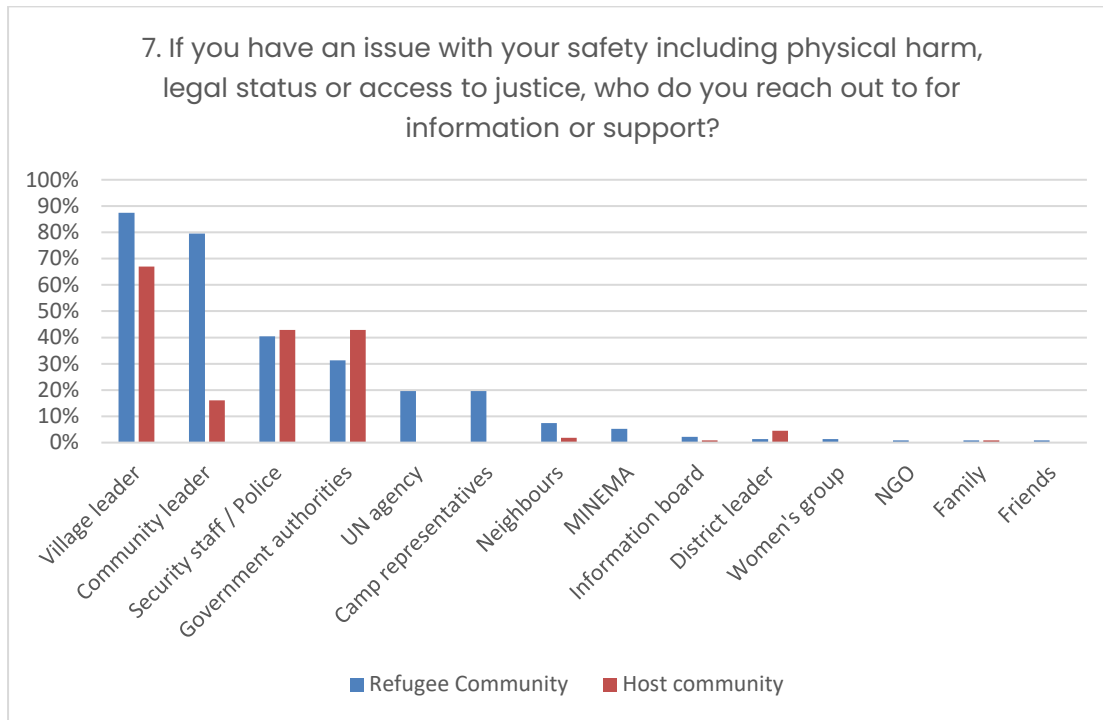


Figure 7: Safety support resources, Rwanda

For issues related to safety, physical harm, legal status or access to justice, refugee respondents most frequently reported seeking support from village leaders (87%) and community/cell leaders (80%). Additional sources mentioned were security staff/police (40%), government authorities (31%), UN agencies (20%), and camp representatives (20%). Smaller proportions turned to neighbors (7%), MINEMA (5%), information boards (2%), district leaders (1%), women’s groups (1%), NGOs (1%), family (1%), and friends (1%). Among host community respondents, village leaders (67%), security staff/police (43%), and government authorities (43%) were the most commonly cited sources of support. Further mentions included community or cell leaders (16%), neighbors (2%), district leaders (4%), information boards (1%), and family (1%). No host respondents reported turning to UN agencies, camp representatives, MINEMA, women’s groups, NGOs, or friends for safety-related support.





Advice Networks for Choosing an Energy Source for Lighting

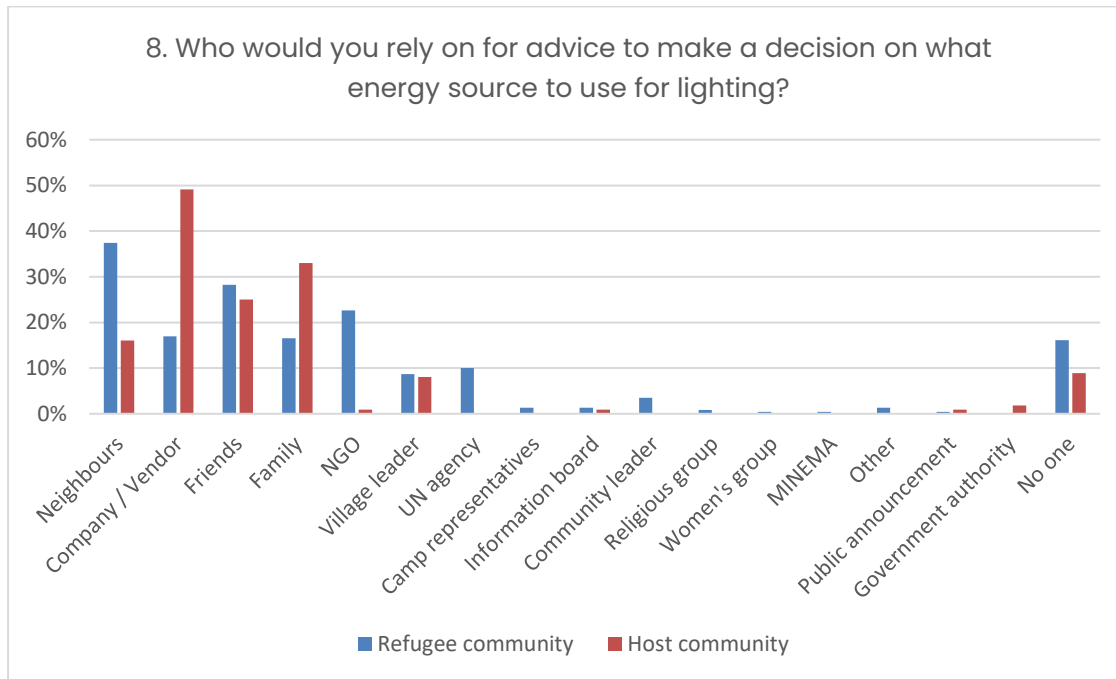


Figure 8: Advice resources for lighting, Rwanda

When asked who they would rely on for advice on selecting an energy source for lighting, refugee respondents most frequently mentioned neighbors (37%) and family (28%), followed by NGOs (23%), company/vendors (17%), and friends (17%). Additional sources included UN agencies (10%), village leaders (9%), community leaders (3%), religious groups (1%), camp representatives (1%), information boards (1%), and other sources (1%). Very small proportions reported relying on women’s groups or MINEMA (each 0%), and 16% indicated that they would not rely on anyone for advice.

Among host community respondents, the most common advice sources were company/vendors (49%), family (33%), and friends (25%), followed by neighbors (16%) and village leaders (8%). Only small proportions reported relying on NGOs (1%), information boards (1%), public announcements (1%), or government authorities (2%). No respondents mentioned UN agencies, community leaders, religious groups, women’s groups, MINEMA, camp representatives, or other sources. 9% of host community respondents indicated that they would not seek advice from anyone.





Advice Networks for Cooking Energy Decisions

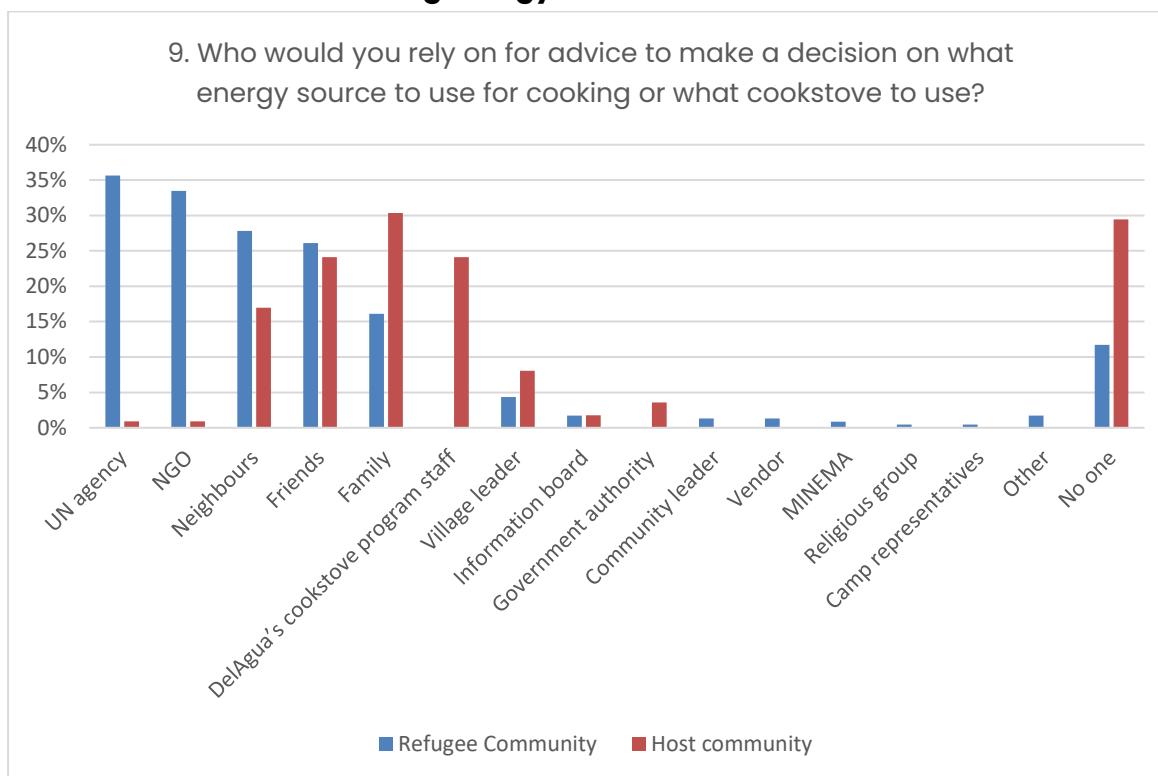


Figure 9: Advice resources for cooking, Rwanda

When asked who they would rely on for advice regarding which energy source or cookstove to use, refugee respondents most frequently mentioned UN agencies (36%), followed by NGOs (33%), neighbors (28%), friends (26%), and family members (16%). Smaller proportions indicated turning to village leaders (4%), information boards (2%), community leaders (1%), vendors (1%), MINEMA (1%), or other sources (2%). 12% of refugee respondents reported that they would take an independent decision and would not rely on advise. Among the host community, the most frequently cited advice sources were family (30%), DelAgua’s cookstove program staff (24%), and friends (24%), followed by neighbors (17%) and village leaders (8%). Smaller proportions relied on government authorities (4%) or information boards (2%). Very few mentioned UN agencies or NGOs (1% each), and none reported turning to community leaders, vendors, MINEMA, religious groups, or camp representatives. 29% of host respondents indicated that they would not rely on anyone for advice on cooking energy.





Advice Networks for Phone Charging, Internet, and Communication Energy Decisions

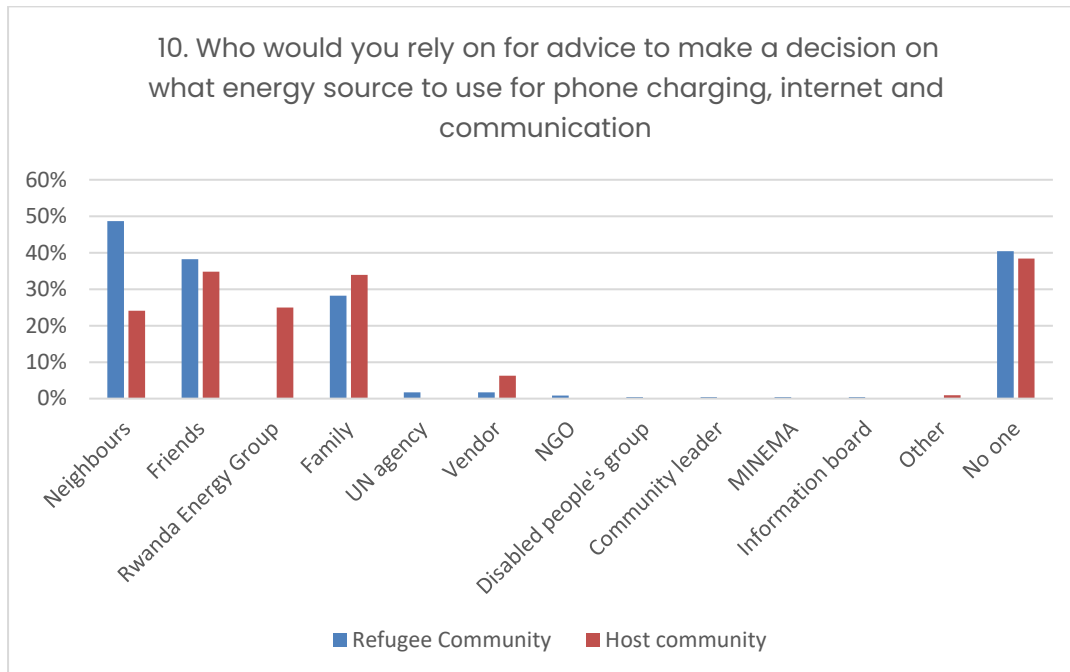


Figure 10: Advice resources for phone charging, internet and communication, Rwanda

For decisions related to energy sources for phone charging, internet, and communication, refugee respondents most frequently relied on neighbors (49%) and friends (38%). Additional sources included family (28%), UN agencies (2%), vendors (2%), and NGOs (1%). Only few respondents reported seeking advice from disabled people’s groups, community leaders, MINEMA, or information boards. 40% of refugee respondents indicated that they would rely on no one for advice.

Among host community respondents, the most common sources of advice were friends (35%) and family (34%), followed by the Rwanda Energy Group (25%) and neighbors (24%). Smaller proportions mentioned vendors (6%) or other sources (1%). None reported relying on UN agencies, NGOs, disabled people’s groups, community leaders, MINEMA, or information boards. 38% of host respondents indicated that they would not seek advice from anyone.

PAGE

3.1.3 GROUP PARTICIPATION

The findings show that the majority of respondents in Mahama camp are not involved in organized community groups. A total of 156 refugee participants (68%) reported no membership in any group. Conversely, 66 respondents (29%) indicated involvement in one group, while 6 respondents (3%) were active in two groups. Only two participants (0.9%) reported participation in three or more groups. Overall, these results highlight relatively low levels of formal group participation within the community.

In the host community there is a slightly different picture. Here, the number of people involved in groups (n=58) exceeds slightly the number of people not involved in any group



(n=54). Making it 48% (n=54) of respondents of the host community that are not involved in any group, 45% (n=50) that are part of one group and 7% (n=8) that are involved in two groups. None of the participants stated to be involved in three or more groups.

Frequency counts

When looking at the frequency count of type of groups, savings and lending groups are in both communities the ones with the highest number. In the refugee community 40% of people who are involved in one or more groups are part of a savings and lending group. In the host community it is 72% of group members who are part of such a group.

Type of group	Nr. and share of group mentions in refugee community	Nr. and share of group mentions in host community
Community clean-up group	0 (0%)	1 (2%)
Community or neighborhood group	8 (11%)	4 (7%)
Cooperation	7 (9%)	4 (7%)
Crafts group	0 (0%)	1 (2%)
Elderly group	0 (0%)	1 (2%)
Farmers' group	4 (5%)	2 (3%)
Group for disabled people	4 (5%)	1 (2%)
NGO	2 (3%)	1 (2%)
Rearing group	4 (5%)	0 (0%)
Religious group	4 (5%)	2 (3%)
Savings & lendings group	32 (43%)	42 (72%)
Sellers' group	2 (3%)	0 (0%)
Sports group	6 (8%)	0 (0%)
Women's group	10 (14%)	5 (9%)
Youth group	1 (1%)	2 (3%)

Table 4: Type of groups and number of respondents participating in them, Rwanda

Other livelihood-oriented groups, such as cooperatives, farmers' groups, sellers' groups, rearing groups were more present in the refugee than in the host community, but memberships tend to be low.

Among the people participating in a group in the refugee community, there is higher participation groups like women's groups (14%), community or neighborhood groups (10%), and sports groups (8%). Several livelihood-oriented groups were also present, including farmers' groups (5%), rearing groups (5%), next to religious groups (5%), as well as



as groups for peer support like groups for disabled people (5%). Smaller numbers participated in NGO-linked groups (3%) and sellers' groups (3%), while youth groups had only one member, and no refugee respondents reported belonging to community clean-up, crafts, or elderly groups.

In the host community, people who are involved in groups are predominantly in savings and lending groups, with 42 (72%) members representing the single largest group across both populations. Other frequently mentioned groups included women's groups (9%), community or neighborhood groups (7%), cooperatives (7%), farmers' groups (3%), religious groups (3%), and youth groups (3%). A small number of host respondents reported participation in community clean-up, crafts, and elderly groups (each 1 member), while only one host respondent mentioned belonging to an NGO-linked group. No host respondents reported membership in rearing, sellers', sports, or disabled-people's groups.

Importance rating

The data further reveal that community group membership holds significant importance for the participants. When asked to rate the importance of the groups they belong to on a scale from 1 (not important) to 5 (very important), refugee respondents reported an average score of 4.1 and host community 4.4.

PAGE

3.2 RESULTS FROM UGANDA

In total, 381 surveys were conducted, of which 256 were done in the villages of Bidi Bidi refugee settlement and 125 in the host community villages.

In the following a new set of actors will be introduced, namely the local councils (LC) and Refugee Welfare Councils. Local governance and community representation in Uganda operate through both the formal Local Council (LC) system and, in refugee-hosting areas, parallel Refugee Welfare Committee structures. LC1 represents the village level, providing the most immediate form of community leadership; in refugee settlements this level is commonly referred to as RW1. LC2 corresponds to the parish level and aligns with RW2, which coordinates several villages or blocks within a settlement. LC3 functions at the sub-county or town council level, and in refugee contexts this role is mirrored by RW3, representing refugees at the settlement level and serving as the main interface with government authorities and humanitarian actors. While LC structures are part of Uganda's formal administrative system, RW structures are refugee representative bodies recognized by the Office of the Prime Minister and humanitarian agencies and are often aligned with LC levels to facilitate coordination.

In the results section, the category "casual labor" refers to short-term, informal work





arrangements used as a coping strategy and source of income. In this context, it typically describes situations where members of the refugee community travel to the host community to provide temporary labor—such as helping with farming or other household and livelihood activities—in exchange for small payments.

3.2.1 INFORMATION ON SUPPORT NETWORKS

Health-related support networks

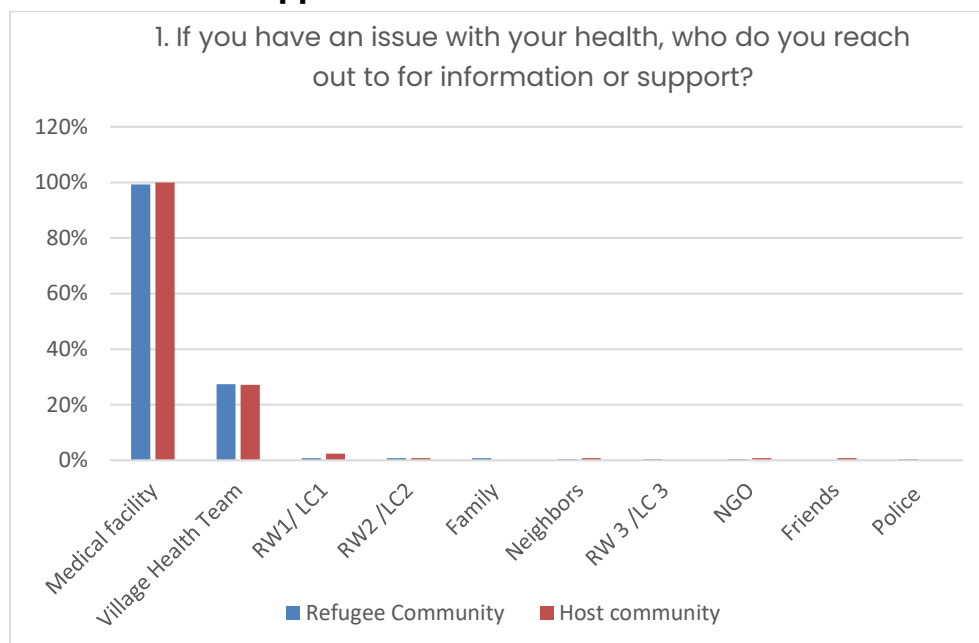


Figure 11: Health support resources, Uganda

For health-related issues, respondents from both refugee and host communities reported an almost universal reliance on medical facilities, with 99% of refugees and 100% of host community members indicating this source of support. In addition, Village Health Teams were frequently mentioned by both groups (27% among refugees and 27% among hosts). Very small proportions of respondents reported seeking health support from family (1% refugees; 0% hosts), neighbors (0% refugees; 1% hosts), or local leadership structures such as RW1/LC1 (1% refugees; 2% hosts) and RW/LC2 (1% refugees; 1% hosts). Only 1% or less from either community reported relying on RW3/LC3, friends, NGOs, or police for health-related support.





Education-related support networks

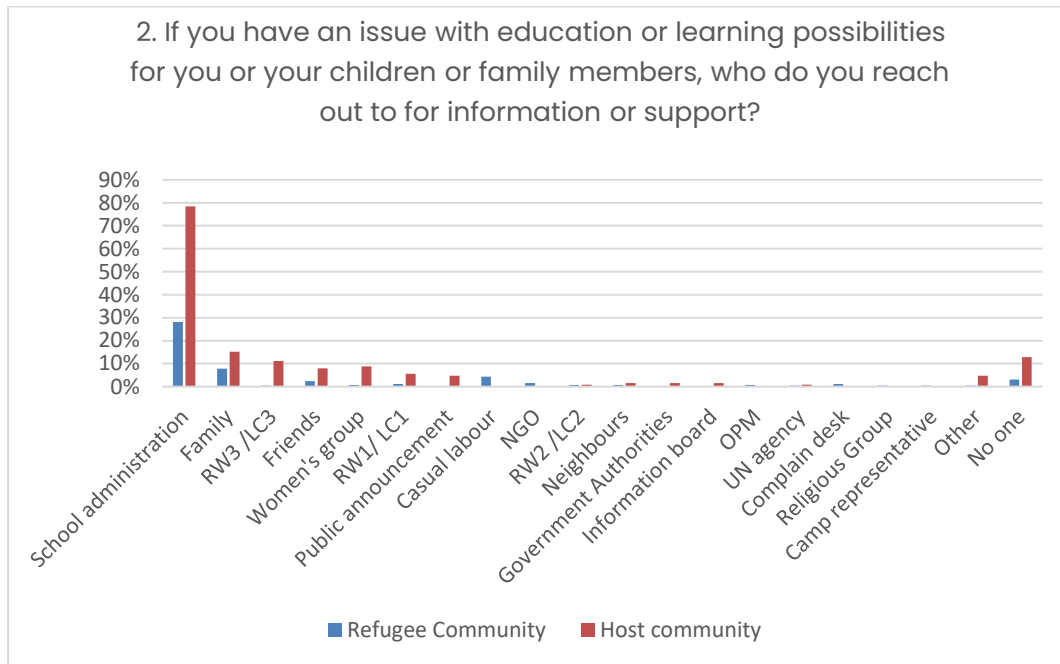


Figure 12: Education support resources, Uganda

For education-related issues, respondents from the refugee and host communities reported different patterns of support. Among refugees, the most frequently mentioned source was school administration (28%), followed by family members (8%). Smaller proportions reported seeking support from friends (2%), NGOs (2%), complaint desks (1%), RW1 (1%), RW2 (1%), neighbors (1%), women’s groups (1%), and OPM (1%). No refugee respondents reported relying on RW3, public announcements, government authorities, or information boards. Three percent of refugee respondents indicated that they had no source of support for education-related issues.

In the host community, school administration was by far the most frequently reported source of support (78%). Additional sources included family (15%), LC3 (11%), friends (8%), women’s groups (9%), LC1 (6%), public announcements (5%), neighbors (2%), government authorities (2%), and information boards (2%). Smaller proportions mentioned UN agencies (1%) and LC2 (1%). Thirteen percent of host community respondents reported having no support source for education.





Lighting, cooking, and other electricity services-related support networks

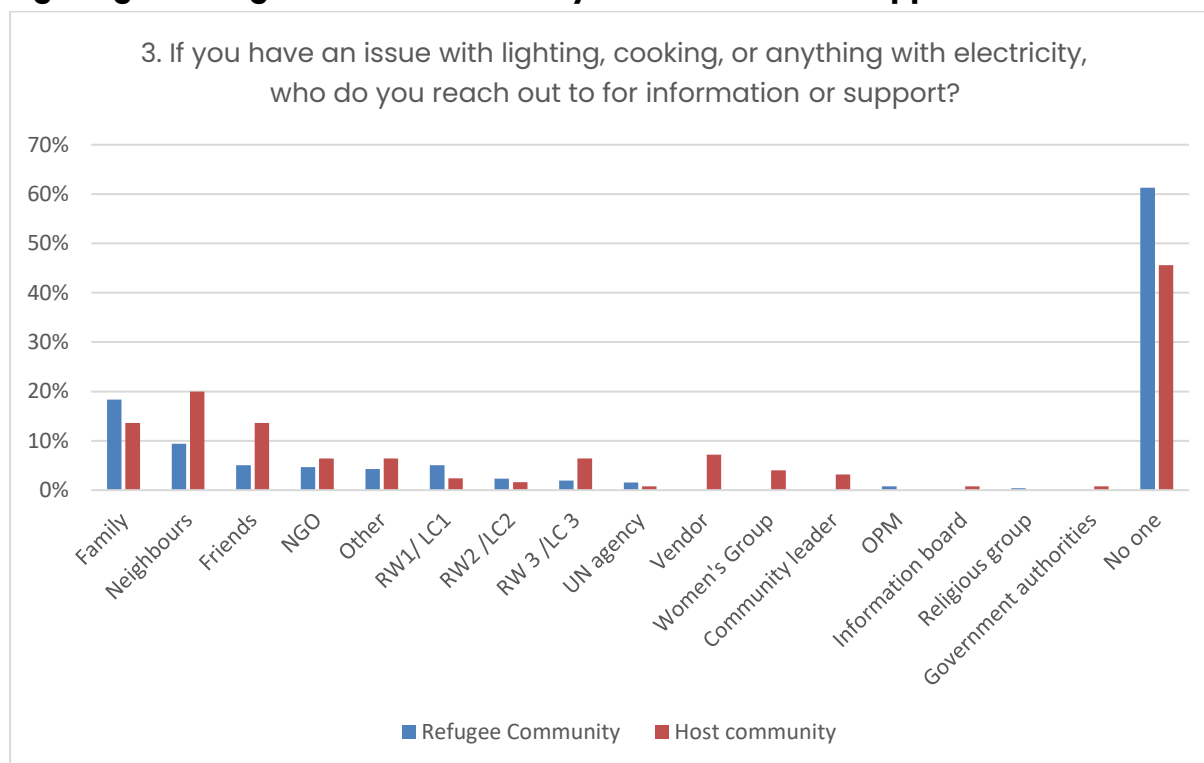


Figure 13: Electricity support resources, Uganda

When asked who people reach out to for information or support regarding lighting, cooking, or electricity, a majority of respondents reported having no support source, particularly within the refugee community. Sixty-one percent of refugee respondents indicated that they would not reach out to anyone. Among those who did report a source of support, the most frequently mentioned were family members (18%), neighbors (9%), and friends (5%). Formal or semi-formal actors were mentioned less frequently, including NGOs (5%), RW1 (5%), RW2 (2%), RW3 (2%), UN agencies (2%), and community leaders (1%). No refugee respondents reported reaching out to vendors, women’s groups, religious groups, or information boards for electricity-related issues.

In the host community, 46% of respondents reported having no support source for lighting, cooking, or electricity issues. Among those who did seek support, the most commonly mentioned actors were neighbors (20%), family (14%), and friends (14%). Additional sources included vendors (7%), NGOs (6%), other sources (6%), and LC3 leaders (6%), followed by women’s groups (4%), community leaders (3%), LC1 (2%), LC2 (2%), UN agencies (1%), information boards (1%), and other government authorities (1%).





Shelter-related support networks

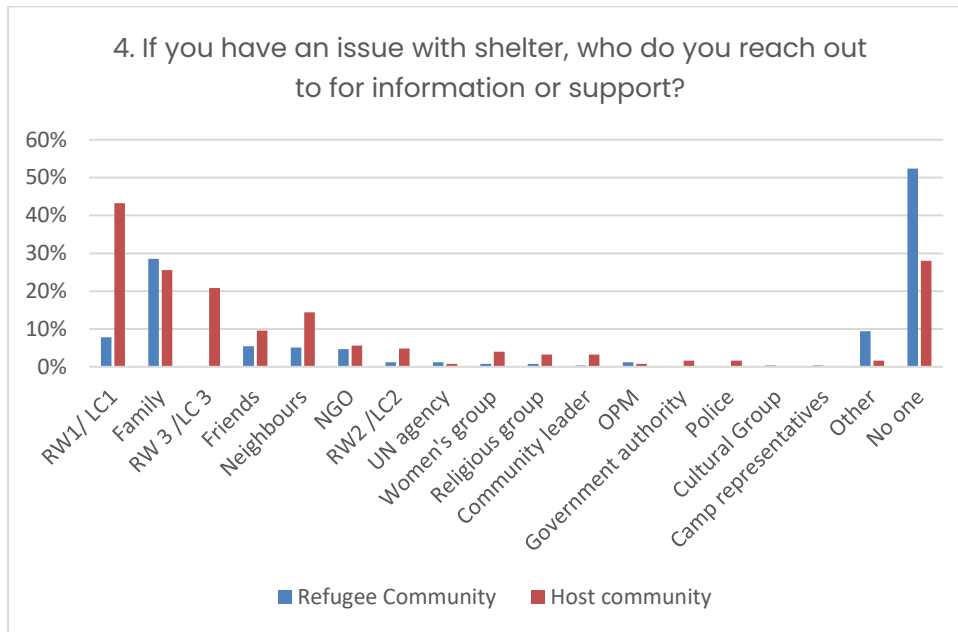


Figure 14: Shelter support resources, Uganda

When asked who they reach out to for information or support regarding shelter, 52% of refugee respondents reported that they would not reach out to anyone. Among those who indicated a source of support, the most frequently mentioned were family (29%), followed by friends (5%), neighbors (5%), and NGOs (5%). Smaller proportions reported reaching out to RW1 (8%), RW2 (1%), UN agencies (1%), women’s groups (1%), religious groups (1%), and community leaders (1%). An additional 9% of refugee respondents selected other sources. No refugee respondents reported reaching out to RW3, other government authorities, police, cultural groups, or camp representatives for shelter-related support. In the host community, 28% of respondents reported that they would not reach out to anyone for shelter-related issues. Among those who did report sources of support, the most frequently mentioned were LC1 (43%) and family (26%), followed by LC3 (21%), neighbors (14%), and friends (10%). Additional sources included NGOs (6%), LC2 (5%), village leaders (4%), women’s groups (4%), religious groups (3%), community leaders (3%), government authorities (2%), police (2%), OPM (1%), UN agencies (1%), and other sources (2%).

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Food-related support networks



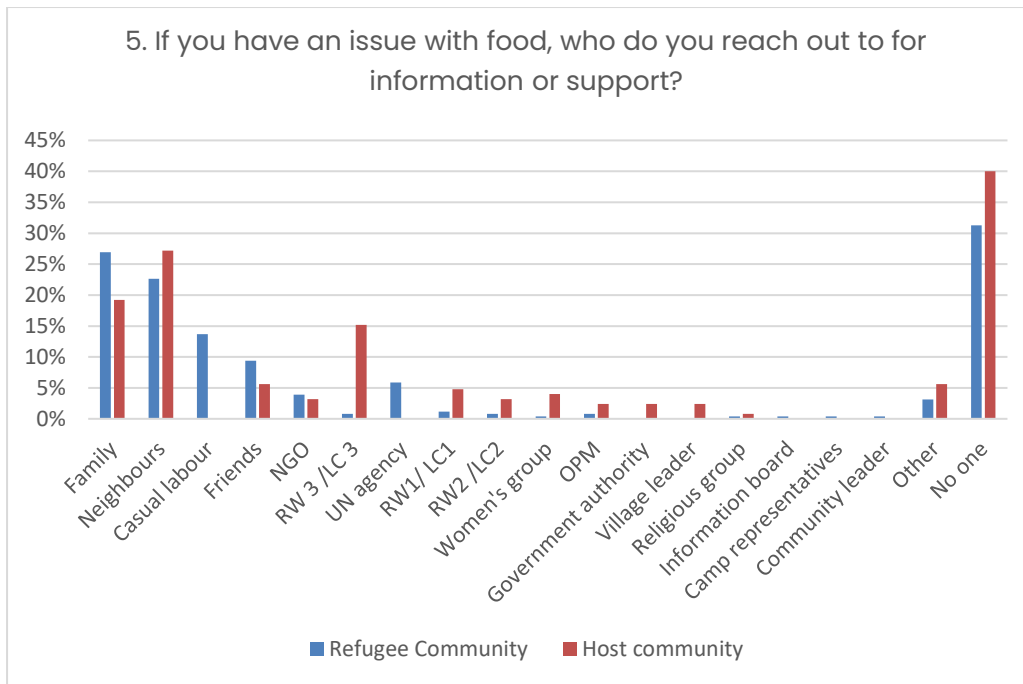


Figure 15: Food support resources, Uganda

When asked who they reach out to for information or support regarding food, 31% of refugee respondents reported that they would not reach out to anyone. Among those who indicated a source of support, the most frequently mentioned were family (27%) and neighbors (23%), followed by casual labor (14%) and friends (9%). Additional sources included UN agencies (6%), NGOs (4%), and other sources (3%). Very small proportions reported reaching out to RW3 (1%), RW1 (1%), RW2 (1%), or OPM (1%), while no refugee respondents indicated other government authorities, or village leaders.

In the host community, 40% of respondents reported that they would not reach out to anyone for food-related support. Among those who did report sources of support, the most commonly mentioned were neighbors (27%) and family (19%), followed by LC3 (15%), friends (6%), and other sources (6%). Additional mentions included LC1 (5%), LC2 (3%), NGOs (3%), women’s groups (4%), OPM (2%), government authorities (2%), village leaders (2%), and religious groups (1%). No host respondents reported using UN agencies, information boards, camp representatives, or community leaders for food-related issues.





Water-related support networks

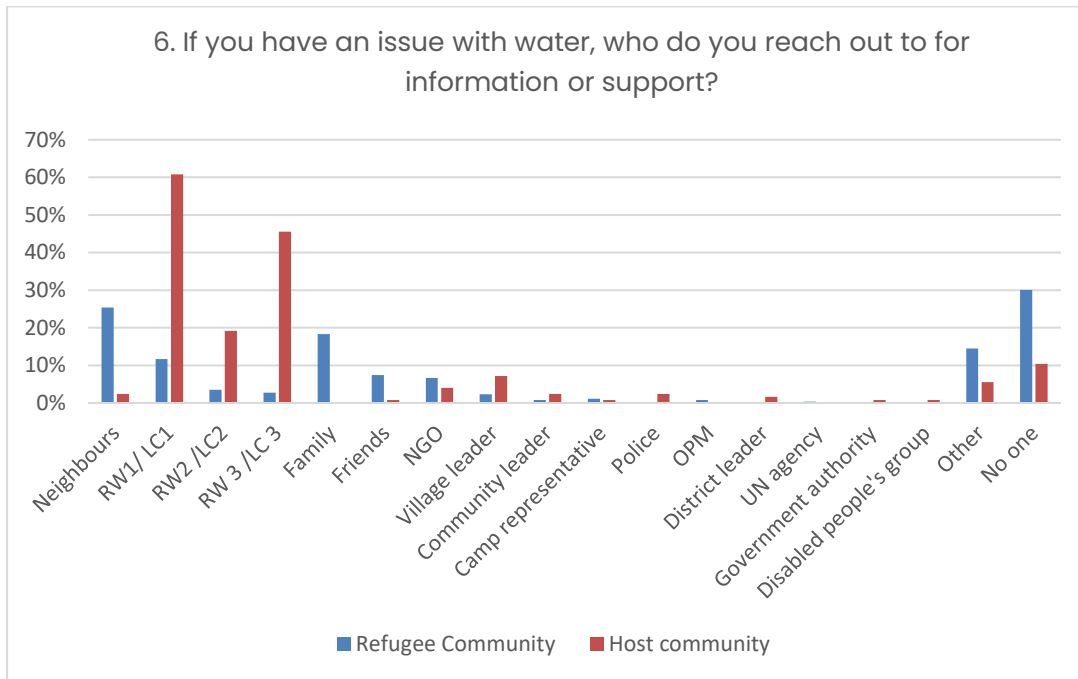


Figure 16: Water support resources, Uganda

When asked who they reach out to for information or support regarding water, 30% of refugee respondents reported that they would not reach out to anyone. Among those who indicated a support source, the most frequently mentioned were neighbors (25%) and family (18%), followed by RW1 (12%), friends (7%), and NGOs (7%). Smaller proportions reported reaching out to RW2 (4%), RW3 (3%), village leaders (2%), community leaders (1%), camp representatives (1%), and OPM (1%). An additional 14% selected other sources. No refugee respondents reported seeking water-related support from police, district leaders, government authorities, or disabled people’s groups.

In the host community, 10% of respondents reported that they would not reach out to anyone for water-related issues. The most frequently mentioned sources of support were LC1 (61%) and LC3 (46%), followed by LC2 (19%). Other sources included village leaders (7%), NGOs (4%), other sources (6%), community leaders (2%), district leaders (2%), police (2%), neighbors (2%), camp representatives (1%), friends (1%), government authorities (1%), and disabled people’s groups (1%). No host respondents reported reaching out to family, UN agencies, or OPM.





Safety-related support networks

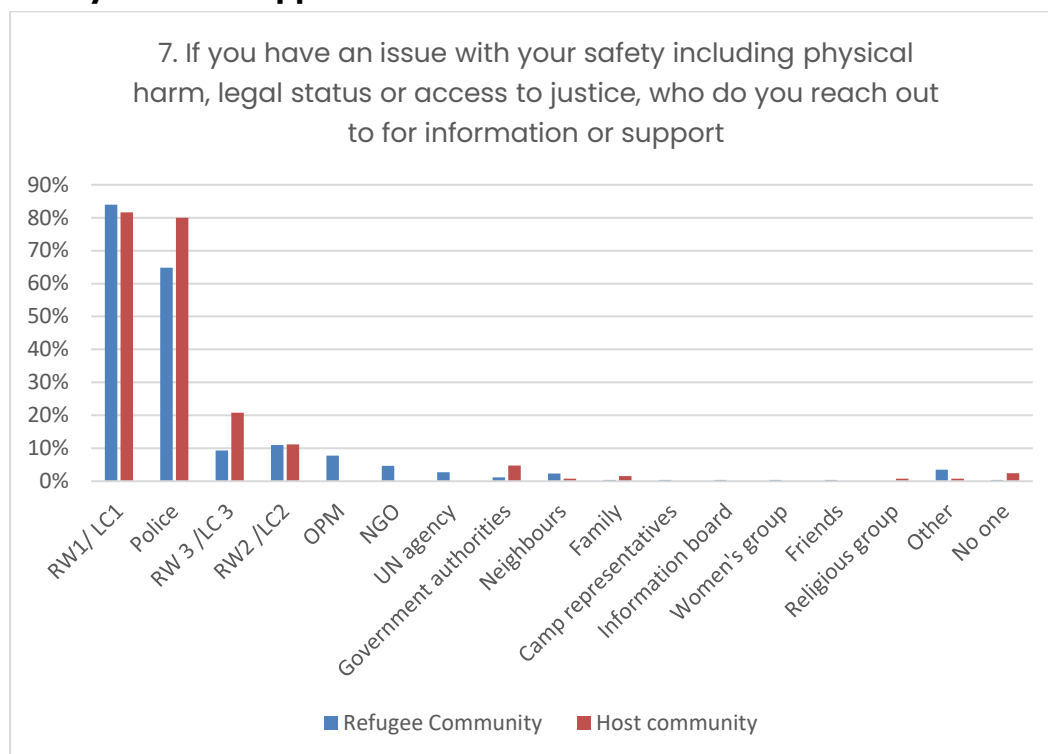


Figure 17: Safety support resources, Uganda

When asked who they reach out to for information or support regarding safety—including physical harm, legal status, or access to justice—refugee respondents most frequently reported RW1 (84 %) and the police (65%). Additional sources included RW2 (11%), RW3 (9%), and OPM (8%). Smaller proportions reported contacting NGOs (5%), other sources (4%), UN agencies (3%), neighbors (2%), and government authorities (1 %). Very small proportions (each 0.4%) mentioned family, camp representatives, information boards, women’s groups, friends, and no one, while religious groups were not reported (0%). Among host community respondents, the most frequently mentioned sources were LC1 (82%) and the police (80 %). Further sources included LC3 (21%) and LC2 (11 %), followed by government authorities (5%). Smaller proportions reported seeking support from family (2%), neighbors (1%), religious groups (1%), other sources (1%), and no one (2 %). No host respondents reported reaching out to OPM, NGOs, UN agencies, camp representatives, information boards, women’s groups, or friends (all 0%).





Advice Networks for Choosing an Energy Source for Lighting

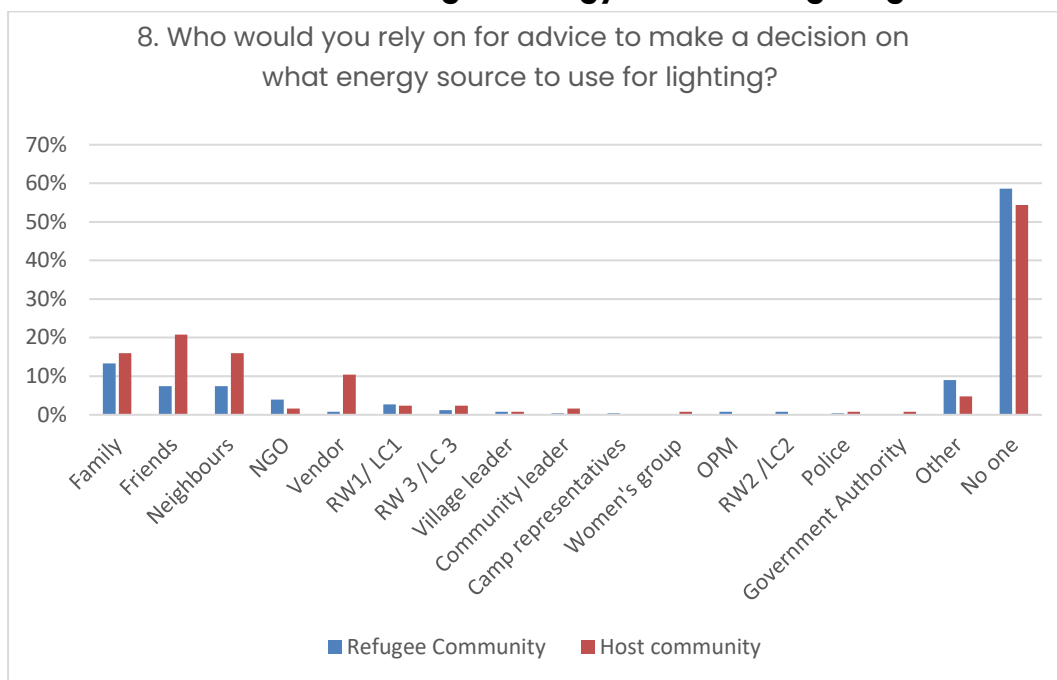


Figure 18: Advice resources for lighting, Uganda

When asked who they would rely on for advice to decide which energy source to use for lighting, 59% of refugee respondents indicated that they would rely on no one. Among those who reported a source of advice, the most frequently mentioned were family (13%), friends (7%), and neighbors (7%). Smaller proportions reported relying on other sources (9%), NGOs (4%), RW1/LC1 (3%), and vendors (1%). Very small shares mentioned RW3/LC3 (1%), village leaders (1%), OPM (1%), and RW2/LC2 (1%). Only one refugee respondent reported relying on community leaders, camp representatives, or the police. None of the refugee respondents stated to seek advice from other government authorities or women’s groups.

Among host community respondents, 54% reported that they would rely on no one for advice on lighting energy sources. For those who did seek advice, the most frequently cited sources were friends (21%), family (16%), and neighbors (16%), followed by vendors (10%) and other sources (5%). Smaller proportions reported relying on NGOs (2%), LC1 (2%), LC3 (2%), and community leaders (2%). Additional mentions included village leaders (1%), women’s groups (1%), police (1%), and government authorities (1%), while no host respondents reported relying on OPM, LC2, or camp representatives (all 0%).





Advice Networks for Cooking Energy Decisions

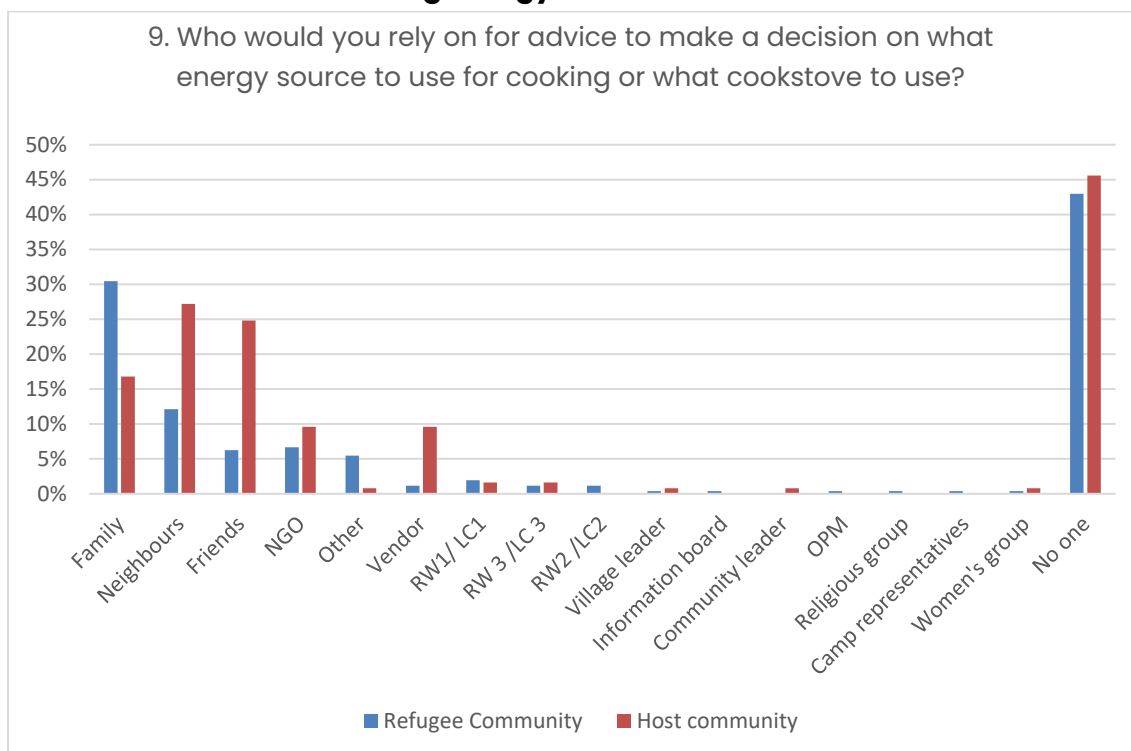


Figure 19: Advice resources for cooking

When asked who they would rely on for advice to decide which energy source to use for cooking or which cookstove to use, 43% of refugee respondents reported that they would rely on no one. Among those who indicated a source of advice, the most frequently mentioned were family (30%), followed by neighbors (12%), NGOs (7%), and friends (6%). Additional sources included other (5%), vendors (1%), RW1 (2%), RW3 (1%), and RW2 (1%). Only one person answered to rely on village leaders, information boards, OPM, religious groups, camp representatives, or women’s groups.

Among host community respondents, 46% indicated that they would rely on no one for advice on cooking energy or cookstove decisions. For those who did seek advice, the most commonly cited sources were neighbors (27%), friends (25%), and family (17%), followed by NGOs (10%) and vendors (10%). Smaller proportions reported relying on LC1 (2%), LC3 (2%), village leaders (1%), community leaders (1%), and women’s groups (1%), while other sources were reported by 1%. No host respondents reported relying on LC2, information boards, OPM, religious groups, or camp representatives (all 0%).





Advice Networks for Phone Charging, Internet, and Communication Energy Decisions

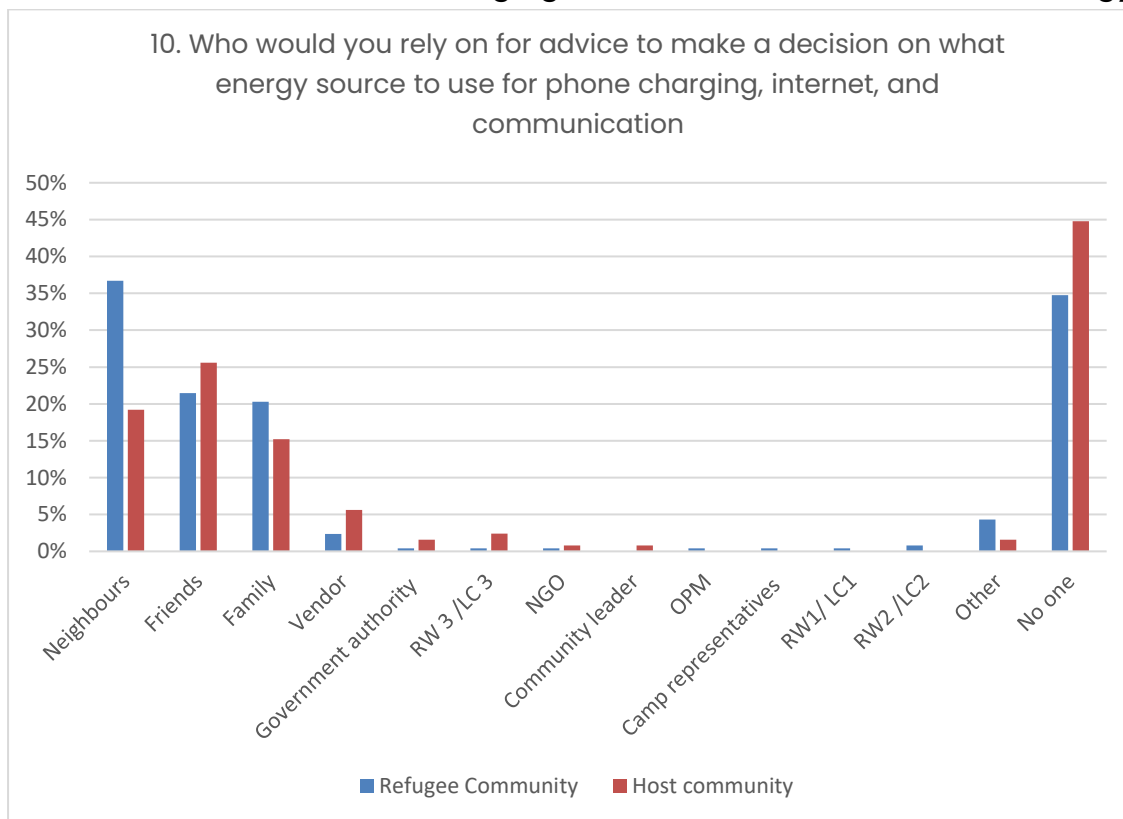


Figure 20: Advice resources for phone charging, internet, and communication

When asked who they would rely on for advice to decide which energy source to use for phone charging, internet, and communication, 35% of refugee respondents indicated that they would rely on no one. Among those who reported advice sources, the most frequently mentioned were neighbors (37%), friends (21%), and family (20%). Smaller proportions reported relying on vendors (2%), RW2 (1%), and other sources (4%). Less than 1% answered to rely on RW3, RW1, other government authorities, or community leaders, NGOs or OPM. Among host community respondents, 45% reported that they would rely on no one for advice on phone charging, internet, and communication energy decisions. For those who did seek advice, the most commonly cited sources were friends (26%), neighbors (19%), and family (15%), followed by vendors (6%). Smaller proportions reported relying on government (2%), LC3 (2%), NGOs (1%), community leaders (1%), and other sources (2%). No host respondents reported relying on OPM, camp representatives, LC1, or LC2.

3.2.3 GROUP PARTICIPATION

The findings show that group participation is low among refugee respondents. A total of 220 refugee participants reported no membership in any group, while 33 indicated involvement in one group and 3 reported participation in two groups, which makes 39 group memberships across the sample. No refugee respondents reported being involved





in three or more groups.

In the host community, group involvement was more common. 58 host respondents reported no group membership, while 56 reported involvement in one group and 11 reported involvement in two groups, which results in 78 group memberships in the host sample. No host respondents reported being involved in three or more groups.

Frequency counts

Across all groups mentioned, savings and lending groups were the most frequently reported type in both communities, accounting for 23 mentions (59%) among refugees and 35 mentions (45%) among hosts. In the refugee community, the next most frequently mentioned group types were women’s groups (15%) and farmers’ groups (13%), followed by NGO-linked groups (5%) and smaller mentions of an elderly group (3%), a reading group (3%), and a refugee-led organization (3%). No refugee respondents mentioned community/neighborhood groups, cooperatives, disabled people’s groups, or sellers’ groups (all 0%).

In the host community, farmers’ groups were the second most frequently mentioned type after savings and lending groups (21; 27%), followed by women’s groups (17; 22%). Smaller proportions were reported for community/neighborhood groups (3%) and a range of other group types including cooperatives, disabled people’s groups, and sellers’ groups (each 1%). No host respondents mentioned NGO-linked groups, reading groups, or refugee-led organizations.

PAGE

Type of group	Nr. and share of group mentions in refugee community	Nr. and share of group mentions in host community
Community or neighborhood group	0 (0%)	2 (3%)
Cooperation	0 (0%)	1 (1%)
Elderly group	1 (3%)	0 (0%)
Farmers’ group	5 (13%)	21 (27%)
Group for disabled people	0 (0%)	1 (1%)
NGO	2 (5%)	0 (0%)
Reading group	1 (3%)	0 (0%)
Refugee-led organization	1 (3%)	0 (0%)
Savings & lendings group	23 (59%)	35 (45%)
Sellers’ group	0 (0%)	1 (1%)
Women’s group	6 (15%)	17 (22%)



Importance rating

The data further reveal that community group membership holds significant importance for the participants. When asked to rate the importance of the groups they belong to on a scale from 1 (not important) to 5 (very important), refugee respondents reported an average score of 4.7 and host community 4.4.

DISCUSSION

The community mapping survey in Mahama (Rwanda) and Bidi Bidi (Uganda) provides a grounded picture of who people actually turn to for information and support in everyday domains (health, education, shelter, food, water, safety, and energy), and who they rely on for energy-related decisions. In participatory energy projects, this type of “support-network mapping” is highly relevant because it identifies (i) trusted and influential intermediaries (information gatekeepers and brokers), (ii) institutional entry points (service providers and authorities), and (iii) gaps and underrepresented constituencies that require proactive outreach. This aligns with the broader “ecosystems approach” in clean-energy interventions in displacement settings, which emphasizes that outcomes depend on coordinated roles across community actors, public institutions, humanitarian agencies, and market actors, and on building trust and reliable support beyond one-off project cycles (Matthey-Junod, 2024).

Across both sites, the findings suggest that participatory processes in SUNNY should be designed as a multi-actor system that combines (a) those actors already central in support networks (because they shape everyday decision-making), and (b) those actors emphasized in the literature as essential for inclusion, accountability, and sustainability, even if they are not yet widely named as advice sources (e.g., disability organizations, youth groups, religious groups, refugee-led groups, and financing actors). In practice, this means SUNNY’s participatory processes should not be limited to “formal” leadership and project partners, but deliberately integrate informal social networks, livelihood groups, and marginalized constituencies.

The Rwanda survey results on support and advice networks provide a detailed picture of which actors people actually turn to in their everyday lives and when making energy-related decisions. Across sectors such as health, education, food, water, shelter, safety and energy, respondents from the refugee community most often reported seeking support from formal humanitarian and camp-based structures, such as community health workers, medical facilities, NGOs, UN agencies, camp representatives and community shelters, whereas host community respondents relied more strongly on local governance structures, private providers and personal networks, including village leaders, government authorities, companies, vendors, family and friends. In the energy domain specifically, refugees reported approaching UN agencies, NGOs, neighbors, friends and family for help with lighting, cooking and electricity, while hosts more frequently turned to companies and vendors, neighbors, family and friends. For advice on cooking-energy choices, refugees mainly cited UN agencies and NGOs, while host respondents mentioned family, DelAgua’s cookstove staff, friends and neighbors. For decisions on phone charging, internet and communication, refugees relied primarily on neighbors and friends, whereas hosts again emphasized family, friends and, to a notable degree, the Rwanda Energy



Group. A sizeable minority in both groups stated that they would not rely on anyone for energy-related advice.

It seems that refugee respondents tend to rely more strongly on humanitarian and camp-based structures for education, food, shelter and parts of the energy system, whereas host community members more often seek support from family, friends, vendors and local authorities. These results clearly show that both communities have different access to support networks. In the host community, for example, the cookstove program by the DelAgua company only reached host community members. On the contrary, refugees have access to support services derived from international humanitarian agencies like the World Food Programme, UNHCR or camp infrastructure like community shelters that are inaccessible for host community members. At the same time, both groups share some key reference points, such as Ayateke Star Company Ltd for water, village leaders and government authorities for questions of safety and justice, and neighbors, friends and family for decisions on household energy use.

Overall results mainly resonate with, but also partly diverge from, what the literature describes as key actor groups for participatory processes in humanitarian energy and clean-cooking interventions. Recent guidance on sustainable humanitarian energy emphasizes that participatory energy planning should, at minimum, involve displaced populations, host communities, community-based organizations, humanitarian agencies, government authorities, private-sector energy companies, financial actors and research or training institutions (Bisaga, 2025; Robinson et al., 2022). The GPA's definition of "meaningful participation" similarly stresses that refugees and host community members, regardless of gender, identity or legal status, should actively shape decisions about energy solutions alongside humanitarian, governmental and private actors (GPA, 2024). From this perspective, the Rwanda data already confirm the centrality of several actor categories identified in the literature, while highlighting other groups that are currently marginal or absent and therefore require deliberate inclusion in SUNNY's co-creation activities.

Even though groups like women groups, youth groups, disability groups or other refugee-led organizations were not mentioned as central points for support and advice, they would be important to include in participatory activities in the SUNNY project because they represent specific constituencies, provide targeted peer support, and can strengthen procedural justice and recognition in participatory processes. The results can be seen as a signal for proactive outreach and capacity building rather than non-relevance.

The READS Kenya report, for example, recommends single-gender focus groups, targeted employment and training for women, and dedicated inclusion strategies for people with disabilities and other vulnerable groups as core elements of participatory project design (Sandwell et al., 2023). Similarly, SUNNY's own proposal commits to include end-users with



different socio-economic and cultural backgrounds and aspects of marginalization. Therefore, groups for youth, women and disabled people are considered important spaces and their members important actors to include.

In Mahama, village and community leaders should be central in SUNNY's engagement strategy, as they often mediate disputes, manage public infrastructure and influence perceptions of fairness and legitimacy in energy interventions but their participation needs to be balanced with more direct representation of diverse community members, including those who may not usually speak in public or be recognized by formal leadership.

Private-sector energy companies, mini-grid operators, clean-cooking enterprises, phone-charging businesses and micro-finance institutions are critical for delivering and maintaining energy services in displacement settings (Patel and Gross, 2019). For SUNNY, this means that actors such as local solar and phone-charging entrepreneurs, and micro-finance institutions should be treated not only as implementation partners but as co-creators in the participatory process. The responses show that many of these actors have community mobilizers which could be persons for involvement.

Informal social networks, particularly neighbors, family and friends, emerge as key advice sources for energy decisions, especially for lighting, cooking and communication, and as important support actors for shelter, food and education among host community members. Co-design and energy-justice scholarship highlights that such everyday relational networks shape how people learn about new technologies, assess risks, and decide whether to adopt or maintain them (Robinson et al., 2022; Lembi et al., 2025). The survey suggests that different livelihood groups (savings and lending groups, women's group, cooperations, rearing, farming and sellers groups) and peer support groups (e.g. disabled people's groups) should be involved in participatory processes in order to reach a diverse set of people. Participants selected via these networks can help the project move beyond "invited spaces" dominated by formal leaders or agencies and instead anchor co-creation in the everyday social fabric of the camp and surrounding villages.

At the same time, group participation results (Mahama) indicate relatively low formal group membership, particularly in the refugee community, which creates a practical constraint for recruitment: if SUNNY relies only on organized groups to recruit participants, a large share of the population will systematically be missed. This reinforces the need to include people who are not part of any group through complementary recruitment channels (random household recruitment, snowball sampling that starts outside leadership structures, or targeted outreach). At the same time, the mapping and workshop components highlight that livelihood and peer-support groups—such as savings groups and groups linked to livelihoods—are important pathways to reach diverse participants and to engage on financing and uptake issues, which the wider evidence base also emphasizes (e.g., the role of informal savings groups in enabling

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acquisition of energy-related assets).

Overall, bringing the survey results into dialogue with the literature suggests a set of concrete recommendations for SUNNY’s participatory strategy in Mahama. The actors that respondents most frequently rely on—humanitarian agencies and NGOs, village and community leaders, camp representatives, local government, key private providers, and informal neighborhood networks—should be treated as potential participants in co-creation activities, because they already structure everyday decision-making and information flows. The results further suggest that community health workers and school-based actors, such as teachers and school administration staff, represent highly valuable, yet often underutilized, participants for SUNNY’s Multi-Actor Learning Labs or training. Across both Rwanda and Uganda, health-related support networks were overwhelmingly dominated by formal healthcare providers, with community health workers and medical facilities being the primary sources of information and support for both refugee and host communities. This indicates that health actors are deeply embedded in everyday trust relationships and communication pathways. As such, community health workers are well positioned to act as intermediaries for information dissemination, community engagement, and feedback loops, particularly in relation to energy solutions that intersect with health outcomes, such as clean cooking, indoor air quality, lighting for health facilities, and safety at night. Their routine interaction with households also makes them effective conduits for reaching women, elderly persons, and people with disabilities—groups that are often underrepresented in formal participatory processes. Similarly, teachers and school administration staff emerge as important actors. Schools function as stable, long-term institutions within both refugee and host settings and serve as key nodes of information exchange that connect households, youth, parents, and local authorities. Involving teachers and school administrators in participatory processes can therefore strengthen the integration of energy solutions into everyday community life. Moreover, their participation can help ensure that energy interventions account for educational needs, intergenerational perspectives, and the long-term development aspirations of both refugee and host communities in both settings.

PAGE

In Bidi Bidi, across sectors such as health, education, food, water, shelter, safety and energy, responses show as well a strong role of formal service providers (especially health facilities and school administration) and local governance structures (RW/LC levels), alongside informal social networks (family, neighbors, friends). For health, reliance is almost universal on medical facilities (99% in the refugee community; 100% in the host community), with Village Health Teams also frequently mentioned (27% in both communities). For education, school administration is the most prominent actor, especially in the host community (78%), while refugee respondents mention school administration less frequently (28%) and rely on a mix of family (8%) and smaller shares across local structures and complaint mechanisms.





For shelter, food, water, and safety, the Uganda results highlight particularly strong reliance on RW/LC structures, especially in the host community. For shelter-related support, host respondents most frequently reach out to RW1/LC1 (39%) and RW3/LC3 (21%), alongside family (26%), neighbors (14%) and friends (10%), while refugee respondents report a much higher share of “no one” (52%), with family (29%) and small shares for NGOs/friends/neighbors (each 5%). For water, host community responses are dominated by RW1/LC1 (61%), RW3/LC3 (46%), and RW2/LC2 (19%), whereas refugee respondents report more reliance on neighbors (25%) and family (18%), and again a substantial share of “no one” (30%). For safety, both communities rely heavily on RW1/LC1 and the police: refugee respondents report RW1/LC1 at 84 % and police at 65%, while host respondents report RW1/LC1 at 82 % and police at 80%, with additional roles for RW2/RW3 and smaller mentions of government authorities. These patterns indicate that the LC/RW governance system constitutes a key everyday interface for support and information across several domains—particularly for the host community.

In the energy domain, the Uganda findings are characterized by high shares of respondents reporting no support source and no advice source, especially for electricity-related issues and energy decision-making. For the question on who respondents reach out to for information or support regarding lighting, cooking, or anything with electricity, 61% of refugee respondents and 46% of host respondents reported “no one.” Among those who did identify support sources, responses were dispersed across family, neighbors, friends, NGOs, vendors and smaller contributions from RW/LC levels. The advice questions show a similar pattern: for lighting decisions, 59% (refugees) and 54% (hosts) reported relying on no one; for cooking/cookstove decisions, 43% (refugees) and 46% (hosts) reported no one; and for phone charging/internet/communication decisions, 35% (refugees) and 45% (hosts) reported no one. Where advice is sought, it is primarily routed through neighbors, friends, and family, with vendors and local authorities playing secondary roles in the host community. In addition, the food-support results show the relevance of casual labor for refugees (14%) as a livelihood-linked coping strategy, turning the host community into a kind of support resource and reflecting the cross-community economic ties that may influence energy affordability and adoption.

Group participation in Bidi Bidi is generally limited, particularly in the refugee community, but where groups exist they provide clear organizational entry points. A large majority of refugee respondents reported no group membership (220), compared to 33 involved in one group and 3 involved in two groups; in the host community, 58 reported no group membership, 56 reported involvement in one group and 11 in two groups. Among the groups mentioned, savings and lending groups dominate in both communities (59% of refugee group mentions; 45% of host group mentions), followed by farmers’ groups (especially in the host community) and women’s groups. This indicates that while many people are “non-joiners,” savings/lending and livelihood groups are still among the most visible organized structures available for outreach, peer learning, and affordability



discussions.

Overall, the Uganda results resonate with—yet also raise specific challenges for—participatory approaches recommended in humanitarian energy and clean-cooking literature, which emphasize engaging a broad ecosystem of community members, humanitarian actors, government authorities, private-sector providers, and enabling actors (e.g., finance, training, research) to ensure inclusion and long-term sustainability (Bisaga, 2025; Robinson et al., 2022; Sandwell et al., 2023; GPA, 2024). In Bidi Bidi, the prominence of RW/LC structures, schools, and health systems offers concrete institutional anchors for participation and communication; however, the high proportion of respondents reporting no energy support or advice source suggests that SUNNY may need to actively strengthen energy information and support pathways (e.g., via trained community mobilizers, vendor/technician capacity, and clearer escalation and referral routes). At the same time, as in Rwanda, groups such as women’s groups, youth groups, disability-related groups and refugee-led organizations may not appear as central support hubs in the survey but remain important to include for representation and procedural justice; their limited visibility should be treated as a signal for proactive outreach and enabling participation rather than as non-relevance.

Both sites show that energy-related decision-making is not strongly institutionalized, but the form differs: in Mahama, refugees combine humanitarian channels with informal neighborhood networks, while the host community is strongly market-facing (companies/vendors). In Bidi Bidi, a large fraction report no support and no advice source for energy decisions, and those who do seek advice rely mostly on neighbors, family and friends. This difference suggests that “one” engagement model will not fit both sites: Rwanda engagement can leverage existing humanitarian and private-provider channels already recognized by communities; Uganda engagement may require building stronger, more visible energy support pathways within (or alongside) the local administrative ecosystem.

In practical terms, SUNNY’s participatory work should combine network centrality (engaging the actors people already rely on) with normative inclusion (ensuring representation of groups that are often less visible in formal processes). This means involving a diverse range of refugee and host community members recruited through both formal leadership structures and informal social networks, alongside key institutional and market actors such as NGOs, local authorities, vendors, and service technicians. Participation should be deliberately structured to include underrepresented constituencies—particularly women, youth, older persons, people with disabilities, minority groups, or single-headed households—as well as individuals who are not members of any community group. Participation should intentionally include people from different socio-economic backgrounds, including low-income and financially

PAGE



constrained households, to ensure that solutions reflect diverse affordability conditions and lived realities. Governance and representation structures should serve as institutional “backbones” for engagement, village/cell leadership in Rwanda and, in Uganda, the LC and RW system, to ensure local legitimacy, coordination, and accessible pathways for feedback and dispute resolution. Finally, accessibility must be built into all engagement formats: given that a substantial number of respondents reported limited literacy, recruitment, facilitation, and project materials should be designed to enable meaningful participation regardless of reading and writing ability, including through appropriate language choices and non-text-based formats where needed.

RQ2 examines which existing social and institutional structures can be leveraged to embed and sustain energy solutions beyond short project cycles. The survey indicates several durable “embedding mechanisms”: local governance and representation structures (e.g., village/cell leaders in Rwanda and LC/RW levels in Uganda) that can support coordination, legitimacy and accountability; stable service institutions such as schools and health providers that offer trusted entry points for communication and continuity; and market-facing structures including vendors and local service/repair actors that can support delivery and after-sales services. Although overall group participation is limited, the groups that do exist, especially savings and lending groups and other livelihood or peer-support groups, are particularly relevant because they meet regularly and can enable peer learning, risk-sharing and affordability mechanisms. In Uganda, casual labor links between refugee and host communities further highlight cross-community livelihood interdependencies that should be considered in energy embedding (e.g., mobility and income timing). Taken together, these findings suggest that MALLs and related activities should align with the practical functions people already value—livelihood improvement and peer support—so participation is seen as beneficial and does not become an additional burden.

PAGE

4. OUTLOOK

Through its emphasis on community mapping, inclusive recruitment, and co-creation methodologies, SUNNY demonstrates how technological innovation can be coupled with social processes to create locally owned, sustainable solutions. The project provides a model for how European research and innovation initiatives can contribute to global challenges: reducing energy poverty, supporting displaced and host populations, and advancing the green transition beyond European borders.

The findings highlight the importance of embedding energy solutions within durable institutions and existing value chains, rather than creating parallel, project-specific systems that risk dissolving once pilot activities end. In both sites, group participation data show that large shares of host and refugee populations are not involved in formal groups, which means that participatory processes that recruit primarily through existing groups



risk systematic exclusion of “non-joiners” (often those most marginalized, time-poor, newly arrived, or socially isolated). At the same time, where groups exist, savings and lending groups and livelihood groups provide meaningful entry points—particularly for linking energy solutions to affordability, productive use, and adoption conditions. This is consistent with practice-oriented evidence that informal savings groups can be leveraged (with training/support) to promote uptake and provide lending services for productive-use assets and energy-related investments. Taken together, they point toward a participatory strategy that combines network centrality (who people already use) and normative inclusion (who must be present to ensure representation and justice). The next steps, particularly under WP2, will build on the foundation of stakeholder engagement to ensure that co-designed energy solutions are technically sound, socially inclusive, and economically viable.



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