

*IMPROVING THE SUSTAINABILITY OF
RURAL ELECTRIFICATION SCHEMES:
CAPTURING VALUE FOR RURAL
COMMUNITIES IN UGANDA*



Stephanie Andrea Hirmer BEng, MPhil

Sidney Sussex College

Centre for Sustainable Development

Department of Engineering

University of Cambridge

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The rural people of Uganda and their efforts for a prosperous future.

ABSTRACT

This research investigates what rural villagers perceive as important and develops recommendations for improved electrification project implementation centring on user-perceived values (UPVs). UPVs capture more than the basic definition of value in the sense that they include benefits, concerns, feelings and underlying drivers that vary in importance and act as the main motivators in the lives of project beneficiaries as perceived at a given time.

Low access to energy continues in rural sub-Saharan Africa despite significant investment by the development community. One fundamental reason is that energy infrastructure adoption remains low, as evidenced by the lack of project sustainability. To counter this, the challenge for energy project developers is to achieve sustainable long-term interventions through the creation of value for beneficiaries, rather than the traditional approach of focusing on short-term project outputs. The question of what is valuable to people in rural communities has historically not played into the design and diffusion of energy infrastructure development projects.

This research drew on design and marketing approaches from the commercial sector to investigate the UPVs of rural Ugandans. To better understand the UPVs of rural villagers a new method, consisting of a UPV game and UPV framework, was developed. This method is suitable for capturing, understanding and mapping what rural populations perceive as important. Case study analyses were carried out in seven villages across rural Uganda. The case studies included the UPV game supplemented by non-energy-specific and energy-specific interviews with villagers. Additionally, interviews with experts were conducted to verify the UPV framework and to identify the gap between experts' opinion and villagers' perception of what is important.

The research demonstrates the effectiveness of the UPV game in deducing the values of rural villagers. The findings demonstrate a disconnect in the ability to accurately capture and design projects which resonate with and respond to the UPVs of recipients of rural electrification projects. A comparison between the villagers' statements and experts' opinion regarding what is most valuable to rural communities reveals striking differences that point to a fundamental misunderstanding of rural community UPVs which are likely to be contributing to widespread electrification project failure.

“Most poor customers are no different from any other in how they make purchasing decisions; their limited means simply makes them extremely good at assessing risk and value”.

(Hirji, 2015)

Further **findings**:

- Income-generating activities and the subsequent improved service delivery can lead to a perception of prosperity and wealth to villagers.
- Projects that facilitated income-generating activities are more likely to withstand difficulties occurring after a project handover.
- There is a notable divergence in what is perceived as important across villages.
- It is difficult to capture and prioritise UPVs from socio-economic data and traditional needs assessments as UPVs can be influenced by multiple factors and are interrelated.
- There are nuanced differences between the prioritisation of male and female UPVs but the language used (stories) to describe what is important is different.
- Beneficiaries of rural electrification have a limited understanding of the range of benefits possible from modern energy sources.

In light of these research findings, a number of theories for improved project implementation were **recommended**; these are summarised below.

- Using UPV-centred project design facilitates more responsible project planning and can lead to more sustainable results.
- Developing an in-depth understanding of the local conditions together with UPVs can fully ascertain local context so as to identify additional important intervention points that might otherwise have been overlooked.
- The UPV-based approach, through integrated project planning, highlights where different sectors are cross cutting and where cost sharing can be applied.
- Developing a UPV-centred communication strategy, with UPV-centred project design, can ensure that project benefits resonate with target communities.
- Capacity building and awareness-creation post infrastructure installation is critical and should demonstrate how project benefits address the community UPVs. This is particularly where entrepreneurship prior to the project is low.
- The research findings will help project developers to implement more sustainable projects by putting what is of importance to the community at the centre of the development initiatives.

DECLARATION

This dissertation is the result of my own work and includes nothing, which is the outcome of work done in collaboration except where specifically indicated in the text. It has not been previously submitted, in part or whole, to any university or institution for any degree, diploma, or other qualification.

Signed: _____

Date: _____

Stephanie Andrea Hirmer BEng MPhil

Cambridge

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Improving the sustainability of rural electrification schemes: Capturing value for rural communities in
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LIST OF ABBREVIATIONS

ADB	—	Asian Development Bank
BOP	—	Bottom of the Pyramid
DAC	—	Development Assistance Committee
DfID	—	Department for International Development
Ec	—	European Commission
EnDev	—	Energising Development
ESMAP	—	Energy Sector Management Assistance Program
EUEI PDF	—	European Union Energy Initiative Partnership Dialogue Facility
FDIS	—	Financial Direct Investments
GDP	—	Gross Domestic Product
GIZ	—	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICT	—	Information and Communication Technology
IEA	—	International Energy Agency
IHDI	—	Inequality-adjusted Human Development Index
INGOs	—	International Non-Governmental Organisations
IPP	—	Independent Power Producer
IRENA	—	International Renewable Energy Agency
LF	—	Logical Framework
M&E	—	Monitoring and Evaluation
MDGs	—	Millennium Development Goals
MHP	—	Micro-Hydropower Project
NGO	—	Non-Governmental Organisation
ODA	—	Overseas Development Assistance
ODI	—	Overseas Development Institute
OECD	—	Organisation for Economic Co-Operation and Development
OED	—	Oxford English Dictionary
PPEO	—	Poor People's Energy Outlook
PPP	—	Private-Public Partnership
PSPP	—	Private Sector Participation Programme
PURE	—	Productive Use of Renewable Energy
PV	—	Photovoltaic
REA	—	Rural Electrification Agency
REB	—	Rural Electrification Board

REF	—	Rural Electrification Fund
REN21	—	Renewable Energy Policy Network for the 21st Century
RESP	—	Rural Electrification Strategy and Plan
SDGs	—	Sustainable Development Goals
SEforALL	—	Sustainable Energy for All
SHS	—	Solar Home System
SMEs	—	Small and Medium Enterprises
SSA	—	Sub-Saharan Africa
UGX	—	Ugandan Shilling
UPV	—	User-Perceived Value
URA	—	Uganda Revenue Authority
USAID	—	United States Agency for International Development
WHO	—	World Health Organisation
WTP	—	Willingness to Pay
ZMET	—	Zaltman Metaphor Elicitation Technique

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CURRENCY

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UGX 1,000 = GBP 0.25

US\$. 1 = GBP 0.78

FOREWORD

This doctoral research arose from my personal experience working on development initiatives.

I have spent several years as a civil engineer working on the design and implementation of small-scale hydropower schemes in Uganda. Additionally, I have helped develop strategies for rural electrification in the developing world. This experience highlighted the need to facilitate more sustainable implementation of rural electrification projects. I found that shortly after the projects were handed over to the project operator—in most cases the community—problems started to show. It became evident during the work in Uganda that, in most cases, the projects failed to ‘add value’ to the community and hence other daily aspects were prioritised over the simple maintenance tasks that were fundamental to the sustainability of the project.

The lack of consideration given to the needs and views of communities can be attributed to the challenge of meeting the perceived needs of different stakeholders throughout the installation of these projects. It became apparent that there were conflicting views regarding the purpose of the projects for the Ugandan Government, the implementing agency, the local government, non-governmental organisations (NGOs) and the local community. The implementing agency, for example, had to fulfil certain indicators set by the funding organisation(s). Those indicators detracted from the actual needs of the beneficiaries as commitments to improve energy access do not automatically translate into improvements which will make the most meaningful difference to people’s lives in poor communities.

A by-product of the standard development processes is that, currently, the underlying motivators are not adequately identified and accounted for. It is the initial hypothesis of this thesis that placing greater importance on what is perceived as important by beneficiaries is imperative for ensuring a successful project.

1 INTRODUCTION

The aim of this research is to better understand what rural villagers perceive as important (hereafter referred to as user-perceived value (UPV)) with regards to off-grid energy access initiatives. The goal is to encourage project developers to move from a system in which priorities are governed by technical performance towards an approach that is more focused on UPVs. Such a system is perhaps most commonly encountered in the free market, where private businesses seek to identify and respond to customer values to ensure they provide desirable products and services. The objective is to influence better delivery of rural electrification developments by integrating UPVs into the project cycle. This research is undertaken within the context of rural electrification projects in Uganda but may have wider applications for other similar development projects.

The research assumes that in order to deploy rural development initiatives in a sustainable¹ manner, the underlying motivations of the served communities must be better understood and catered for. A tailored and more appropriate initiative can then be developed and communicated to the community; this should result in improved user acceptance of development initiatives. It is theorised that the initiatives will then be

¹ In this research the sustainability of off-grid energy projects refers to an electrification project that keeps working for a long time, and that serves its community well and does not unduly compromise future needs in communities.

perceived to have personal value to the beneficiary and so the beneficiary is more likely to care about the continued success and functioning of the project.

Creating value to the project communities is an approach common in marketing and product design but has not yet found a mainstream role in development work, a research gap further discussed in Section 1.1. The consideration of a more value-driven approach in development work is particularly important for the off-grid energy sector to provide a meaningful change to the lives of rural communities because “energy [...] is a critical ingredient in all economic endeavours, [and is] essential for the provision of all human needs, including adequate sustenance, shelter and healthcare” (IRENA, 2017, p. 17).

Accordingly, in order to understand what villagers in rural Uganda perceive as important, in this research a method (UPV game) was developed to determine UPVs. The UPV game was informed by a theoretical framework of user-perceived value for rural electrification developed as part of this PhD research. The framework was initially based on a literature review of value-theory and was refined by enfolded the results from the UPV game conducted in seven Ugandan villages. The framework was then validated through key informant interviews. These were also used to identify gaps in the current understanding of what is important to rural villagers. The UPV methodology, consisting of the UPV game and UPV framework, formed a major output of this PhD research. A second output of this research, using the data from the UPV game, was to analyse what is important to rural communities to help improve current implementation methods. Additionally, to contextualise the findings from the UPV game and fully understand UPVs, the researcher conducted energy- and non-energy-specific interviews in the same villages.

This introductory chapter presents the research need and scope. It then concludes with an outline of the thesis structure.

1.1 Research need

While there have been improvements in recent years regarding the way projects are being implemented, issues are still arising in the long-term sustainability of these projects.

For decades, international development agencies have endeavoured to support rural communities in improving their livelihoods, as evidenced by the amount of aid money channelled to developing communities internationally (Moyo, 2010). For example, in

2014 alone, overseas development assistance (ODA) contributed USD \$135.2 billion in to the economies of developing countries and economies in crisis (OECD-DAC, 2015).

At present, development initiatives are commonly donor funded and, consequently, schemes are implemented to align with programme and project strategies. These strategies are usually derived from regional and country-level data, and so do not necessarily represent the priorities of local communities {further discussed in Section 2.2}. The disconnect between programme priorities and project communities' priorities is not just an energy problem but also appears in other sectors. This is illustrated by the findings from a study assessing the quality of healthcare related projects in Uganda which found that:

Limited effects may be attributable to a lack of alignment between programme priorities, defined externally to the local population, and local priorities. The design of health programmes does not appear to take these local realities into account. Understanding local aspirations and the moral landscapes into which programmes are introduced and enacted may provide insights for more nuanced approaches to improving health care. (Chandler *et al.*, 2013, p. 2)

This point is further emphasised by Marshall and Kaminsky (2016) who found that (water and sanitation) projects were deemed unsuccessful if they did not address the needs of the communities and merely focused on the needs of donors. By contrast, they identified successful projects as those which considered and addressed a multitude of community needs (*ibid*). Further, the need of systems to create value for people was highlighted by McCulloch and Clements (2016, p. 9). They state that it is important to know “what are people’s aspirations and what are their capabilities”. The consideration of the value to beneficiaries is seen as a key factor for ensuring the sustainable design of infrastructure projects (Fraser *et al.*, 2006; Reed *et al.*, 2006). Despite this recognised need, Watson highlights the disparity between this recognised need and current implementation methods:

The rush to provide new sustainability solutions often ignores the complex realities and needs of those on the ground as well as their values, capabilities and adaptability. As a result, technological ‘fixes’ are often mal-adapted to the socioeconomic and cultural

context, and the theory on paper looks very different to what actually takes place on the ground. (Cambridge Forum for Sustainability and the Environment, 2017)

The impact of failing to accurately capture what is important to rural communities was also demonstrated in another example. Despite great efforts to minimise mosquito-borne diseases through the free distribution of mosquito nets, usage remained low (Hetzel *et al.*, 2012). One of the main reasons for that low uptake was discomfort caused by heat (Pulford *et al.*, 2011); in this case communities prioritised their thermal comfort over health benefits. The misalignment between community priorities and those perceived to be important by project developers further accentuates a requirement to delve deeper into the complexity of motivators and priorities which point to real drivers.

This research advocates using value-theory to help fill the gap between what is important to beneficiaries and projects. In the context of marketing and design, according to Gallarza and Saura (2006), understanding the values of consumers is fundamental to better understand consumer decisions. In recent years it has become recognised as one of the more important decision-making measures for consumers—something that has not yet been widely deliberated for the implementation of rural development initiatives. Some consideration of value to the beneficiary has been given to off-the shelf products, including energy products {this is further discussed in Chapter 2.4} but not for off-grid energy access initiatives.

The off-grid energy sector is becoming increasingly more commercialised. Governmental donors embrace market-based approaches², causing a transition from the traditional ‘donor to recipient’ model towards a ‘private-public partnership’ (PPP) model. This is exemplified in projects such as the Private Sector Participation Programme (PSPP) in Rwanda (Plas, 2009), the AR PERMER Renewable Energy Additional Financing Project in Argentina (Johnson, 2008), and the Energy Development and Access Project in Ghana (Iyer, 2005). However, despite a move towards PPPs the sector continues to be dominated by donor-led approaches and has yet to fully adopt existing business concepts to development work. The fact that the sector is dominated by donor-led approaches in turn

² Market-based approaches refers to a method employed whereby the private sector is included to deliver aid more effectively (Davies, 2011).

may increase the chance of future private sector involvement, thus reducing the need for aid funding or government subsidisation, and a move towards supply and demand mechanisms where provision of quality services respond to customer needs.

1.2 Aims, objectives and research questions

Despite the good intentions of development projects, the distinctive needs and UPVs of beneficiaries are often misunderstood or overlooked. One reason for this is that, to date, the systems that facilitate the identification and inclusion of what is perceived as important by project communities for off-grid energy initiatives are imperfect and are often based on assumptions or needs. A sustainable initiative should be tailored to incorporate these aspects and should be sensitive to differences in the perception of values between countries, regions, villages and people.

Given this dilemma, this research aims to better understand what rural villagers perceive as important and to demonstrate and to enunciate the benefits of how project developers could shift away from a system whereby priorities are governed by technical performance towards an approach that is more focused on UPVs.

The objective is to enable project developers to better respond to what is of importance from the perspective of the benefiting communities and to enable better integration of community UPVs into the project planning, design and communication. This PhD research was based on a case study approach of off-grid electrification projects in rural Ugandan villages. A methodology to capture and display UPVs in different communities across Uganda was developed.

The topic of this PhD thesis: ‘Improving the sustainability of rural electrification schemes: capturing value for rural communities in Uganda’ will be examined by addressing the following research question: **What is important to rural communities in Uganda and how can a more user-centred approach benefit the effectiveness of rural electrification initiatives?**

This will be answered through a number of research questions based on rural Ugandan villages that have benefited from an electricity project:

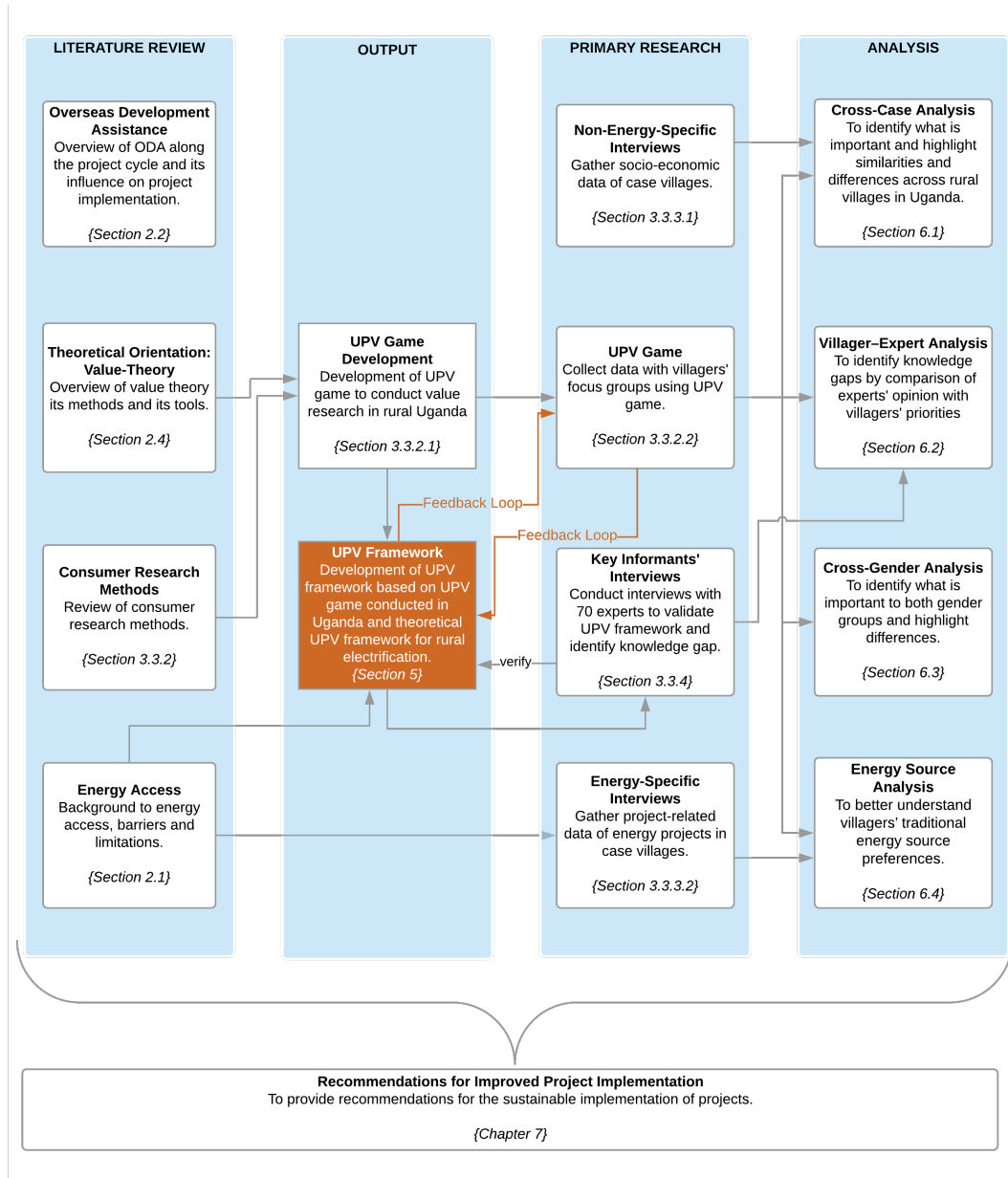
- What is important to rural communities and how do the different villages compare?
- What makes a project or service successful according to the perception of villagers?
- What is the influence of participatory approaches on project success?
- What is the gap between experts' opinion and villagers' priorities?
- What are the similarities and differences of UPVs between men and women?
- What are the perceived benefits from the perspective of the beneficiary associated with off-grid energy sources and how do traditional and modern energy sources compare?

1.3 Thesis structure

This introductory chapter has provided the general context for research on user-perceived value (UPV) with reference to rural electrification. This included a brief introduction to the general problem concerning the lack of consideration given to the UPVs of rural communities.

Figure 1 shows a summary of the structure of this thesis, which is further discussed in the paragraphs below.

Figure 1: Summary of thesis structure



The literature review is presented in **Chapter 2**. The role of energy access for rural communities is discussed {Section 2.1} including benefits {Section 2.1.1} and barriers {Section 2.1.2}. This is followed by an introduction of the role of overseas development assistance with a specific focus on the project cycle {Section 2.2}. Further to this, the chapter gives a brief overview of the case study context {Section 2.3}. Section 2.4 introduces the theoretical orientation of this research; more specifically, current methods to assess the needs of communities are reviewed and the need for this research is enunciated {Section 2.4.1}. Subsequently the role of value-theory is discussed {Section

2.4.2}, followed by a review of value-theory in the context of rural electrification {Section 2.4.3} leading to the definition for UPV as seen in this research {Section 2.4.4}.

Chapter 3 briefly outlines the research theory and structure {Sections 3.1 and 3.2} as well as the methodologies governing the research {Section 3.3}. Additionally, the chapter gives an account of the specific sampling {Section 3.4}, the methods for data analysis {Section 3.5} and ethical considerations {Section 3.6}. Lastly the chapter concludes with assumptions and potential limitations of the research {Section 3.7}.

In **Chapter 4** the seven case study villages are analysed. For each village, the chapter gives an account of community organisation and participation, the perceived project benefits and the perceived project limitations as seen by the beneficiaries. Additionally, for each of the seven villages, a brief account of the location and the background of the electrification project is given. The chapter concludes with a discussion of project success according to the perception of villagers and the influence of implementation procedures on project success {Section 4.5}. The socio-economic data pertaining to this chapter is presented in the Infographic (fold-out) in Appendix III and seeks to guide the discussion and analysis chapter {Chapter 6}.

Chapter 5 introduces the main UPV framework that underpins and guides the analysis and discussion section pertaining to the UPV game {Chapter 6}. The final UPV framework is graphically depicted as a UPV wheel {Figure 19} in Section 5.2.

Chapter 6 presents the main data from the UPV game. The chapter begins with a cross-case comparison {Section 6.1}. This is followed by a villager–expert case comparison {Section 6.2} which seeks to highlight the gaps between experts’ opinion and villagers’ perception {Section 6.2.3}. In Section 6.3 a cross-gender comparison is made, the similarities and differences in UPVs between men and women are highlighted and compared. Finally, the chapter finishes in Section 6.4 with a review of the benefits linked to the different energy sources as seen by the villagers themselves.

Based on Chapters 0 and 5, **Chapter 7** presents the theories for improved project implementation (recommendations).

Chapter 8 has conclusions on the work and specific reflections on the process.

2 LITERATURE REVIEW

This thesis focuses on rural electrification development projects because of the large amount of resources being invested in providing rural electrification to low-income countries and the potential for rural electrification to meaningfully improve lives. Furthermore, rural Uganda was selected as a case study country because of the favourable business environment and the researcher's previous work experience in the country.

This chapter gives a background, from the literature, of the history of energy access initiatives {Section 2.1}, including the potential benefits {Sections 2.1.1} and barriers {Sections 2.1.2} of energy access for rural communities. It then goes on to outline the role of international development assistance with a specific focus on the project cycle {Section 2.2} with a brief overview of the case study country {Section 2.3}. As part of better understanding the theoretical orientation of this research towards user-perceived value {Section 2.4}, the chapter concludes with a review of methods currently used to assess the needs of communities {Section 2.4.1}. Subsequently, the role of value-theory is discussed {Section 2.4.2}, followed by a review of value-theory in the context of rural electrification {Section 2.4.3} leading to the definition of UPV used within this research {Section 2.4.4}.

2.1 The role of off-grid energy access

This section introduces off-grid energy access, its benefits and its barriers. A brief account of the history of energy access initiatives is given with a reflection on why on-grid has been pursued globally, and why off-grid can be a more suitable alternative for rural areas.

Energy access is seen as key to improving rural livelihoods (IRENA, 2017). Despite this, 1.06 billion people globally do not have access to sustainable energy sources, and 80% of these people live in rural areas across 20 countries in Asia and sub-Saharan Africa (SSA) (SEforALL, 2017). To decrease this energy gap, and to improve rural livelihoods, the last decade has seen numerous international organisations launch initiatives to promote regional and global sustainable energy access. For example:

- in 2011 the Asian Development Bank (ADB) launched the ‘Energy for All Partnership’, focusing on affordable, off-grid energy access in Asia (ADB, 2011);
- in 2013 the United States Agency for International Development (USAID), launched ‘Power Africa’, concentrating on energy access in sub-Saharan Africa (Power Africa, 2016); and
- in 2014 the United Nations (UN) launched the ‘Sustainable Energy for All’ (SEforALL) initiative which aims to push universal energy access by 2030 (Foster et al., 2015).

The targets set out in the above initiatives, along with subsequent donor support and political ambitions, have led to a major increase in the development of rural electrification schemes globally (Ahlborg and Hammar, 2014, p. 123). Despite efforts to meet these targets, progress, particularly in SSA remains slow (SEforALL, 2017).

One reason for this is that energy access cannot be provided using a ‘one-size-fits-all’ approach. While project developers continue to focus upon on-grid energy access as it is seen as the most cost-effective solution to reach large groups of people, according to the International Energy Agency (IEA), on-grid systems are only an economically viable solution for urban areas and 30% of rural areas (2011b). This low applicability of on-grid solutions for rural areas is because villages are often remote, far apart and sparsely populated (Prahalad and Hart, 2002; Lahimer *et al.*, 2012), hence the cost per household of a transmission line is high. Additionally, grid expansions can be impractical due to

very low economic activity in rural areas (Cabraal and Davies, 1996; ESMAP, 2007; IEA, 2011c). Consequently, rural communities and trading centres wait in vain for grid connections to replace expensive alternatives (such as generators). For example, in Kenya, only 5% of the rural population is connected to the grid (Lee *et al.*, 2016). For such areas, renewable off-grid power options are often the cheapest solution to ensure sustainable energy access (ESMAP, 2007; Yannick Glemarec, 2012; REN21, 2013).

Discussed below are the benefits {Section 2.1.1} and barriers {Section 2.1.2} to energy access.

2.1.1 The benefits of energy access

The purpose of this section is to explore the benefits of energy access for household use, community services (including health care and education) and productive use.

Electrification and development are often assumed to go hand in hand. The relationship between the two has been demonstrated by a comprehensive study that analysed 77 countries over a period of 25 years (Welle-Strand *et al.*, 2012). Although the researchers highlighted the relationship was dependent on the interaction of multiple factors, electrification was nonetheless seen as a key mechanism to improve living standards (Practical Action, 2010), to increase income through ‘income-generating activities’ (Practical Action, 2012) and to improve community services such as education and health services (Practical Action, 2013). Discussed below are the potential benefits of off-grid energy access for household energy use, community services (education and health care) and productive use. This is important in order to later understand the UPVs of electrification projects.

2.1.1.1 Household energy use

Research shows that the majority (>80%) of the energy consumed from traditional sources of energy in rural areas is for household activities such as cooking, water heating,

lighting and space heating (Karekezi and Kithyoma, 2002; Karekezi and Kimani, 2004). Benefits of energy access to rural households include³:

- Improved access to information and knowledge through modern channels of communication and improved entertainment from radio, television or mobile phone access.
- Reduced operational expenditure from improved service delivery and the subsequent mitigation of transport costs from not having to travel far as well as the reduced use of traditional fuels.
- Reduced labour (generally for women) through decreased need to collect fuel and undertake household tasks manually.
- Improved security and increased comfort in rural settlements at night (particularly for women) from street lighting for example.
- Improved health from reduced chance of food poisoning thanks to refrigeration, increased variety and quality of the diet through improved micronutrient intake and the reduction of respiratory diseases from reduced use of traditional fuels.

2.1.1.2 Community services

The availability of electricity is seen as crucial to improving access to community services like health care and education (Harsdorff and Bamanyaki, 2009; Barua *et al.*, 2011) (Practical Action, 2016). Moreover, energy access in rural areas can help to attract and retain skilled workers such as teachers (Sovacool and Ryan, 2016) and healthcare workers (WHO, 2014). Discussed below are the benefits of off-grid energy access related to education and health care.

³ Findings are based on (USAID, 2006; Sánchez and Salinas, 2008; Aker and Mbiti, 2010; Practical Action, 2012; Yadoo and Cruickshank, 2012; Maristes, 2012; Garside, 2013; Lahimer *et al.*, 2013; Loka *et al.*, 2013; Paul and Uhomoibhi, 2013; Aguirre, 2014; Terrapon-Pfaff *et al.*, 2014; WHO and World Bank, 2014; Peters and Sievert, 2015; United Nations Educational Scientific and Cultural Organization, 2015; Arráiz and Calero, 2015; Lecoque and Wiemann, 2015; Sovacool and Ryan, 2016; and Mandelli *et al.*, 2016).

2.1.1.2.1 Education

To date, globally there are approximately 200 million children attending primary and secondary schools which are not connected to energy services (Sovacool and Ryan, 2016). Inclusive and quality education is a key driver for sustainable development, and “is also widely recognised as one of the most essential components for poverty reduction” (Sovacool and Ryan, 2016, p. 108). Developing the infrastructure of schools, such as through energy access, can be vital for improving rural livelihoods. This is because it can help to shift the balance between rural and urban communities by making rural dwellers more competitive, such as in their ability to receive higher levels of education.

The benefits of energy technologies and facility support functions within education can include⁴:

- Better education through access to e-learning and evening classes in schools from extended classroom hours (enabling early morning and after-dark teaching) and increased time for reading and homework.
- Increased access to information and knowledge from improved information and communication technology (ICT), enabling better access to educational programmes, mobile learning and cultural awareness. This narrows the educational and social gaps, gives better employment opportunities and can promote intercultural awareness.
- Improved offerings at school (such as laboratories and workshops) enabling schools to expand vocational offerings in engineering, welding, metalwork and carpentry.

2.1.1.2.2 Health care

According to the World Health Organisation, “energy access is a critical enabler of access to medical technologies, and thus an important determinant of the effective delivery of essential health services” (WHO, 2014, p. 1). Despite this, Adair-rohani *et al.*, (2013)

⁴ Synthesised from (Sánchez and Salinas, 2008; United Nations Educational Scientific and Cultural Organization, 2015; Sovacool and Ryan, 2016).

found that only 36% of hospitals in the surveyed countries in sub-Saharan Africa have reliable energy access. Whilst there are different energy requirements pertaining to the size of the health centre and the services offered by said facilities (USAID, 2006), electricity access in health centres can significantly improve a wide range of health services (immunisations, basic emergency treatment and surgical services) through, for example, extended night-time hours, faster emergency response, improved equipment and refrigeration for cold chain supplies. Other benefits include (USAID, 2006; Maristes, 2012; WHO, 2014):

- Improved health services from delivering adequate treatment and care through better medical equipment, enhanced refrigeration and the ability to prolong life from incubators.
- Faster emergency response through extended opening hours stemming from better lighting in health centres as well as access to mobile-health applications, improved communication between health care staff, patients and/or other facilities.
- Improved hygiene from sterilisation equipment through the ability to provide the thermal energy needed for water heating.

2.1.1.3 Productive use

The European Union Energy Initiative Partnership Dialogue Facility (EUEI PDF) holds the view that the “residential use of electricity improves the quality of life of the rural community while productive use of renewable energy (PURE) in rural areas leads to increased rural productivity, higher economic growth and a rise in rural employment” (Lecoque and Wiemann, 2015, p. 4). In a similar sentiment, rural electrification is seen as a major contributor to poverty eradication (Practical Action, 2014). Similarly, agricultural practices are the dominant source of income in most developing countries (Kaygusuz, 2011). Therefore, improving agricultural practices is a critical element for the economies of developing countries as it is linked to increased rural productivity, food security, higher economic growth and a rise in rural employment (Lecoque and Wiemann, 2015).

In addition to the agricultural sector, rural electrification initiatives can greatly benefit the local service sector by providing electricity to hairdressers, beer halls, shops, kiosks and

local repair and maintenance businesses, for instance. Small and medium enterprises (SMEs) that undertake labour intensive activities such as milling or fruit and vegetable processing can also greatly benefit through increased productivity. The benefits that can be attributed to small-scale energy solutions for productive use include⁵:

- Improved agricultural and labour market efficiency, coordination with suppliers and distributors and or service delivery platforms from improved communication.
- Improved yields, higher value crops, greater reliability and the ability to grow during periods when market prices are higher from electric pumping systems for water.
- Improved value added to products from raw agricultural commodity and an unburdening of labour from time-consuming tasks usually performed by women (such as milling).
- Improved service delivery from extended opening hours and greater business opportunities.
- Increased productivity from electrically powered machinery.
- Improved community life through a greater variety of local services and entertainment (i.e. local hairdresser or cinema) and enhanced security from village street lighting.

2.1.1.4 Summary of the benefits of energy access

The purpose of this review was to amalgamate the benefits of energy access to households, community services (health care and education) and primary production activities such as agriculture. Understanding the benefits of energy access is significant in the sense that it requires a focus on what the development community perceives as important. During this research it became apparent that there is good existing knowledge within most development communities concerning the potential benefits of energy. This

⁵ From (Fishbein, 2003; Aker and Mbiti, 2010; Maristes, 2012; Practical Action, 2012, 2016; Loka et al., 2013; Arráiz and Calero, 2015).

is relevant for linking the benefits of rural electrification and value-theory to develop the theoretical UPV framework {Chapter 3}.

Despite this, projects still tend to focus on implementing easy and quick solutions focused on household energy (such as electric lighting and mobile phone charging). Project developers tend to ignore the wider benefits of electricity and focus on less productive uses of electricity, and income generation is not an objective of most rural electrification initiatives.

2.1.2 Barriers to sustainable energy access in remote areas

A number of barriers to sustainable energy access have been identified from the literature. These are discussed below and include an overemphasis on development thinking as a key to project acceptance, the lack of agreement on factors that determine project success and insufficient power provision to meet the (future) needs of beneficiaries.

This is not to say that there are not other significant barriers (e.g. last mile distribution, maintenance and repair infrastructure and access to finance). However, for the sake of brevity only the most relevant barriers have been focused on—a comprehensive review of barriers pertaining to energy access in remote areas has been conducted by (Yaqoot *et al.*, 2016).

2.1.2.1 *An overemphasis on development thinking as a key to project acceptance*

To effectively introduce new infrastructure within a community, developers apply aid and development thinking (such as capacity building⁶) rather than commercial thinking to consider the longevity of projects post-implementation (such as appropriate communication and value creation). One reason for this is that projects are developed against an agenda of poverty alleviation and whilst income generation is acknowledged, it tends not to be a determinant in designing first wave electrification projects in rural areas—this is discussed in more detail in Section 2.2. Instead, developers perceive

⁶ Capacity building is “a conceptual approach to social or personal development that focuses on understanding and tackling the obstacles that inhibit people, governments, international organisations and non-governmental organisations from realising their development goals” (Adeola et al., 2016, p. 1).

customers of electricity services as beneficiaries and passive recipients, relying on participatory approaches of ‘awareness-raising’ and ‘capacity building’ as fundamental to achieve ownership and buy-in and thus sustainable development (Schragl, 2008; Nikkhah and Redzuan, 2009; Bhattacharyya, 2013). In line with this, community capacity building activities are now commonly part of any international aid intervention as efforts to establish project ownership and acceptance within the community (Simpson *et al.*, 2003; IFC, 2010). This is highlighted in the following statements:

- “[Governments have] stressed the importance of ownership of development initiatives as a means to sustainable community development” (Simpson *et al.*, 2003, p. 277).
- “True participation [...] ensures people take ownership” (Botes and Rensburg, 2000, p. 11).
- “Infrastructure is maintained and repaired locally, based on a sense of local ownership” (Tango International, 2009, p. 7).

This is further emphasised in research by Wilson *et al.* (2012), Yadoo and Cruickshank (2010), Silva *et al.* (2010), Aron *et al.* (2009) and Benecke (2008). In line with this thinking, there are four main factors that influence responsible ownership:

- training of users and local technicians (Drinkwaard *et al.*, 2010; Vetter, 2011; Palit, 2013),
- financial contributions by the project community (Davidson and Sokona, 2002; Schragl, 2008),
- contributions in kind (such as free labour and materials) (Schragl, 2008; Drinkwaard *et al.*, 2010; Silva *et al.*, 2010), and
- the participation of beneficiaries during all project stages (Schragl, 2008; Silva *et al.*, 2010; Yadoo and Cruickshank, 2010; Els *et al.*, 2012).

Despite all the above research extolling the virtues of project ownership, there is little evidence in literature that suggests that these approaches do indeed lead to more successful projects (Sovacool, 2012). There is often a failure to make the transition from ‘the project’ to a long-term community infrastructure reality. This is in line with a recent study undertaken by Chowns (2015) which questioned whether community management

models of water points in Malawi do indeed lead to improved sustainability. The author states, “findings challenge the assumptions of efficiency and empowerment that underpin the community management model, and show that in fact it frequently generates conflict and reproduces inequality at community level” (Chowns, 2015, p. 1).

This highlights the assumption that often beneficiaries are expected to support the schemes that are designed to help them, even though the design may have made false/unduly optimistic assumptions about the communities’ commitment to making the projects work after installation. While this is not to say that local participation and capacity building are unimportant, in particular for community owned and operated projects, but that other aspects are equally important and that more focus has to be placed on income generation and commercial thinking. For energy access developments an example would include providing adequate supply for the running and growth of businesses, providing appropriate marketing, training technicians and sales people, training for after-sales service(s) and setting up supply chains (Goyal *et al.*, 2017). These are more commonly part of commercial thinking, which sees the beneficiary as a customer, and results in more sustainable project implementation (Prahalad and Hart, 2002; Davies, 2011; Kolk *et al.*, 2014).

2.1.2.2 Lack of agreement on factors that determine project success

There is great divergence in opinion amongst different stakeholders as to what makes a project successful when delivering electrification as a service with everyone having their own goal. As Wilson *et al.* (2012, p.12) point out, “different stakeholders may have conflicting views on the success of a delivery model; in other words, local communities may have very different priorities from businesses, donors or government”. One possible explanation for this is the difference of interests between implementing agencies: in other words different delivery and financial models offer different benefits to different stakeholders. To illustrate, the majority of schemes are implemented by non-governmental organisations (NGOs) and development agencies (Mondal *et al.*, 2010) which are liable and accountable to their donors (donor dependency) (Ahlborg and Hammar, 2014). Hence the focus of these NGOs/development agencies, and the subsequent measures of success, are based on the indicators they report against which, in turn, reflect donor priorities and targets. For example, the output indicator ‘electrify 100

households’ does not indicate the amount of power needed by the 100 households for a country to be on target for meeting their long-term objective of poverty eradication (outcome/impact), as is further discussed in Section 2.2. Nor does it indicate how much power would be deemed useful to the end-user, or consider context-specific design by linking project benefits to the needs of the community. While poverty eradication is the overarching goal of most development interventions, there are a number of different ways of measuring the success of such a goal. However, as this is rarely done from the point of view of end-users, the perspectives of the communities themselves have not been included in the overall assessment of performance. This is evident from the indicators used to measure project success, as illustrated later in Table 1.

Table 1 {Section 2.2}. Therefore it is the opinion of this researcher that accounting for UPVs at the start of the project and thus including them as measures of success, helps to achieve mutual benefit as the goals are more aligned and by doing so actually benefit the people the scheme is meant to help.

2.1.2.3 *Insufficient power provision*

The full benefits of energy access discussed in Section 2.1.1 can only be realised if projects cater for energy use beyond those of electric lighting and mobile phone charging. This is often because insufficient power provision is provided by new energy projects.

To date, rural electrification services rarely extend beyond the provision of household energy for lighting (Davidson and Sokona, 2002; Holland *et al.*, 2006; Bernard, 2010; Silva *et al.*, 2010; Practical Action, 2013)—as this provides the simplest means of modern energy services to rural areas {also discussed in Section 2.1.1.4} (Terrapon-Pfaff *et al.*, 2014). Whilst lighting can have positive effects on households and institutions (Bensch *et al.*, 2011), it is widely acknowledged that income-generating activities are a key component of poverty eradication in rural areas (Brew-Hammond and Kemausuor, 2009; Mondal *et al.*, 2010; Silva *et al.*, 2010; Brüderle *et al.*, 2011; IEA, 2011a). This is manifested in the following statements:

- “Carpentry and tailoring artisans demonstrate that availability of electricity has the potential to transform rural small and medium enterprises (SMEs) in ways that

enabled increased productivity and value addition, thus boosting income generation” (Kirubi *et al.*, 2009, p. 1214).

- “Access to electricity also encourages them [villagers] to participate in productive and income-generating activities which can help improve their own and their family’s livelihood” (Sapkota *et al.*, 2013, p. 1184).
- “Productive uses of energy play [a role] in enabling poor people to earn a better living” (Practical Action, 2012, p. 31).

This suggests that, through the provision of sufficient power to enable income-generating activities, two ancillary issues are addressed:

- 1) rural electrification schemes are less likely to have funding problems associated with post project operation and maintenance because a local community’s financial gains arising from income-generating activities can act as both an incentive and an enabler for improved livelihoods; and
- 2) if insufficient power is provided, end-users cannot meet their progressively increasing demands in energy consumption (Practical Action 2013).

A critique by Practical Action (2013, p.28) reads, “they [the implementer] do not recognize the energy supply ladder, whereby a user’s improved energy access leads to more demand for greater quantity and quality of energy”.

According to the research undertaken by Bazilian and Pielke (2013), once an initial connection has been made, energy consumption increases to the regional average within five years. This is in accordance with the International Energy Agency (IEA), who define access to modern energy services as “a household having reliable and affordable access to clean cooking facilities, a first connection to electricity and then an increasing level of electricity consumption over time to reach the regional average” (IEA, 2011b, p. 473).

This indicates that there is a need to disseminate larger and better performing systems to ensure the anticipated increase in demand can be met (Jacobson, 2007; Practical Action, 2016). Further to this, incentivising the utilisation of off-grid energy projects through income-generating activities would create a sense of value regarding electrification projects as the power provided would be acknowledged and appreciated throughout the host community. Electrical power would no longer be seen as just a basic complement to traditional lighting (which offers lighting with no additional benefits) (Bernard, 2010).

In an attempt to address the issue of insufficient power provision, Practical Action has recently launched its Poor People's Energy Outlook (PPEO) 2016 which focuses on energy access planning by taking stock of the community needs in terms of equivalent energy consumption (Practical Action, 2016). The report looks at the issue of energy quantity and quality and explains that “definitions of energy access—‘having access’ or ‘not having access’—fail to capture important differences in quality and quantity of energy supply technologies” (Practical Action, 2013, p. 28). To accurately estimate the required power provision of communities, it is important to gain an understanding of the beneficiaries' UPVs and link these to energy access for consideration in the project design.

2.1.2.4 Summary of barriers to energy access in remote areas

The previous sections discussed a number of barriers pertaining to energy access in remote areas hindering sustainable project uptake. These were as follows: an overemphasis on development thinking as key to project acceptance, the lack of agreement on factors determine project success and insufficient power provision to meet the needs of beneficiaries.

The review of the literature demonstrates that, in general, there is a lack of consideration given to the needs and desires of the project beneficiaries. This in turn impacts on the success of rural electrification schemes as developers have a misplaced focus, do not know what makes a project successful and provide insufficient power to have a real impact on the lives of beneficiaries. To date, the deployment of improved lighting has commonly been accepted as a minimum target for access to energy and is seen as a contributor to reducing poverty—because of the associated health, safety, environmental and financial benefits. Whilst simple energy solutions, such as indoor lighting, can marginally help to provide these benefits, they may not be seen as priorities for the affected community. This can influence the uptake and sustainability of a project. Without a holistic energy approach that includes cultural shifts regarding energy, people are not going to get the full benefits—because they are still suffering so badly in other areas.

Therefore, in order to deploy development initiatives successfully in low-income settings, more time needs to be spent on identifying what beneficiaries truly value {discussed in

Chapters 1 and 7}. Understanding what is important to benefiting communities is particularly relevant for project implementers funded by international development aid, as this form of financial assistance represents the largest share of money channelled into developing countries.

2.2 The role of overseas development assistance

Overseas development assistance (ODA) continues to provide the majority of money channelled into developing countries in an attempt to further infrastructure development, including energy. Consequently, the mandates, country strategies and targets of financiers of ODA often influence implementing procedures. An output of this PhD research is to give recommendations for improved project implementation {Chapter 7}. To do this, it is important to understand the current mechanisms pertaining to ODA.

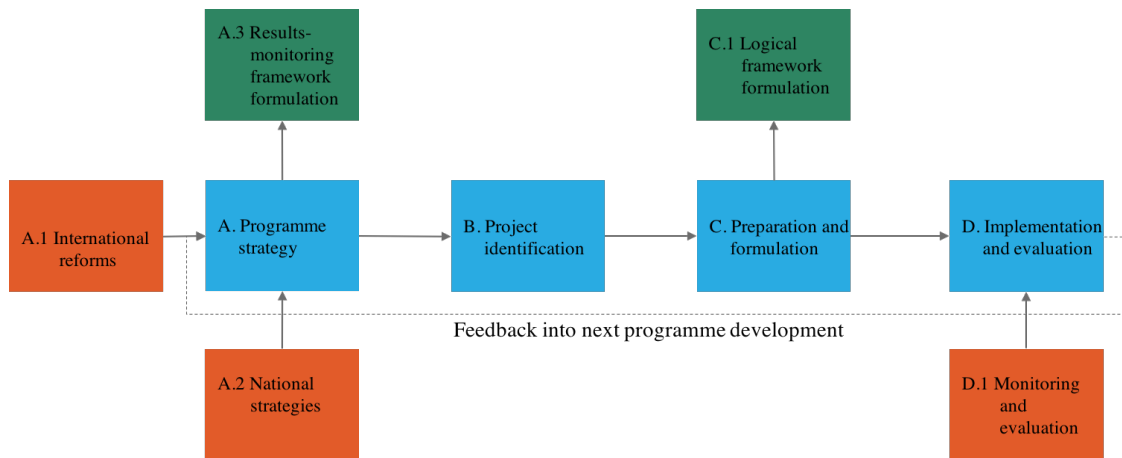
This section seeks to give a brief overview of the project cycle including the specific intervention points at each stage.

2.2.1 Project cycle

Development project programmes run through different stages and, although these stages may vary between donors, they (in most cases) start at the countrywide programme level. These project programmes can broadly be split into four stages: programme/country strategy; project identification; preparation and formulation; implementation and evaluation {see Figure 2}. This cycle is used as the main skeleton for this review of development work and is hereafter referred to as the ‘project cycle’.

Figure 2 depicts an example of a project cycle (shown in blue). The stages at the beginning and end of the project cycle depend on specific reforms, strategies and procedures (shown in orange). Some stages also result in various frameworks being formulated (shown in green). The role of the different stages are discussed below.

Figure 2: Simplified project cycle for development work



ADAPTED FROM THE EUROPEAN COMMISSION EC (2004)

A. Project cycle: programme strategy stage

In general, development organisations have a ‘programme strategy’ (first stage). A programme strategy forms the pretext in which potential projects are considered for further development (EC, 2004, p. 26). A programme strategy is often thematic and is developed based on the policies, targets and strategies of a recipient country as well as international reforms (EC, 2004, pp. 26–27). A programme ‘results framework’ is formulated at this stage of the programme cycle to feed into the organisation’s overall performance measurement system.

A1. International reforms

With the aim of improving aid and development effectiveness on the ground the international community has developed a number of key reforms and objectives. These address the concern for aid spending that is unaccounted for, inefficiently allocated and overall does not bring about positive, lasting impact (Publish What You Found, 2015). These reforms influence which programmes are considered during the programme strategy stage. Examples of such reforms and objectives include, for example, the Sustainable Development Goals (SDGs) which are to replace the Millennium Development Goals (MDGs), the Paris Declaration of Aid Effectiveness, and the Accra Agenda for Action.

A2. National strategies

National strategies are usually based on international targets and milestones. For example, in order to qualify for World Bank financial aid, a country, in consultation with development partners and other stakeholders, such as donors and large International Non-Governmental Organisations (INGOs), must develop a Poverty Reduction Strategy Paper (PRSP). That document is part of the country's national strategy and should align with the MDGs or the SDGs. According to the IMF (2013), these outline: "the country's macroeconomic, structural, and social policies, in support of growth and poverty reduction, as well as associated external financing needs and major sources of financing". Additionally, the document is often used to monitor and evaluate a country's performance in terms of effectiveness (the extent to which targets are being met) and efficiency (the relationship between inputs and outputs). However, the PRSP's implementation monitoring is often based on financial targets as it draws on administrative and budgetary data from ministries of finance, and less attention is given to the actual local requirements of a country (Shaffer, 2012).

A3. Formulation of results-monitoring framework

At this stage in the programme cycle, a programme-specific framework for results monitoring is formulated. The national strategies and international reforms provide the main guidance used to help formulate the results-monitoring framework. During early programme development the results-monitoring framework outlines high-level country-specific goals, for example, the 'number of people with access to electricity in Sierra Leone' (DFID, 2011). These goals can have targets and milestones which provide the overarching objectives of the results-monitoring framework. They also play a co-ordination role for monitoring systems (Shaffer, 2012). This is in line with the European Commission which states that "project ideas should be drawn from the priorities and targets identified in the relevant Country Strategy Paper and National Indicative Programme" (EC, 2004).

B. Project cycle: project identification stage

During the project identification stage, projects that meet the objectives of the programme (as outlined in the results-monitoring framework) are identified and their relevance and feasibility are assessed. At this stage, projects that are very different in nature are

compared to decide which best address the identified issues. One project may suggest an infrastructure solution, whereas another may suggest a solution related to education and raising awareness. Evidence suggests that a project's ability to meet the needs of the benefiting stakeholders (the overarching theme of this research) often lacks comprehensive assessment (Ugwu *et al.*, 2006) as projects are predetermined (the actual benefiting community is not yet identified) and projects are primarily chosen based on their ability to meet the specific indicators identified as part of the results-monitoring framework {Section A.3} (Eldridge and Palmer, 2009).

C. Project cycle: preparation and formulation stage

At this stage of the cycle, the identified projects are further developed and approved. This is based on, for example, the feasibility study and financial study performed with the project community. At this stage community-specific considerations should be considered. However, in most cases these do not go beyond what was set out in the preceding stages and are augmented by technical and financial feasibility. The feasibility study would require decision makers to take into account the social feasibility. At a minimum, for electrification this includes consideration given to the specific energy requirements of communities, for example household energy versus commercial use {discussed in Section 2.1.2.3}. Additionally, a logical framework (LF) is formulated. The LF is a tool intended to help design, monitor and evaluate international development projects (tools tend to vary between donor organisations) and is relevant during and after project implementation.

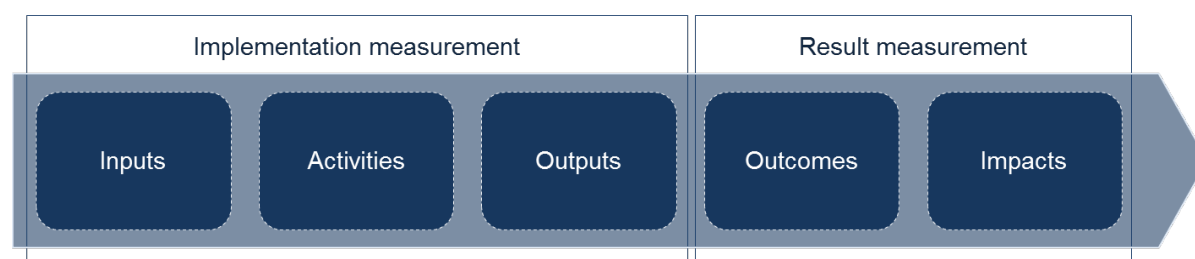
C1. Logical framework formulations

Depending on the organisation, a framework for monitoring project performance is formulated⁷. LFs, by their definition, serve as a tool for project management, performance

⁷ Some organisations follow a Logical Framework approach, also known as results chain (DfID and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)) or the intervention logic (EC), while others use a Results Framework approach (e.g. World Bank). So as to avoid confusion with the results-monitoring framework {Section A.3} developed at the programme strategy stage, the framework during preparation and formulation is hereafter referred to as Logical Framework (LF).

monitoring and reporting. At this stage a LF explicitly states the expected results of a development intervention and what is to be achieved (success) (IEG, 2012). Project implementers are required to report against the LF to demonstrate progress in order to receive further funding. Consequently such methodologies are inevitably rigid, rely on quantitative data collection to inform predetermined indicators and have a strong focus on predefined views of project success. The issue with using parameters outlined in the LF as a measure of project success is discussed in Section 2.1.2.1. Figure 3 shows the project logic (Shaffer, 2012)—how the project intends to bring about the desired change. It can be broken up into two parts: implementation measurements tend to measure inputs, activities and outputs, whereas results measurements focus on the outcomes and impacts reflecting longer-term effects (usually based on a dimension of wellbeing (Adam and Gunning, 2002)).

Figure 3: Logical Framework for development intervention



ADAPTED FROM THE DEPARTMENT FOR INTERNATIONAL DEVELOPMENT'S (DFID) LF (VOGEL, 2012)

Selected indicators are used to design and measure inputs, activities, outputs, outcomes and impacts related to a project or programme. Examples of indicators used for the implementation and results measurements of a rural electrification scheme are shown in Table 1.

Table 1: Example indicators used on rural electrification schemes

Project	ADB: Republic of Congo Rural Electrification	DFID: Sierra Leone Multi-Donor Trust Fund for Infrastructure Energy Access Project	UNDP: Lesotho Renewable Energy-Based Rural Electrification Project
Impact	Contribute to improving the quality of life of Congolese people.	Poverty reduction through economic growth based on improved power supply.	Improve people's livelihoods by promoting the utilisation of renewable energy to provide basic electricity services to the rural areas in Lesotho.
Impact Indicators	National electricity access rates. Rural electricity access rates.	Gross Domestic Product (GDP) (nominal) (Billions of USD).	Number of customers reached by renewable energy-based electricity services.
Outcomes	Access to electricity infrastructure and greater energy services.	Increased availability of power supply.	Implementation of different delivery models for renewable energy-based rural electrification targeting different end-user groups and making use of different technology packages.
Outcome Indicators	Number of people: <ul style="list-style-type: none"> - with access to electricity. - with access to electricity in rural areas. - connected to the electric grid in rural areas. 	<ul style="list-style-type: none"> - Number of rural inhabitants with improved access to rural clinics and schools in 14 targeted chiefdom villages. 	<ul style="list-style-type: none"> - Number of households with Photovoltaic (PV) systems in the project area will increase by 1000 annually. - A hybrid mini-grid using PV and wind is established at Sani Top. - The Semonkong mini-grid is equipped with additional hydro generation equipment.
Outputs	<ul style="list-style-type: none"> - Connections made. - Public lighting. - New localities electrified. - New households connected. 	<ul style="list-style-type: none"> - Improved access to electricity in rural areas. - Supply infrastructure. 	<ul style="list-style-type: none"> - At least three business centres are established in each district using PV as their energy source.
Output Indicators	Number of: <ul style="list-style-type: none"> - street lighting units installed. - rural centres electrified. - localities electrified. - households connected. - schools electrified. - health centres electrified. 	<ul style="list-style-type: none"> - Number of chiefdom villages with electrified community buildings (clinics, schools, courts and halls), i.e. improved health, education and community life conditions) through a scalable pilot project. 	<ul style="list-style-type: none"> - Nine business centres established using PV.

BASED ON (UNDP, 2007; DFID, 2011; ADB, 2012)

A problematic result of using indicators to design and measure development interventions is that indicators are often not selected according to their effectiveness. According to Fraser *et al.* (2006, p. 114), “[...] development experts [...] simply choose what they see as the most relevant indicators”. If designed poorly these indicators, set by the funding organisation(s)/implementation teams, detract focus from long-term aims (such as poverty eradication) stipulated during the creation of aid legislation (Adam and Gunning, 2002). As outlined by Eldridge and Palmer (2009, p.164), “they [targets] cease to reflect this broader system goal and just become a measure of the ability of an organisation either to meet this specific target, or fool the purchaser into believing that they have done so”. This highlights the role indicators play in the implementation of development initiatives. Indicators do not necessarily reflect the needs and priorities at a community level. Project success is often measured against these indicators, but rarely against project communities’ needs. Hence a project may succeed from a donor’s point of view but not help rural communities.

D. Project cycle: implementation and evaluation stages

As the name suggests, the implementation stage concerns project implementation and can be broken up into the following three phases: inception, main implementation and phase out. During the inception phase, the Monitoring and Evaluation (M&E) system is further developed based on the project’s LF and indicators developed during the preparation and formulation stage. The M&E process provides lessons learned which are fed back to aid the implementation of forthcoming projects.

D1. The role of monitoring and evaluation (M&E)

M&E methods describe a rather broad family of tools that serve to answer different questions that project stakeholders (donors, recipients, ultimate beneficiaries, etc.) may have with regards to an intervention (project, programme or country/region-wide development plan). Consequently M&E methods create a feedback loop in the intervention which enables the determination of its success. While some tools are designed to do both, monitoring and evaluation have significantly different functions.

In theory, M&E helps organisations to learn from past experiences, improve their service delivery, improve planning and resource allocation and demonstrate results as part of their accountability to key stakeholders (World Bank, 2004; Holvoet *et al.*, 2012). M&E also

provides project managers with regular feedback on the extent to which the project is on schedule to meet planned/expected activities. Often development agencies establish their own M&E systems and insist on the collection of specific data to meet the accountability requirements of their own governments (or to satisfy their political agenda) (Segone *et al.*, 2009; Holvoet *et al.*, 2012; Newcomer *et al.*, 2013).

2.2.2 Summary: the role of overseas development assistance

The purpose of this section was to gain an understanding of the role of ODA and highlight issues in the methods. This is important as an output of this PhD research is to give recommendations for improved project implementation {Chapter 7}.

Currently, success is measured based on the priorities and targets (measurable indicators) of donors, because they fund the majority of projects (IEA 2011a). These measurements of success are conducted during and at the conclusion of construction and do not include an evaluation of longevity. To illustrate, measurable indicators such as ‘the number of households electrified’ do not indicate the power provision necessary to (i) adapt to the changing power needs of communities and (ii) enable profit generation. The latter of which is a key component of poverty eradication efforts. However, projects funded by ODA money have strong financial incentives to achieve the measurement indicators. This unfortunately results in the needs and opinions of the end-users being overlooked throughout the project cycle.

An examination of the project cycle demonstrates that programmes and projects are pre-designed even before the community is identified. Even at later stages, such as implementation, projects are subjected to influences which are external to and separate from the beneficiary community. In this way, UPVs of project beneficiaries are often completely circumvented.

2.3 Case study overview

Uganda was selected as the case study country for this PhD work because of the researchers past experience working in the country, its rapid speed of development and its high degree of financial inequality. The majority of Ugandans that live below the

poverty line live in rural areas. Therefore in order to provide benefits to the maximum number of people, rural areas of Uganda are the focus of this PhD research. The researcher was able to leverage existing contacts in order to set up research programmes in rural villages.

Uganda is in SSA. In this research SSA provides the widest step in narrowing down to rural Uganda. In contrast to other areas, it is predicted that SSA is going to lag behind when it comes to energy access, the reasons for which are described below.

2.3.1 Sub-Saharan Africa focus

Globally, the number of people without access to electricity will considerably decrease by 2030. However, SSA goes against this trend as population growth rates are predicted to outpace electrification rates. This is expected to lead to a continued rise in poverty (Practical Action, 2012). The lack of projected development is not just an energy problem but is symptomatic for SSA, as was highlighted by UNDP (2017):

Despite outpacing global human development growth rates over 15 years, sub-Saharan Africa remains burdened by the world's most uneven distribution of development gains, with women, girls, people living in rural areas, migrants, refugees and those in conflict-affected areas systemically left behind.

Consequently, the affected areas in SSA require particular attention because of the low electrification rate of community services. Primary schools, for example, only have a 35% electrification rate (Practical Action, 2013). This is one of the lowest electricity access rates in the world (with the global average at 50%) (*ibid*). There is an internationally recognised need to increase electricity access in rural areas of SSA, and the UN has emphasised the need to accelerate progress in this same area (UNDP, 2012).

2.3.2 Uganda focus

The Republic of Uganda is a landlocked country bordering Kenya, South Sudan, the Democratic Republic of Congo, Rwanda and Tanzania. Uganda is amongst the fastest growing countries across Africa, with an average GDP growth rate of 5% from 2009 to 2014 (AfDB *et al.*, 2016). However, across different sectors there is unequal growth. To illustrate, strong growth can be attributed to the construction and manufacturing

industries while there is an average decline of 0.4% in the ‘electricity, gas and water’ sector (AfDB *et al.*, 2016). In 2015, Uganda received US\$1.3 billion in financial direct investments (FDIs) from the Overseas Development Institute (ODI). This strong investment corresponds to Uganda being recognised amongst the top ten countries for doing business in the world since 2011 due to their favourable business reforms (World Bank, no date). Furthermore, Uganda has been identified as one of twelve high-impact countries⁸ in SSA (SEforALL, 2013). A recent publication by the SEforALL stressed that progress towards energy targets is highly dependent on the efforts of high-impact countries (SEforALL, 2013).

In addition to financial direct investments, Uganda has received US\$1.05 billion in remittance (gifts of money sent abroad), making it the fifth largest receiver of remittance money in Africa (AfDB *et al.*, 2016). However, the wealth in Uganda is not distributed equally. With a Gini coefficient⁹ of 0.44, the country experiences huge inequality with regards to income and wealth distribution (World Bank, 2017). This inequality, coupled with low life expectancy, education and per capita income, ranks Uganda amongst the bottom 20% of the ‘Inequality-adjusted Human Development Index’¹⁰ (IHDI) (UNDP, 2015).

The lack of development in Uganda, despite the aforementioned financial flows into the country—together with the researchers’ previous work experience in Uganda—and the favourable business environment that has resulted in a large influx of social enterprises that enter the Ugandan market, has fostered the decision to focus on Uganda as a case study country.

⁸ High-impact countries have a high deficiency in electricity access and a low electrification rate. They offer the most potential to make rapid progress (SEforALL, 2013, p. 98).

⁹ Gini coefficient is an index of inequality (a value of 1 means absolute inequality and a value of 0 perfect equality) (Grainger, 2009).

¹⁰ The IHDI considers life-expectancy, education and income and is taken as an average across the population.

2.3.2.1 *Rural Uganda focus*

Uganda has a population of 39 million (World Bank, 2016c) and has one of the lowest electricity access rates in the world—placing 14th of 58 countries in Africa (IEA, 2016). As of 2014, 84% of the population live in rural areas and of these only about 12% have electricity. In contrast, 52% of those living in urban locations do have access to electricity [*ibid*]. In Uganda, like in any other country, the energy sector plays a central role in the economy. Thus energy poverty exists in all levels of Uganda but is particularly strong at household level in rural areas—rural communities constitute 94.4% of Uganda’s poor population (UNFPA, 2012). Hence 7.1 million, out of the total 7.5 million Ugandans below the poverty line, live in rural areas [*ibid*]. Therefore, in order to provide benefits to the maximum number of people, rural areas of Uganda are the focus of this PhD research.

2.3.2.2 *Off-grid energy situation in rural Uganda*

Energy is seen as the engine of economic growth and development and a vital input for all productive and social sectors of the economy (AfDB *et al.*, 2016) as described in Section 2.1.1. Uganda has one of the highest population growth rates globally, and to meet this ever-increasing energy need and foster development, the country cannot rely on centralised energy systems alone (Eder *et al.*, 2015). In Uganda, the rate of rural electrification will not keep up with the pace of national population growth. By 2022, national population levels are predicted to increase by approximately 8 million people¹¹. Future development plans in Uganda include extensions of the grid. However, these are not planned to reach as far as rural areas with poor road access (World Bank, 2016a). Rural areas near roads connecting towns sometimes receive grid connections from transmission lines provided to the towns, but more remote communities away from roads are highly unlikely to be provided with grid connections. In line with this, the government has announced that there are 1.4 million planned rural energy connections through mini-grids by 2022 (Oirere, 2017).

¹¹ This has been calculated using a population of 39 million in 2016 (World Bank, 2016c) and a modest yearly predicted population growth of 3.2% (UNFPA, 2012).

In the past, there have been numerous governmental initiatives that sought to address energy poverty in Uganda, and the most significant are listed here:

- In 2000 the second poverty eradication action plan was launched and included the development of energy services at household level including the promotion of efficient cooking technologies and smart subsidies for rural electrification (MFPED, 2000).
- Inaugurated in 2001, the Government's 'Rural Electrification Strategy and Plan' (RESP) was established to "improve the performance of the sector, focusing on measures to accelerate electricity access while ensuring program efficiency and sustainability" between 2001 and 2010. Following delays to the implementation of the Bujagali hydropower project, the programme ceased in 2012 (REA, 2013).
- In 2001, an organisational collective was established to manage Uganda's rural electrification program, comprising the Rural Electrification Agency (REA), the Rural Electrification Board (REB) and the Rural Electrification Fund (REF). Within these agencies, REA is responsible for developing and promoting rural electrification (ERA 2009).
- In 2002 the Ugandan Government inaugurated its Renewable Energy Policy 2002 which follows the commitment of the National Energy Policy 2002 to develop the use of renewable energy resources in Uganda. It intended "to make modern renewable energy a substantial part of national energy consumption" (ERA, 2012, p. 1). This was reinstated in the REP 2007.
- Most recently and still ongoing, in 2013, the second phase of the RESP was launched. With a similar sentiment to its predecessor, the aim is to accelerate electricity access and service penetration through to 2022. By the end of this period, the government plans to achieve a rural electrification access level of 26% (Oirere, 2017). Furthermore, they set the ambitious target of a national access rate of 51% in 2030 and 100% by 2040. As part of this, the programme has a component of replacing traditional forms of energy (such as kerosene lighting and biomass cooking) with modern forms of energy by 2030 (REA, 2013).

In line with these ambitious targets it is of paramount importance to take stock of what is important to rural communities in Uganda. Energy access alone without further consideration given to the community does not ensure that the success of a project.

2.4 Theoretical orientation: the user-perceived value

Based on literature, in this section the theoretical orientation of user-perceived value (UPV) is introduced.

Creating value for the beneficiary is particularly important for project acceptance and the sustainability of a scheme once it has been handed over to the local community and as such can be used as a tool for communication. To date little attention has been given to creating a link between potential project benefits and what communities actually perceive as important. Moreover, stated benefits rarely extend beyond those that are most obvious or already commonly seen (such as those arising from electric lighting). Accordingly, understanding value as it is defined by the users themselves is crucial.

The following sections reviews some of the existing methods and tools for assessing UPV and considers where these might go beyond commonly used needs assessments. UPV in the context of rural electrification is discussed next before the section concludes with a definition for UPV.

2.4.1 Review of needs assessments

The aim of this review is to analyse existing methods and tools that are already used to identify the needs and priorities of rural communities, and to highlight their strengths and weaknesses.

It is widely acknowledged that gathering appropriate and sufficient data on the ground informs the process of developing an effective product or service to address beneficiaries' needs and wants (Prahalad and Hart, 2002; Davies, 2011; Kolk *et al.*, 2014). In line with this, development organisations and NGOs commonly use needs assessments to better understand their targeted communities. The literature review reveals that there is a wide variety of assessments that seek to identify needs and wants of project communities. The most commonly used in a development context are summarised in Table 2.

Table 2: Comparison of existing tools used to identify beneficiaries' needs

Type of Method	Strengths	Weaknesses
Pair-wise Comparison Method: The pair-wise comparison technique is used to prioritise multiple options. It can be used to prioritise or rank needs or possible solutions (e.g. interventions or activities) (Kumar <i>et al.</i> , 2002; Narayanasamy, 2009; Watkins <i>et al.</i> , 2012).	Structured method for comparison. Helps to understand the decision-making process. Investigates the reasons behind preferences. Can be used individually and in group settings. Stimulates discussion.	Choices have to be comparable. Relies on predetermined choices for comparison which are based on the subjective opinion of the facilitator. Limited to less than 10 items to be compared.
Matrix Ranking and Scoring: Requires the participant to rank choices (putting them in order) and add a score (weight given to the different choices) (Narayanasamy, 2009).	Easy to conduct thus can be done by participants themselves. Can be used with illiterate participants. Can be used individually and in group settings. Can act as a stimulant for discussion. Gives insight into decision-making process. Provokes discussion in a group setting.	Choices have to be comparable. Relies on predetermined choices for comparison which are based on the subjective opinion of the facilitator.
Document or Data Review: An evaluator collects important data through the review of existing documents and previously collected data or research (Witkin and Altschuld, 1995).	Good for triangulation. Gives insight of existing understanding.	Relies on existing data to highlight needs. Quality of data can be questionable. May not provide required information. Can be time consuming. Has a focus on facts rather than differing perspectives and priorities.
Rapid Appraisal (or Key Informant Interviews): Key informants with knowledge of the area give insight with regards to the topic or issue (Kumar <i>et al.</i> , 2002).	Easy and fast to collect. Gives an overview of a topic.	Relies on the subjective opinion of the expert as to what they perceive to be important for the beneficiaries.
Delphi Technique: Goes beyond the rapid appraisal as it requires experts to come to a consensus through anonymous questionnaires (Rowe and Wright, 1999; Hsu and Sandford, 2007).	Iterative process requires experts to reflect and evaluate their contributions. Discussions are anonymous which may lead to deeper insights. Facilitates equal contribution.	Relies on the subjective opinion of the expert as to what they perceive to be important for the beneficiaries. Time consuming. Requires long-term engagement from experts.
Focus Group Interviews: Facilitator presents a group of participants with questions designed to yield insight	Encourages discussion among group members. Can give unexpected results.	Relies on the topic or issues of discussion to uncover needs.

Type of Method	Strengths	Weaknesses
into to a specific topic or issue (Tipping, 1998).		Risk of going off-topic—requires a good facilitator.
Nominal Group Technique: The technique provides a structured process for working with group members to prioritise their ideas, concerns, or other decision inputs in a format that is inclusive and builds consensus (Marti-Costa and Serrano-Garcia, 2001).	Facilitates equal contribution from all group members. Provides a set of prioritised solutions.	Relies on the topic or issues of discussion to uncover needs. Fails to uncover the underlying drivers.
Face-to-face Interviews: To conduct interviews with a single person on an issue or topic—format can vary (Crandall and Salem, 1998).	Allows for why-probing. Can adapt to the interviewees need. Interviewee may offer insights that they are not willing to talk about in a group setting.	Questions are subjective to the interviewer. Time consuming as many need to be asked for a balanced perspective. Requires the interviewee to ask the right question to uncover needs.
Field Work and Observation: Researchers observe a particular group in their own environment and make recommendations regarding needs based on their observations (Sandhu <i>et al.</i> , 2007).	Allows a focus on specific area of interest. The natural setting can give a richer understanding of the subject.	Relies on the subjective opinion of the observer. Time consuming. Fails to uncover motives behind actions.
Draw and Write Technique: Involves drawing pictures concerning an aspect of the participant's life or experience and then labelling or describing the drawing (Backett-Milburn and McKie, 1999).	Requires little or no literacy skills. Non-intrusive, cost effective and can be used with individuals and groups.	Time consuming. Difficulty in expressing desired aspects in pictures. Most meaningful or relevant aspect may not be recorded.
World Café: Moving between groups, participants discuss topics in small, intimate conversations, cross-pollinate ideas and make new connections around questions that really matter to their life, work or community (Watkins <i>et al.</i> , 2012).	Not limited to a certain number of people. Easy to set-up. Can give quick insights into a topic.	Risk of being facilitator-driven. May fail to uncover underlying issues. Cross-pollination may send discussion in wrong direction.
Photovoice: Participants use video and/or photo images to capture aspects of their environment and experiences and share them with others. The pictures can then be used to facilitate discussion (Wang and Burris, 1997).	Not limited to a set of stimuli. Can give a true reflection of what is important, as stimuli are collected by participants. Can uncover participants underlying ideas through discussions with others.	Requires a technical understanding. The need for external probes may cause participants to get distracted from the task. External probes may change short-term value perception.
Root Cause Analysis: Participants are required to reflect on their personal opinion with regards to a topic/issue. The interviewees are then further questioned through why-probing (Watkins <i>et al.</i> , 2012).	Can uncover the underlying cause for the topic of concern through why-probing.	Relies on the interviewee to identify predominant problems prior to questioning. Risk of participants giving false reason due to further probing.
Flow Diagrams: Seeks to identify (and visually represent) causes and the	Can uncover underlying causes and shows complex link between.	Based on subjective opinion of the expert.

Type of Method	Strengths	Weaknesses
relationships between the causes (Narayanasamy, 2009).	Link micro with macro-realities. Suitable for illiterate participants.	Risk of being facilitator-driven. Identification of wrong failures/problems can lead to misleading results. Complex and time consuming Requires in-depth probing to uncover deeper causes.

The 14 methods shown in Table 2 are generic in their form; most of the methods and tools are not unique to the needs assessment process. Most tools reviewed above can produce ambiguous results as a consequence of one or more of the following problems: being susceptible to subjective influences or interpretational issues, lacking in consistent application or lacking the ability to delve deeper into the complexity of motivators and priorities. The value of these tools is defined by their application; a needs assessment is only valuable if it is carried out before a decision on how to act is made. This requires the interviewer to ask questions which will uncover needs and wants. This is also highlighted by Watkins *et al.* (2012, p. 65), who state “despite this unpredictability, your needs assessment must define and prioritise needs and then must support decisions about what to do”. The users of such tools need to link the beneficiaries’ needs to a project in an aim to close this need gap.

However, as a result of the potential misconceptions generated from such tools there is a failure to uncover the beneficiaries’ priorities without project bias (Watkins *et al.*, 2012). To elaborate, needs assessments that are linked to rural electrification projects, for example, tend to focus on the energy need and the technical requirements instead of taking an unbiased approach and identifying what may be most important to project communities (USAID, 2006; Masangwi, 2015). Additionally, since villagers will usually know why the needs assessment is being conducted (e.g. for rural electrification), a bias towards stating electrification as a need is introduced. Further to this, with the exception of Flow Diagrams and Root Cause Analysis, most of the tools discussed above fail to reveal complex values such as aspiration, morality or time benefit which may impact on peoples’ project acceptance. Therefore in order to better realise these complex needs a new, value-driven technique for attaining more accurate understandings of villager UPVs

is proposed. However, before the researcher outlines the proposed system, it is important to understand the role of value-theory and to define UPV.

2.4.2 The role of value in marketing and product design

The lack of consideration given to the specific needs of project communities was evident from the:

- project reports and applicable indicators available from agencies active in the sector {see n Table 1.
- Table 1, Section 2.2}; and
- previous review of needs assessments {Section 2.4.1}.

Learning from marketing and product design literature, there is an opportunity for rural electrification projects to incorporate the value perception of the end-user and extend the success of projects beyond the commonly used criteria of financial value, appropriateness of the technology, capacity building and community ownership {described in Sections 1.1 and 2.1.2}. Value is an approach common to marketing and product design but has not yet found its role in the uptake of development initiatives—the need for its consideration in development was highlighted earlier in Chapter 1 {Section 1.1}.

In marketing and design practices it has long been recognised (as early as the 1990s) that product demand and the end-user's perception of personal product value influence the product's success (Allen, 1999; Boztepe, 2007b; Borgianni *et al.*, 2013). This is epitomised by Nurkka *et al.* (2009, p.451) who state that “individual values have a significant impact on consumers' inclinations to adopt new products”. In conventional marketing (employed predominantly by for-profit private businesses) the focus is on presenting products or services as meeting the ‘needs’ or ‘wants’ of consumers by hooking onto existing value profiles. Thus the provider may seek to convince the consumer that their existing ‘need’ (e.g. hunger) can be satisfied by a specific ‘want’ (e.g. a hamburger from a fast food outlet—the product) through messaging that appeals to existing values of the consumer (e.g. time saving [fast delivery], affordability [low cost], appealing [taste]). In contrast to profit-making businesses, development schemes have a predominantly not-for-profit humanitarian character, thus focusing instead on understanding end-users' apparent ‘needs’ for appropriate design of development

initiatives and then typically seeking to change UPVs through awareness-raising campaigns. Such an approach is illustrated in the ‘Light in Dark’ campaign where the aim was to raise public awareness regarding the role of energy access through targeted messaging (EnDev, 2014)¹². Although awareness-raising can itself serve as a development instrument, in that it aims to educate the public on important social, economic or health issues, as a marketing tool it often fails to link ‘needs’ and ‘wants’ in the minds of consumers. Instead, it is better to attempt to convince the user that what has been developed to meet their need is something they want. A case in point is where the Shell Foundation aimed to introduce into rural Indian households specific designs of ‘improved’ cook stoves (object or ‘want’) with the aim of reducing indoor air pollution arising from conventional open fire cooking and the resulting respiratory health issues (developmental ‘need’). However, following the initial awareness-raising campaign, which used messaging centred on the health benefits of the products, product uptake was poor. This position reversed when the Shell Foundation instead introduced the ‘Room to Breathe Campaign’. By adopting a more user-specific marketing campaign, the Foundation brought notable success through the alignment of advertisement messaging with (existing) gender-specific values of the end-users (Bishop *et al.*, 2010). The marketing reflected that women placed great importance on improved cleanliness in the household arising from reduced smoke emission, whereas men prioritised the money-saving aspects of ‘improved’ cook stoves [*ibid*]. The Shell Foundation has since become an advocate of fully embracing corporate thinking in accelerating energy access with a focus on transferring market skills and commercial returns for energy products (Shell Foundation, 2014). This, however, is an isolated example. To date, appropriate marketing for lower-income consumers has so far focused mainly on identifying the most successful communication channels, such as radio, television commercials and road shows; but the vital message needed to trigger an understanding of how the product aligns with the actual customers’ needs has been largely neglected. One reason for this may be that marketing,

¹² Other examples of this would be trying to market solar energy in Indonesia by focusing on ‘light for learning’ or ‘business never sleeps’.

linked to bargaining and sales, is far from the culture of not-for-profit NGO's or development agencies. Instead it is associated mainly with commercial enterprises and perceived to have negative connotations in the development context. Therefore, identifying UPVs is important both for appropriate project planning and design and appropriate messaging.

2.4.3 Understanding value-theory in the context of rural electrification

Value is a broadly used term, and different value theories are unique in their approach towards analysing UPV (Graeber, 2001). However, concepts of sociological value most often refer to the cultural, social and individual behaviour of people within communities (Hitlin and Piliavin, 2004). According to Woodall, who assessed 90 different value studies, there are three common strands that describe value. Value is (Woodall, 2003):

- (i) inherent in or linked to the use of the product, service or object (**value in use**);
- (ii) something perceived by customers rather than objectively determined (**value in experience**); and
- (iii) a trade-off between what the consumer receives and what he or she gives up to acquire for a product or service (**value in exchange**).

These three strands, together with a fourth proposed by the sociologist Baudrillard (1998) – **value in sign** – are further described below:

- **Value in exchange.** Within the economic paradigm, a product or service has a certain value to individuals. This theory assumes that customers make a decision to purchase at the point of product exchange. This is in line with the theory of Kotler (1994) and refers to trading one form of value, usually monetary, for another form of value. This shows their willingness to pay (WTP) an agreed amount for a product or service (Zeithaml, 1988; Modi *et al.*, 2005; Narula *et al.*, 2012). In rural electrification, the WTP can be tested through, for example, auctions of solar products (GTZ and GIZ EnDev, 2010; Mayer-Tasch, 2010). While this theory is more applicable to products, it is still relevant for off-grid energy projects as communities are often expected to commit to the scheme through the provision of their labour prior to implementation and are required to pay for the service (ESDA, 2003; GIZ, 2011).

- **Value in use:** The ‘value in use’ strand refers to the value perceived by customers when using a product or service (Woodruff, 1997). This relates more to the user's practical experience when interacting with their purchase. In rural electrification, value is predominantly created through the service experience (Holbrook, 1999). This is particularly true for remote areas and countries with extremely low electrification rates (e.g. SSA). Nevertheless, customers may still hold a certain level of expectation with regards to electrification. For example, mobile phone usage across SSA increased from 27% in 2010 to 43% in 2016, even reaching highly remote areas (GSMA, 2016). This leads to greater awareness about the need for electrification, as people need to charge their mobile phones.
- **Value in experience:** It has been attested that the consumer desires a product or service for the associated emotive experience or interaction and not necessarily for practical reasons (Pine and Gilmore, 1998; Holbrook, 1999). This is, however, user-subjective. Experience can be active or passive (known as ‘trying’ and ‘undergoing’ respectively) (as seen in Holbrook, 1999; Wagner, 1999). In rural electrification an example of passive experience would be the ability power a television to watch programmes and the emotive experience gained.
- **Value in sign.** The prestige (social status) of a product or the service rather than the value of the actual object, its function or the user value derived from it referred to as value in sign (Baudrillard 1998). A recent study has shown that one of the perceived benefits from electricity in rural villages is improved social status (Matinga and Annegarn, 2013). This is in line with Veblen and Mills who highlight that goods may be valued because of the prestige that comes with them (Veblen and Mills, 1953). For example, in emerging economies people may strive for a product or service because it resembles the lifestyle of the Western world (Ger and Belk, 1996). Additionally, as many of the rural population may desire an urban lifestyle, rural electrification may initiate countryside urbanisation or ‘urban living’. This desire for ‘urban living’ is believed to originate from its association with improved development and opportunity (Brauw *et al.*, 2014).

Creating value by broadening the perception of a ‘product experience’ rather than just ‘product use’ is seen as the predominant factor for product success (Boztepe, 2007a). This

has to some extent been acknowledged in the development of energy products for emerging economies (such as solar lanterns or biomass stoves), and this is highlighted in a number of reports (Schlag and Zuzarte, 2008; Cordes, 2011; Shrimali *et al.*, 2011). The distinction between product experience and product-use is, simply put, one of form and aesthetic versus practical function. In a development context, such design considerations have started to occur. To illustrate, some products are developed in conjunction with the colour preferences of end-users. These design considerations are further illustrated in the following example, whereby a product developer designed a lamp that resembles the sun (UNDP, 2016). The lamp was developed as an introduction to sustainable living for children and thus the product was imbued with an educational and aesthetic appeal in addition to its functional use—increasing its chance of being valued by the end-user. Outside of this user-focused design, research on rural electrification does not draw sufficient attention to the importance of user-perceived value with regards to the overall success of a project or value creation on service delivery.

Further to the above, value can be classified as an extrinsic value (also known as instrumental value or contributory value). This includes the direct benefit(s) exhibited from the use of the product or service (e.g. improved lighting). These extrinsic values can lead to the accomplishment of further outputs which is not an end in itself (intrinsic value) when seen from an end-user perspective (Holbrook, 1999). An example of this may be reduced eye-strain (intrinsic or secondary) resulting from the improved lighting (extrinsic or primary). Both value types are relevant to beneficiaries.

2.4.4 Definition of user-perceived value

A number of different definitions for value exist. For example, Justin Longenecker, J. Petty, Leslie Palich (2013, p. 424) offers the following definition of values: “the extent to which a good or service is perceived by its customer to meet his or her needs and wants”. Schwartz’s definition goes further; he describes value as “desirable, trans-situational goals, varying in importance that serve as guiding principles in the life of a person or other social entity”. Schwartz (1994, p. 21)

However, this researcher believes that these definitions are insufficient to describe UPV in the context of infrastructure development.

Taking the example of rural electrification, understanding the UPV of project communities is important in order to appreciate their real motivations and the drivers for wishing to adopt and sustain an electrification scheme. Beneficiary values in relation to a rural electrification project may include, for example, the flexibility of the power output, the novelty of the project and the sense of safety the scheme provides through street lighting. However, as highlighted by a number of researchers (Zeithaml, 1988; Woodruff, 1997; Holbrook, 1999), the degree of value differs between objects, individuals or groups and circumstances (time, location and environment). For rural electrification, while the electricity may not be provided by the same power source and the amount of power produced may vary, the service provided (the electricity) remains the same; but the extent to which the service is valued and the way in which it is used can be different. This further exemplifies the different uses and experiences a rural electrification project may provide {as described in Section 3.3}. Consequently, the perceived value differs between beneficiaries.

Hence, to reflect on the complex set of values and motivators {described in Section 2.4.2} that determine what is important to rural communities, the following definition for user-perceived value was adopted in this research:

User-perceived value (UPV) refers to the benefits, concerns, feelings and underlying drivers that vary in importance and act as the main motivators in the lives of the people—as perceived and defined by the beneficiaries themselves at a given time.

UPVs can be broken up into three categories: primary, secondary and tertiary. The first two categories are in line with the extrinsic and intrinsic value categories described in Section 2.4.3. However the researcher has decided to include a third category to encompass UPVs with more abstract associations. The three categories were derived by the researcher and are used as a means to discuss the complexity of UPVs. This is not to say that any of the categories are of lesser importance but to show that motivators can be complex.

To illustrate, a primary UPV (or immediate goal) of a mobile phone would be the ability to communicate [*communication*]¹³. This is the most obvious association. A secondary UPV might be cost savings associated with not having to travel long distances to talk [*operational expenditure*]. A tertiary UPV might be the ability to pay school fees; because of transportation cost savings there will be more money to pay for school fees [*school fees*]. Tertiary values are further removed from the initial product/service selection and as such they are more abstract as there may be no direct link between, in this case a mobile phone, and the UPV.

This illustrates the layered motivation in which villagers may express a topic of personal concern that indirectly links a product/service to a UPV category. Thus, the link between UPV and the actual product/service may not be immediately apparent. This is important to consider in planning electrification development projects as the benefit from rural electrification schemes goes beyond power output and can lead to long-term positive development when designed properly.

2.5 Chapter Summary

Firstly, the aim of this chapter was to better understand the role of rural electrification in contributing to the eradication of poverty in rural developing communities. The benefits of rural electrification and the barriers to its sustainable development were also discussed. The chapter also provided a brief introduction to the role of overseas development assistance; understanding ODA is important as it provides the biggest source of funding for energy access globally and this research seeks to influence how rural electrification projects are implemented. The case study context, including the sector and country, was also introduced. Finally, the chapter closed with an overview of value-theory and how this can provide a useful basis from which the success of rural development projects can be assessed. A definition for UPV was also developed.

¹³ Note, throughout this PhD thesis, UPVs are marked in italics and square brackets.

3 RESEARCH DESIGN

This chapter briefly outlines the theory, structure and methodologies used to address the research topic, **‘Improving the sustainability of rural electrification schemes: Capturing value for rural communities in Uganda’**. This chapter explores the following questions:

- What is the research theory?
- What structure does the research follow?
- What is the research methodology?
- What specific methods govern this research?
- What are the assumptions and limitations of the research?

These elements largely dictate the design of the study (Flick, 2006) and therefore need comprehensive examination. Section 3.1 will explain the terminologies used to characterise the research theory while Section 3.2 further describes the adopted structure. Section 3.3 focuses on the research methodologies and the specific research methods that govern this research. Section 3.4 briefly outlines the specific sampling approach. In Section 3.5 the methods for data analysis are discussed. Section 3.6 briefly addresses the ethical considerations and lastly Section 3.7 reviews the assumptions and potential limitations of the research.

3.1 Research theory

This research adopted a constructivist (ontological) perspective, which was aligned with the epistemological perspective of pragmatism, further discussed below.

3.1.1 Ontology: constructivism

Constructivism is a term coined by Jean Piaget in 1967 and refers to how humans make meaning in relation to the interaction between their experiences and their ideas (Piaget, 1968). This research is underpinned by a belief in the social construction of knowledge and the influence of technology on society and society on technology. In short, the importance of beneficiary values (UPVs) in the ability to successfully deliver, in this instance, energy access projects. This perspective supported the idea that an ontological position grounded in social ontology was appropriate for this research. Guba and Lincoln (1989 p.43) argue that the constructivism paradigm denies the existence of an objective reality “asserting instead that realities are social constructions of the mind, and that there exist as many such constructions as there are individuals ...”. Furthermore, Bryman (2012a, p. 33) implies that “social phenomena and categories are not only produced through social interaction but [...] are in a constant state of revision”.

This is in line with Rokeach (1979) who believed that personal values are unique and are shaped by a person’s surrounding environment. This implies that a person’s view of ‘the world’ is moulded by experience: hence their values may change. For example, a rural villagers’ perception of whether they are poor may change if they were to witness a ‘Westerner’s lifestyle’ first-hand—say, through watching a Western television programme—despite there being no change in their own circumstances (Layard, 2005, p. 73).

3.1.2 Epistemology: pragmatism

In this research epistemology, or the study of knowledge, was investigated based on a practical application. Also known as pragmatism. According to Creswell (2002, p.13), pragmatism is followed if “knowledge claims arise out of actions, situations, and consequences [...] instead of methods”. He goes on to convey that “the problem is most important, and researchers use all approaches to understand the problem” (Creswell, 2003, p. 11).

Pragmatism is commonly used in research embedded in a social context (Evans *et al.*, 2011) and is known for its mixed method approach, which is both qualitative and quantitative (Onwuegbuzie and Leech, 2005). The pragmatic paradigm allowed for the

research method to be defined around the research problem (Cherryholmes, 1992). It therefore follows that pragmatism was appropriate for this study as it adopts a more exploratory approach towards an issue which is not well defined to date.

3.2 Inductive research structure

This research largely respects an inductive research structure. Principally because identifying and solving a problem first requires the collection and analysis of data to understand its root cause. In addition to this, this researcher's personal professional experience in the field triggered interest in this research area for which there is limited pre-existing data.

Induction refers to the process of collecting and analysing data to construct a theory (Saunders *et al.*, 2009). Working inductively is commonly used in topics that have limited available literature, as is stated by Saunders *et al.* (2009, p.127):

With research into a topic that is new, is exciting much debate, and on which there is little existing literature, it may be more appropriate to work inductively by generating data and analysing and reflecting upon what theoretical themes the data are suggesting.

This approach fitted with the need to address the status quo that currently pervades research and development work on rural electrification {as described in Chapter 1}. This was re-enforced by the point that the UPV method does not have any preconceptions.

Inductive research is working from the bottom-up. The researcher initially formed a tentative hypothesis which was based on the researcher's observation stemming from the practical work experience. This formed the pretext of this PhD research.

3.2.1 Research methodology

In line with the epistemological perspective of pragmatism, a concurrent mixed method approach was applied to the investigation of value-theory in the context of rural electrification.

Concurrent mixed method research simultaneously integrates quantitative and qualitative research into a single investigation (Bryman, 2012b). This is in accordance with the inquiry of pragmatism which does not hold a singular worldview (Creswell, 2002) and

has been reflected in the different research methods adopted as part of this research. The benefits of such a flexible approach are also explained by Greene (2008, p.20):

A mixed methods way of thinking is an orientation toward social inquiry that actively invites us to participate in dialogue about multiple ways of seeing and hearing, multiple ways of making sense of the social world, and multiple standpoints on what is important and to be valued and cherished.

Accordingly, initially values of significance were identified from the literature, these were then revisited and modified based on the findings from the UPV game.

3.3 Specific research methods

This research adopted five key methods, namely: literature review, a user-perceived value game, energy-specific and non-energy specific interviews and key informant interviews. These are further discussed in detail below.

3.3.1 Literature review

In line with Knopf (2006), the aim of the literature review described in Chapters 1 and 1 was to:

- (i) summarise claims and findings from prior research on rural electrification and value-theory;
- (ii) enable judgement on how precise and complete that information is; and
- (iii) help to understand the role UPV can have in the context of rural electrification.

3.3.1.1 *Interdisciplinary literature review*

As previously discussed in Chapter 1, a tentative hypothesis of this research was that the UPVs of benefiting communities are not fully taken into consideration in the planning and implementation of rural electrification projects. To facilitate integration of UPVs into project planning and implementation, and communication, this research applied value-theory to development work {Section 2.4}. Value-theory is common in disciplines such as marketing or product design, but has not been applied to rural electrification to date. Hence this research was interdisciplinary, drawing on ideas from one field and applying them to another. This aligns with the area of inquiry of pragmatism due to the fact that

rural electrification is inherently interdisciplinary—technical, environmental, social and economic aspects play important roles during project design and implementation (Iliskog, 2005). Consequently, information should be drawn from a wide variety of sources (Acutt *et al.*, 2000). Interdisciplinary research allows for flexibility and freedom in the research design as it is not constrained by the theory and methods of only one discipline (Szostak, 2012).

3.3.1.2 *Development of a conceptual framework*

A framework for the assessment of UPV of rural electrification was developed from the literature review {this process will be addressed in Chapter 1}. Initially, important value attributes were identified from value-theory literature. These attributes were then applied in the context of rural electrification. The framework sought to give an overview of what is, per literature, perceived to be important with respect to UPV for rural electrification. This provided the starting point for the final framework developed as part of this research {Chapter 1}—a UPV game—discussed below.

3.3.2 User-perceived value game

A ‘User-Perceived Value game’ was proposed to better understand what users of development initiatives find to be of value. The UPV game was created as it bypasses the interviewees’ predispositions and preconceptions by redirecting the focus of the participants to the game itself—instead of trying to assume or second-guess the forthcoming solution. All the while, the game also seeks to identify UPVs. The game was developed as other needs assessment tools {reviewed in Section 2.4.1} were deemed insufficient to recognise UPVs. The game avoids the shortcomings set out within Table 2. It was specifically designed to ascertain the underlying reasoning as to why something is important to beneficiaries (UPVs) and was based on methods commonly used in market research and product design (these are discussed in the following Section).

The UPV game was conducted with a variety of different groups and required participants to select items based on which were most important to them. Participants also had the option to identify new items or matters of value to them. This was followed by an inquiry as to why the selected items were important. The game specifics are discussed in Section

3.3.2.3. In this research a total of 17 interviews were conducted in each of the seven study villages that made use of the UPV game (equating to a total of 119 interviews).

3.3.2.1 Overview of mechanisms that informed the development UPV game

As described above, the UPV game focuses on deducing value from indirect links to avoid project bias and was developed using methodologies common to product design and market research. In marketing practices it has been widely acknowledged that consumers are usually unable to articulate their needs, wants, and values (Ulwick, 2005; van Kleef *et al.*, 2005; Pinegar, 2006). The main reason for this is that they are often not aware of their own motivation. This has also been highlighted by Ulwick (2002, p. 97) who states, “coming to an understanding of what customers value is a far more fruitful exercise than merely asking them to submit their own solutions”.

In light of the above, it is this researcher’s opinion that it is imperative to look at other means to capture what is important to project communities. Table 3 below is a review of existing consumer research methodologies used for the indirect identification of personal values.

Table 3: Comparison of five consumer research methods for indirectly assessing User-Perceived Value

Type of Method	Method Summary	Key features
Empathic Design (Leonard and Rayport, 1997)	Empathic design is the process of identifying 'hidden' user needs by seeking to understand, through observation, the behaviour and of the observed participant(s) in their own environment and routines.	<ul style="list-style-type: none"> - Observation. - Need focused. - Drives innovation.
Free Elicitation (Trijp <i>et al.</i> , 1997); based on theory by (Collins and Loftus, 1975)	Participants are asked to verbalise what comes into their mind with regard to certain products. They can be presented with a memory prompt (usually words). Their first statements are assumed to carry the most significance.	<ul style="list-style-type: none"> - Storytelling. - Memory prompt.
Repertory Grid (Easterby-Smith, 1980; Trijp <i>et al.</i> , 1997)	Participants are asked to compare a triad of stimuli (products) out of a larger product set. They are required to state attribute(s) indicating why two are similar but different to the third. This method is used to identify which attributes are important in the participant's perspective as well as seeking to understand the participants' way of thinking.	<ul style="list-style-type: none"> - Person-centred approach. - Can be applied for a wide variety of contexts and purposes. - A matrix of products vs. attributes can be generated.
Laddering (Reynolds and Gutman, 1988)	Laddering is a method of enquiry through which participants link their personal reasons for preferring a particular product to distinct attributes. The interviewee is then questioned 'why' further, and through their answers these attributes are translated into characteristics and subsequently into values.	<ul style="list-style-type: none"> - Captures people's core values and beliefs. - The participant's product attribute is questioned (why-probing).
Zaltman metaphor elicitation technique (ZMET) (Zaltman and Coulter, 1995); (Coulter and Zaltman, 1994)	The ZMET technique requires participants to collect pictures that represent their thoughts or feelings with regard to the topic of interest. Several days later, in an interview setting, the participants give an account as to why they selected their chosen images; often in the form of a story.	<ul style="list-style-type: none"> - Participant selects stimuli. - The participant's reasoning is questioned (why-probing). - Storytelling. - Sorting exercise (participants rank their choices).

All the methods discussed in Table 3 above adopt an indirect means of identifying personal values and are predominantly used in marketing research. Despite their successful application in that context, the following strengths and weaknesses for identifying the UPV in a developmental context have been identified {Table 4}.

Table 4: Key strengths and weaknesses of consumer research methods for identifying User-Perceived Value in a developmental context

Type of Method	Strengths	Weaknesses
Empathic Design (Leonard and Rayport, 1997)	<ul style="list-style-type: none"> - No influences on participants' behaviour or responses; true representation of culture, environment, and behaviour. 	<ul style="list-style-type: none"> - Fails to reveal user-perceived value; focuses instead upon the observer's perception of the participant's need.

Type of Method	Strengths	Weaknesses
		<ul style="list-style-type: none"> - Building trust with participants to get true insight into behaviour and environment can be time consuming.
Free Elicitation (Trijp <i>et al.</i> , 1997); based on theory by (Collins and Loftus, 1975)	<ul style="list-style-type: none"> - No influences on participants' response. - Uniformity of enquiry through the use of prompts. 	<ul style="list-style-type: none"> - Stops short at attributes perceived as important by the participant, i.e. does not investigate the 'why'. - The assumption that the first thing comes to mind is of greatest importance is questionable.
Repertory Grid (Easterby-Smith, 1980; Trijp <i>et al.</i> , 1997)	<ul style="list-style-type: none"> - Tries to understand participant logic. 	<ul style="list-style-type: none"> - Not suitable for comparing across a variety of stimuli (goods or services). - Fails to investigate the real 'why' as it is limited to the product array.
Laddering (Reynolds and Gutman, 1988)	<ul style="list-style-type: none"> - Captures people's core values and beliefs through why-probing. 	<ul style="list-style-type: none"> - The interrogatory nature of this method may lead to interviewees giving answers they think the interviewer wants to hear. - Requires skilled interviewers to move participants from attribute to value. - Risk of participants giving false reason due to further probing.
ZMET (Zaltman and Coulter, 1995); (Coulter and Zaltman, 1994)	<ul style="list-style-type: none"> - Not limited to a set of stimuli. - Can give a true reflection of what is important, as stimuli are collected by participants. - Understanding people's core values and beliefs through 'why' probes. 	<ul style="list-style-type: none"> - Requires a technical understanding. - The need for external probes may cause participants to get distracted from task at hand. - External probes may change short-term value perception.

Following the above assessment of the strengths and weaknesses of the five consumer research methods, a common drawback was identified. None of the methods of identifying value is appropriate to a development context. To elaborate, all of the methods considered in Table 4 are subject to one or more of the following flaws, they are:

- not appropriate for an illiterate sample group;
- subject to changing the short-term value-perception through the use of advanced technologies; and
- not simplistic in their interrogation to account for the large set of different languages and the subsequent need of different investigators throughout a study.

This is in line with Gallarza and Saura (2006), who highlight the lack of methodologies to measure customer value in a development setting. This researcher decided that a 'game' was most appropriate to identify 'what is important' as opposed to asking participants directly. This is in accordance with Ulwick (2002, p. 94) who states that

“customers don’t really know what they want”. He also highlights, “customers should be asked only for outcomes—that is, what they want a new product or service to do for them” (Ulwick, 2002, p. 92).

The UPV game drew on the ‘laddering’ method and the ZMET¹⁴ described in Table 3 and Table 4, as these were considered the most appropriate to the development context.

3.3.2.2 *Application of UPV game in field work*

To conduct the UPV game with rural villagers in Uganda the researcher employed translators. This was necessary as in the four different regions in Uganda five different languages are spoken. To ensure consistency in the data collected, the researcher led a two-day training session with the translators prior to the fieldwork {shown in Figure 4}.

Figure 4: Training session with translators held at Makerere University



During the field work, each translator was required to take notes throughout the interviews and make a recording of interactions with interviewees. Further to ensure

¹⁴ Note, these are similar to the ‘Root-Cause-Analysis’ and ‘Photovoice’ methods respectively discussed as part of the review of needs assessments {Section 2.4.1}. Their main difference to the ‘laddering’ method and ‘ZMET’ lies in the application.

consistency across all villages, a local research assistant was hired to accompany and oversee the entire field work.

Despite the training course there was great deviation in the quality of work amongst the translators. Some translators delivered more detailed stories from interviewees resulting in a richer data set. To minimise the deviation in quality, the researcher and the research assistant oversaw the interaction between interviewer and interviewee.

Despite these precautions, one set of interviews had to be re-transcribed from the recording and a second set of interviews was completely re-done as the recording was of poor quality.

3.3.2.3 *Narrative of the UPV game*

The UPV game was semi-structured in the form of storytelling, encouraging discussion of topics which resonated with each participant's experience. It made use of the standard focus group method of a group interview, consisting of six participants (Narayanasamy, 2009; Bryman, 2012a; Silverman, 2013). Equal numbers of participants were selected from each gender (6 women and 6 men), and there were also a variety of backgrounds and ages. These consisted of five group interviews and 12 individual interviews, each one including six participants as follows:

- men (individual);
- women (individual);
- men (group discussion); and
- women (group discussion).

Following the initial male and female sessions, the three most active participants of each group were asked to participate in a mixed gender discussion group. Finally, men were asked to discuss the solutions proposed by women and vice versa—giving a more complete insight into the underlying decision-making.

The reason for conducting the game in a variety of settings (i.e. individual, group male/female/mixed) was to obtain results representative of the community given the complex nature of different influences in human decision-making. People have personal preferences but these may change in specific group settings. Thus to record the UPVs of the community as a whole, UPVs were identified within different settings but were

aggregated and analysed collectively to generate a composite community profile (this is in line with the constructivist ontological perspective of this research which believes that values change based on the specific setting and experiences). Additionally, by initially taking into consideration the inputs of all individuals, this technique allowed for all participants to have an equal say, regardless of their position within the group (Gallagher *et al.*, 1993; Barry *et al.*, 2008).

For each round of interviews (except men/women discussing womens'/mens' choices), participants were asked to select 20 out of the 46¹⁵ presented items based on what is important to them. Items were not specifically related to electricity, but instead revolved around everyday products or services found in rural areas of Uganda. Playing the game with such a wide variety of items (rather than selections focused on energy/ electricity) had the benefit of removing unintentional bias and thus makes it applicable to the wider development context. Items included, but were not limited to:

- livestock (e.g. cow, chicken);
- basic electronic gadgets (e.g. mobile phone, television, radio);
- household goods (dishes, soap, blanket); and
- horticultural items (e.g. plough, hoe).

Participants could also name any additional items they perceived as important. For a full list of the initially presented items refer to Figure 26 in Appendix I and for a full list of items selected by participants refer to Table 14 in Appendix I¹⁶.

The initial selection of items was based upon the 'game' developed by Peace Child International (Peace Child International, no date); and, with the support of national and international experts from Uganda, these were adapted to a Ugandan context and represented graphically. The decision to represent such items graphically stems from the low level of literacy across developing countries (UNESCO Institute for Statistics,

¹⁵ There were a total of 89 items, these were agglomerated to a total of 46. An example of this would be to include 'chairs', 'table', 'sofa' as part of 'furniture'.

¹⁶ To conceal the identity of participants, pseudonyms were used.

2013)—an average of 43% of people in Uganda are illiterate; rural areas are the worst affected (World Bank, 2016b).

Following item selection, participants were asked to:

- Rank their selection in order of importance [Ranking]. Whilst, in this research, the ranking was not considered during the analysis, it forced participants to think more closely about their selections instead of simply choosing items at random.
- Give reasons as to why these items are most important to them personally. [Why-probing]. At this stage, participants were encouraged to give reasons (“*why is this important to you?*”) that reflected their personal lives [storytelling].

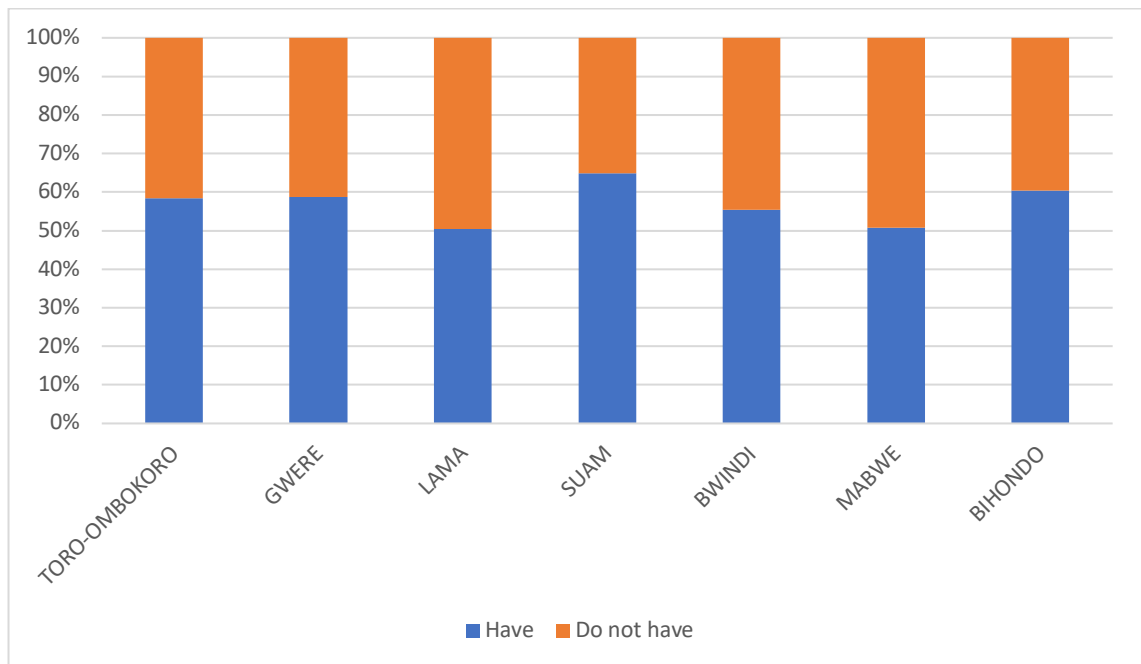
One example of an interviewee’s selection, the reasoning behind it and the respective evaluation is shown below.¹⁷

“If I had solar, I have light in my home [*energy access*] and it can even help my children to read their books [*knowledge attainment*] and pass their exams in comparison to before [*aspiration*]. I can’t eat in the darkness so I have to make sure I buy kerosene which is more expensive than solar [*operational expenditure*]”. Noel, Bihondo

Upon completion of the game, the participants were asked to indicate which items, of the 46 presented to them, they already have. This information was used to establish whether the participants are only selecting items that they already have or vice-versa and whether item selection was independent of this—a summary of this is shown in Figure 5.

¹⁷ The method of codifying the results and the process by which this was done is explained in Section 3.5.1 and is similar to the stories used throughout this thesis to illustrate discussion—UPVs are highlighted in italics and [square bracket].

Figure 5: Percentage of villagers that have/do not have items they selected as part of the UPV game



From Figure 5 it appears that item selection was independent of people having or not having that item. For a full list of items selected refer to Table 15 in Appendix I.

Following the process outlined in Section 3.3.2.3 in each village where the UPV game was utilised, a total of 17 interviews were conducted with 12 participants (equating to a total of 119 interviews and a total of 84 participants). Examples of group and individual interviews using the UPV game are shown in Figures 6 to 10. Each participant received a small financial compensation of UGX 5,000 (£1.25).

Figure 6: Individual interview in Gwere-Luzira



Figure 7: 'Male group discussion' in Bihondo



Figure 8: 'Female group discussion' in Toro-Ombokoro



Figure 9: 'Mixed group discussion' in Mabwe



Figure 10: Individual interview in Lama



3.3.3 Other interviews with villagers

Whereas the UPV game provided the main part of this PhD research, the purpose of both the non- and energy-specific interviews was to provide background data for the research. Both interviews were conducted in a semi-structured way to allow for flexibility. This is particularly relevant when the investigator seeks to gather data within a social context, as it allows for dialogue rather than rigid questioning (Bryman, 2012c). This is also emphasised by Narayanasamy (2009, p.291), “a good lively dialogue [...] helps us to gain more accurate insights into rural situations, problems, customs, practices, systems, values and the way rural people think, act and perceive things”.

To avoid unintentional biases on the selections and answers of the UPV game towards energy, the ‘energy-specific interview’ was conducted on a separate, later visit to Uganda. Similar to the UPV game, the interviews were conducted with help of translators in the local languages.

3.3.3.1 Non-energy-specific interview

A non-energy-specific interview was conducted during the same visit (beginning of 2014) as the UPV game with the same 12 participants in each village. This interview covered the following seven categories: general information; education and employment; living situation; infrastructure; household shocks, borrowing and household debt; subjective wellbeing and social attitudes; and religion and exposure {for the full interview, refer to Appendix II}.

In addition to providing background information, the interview gathered information regarding the villagers’ life stage, external influences and their social, economic and cultural predispositions and perceptions. This was then compared with the participants’ stories and value perceptions that had already been identified using the UPV game and feeds into the discussion section later in the thesis. The socio-economic data gathered through these interviews are graphically depicted in the infographic in Appendix III and informed the analysis and discussion in Chapters 0 and 5.

3.3.3.2 Energy-specific interview

The data collection for the ‘energy-specific interview’ took place during a second visit to Uganda, over two months at the end of 2014. Here interviews specific to energy use were

conducted with 20 villagers in each of the seven villages (totalling at 140 interviews). Different participants were selected for this round of interviews.

The interviews covered the following five sections: general information; personal understanding of the local electricity system; local acceptance and ownership; personal and community impact of the electricity system; and exposure to educational programmes {for the full interview refer to Appendix IV}. The aim of these interviews was to identify the impact of the rural electrification initiatives upon each of the villages several years after original implementation. The interviews were therefore conducted in a semi-structured way {for a detailed discussion on the villages refer to Chapter 4}. This gave an insight into the specific influences of the project on the beneficiaries as well as background information concerning the seven case study villages. Furthermore, the interview investigated how energy initiatives impact villagers' wellbeing from their own perspective.

3.3.4 Key informant interviews

The purpose of the key informant interviews was twofold. Firstly, it was used to gain expert reviews of the UPV framework that was developed as part of this PhD research {for the framework refer to Chapter 4}. Secondly, it was to identify what experts considered to be most important to rural Ugandan communities. This was then compared against what villagers in Uganda perceived as important and gaps were highlighted {Section 6.2}.

The 70 experts came from a wide range of backgrounds and covered a broad range of sectors, including public sector, private sector, social enterprises, NGOs and research institutions. Their disciplines span across 14 of the 17 United Nations sustainable development goals (SDGs) (UN, 2014), with the majority of people having more than five years of experience in their respective field of work {refer to Appendix V for details on experts}. The questionnaires were anonymous and collected using a piece of software called Qualtrics (2015). All questions were structured, containing only close-ended questions to remove any scope for ambiguity. The following questions were included {for the full set of questions refer to Table 18 in Appendix V}:

- Which of the following 64¹⁸ values are perceived as most important by those who live in Uganda's rural settlements? Please tick the 10 values that you think people value most. Experts could also name any additional UPVs they perceived as important.
- Rank selection in order of highest [1] to lowest [10] priority for rural villagers.
- How confident are you with each of your recommendations (ranging from not confident, somewhat confident, confident, very confident)?

It is important to note that the key informant survey did not question why the specific values were selected. Experts were also asked to provide information with regards to their background (gender, age and current residency), work experience (sector, years of work experience in sector, field of work in relation to SDGs and job title) and Uganda-specific experience (years of experience, years of rural work experience, regional focus in Ugandan and confidence with regards to understanding the Ugandan context).

3.4 Sampling

In this section, the specific sampling considerations are discussed. A number of samples from specific populations were taken at different stages of this research. Sampling is a process in which observations are made based on a sampling group of the population (Marshall, 1996). This section looks at the specific sampling considerations applied to case selection, villagers' focus group members, interviewees and experts.

3.4.1 Case selection

This research sought to identify case villages that provide a representative sample of a population of rural Uganda that could then be interviewed. In the context of qualitative research, sample cases are selected based on the research question posed. This is referred to as purposive sampling (Bryman, 2012c). In this research, cases were selected based on a purposive sample using a critical case sampling technique,¹⁹ as recommended by

¹⁸ As per final UPV framework discussed in Chapter 5.

¹⁹ Critical case sampling refers to a technique whereby participants or groups are selected that are likely to yield the most information and have the greatest change of helping to develop new knowledge.

Bryman (2012c, p.419), “Sampling a crucial case permits logical inference about the phenomenon of interest—for example, a case might be chosen precisely because it is anticipated that it might allow a theory to be tested”.

In line with the question set out in this PhD research, villagers that had benefited from off-grid energy access were selected and focussed upon. The reason being that, in order to effectively improve the sustainable implementation of future rural electrification projects, the strengths, weaknesses, opportunities, and threats associated with past and present projects need to be identified and better understood. Further, the following selection criteria was applied to select each village:

- The nature of the project including longitudinal project implementation history dating back 5 years or more.
- Different project characteristics and sizes—common factors but a range to give a sense of diversity.
- This researcher’s prior knowledge of villages and thus a deeper understanding of the project contexts.

3.4.1.1 Case study villages characteristics

A brief summary of the seven case study villages is given below; for detailed information on each of the villages and the energy access project in each village refer to Chapter 4 or the Infographic in Appendix III.

The seven case study projects are located in four different regions across Uganda, namely the West Nile Region located in Northern Uganda; Mount Elgon Region in Eastern Uganda; the Bwindi National Park in South Western Uganda; and the Ruwenzori Mountains in Western Uganda. These are shown in Figure 11 below, and are as follows:

West Nile Region

1. Okabi village Solar Project
2. Gwere-Luzira Self-Help Electrification Project (1.5kW)
3. Lama Solar Project

Mount Elgon (Eastern Uganda)

4. Suam Micro Hydro Community Project (40kW)

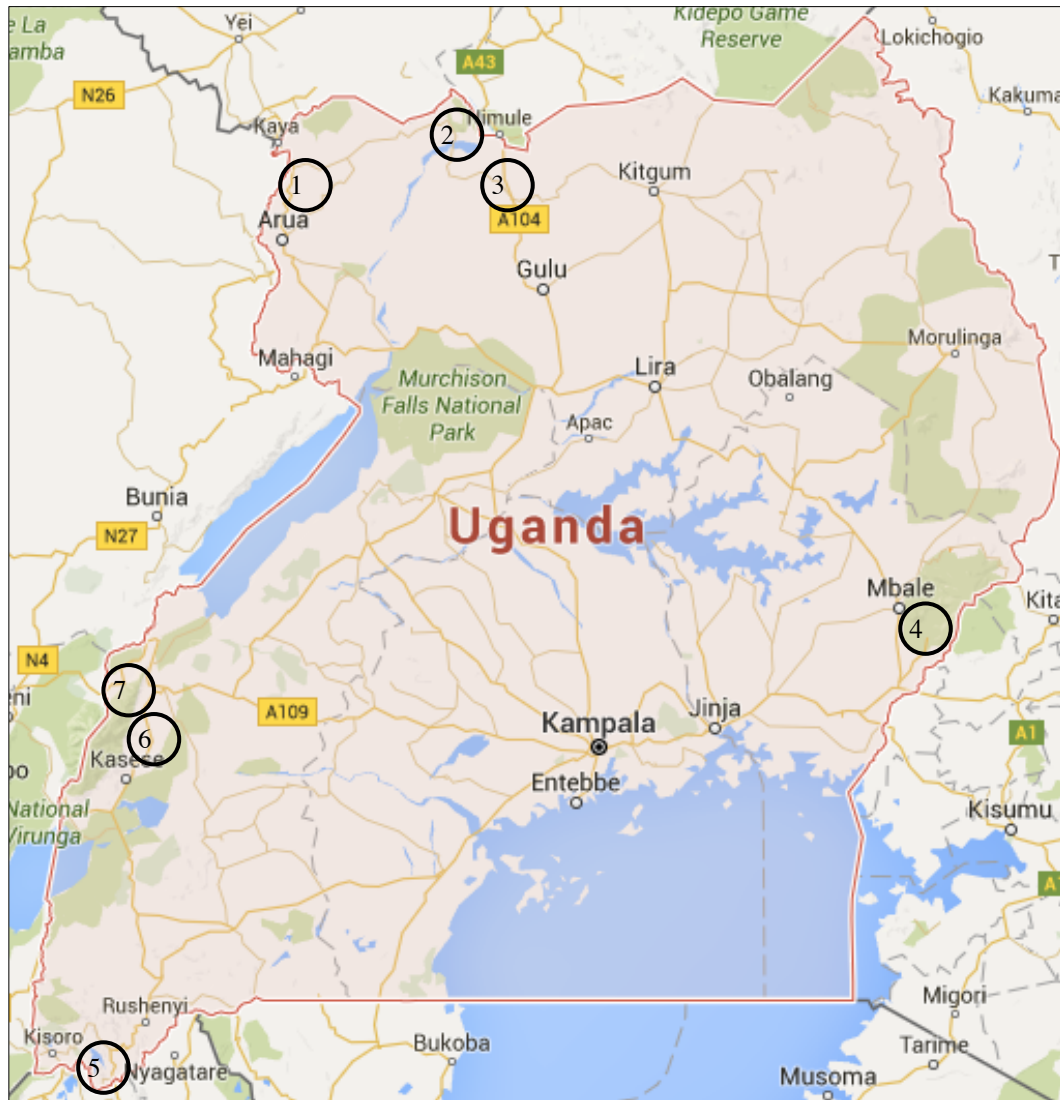
Bwindi National Park (South Western Uganda)

5. Bwindi Micro Hydro Community Project (64kW)

Ruwenzori Mountains (Western Uganda)

6. Mabwe Small-Scale Hydropower Project (2kW)
7. Muhingy Small-Scale Hydropower Project (1.5kW)

Figure 11: Seven case study site locations across Uganda



The seven case study villages are located in four remote regions in Uganda. At the time of the research, the settlements were far from the main roads, making it unlikely that the national electricity grid will reach them in the near future—despite the unfulfilled promise in Bwindi. Each village possessed a distinct village centre beyond which dwellings were more scattered. Aside from Bwindi and Mabwe, it was difficult to access the five

villages—access to Suam in Eastern Uganda and Lama in the West Nile Region was particularly difficult during the rainy season. The relative isolation of all villages greatly limited the economic activity occurring beyond the confines of internal economic trade such as local markets. In five of the studied villages, the main source of income was from subsistence farming and animal rearing—in Bwindi and Mabwe employment was more diverse and included a range of non-agricultural employment and business ownership. Five of the seven villages were powered by community hydropower projects and two by solar home systems (SHSs).

3.4.2 Villagers' focus group meetings sampling

The UPV game was conducted in a multitude of settings mainly consisting of group discussions {described in Section 3.3.2}. Discussed below is the sampling pertaining to these focus groups followed by individual participant selection for the same focus groups.

According to Flick (2006, p.198), “The number of groups you should conduct depends on your research question and on the number of different population subgroups required”. Concurrent with literature (Bryman, 2012c), five focus group meetings in each of the seven case villages with six participants in each group were held, giving a total of 35 focus groups. Each village group was initially separated into male and female participants to facilitate equal gender participation (as female participants in the rural Ugandan village setting may be less likely to voice opinions in the presence of male participants) (FIDH, 2012). This is in accordance with Bryman (2012d) who suggests that members can be selected based on the topic investigated and separated into specific groups.

As outlined by Kitzinger (1994), the selection of focus group participants is paramount. Particular attention was paid to the composition of the group as well as group interaction. Hence members were selected to represent the diverse interests of the village, e.g. large family, farmer or female head of household (Bryman, 2012c). Table 5 sets out the focus group purposive selection criteria²⁰ applied to each village.

²⁰ Also known as judgement, selective or subjective sampling. The method relies on the researchers judgement to select participants.

Table 5: Participant Selection Focus Groups

Category	Focus groups should consist of...
Age	... varying age groups (18+)
Gender	... one gender group i.e. male or female
Culture	... similar ethnicities
Religion	... similar religious beliefs
Social	... different social classes
	Focus groups should not consist of...
Relatives	... close relatives
Leaders	... leaders of organisations or governmental officials
Aggressors	... dominant or overpowering individuals
	Focus group participants should...
Residents	... have lived in the village prior to the construction of the power project
Available	... be available the entire lengths of the session
Willing	... be willing to work with translators
Newcomers	... have not participated in any focus group in the previous six months

ADAPTED FROM KARIM (2009)

Equal numbers of participants were selected from each gender, and there was also a variety of backgrounds and ages. For details on the participants refer to Appendix I. Note, the same people participating in the UPV game were asked to take part in a non-energy-specific interview.

3.4.3 Villagers' interview sampling

Here the sampling method for the energy-specific interview is discussed. The same criteria used for the participant selection for the UPV game was applied with the exception that participants that took part in the UPV game could not be interviewed as part of the energy-specific interview. This was to avoid any possibility of participants' answers in the interview being biased towards the game.

There is great variation on the guidance regarding how to determine valid sample sizes for qualitative interviews. Bryman (2012d) suggests that 20–30 people is the minimum needed to support an argument and more than 150 produces too much material to analyse. Weller and Romney (1988, p.77) wrote, “when we are interviewing about culture patterns or items with high agreement, reliable and valid answers can be obtained with small numbers of informants”.

In line with this twenty interviews were conducted in each village, resulting in a total of 140 interviews. For details on the participants interviewed, refer to Appendix IV.

3.4.4 Key informant interview sampling

Here the specific method for expert sampling is described. For information of the 70 experts interviewed as part of this research, refer to the infographic in Appendix V.

This research followed the guidance of Woodhouse (1998, p.132), whereby “the selection of informants is driven by the investigators’ need to test or clarify elements of their evolving hypothesis about the issue they are testing”. Bogner, Littig and Menz (2005) stress that experts must have both expertise and practical knowledge. In line with this, criteria were established to help identify those experts best placed to answer what is important to rural communities in Uganda, as follows:

- first-hand experience working with rural communities in Uganda,
- a minimum of one year of relevant experience,
- work in an area related to the sustainable development goals.

Initial expert selection stemmed from this researcher’s personal work experience in rural Uganda (using judgement sampling) as well as targeted outreach to development practitioners with work experience in Uganda including organisation and groups. Initial contacts were asked to recruit further contacts from their acquaintances (snowball sampling²¹). Background information was collated to ensure the abovementioned research criteria were met.

3.5 Data analysis

Discussed below are the main methods used to analyse the data gathered as part of this PhD research.

²¹ Snowball sampling refers to the process whereby existing study subjects recruit future subjects from among their acquaintances (Saunders et al., 2009).

3.5.1 User-perceived value game

The 117 interviews from the UPV game were initially transcribed into English by the translators. With the help of the computer-assisted qualitative data analysis software HyperRESEARCH (Researchware, 2015), the interviews were then coded (or indexed). This was done using a qualitative analysis process called cross-sectional indexing²² (Mason, 2002). This method was chosen as it allowed the researcher to compare themes across interviews by specific codes: in this case UPVs. The reasons the researcher chose to use this software-driven cross-sectional indexing method was to ensure consistency across interviews for each specific code, as the large volume of codes and subsequent scores (each time a code was chosen) put emphasis on the importance of consistency in data processing.

This coding was an iterative process. Indexing categories were initially recorded based upon the ‘User-Perceived Value Framework’ of rural electrification {discussed in Section 1}. Based on the coding guidelines by Bryman (2012b) and following the initial indexing category selection, additional categories began to emerge throughout the analysis of the interviews (open coding) until finally an exhaustive list of codes was generated. Afterwards, codes were revisited and defined to be inclusive of all values but mutually exclusive where possible. To ensure consistency of the use of categories, all scores were revisited several times. Statements linked to specific codes were then compared against one another, resulting in a total of 64 codes²³. The three examples below illustrate the use of codes, highlighted in [square brackets] and italics.

Example 1. Noel²⁴ a man from Bihondo in the Ruwenzori Mountains chose a television because [Television]:

²² Cross-sectional indexing allows the researchers to compare themes across interviews by specific codes (Mason, 2002).

²³ Coding took place vertically (individual interviews) and was followed by a comparison across codes (horizontally). The process of defining, merging, adding and removing codes was repeated several times resulting in a total of 64 codes from an initial list of over 100 codes.

²⁴ For the purpose of concealing the identity of participants, pseudonyms were used.

“If I have a television; I can get first class news around the world [*Access to information*] [*Quality*]. I can start up a business showing football to people. It becomes a source of income for me and my family [*Income generation*] and also entertainment for my family as well [*Entertainment*]. In my village when you have a television, you are referred to as a rich person [*Reputation*]”.

Example 2. Women in a village in the West Nile Region discussing why the men in their village may have selected corrugated iron sheets [*Corrugated iron sheets*]. Their reason is as follows:

“The reason is the suffering they face from using grass, which can be eaten by termites and rats. They make holes on the roof where sun rays and moonlight go directly into the room [*Unburden*]. When it rains, the water wets everything in the room including people who sleep there [*Contentment*] [*Reliability*]. Iron sheets are durable [*Durability*]; accidents of fire are common and it mainly affects grass-thatched houses, everything in the house can just burn into ashes within the shortest time [*Safety*]”.

Example 3. Scola, a widow from Bwindi village, chose a flush toilet because [*Flush Toilet*]:

“If I have a flush toilet in my house I think I can be the king of all kings [*Reputation*] as I don’t have to go out on those squatting latrines [*Aspiration*]. By the way you can get diseases on those squatting latrines [*Preservation of health*]. Some diseases are anus itch and Candida. I have never suffered from those diseases. It can protect me from going outside alone. My husband used to escort me to everywhere I used to go, and now I am scared anything may happen [*Contentment*]. And recently I was almost raped by a thug when I escorted my son to the latrine at around 10:30pm in the night [*Security*]. That flush toilet helps a lot for those young children who are just learning how to sit on the toilet because there is no risk that a kid will fall into the toilet; actually we have so many cases in our village of kids that fall into pit latrines [*Safety*] [*Caring*]”

The researcher did not attempt to infer meaning beyond the villagers’ statements regarding why something is important. This is in line with Roulston (2015) who highlights that the challenge faced by those conducting qualitative research is the task of interpreting and reducing large data sets to distil the meaning of participants’ discussions.

Each of the above value tags represented a score of one for each UPV for each village and these were counted and aggregated to generate a UPV profile {for an example of such

a profile refer to the end of Chapter 8}. This regression analysis took place with aggregated data (village-level) rather than on an individual-level. The analysis resulted in a total of 64 values and close to a total of 6,700 UPV scores—how frequently a UPV keyphrase²⁵ was mentioned. The data pertaining to the UPV game provided the main content of the results and analysis sections {Chapter 5}. Quotes from the interviews (like those in examples 1 to 3 above) will be used to support the assertions of the main text.

3.5.2 Other interviews with villagers

Both the non-energy-specific and energy-specific interviews were analysed using a statistical analysis software called SPSS Statistics (IBM Corp., 2016). The main aim of the villagers' interviews was to critically review the information to build up a picture of the case study context {Chapter 4}. Information that was specifically looked for included the specific village context, the personal situation, the perceived wellbeing and, finally, how the specific energy project was considered amongst villagers and its perceived impact (descriptive statistics). This information helped to develop an understanding of each of the cases villages and also highlighted any specific points of interest that could have influenced villagers' value perception.

3.5.3 Key informant interviews

Similarly to the villagers' interviews, SPSS was used to analyse the expert interviews. Comparisons were drawn using regression analysis²⁶ to, for example, draw correlations between the experts' confidence with regards to the selected values and their years of experience. The 70 experts selected ten values each resulting in a total of 51 values (out of the 64 presented) which were collectively analysed. These were then compared against the findings from the UPV game, as is discussed in Section 6.2. In contrast to villagers who selected *objects* in the UPV game, the experts selected from the full set of UPVs

²⁵ A UPV keyphrase is a phrase that links explicitly to a UPV. Keyphrases are graphically depict in the keyphrase wheel shown in Figure 20.

²⁶ Regression analysis refers to the relationship between variables to determine a cause-effect relationship (Saunders et al., 2009).

irrespective of whether these emerged from the beneficiaries. This was in order to employ appropriate data gathering methods for the context by making the survey information and questions easy to assimilate for the respondents' level of knowledge/experience, and to more closely reflect on the way in which development experts make decisions.

3.6 Ethical considerations

When working with human participants, in this case with vulnerable communities, greater care has to be taken regarding ethics (Yin, 2011). To protect the participants from harm and deception and to ensure the integrity of the study, the researcher followed the University of Cambridge's Code of Ethics (Cambridge, 2012)—an ethics risk assessment was completed prior to each visit to Uganda. Dealing with vulnerable communities, it was of paramount importance to the researcher to follow the appropriate protocol for entering the villages and establishing the initial contact. For this, the researcher, with help of local organisations, gained permission from the representative sub-county. A representative would then contact the village chairman. He in turn provided the necessary initial contacts for identifying participants and introducing the research team to the community.

Prior to the start of the interviews, all participants were gathered collectively for the purpose of communicating any specifics pertaining to the research such as the research purpose and the interview protocol. Furthermore, permission to record the interviews and take photos was also gained from the interviewees. Interviewees were given the opportunity to withdraw from the interview at any time. All documents pertaining to interviewees' consent are available in Appendix VI. Because of illiteracy, these were verbally communicated to all interviewees prior to the start of the interviews.

3.7 Research assumptions and limitations

As with all research, the contested aspects of the methods employed should be recognised in order to identify the effects on the data collected and to mitigate these. The following assumptions and limitations of the chosen methodology were identified:

- **Credibility:** Flick (2010) highlights the need for credibility, stating that if credible sources are chosen, a literature review can provide a good baseline to the problem

studied. Further to this, to enhance the integrity of the findings, this research employs a mixed method approach (Bryman, 2012c). This is in line with the concept of triangulation, whereby multiple sources of information are used to test and modify one's understanding (or theory) of a given problem or situation. Taking the example of the UPV framework, the initial framework was based on theory, was peer-reviewed and published in 2014. It was then modified based on the UPV game and tested through experts' opinions.

- **Validity:** The validity refers to the degree to which interpretations of gathered data are credible (Silverman, 2013). The validity of the data can be strengthened if the theoretical framework on which the investigation has been built is credible. Silverman (2013) highlights three possible options for this: include negative cases, consider alternatives or validate through informants. For the purpose of this research negative cases were included, whereby the community has been undesirably impacted by the energy project {discussed in Section 6.2}.
- **Reliability:** According to Hammersley, as seen in Silverman (2013, p. 284), reliability refers to “the degree of consistency with [which similar] instances are assigned to the same category by different or by the same observer on different occasions”.
- Within this research reliability was ensured by following the same methodological design throughout all seven case villages. Further to this, with regards to the coding, all codes were revisited several times to ensure consistency across interviews.
- **Consistency:** Arguably, one of the biggest limitations of this research was working with a multitude of translators. This was necessary because the case villages were located in four different regions of Uganda where different languages are spoken. Whilst all translators were asked to record word-by-word the stories of the villagers there were differences in the manner and quality by which this was done. Each translator had their own interpretation of what was said and how this translates into English. Thus it is unavoidable that some information was lost or altered, unfortunately during this process. To minimise misreporting and avoid summary notes instead of reporting the full story, the researcher checked the notes taken by the translators multiple times a day.

- **Biases:** Biases are inevitable (Marshall, 1996) and can occur from all sides of the investigation (investigator, informant and enumerator). For example, the investigator determines what information is being sought and the informant determines how much information is being revealed (Woodhouse, 1998). In focus groups there may be one type of bias, whereas in semi-structured interviews (SSIs) another. This research takes the position that certain biases are predetermined in the research process, owing to the fact that “people perceive the world differently; therefore reality is relative to each of us. Consequently multiple constructions of reality exist...” (Agostinho, 2005, p. 5).
- Thus, the ‘worldview’ of the researcher shapes the way the research is conducted, analysed and interpreted. As a result the quality and coherence of the findings are affected. Any biases can be considered when known to the researcher (Trembley, 1957). Further to this, during interviews information can be supplemented through the observation of gestures, facial expressions, pauses and local ambience (Narayanasamy, 2009). In addition the researchers influence on the interviewee may lead to false reporting from the interviewee—this may be influenced by the attitude, behaviour and experiences of the researcher (Silverman, 2013). Therefore to minimise biases, a ‘User-Perceived Value Game’ provided the main platform for this research. Introducing a game to the interviewing process diverts the attention of the interviewee away from answering questions in the manner they think the interviewee wants to hear. Furthermore, all questions relating to the energy project were removed from the initial discussion and separated in to an energy-specific interview conducted on a separate visit.
- **Representativeness:** As different villages may hold different values, the findings in this research are specific to each of the seven case villages studied. Therefore, a statistical representation is not suitable for extrapolating and applying these results to other villages. If, however, the results can be verified through a number of case selections, the findings can potentially be associated with a particular theory (Yin, 2009), as is the case in this research. Further, a key limitation of the research is that it has not included any case villages that have not benefited from energy access initiatives. The decision to focus only on such villages was in order to ensure uniformity between the case studies, to reduce influencing factors, as

well as to enable more in-depth data to be collected on project successes and failures from the perspective of communities. Therefore, it is recommended that the UPV framework developed is now tested in a broader range of settings, both in Uganda and abroad, in rural, peri-urban, slum, and city environments.

4 CASE STUDY: ANALYSIS AND DISCUSSION

The aim of this chapter is to help to understand what makes a project successful according to the villagers' perception and to understand the influence of participatory approaches on project success {discussed in Section 4.5}. The case study analysis and discussion is based on the cumulative effect of all questions from the interviews. Furthermore the information presented in this chapter informs the discussion of the results from the UPV game {Chapter 5}.

The seven villages studied as part of this PhD research are discussed within the respective region as follows {reasons for case study site selection were discussed in Section 3.4.1}:

- **West Nile Region:** Toro-Ombokoro, Gwere-Luzira, and Lama villages
- **Eastern Uganda:** Suam village
- **South Western Uganda:** Bwindi village
- **Western Uganda:** Mabwe and Bihondo villages

For each village account of the community organisation and community engagement, the perceived project benefits and the perceived project limitations, as seen by the beneficiaries of the seven case study villages researched as part of the PhD, are given. These are mainly based on the results from the energy-specific interviews {Section 3.3.3.2} but also draws upon the non-energy-specific interviews {Section 3.3.3.1}. Parts of the data collected from the energy-specific survey is summarised in Appendix IV.

For each of the seven villages, a brief account of the location and the background of the electrification project is also given. This is based on project-related documents obtained from the developers—for a list of these, refer to Appendix VII.

Example quotes from the non-energy-specific and energy-specific interviews are included to support the assertions of the main text. For the exchange rate applied throughout this chapter, refer to page xxix.

4.1 West Nile Region

Here the three villages studied within the West Nile Region of Uganda are discussed, namely Toro-Ombokoro, Gwere-Luzira and Lama.

4.1.1 Region background

The West Nile region is located in the north-west of the country along the Congo and South Sudan border. It has an elevation of approximately 1,500 m above sea level. The annual rainfall ranges from 1,200 mm to 1,570 mm. The region has a single rainy season which lasts for 7.5 months from April to mid-November. During the dry season, this region is heavily affected by drought. The population density in this region is sparse, when compared with other regions of Uganda.

The region has experienced years of conflict with, for example, the Lord's Resistance Army causing violence and terror. In contrast to other regions of Uganda, infrastructure development has been lacking. Thus, northern Uganda has the lowest electricity access rate, despite it being inhabited by more than 15% of Uganda's population (GIZ PAMENU, 2011). Furthermore, in contrast to Uganda's average poverty level (of 38%), the poverty level in the West Nile region exceeds 60% (German Cooperation, 2014). These two facts have led to Germany and Uganda's joint decision for German aid activities to focus on this region (GIZ PAMENU, 2011). Discussed below are the three case study projects pertaining to that aid programme.

4.1.2 Toro-Ombokoro village

Okabi village Solar Project is located in Toro-Ombokoro village within the constituency of Arua District, approximately 16 km from Arua Municipality. The village has 108 homesteads sparsely scattered over approximately 5 km²; 98 families live in the main village and 10 live in a nearby valley. Most land in the area is agricultural or grassland. The village can be reached through a 5 km dirt road heading off the main road that connects Arua town with Koboko town.

4.1.2.1 *Project background*

In August 2011, Toro-Ombokoro village was electrified through a 550 W small-scale hydropower project. The electricity produced was used for daytime phone charging and night-time light for the local grocery shop and the 98 homesteads located near the village centre. However, after only a few months of operation, unpredictable climatic conditions and bad water management further upstream of the site (people further upstream diverted water for agricultural purposes) left the Okabi River dry. Following this continuous drought, the resulting decay and theft of equipment, and a standstill of almost 2 years, the project was changed to a solar home system (SHS) in 2013. This change was carried out entirely by the German Development Cooperation (GIZ)—the initial project implementer. Each household was provided with a small SHS providing four lighting points and mobile phone charging {shown in Figure 12²⁷}.

²⁷ The small solar panel can be seen on the roofs of the grass-thatched houses.

Figure 12: Households in Toro-Ombokoro village that received small SHS



4.1.2.2 *Community organisation and community engagement*

For the initial small-scale hydropower project the implementation was based on a ‘community-based participatory approach’ which required the community to participate or contribute in all aspects of implementation including labour, finances and materials. In an aim to minimise the risk of project failure relating to project ownership and lack of project knowledge, support from the district and sub-county was also sought to:

- assist with community organisation and mobilisation;
- give technical assistance;
- help the supervision of project implementation; and
- advise on bureaucratic aspects.

Benefiting community members were required to participate in community work days, provide local materials for civil engineering works (such as stones, poles and sand).

Beneficiaries also had to make a financial contribution of UGX 5,000²⁸ (£1.25), and pay a membership fee of UGX 2,000 (£0.50) (which also entitled them to a reduced mobile phone-charging rate).

Throughout project implementation four masons from in and around Toro-Ombokoro were trained to construct the turbine house, intake and charging station. The objective was to ensure locals were trained in all aspects of the project. The community decided to employ two operators (for day and night shifts) to run the battery-charging station and to ensure the scheme was fully functional. Furthermore, a maintenance manual was provided to the operator and the district.

Following the change to SHS, local people were trained to resolve minor technical issues and a local point of contact was established for major issues, connecting villagers with a solar representative. Villagers were encouraged to save money for replacing the battery in a few years' time as each villager was responsible for their own system.

To date, the majority of people in Ombokoro (90%²⁹) have an SHS provided by GIZ, and all are operational. The systems are only used for home lighting and mobile phone charging and do not provide any income-generating activities. All villagers report that they fully own the system and know the person to approach in case of failure. Nevertheless, in case of malfunction almost all villagers believe that GIZ is responsible for the repair as they are seen to have the technical expertise.

4.1.2.3 Perceived project benefits and limitations

From the energy-specific interviews it was found that, at the time of the interview, the villagers that used traditional lighting sources to augment the SHS spent 50% less on traditional lighting sources, averaging at UGX 6,500 (£1.64) per month in contrast to villagers that did not have an SHS. Despite the reduction of paraffin consumption, 13 of the 20 interviewed villagers that own an SHS used it in combination with a traditional lighting source. Other system benefits reported included:

²⁸ To put this into context, the monthly income (median) in the village is approximately UGX 75,000 (£18.75) {refer to infographic Appendix III}. Currency exchange information is shown on page xxix.

²⁹ Note: The 10% of villagers living in the valley did not receive a SHS.

- improved lighting and security;
- ability for children to read at night, improved health of children (reduced smoke and eye strain); and
- improved hygiene and cleanliness through a reduction of smoke inside the house.

Additionally, some villagers reported increased performance at school of children because of available light to study at night. The following examples were representative of the benefits of SHSs as seen by the villagers:

Ralph: “The solar system has left my main house cleaner than before”.

Rueben: “It has relieved me from unnecessary spending on paraffin; reading has also improved my performance in school. My child also uses it for reading at night—and the children from the village perform better because of the availability of light. My eyesight is working perfectly since the installation”.

The majority of villagers (53%) believed themselves to have ‘remained the same’ as the system was not used for income generation and no new businesses formed in the village. Nevertheless, some villagers reported that they had become slightly better off as their spending on traditional lighting methods has decreased.

Arminda: “Somehow there is slight change with regards to income because people save money from paraffin to do other things”.

Villagers described the following disadvantages of the system:

- limited power during rainy season;
- a need to replace batteries, requiring villagers to save;
- envy from neighbouring villages regarding the SHS system; and
- fear of theft.

Some of these are illustrated in the statements below:

Arminda: “Thieves are threatening us: some solar panels have been stolen”.

Alfred: “It is only limited to the main house and only serves lighting and phone charging. During the rainy season the system is unreliable”.

The interviews revealed that there is a limited understanding of the possibilities of electrification. When asked *‘what each of the different energy systems (including*

generator and grid) can be used for', villagers rarely mentioned anything other than lighting, phone charging and entertainment purposes.

4.1.3 Gwere-Luzira village

The Gwere-Luzira Self-Help Electrification Project is located in the village of Gwere-Luzira in the West Nile region, 8 km from Moyo town in the north-eastern direction. The village has 72 homesteads (approximately 600 people) that form a distinctive village centre. During the rainy season the area has a good level of vegetation; throughout this period many villagers move to their gardens in the mountains to plant their agricultural products. Access to the village is via a 7 km dirt road.

4.1.3.1 *Project background*

In 2008, the 'Gwere-Luzira Self-Help Electricity Project' was initiated by the community in an attempt to access electricity. The project was implemented with support of GIZ and the EU. The main goal of this small-scale hydropower scheme was to provide light to the 72 homesteads in the village of Gwere-Luzira {an example of such a connection is shown in Figure 13} and to create battery and mobile phone-charging facilities at a central e-Shop. The scheme was operationalised in 2011. However, following continual technical failure, the scheme was stopped, approximately two years post inauguration. It has been non-operational since the beginning of 2013.

Figure 13: Home in Gwere-Luzira connected to the small-scale hydropower project



4.1.3.2 Community organisation and community engagement

Before the start of the project implementation in 2009, ten months of community organisation and consultation was undertaken. As part of the community participation, community members had to contribute labour and materials (such as sand, stone and cement) for civil works. Additionally, all adults in the village were required to make a personal financial contribution (men: UGX 20,000³⁰ (£5), women: UGX 10,000 (£2.5)). A compulsory registration fee of UGX 2,000 (£0.5) was charged to all project members. As part of capacity building, a mason was trained during project construction to be able to build hydro-specific civil components (weir, channel and powerhouse). A local

³⁰ To put this into context, the monthly income (median) in Gwere-Luzira is around UGX 67,500 (£16.90); see Appendix III.

welding shop manufactured metal components (e.g. channel section, draft tube and a trash rack).

After the project was handed over, the community, via two elected operatives, was meant to take full responsibility for the daily operation and maintenance (O&M). Funds were generated through the battery and phone-charging service, in addition to tariffs paid by the 72 homesteads. This thorough setup included community participation before and throughout implementation, locally manufactured parts, a local technical team, manuals depicting appropriate operation and maintenance and the committee overseeing and managing operation and maintenance proceedings. Despite this, shortly after the project was handed over problems started to develop as a result of daily maintenance tasks, such as emptying the turbine filter, not being conducted. Subsequently the project became and remains non-operational.

Compounding matters, the community was not able to control the loads. This resulted in a continual power shortage and subsequent brownouts and blackouts, as described by Paul:

“When it rained heavily, the channel would be blocked with rubbish, and water could not reach the turbine and this could not provide adequate power”.

Even though all villagers stated that the project was fully community owned, when interviewed 73% of villagers believed that the implementer was (and remains) fully responsible for the operation and repair of the project. The remaining 17% stated that the project management committee is responsible and one villager stated:

Antonio: “The community should have been responsible [for project repair and maintenance] but there was no official handover of the hydropower system to the community and no training was given”.

It should be noted that an official handover ceremony, where district officials attended, was held. This clearly shows a disconnect between the perceptions of beneficiaries and the project implementer.

4.1.3.3 Perceived project benefits and limitations

During the operation of the project, the people of Gwere-Luzira could identify several benefits. These included the following:

- improved lighting;
- ease of phone charging, including a subsidised rate for phone charging as well as savings from reduced travel costs; and
- the ability to read at night.

Additionally, there was a general sense of improved wellbeing:

Filiberto: “The changes I have observed since the project has reached this village is that those who have benefited from this project are all very happy and say that they are living in the town”.

However, during the time when the project was operational, numerous limitations were also identified:

- envy from neighbouring villages regarding the project;
- limited and unreliable power supply;
- fear of safety from unprotected cable; and
- the fear of missing out from other governmental community development initiative as the village has already benefited.

The latter was described by Antonio:

“Politically we missed out on other government projects coming, as they think the village has already benefited enough”.

Whilst villagers did not see themselves or the community as richer post-project implementation as community change was limited to improved lighting and phone charging, there was a common perception that the status of the community had improved which plummeted after the project failed. The rise and fall of community pride was described by Caesar and Odego respectively:

“Important visitors from outside, including local government officials, came to the village and [the project] also acted as a study centre for students from nearby secondary schools”.

“We used to walk with our heads raised high as there was power in each household, but now we are ashamed for it; other villages are laughing at us”.

4.1.4 Lama village

The Lama Solar Project is located in Lama village in the West Nile Region of Uganda; further downstream of the previously installed small-scale hydropower scheme in Gwere-Luzira Village. There are 94 families in this village. It is 6.5 km from Moyo Municipality in the north-eastern direction. The road to the village is in a poor condition making it difficult for villagers to move outside of the village particularly during the rainy season.

4.1.4.1 Project background

Shortly after the installation of the pilot scheme in Gwere-Luzira, the people of Lama village sought out GIZ for the installation of a small-scale hydropower project. However, due to the technical difficulties experienced in Gwere-Luzira, this was later changed to an SHS project. The system and set-up resembles that of Toro-Ombokoro village where out of the 94 households 74 received an SHS to power four lighting points and mobile phone charging—only the households initially intended for a hydropower connection received an SHS.

4.1.4.2 Community organisation and community engagement

As the project is in close proximity to Gwere-Luzira, the villagers were already aware of how the project would work, and hence only two months of community organisation and consultation were deemed necessary by the implementer. As part of the capacity building, the site assessments for the planned small-scale hydropower project were conducted with community members of Lama village {Figure 14}.

Figure 14: Community members from Gwere-Luzira participating in site assessment for planned hydropower scheme in Lama



Whilst the community was not yet collecting financial contributions, they had started to collect materials for the dam. However, because of the problems experienced in Gwere-Luzira, the project was put on hold. Several years later, together with Toro-Ombokoro, the community received SHSs free of charge. The community were asked to contribute lunch to the installation team, equating to a contribution of UGX 1,000³¹ (£0.25) per benefiting household. The local people received a small amount of training to deal with minor issues, and a point of contact with a solar representative was also established.

Similar to Toro-Ombokoro, despite acknowledging personal ownership, the people of Lama village believed that the implementer is responsible for repairing the solar systems

³¹ To put this into context, the monthly income (median) in Lama is UGX 80,000 (£20.00) {Appendix III}.

in case of failure. The main justification for this is the lack of expertise amongst villagers and the implementer having brought the system to the village.

4.1.4.3 Perceived project benefits and limitations

At the time of the interviews, the SHSs were mainly used for lighting and phone charging. Community members described the following benefits resulting from these functions:

- the provision of light;
- improved education for children as light helps the children to read; and
- reduced workload and expenditure relating to no longer having to purchase paraffin.

The following statements are representative of the benefits stated by the villagers:

Carmelo: “My solar light works nonstop (day and night). I observed great change in terms of children’s education and free lighting systems in the village of Lama”.

Margarita: “It has reduced burden of buying kerosene, we have to move a long distance to purchase. The number of children going to school has increased and also their performance at school”.

It was noted that in contrast to other villages, most people in Lama were extremely grateful for their system and did not state many limitations, other than a reduction in power supply during the rainy season and a fear of theft. One reason for this appreciation may be that Lama is difficult to reach, particularly during the rainy season. This makes it difficult for villagers to stay connected and to purchase goods such as paraffin and thus the project achieved a comparatively larger positive impact, as described by Cuc:

“It has positively impacted us because, as you can see, it is very far for us to go to town to charge phones and also to buy kerosene for the lantern as we do not have a proper functioning trading centre”.

Villagers stated that they have not become richer but had become somewhat better off because of a reduction in their expenditure. 89% of villagers’ stated that there had been no change regarding income generation in the village.

4.2 Eastern Uganda

Eastern Uganda is home to one of the villages studied, namely Suam.

4.2.1 Region background

The region is located in eastern Uganda at the foot of the Mount Elgon. Mount Elgon has a height of 4,321m at its peak on the Ugandan side and is the largest mountain close to the Uganda–Kenya border in the eastern region of the country. The region has one rainy season annually from July to October, with an annual rainfall of 1,030 mm to 1,570 mm. Whilst it is believed that Kenyan fugitives operate in eastern Uganda (planning to overthrow the Kenyan government), in contrast to the western side of Mount Elgon in Kenya, the Ugandan side remains relatively free of conflict as a result of defence forces (Wachira *et al.*, 2009).

4.2.2 Suam village

The ‘Suam Micro Hydro Community Project’ is located 6 km from Suam village. Suam is in Bukwo District in eastern Uganda and is a border-trading centre with Kenya. A seasonal gravel road of 77 km leads to the village. During the rainy season the village can only be accessed through Kenya—albeit with difficulty. The community has 165 households, several grain mills, lodges, hairdressers and video halls as well as a large number of commercial centres (for example restaurants and bars, retail shops, pharmacies). Institutions in the region include the Uganda Revenue Authority (URA) custom office, a police post, immigration office and a primary day school. The major source of income is through farming and the growing and selling of maize and wheat.

4.2.2.1 Project background

In 2014 the people of Suam village received a 40 kW micro-hydropower project (MHP). The project was funded and managed by GIZ, and in June 2016 handed over to the Rural Electrification Agency (REA) who supervised the operation of the project. The project is registered as a limited company with the name ‘Suam-Micro-Hydropower Ltd.’ and is chaired by members of the community. In total there are 116 connections to the project in the village, consisting of two households, seven institutions and 107 small-and-medium enterprises. Almost all those who operate these 107 businesses also live within the premises, thus power is also consumed privately.

4.2.2.2 *Community organisation and community engagement*

The project followed a business approach whereby an independent power producer (IPP) undertook the implementation of the project. This IPP was financed by GIZ. The IPP was required to hire community members who worked in various capacities {shown in Figure 15}, some of which are still employed to date.

Figure 15: Suam villagers employed to construct the channel for MHP Suam



The community paid for the land on which the scheme was built (UGX 3,000,000 or £750).

Against a monthly tariff, which varies in accordance with consumption, the power can be used privately or commercially. The following tariff structure applies:

- Flat rate UGX 5,000³² (£1.25) and UGX 10,000 (£2.50) per month for 0.25 A and 1 A load limiter respectively,
- Meter connection is UGX 450 per kWh (£0.12 per kWh),

³² To put this into context, the average income (median) in Suam is UGX 450,000 (or £113) per month; Appendix III.

- Wiring fee ranges from UGX 300,000 (£75) to UGX 500,000 (£125),
- Connection fee ranges from UGX 50,000 (£12.50) to UGX350,000 (£88) depending on the tariff.

4.2.2.3 *Perceived benefits and limitations*

The interviewees reported that since the installation of the project, Suam underwent great changes and villagers benefited personally as well as commercially. Many new businesses formed and existing businesses improved. The following examples were representative of the comments made by the villagers with regards to this:

Helen: “Bar and hotel businesses have improved; new businesses such as chips and roasting chicken and selling of soft drinks have emerged. The businesses have improved because of light when compared to the past. The community has become richer; they have built houses and business enterprises. They work day and night”.

Simon: “I could travel to Kitale for welding services spending on transport which is now not the case. I have become a little bit richer since the services are near. The community has improved too as a result of various village mates coming up with businesses and this has improved living standards”.

Moses: “Nowadays the money I spend on power is less than the amount I used to spend before; my business can also proceed into the night and I feel secure. The community has improved too because printing, welding and mechanic services are now near, unlike before when we could travel to Kitale or Kapchorua for these services”.

As described above, villagers saw themselves, as well as the community, as richer—either through a direct financial gain or through access to improved services. Only one of the 20 interviewees reported becoming poorer as the low voltage blew his television and kept breaking his light bulbs. Villagers placed great importance on improved entertainment. This was also something that could be observed during the field work—most bars, restaurants and hair salons were equipped with a television and the village greatly benefited from evening entertainment such as a video shows and music. Furthermore, much value was placed on the improved security and subsequent reduction in theft, as outlined by Emily:

“We have music everywhere and at night we feel secure since we can easily identify enemies”.

Other benefits included income opportunities for youths, improved education access as parents have more money to pay for school fees, reduced time and money spent on transportation as services are near, a laboratory service available at the health centre, as well as access to steel doors and windows resulting in the ability to build permanent houses.

Despite this, people in Suam were dissatisfied with the project. The water level is heavily affected by seasons and thus power supply is unreliable. Villagers reported the repeated failure of the system, each time taking several months to repair and blamed the lack of quality machinery for this. This problem was described by Cliff:

“It affects me because my wife does not work and hence my family solely depends on my business and without power we lack food and light at home”.

This had also been emphasised by Benton, a business owner in Suam:

“It is available 24 hours a day providing the level of water is stable. When the season changes, the power is not available since the water level reduces below the standard. If intermittent, it burns up my equipment and reduces my working hours”.

As opposed to other villages, almost all of the interviewed villagers in Suam (85%) agreed that the community owned the project, with the responsible person being the local technician (94%). This was also the reason for the prolonged time to repair equipment related to the project after failure—the community is required to collect the necessary funds which can be time consuming, as stated by Faima:

“It could go for two months before breakdown, but mostly it is just water problems because the turbines are not original and not so good. For minor problems 1–3 days and for major problems it can take like 2–3 weeks to be repaired. I think this is because of the lack of enough money and also how much time is taken in waiting for the technicians, who were initially two but for now there is only one”.

Further to the unreliable power supply and the high failure rate, interviewees critiqued the high connection fee of UGX 300,000 (£75) which makes it inaccessible to the poorer people within the community and the limited power which is not enough to power agricultural machinery, as highlighted by Moses:

“The power voltage is low and hence my dream of having a grinding mill and welding machine will have to wait until the day we shall get stronger electricity”.

4.3 South Western Uganda

One village in South Western Uganda was studied as part of this research, namely Bwindi.

4.3.1 Region background

Bwindi National Park is located within Kisoro/Kabale districts in the Southwest of Uganda. The area experiences two rainy seasons per year with heavy rains from March to May/June and from August to November. The mean annual rainfall is 1,000 mm to 1,500 mm. The area has remained relatively free from conflict.

4.3.2 Bwindi village

The ‘Bwindi Micro Hydro Community Project’ is situated on Munyaga River close to Bwindi Impenetrable National Park. This scheme is in Kanungu District in the South-Western part of Uganda close to the Congo border. Because of its proximity to the National Park the area benefits from national and international tourism. There are 153 households in the village with an approximate population of 826 people. Further to this, there is a trading centre with shops providing services and products, a church and a community hospital, as well as hotels and restaurants to cater for tourists.

Figure 16: Transmission line following road network through Bwindi



4.3.2.1 Project background

The installation of the Bwindi micro-hydropower project was initiated in 2005, completed in October 2014 and handed over to the REA in December 2014. The 64 kW project is a community registered company, 'Bwindi Community Micro Hydro Power Ltd.', with the 'Bwindi Community Hospital' as its main shareholder. The initial project setup was such that both the community and the hospital were beneficiaries of the project.

Following the repeated breakage requiring minor repairs, in August 2013, the hydropower turbine failed beyond repair and required the replacement of the generator. This resulted in a standstill of over one year. The main reason for the high project failure rate was the shortage in supply being unable to meet the power demand, resulting in overloading the turbine. Thus, it was agreed to disconnect the community with the unfulfilled promise to connect the community to the national grid in the near future. The hospital carried the cost of turbine replacement. This decision was made in order to provide reliable, cheaper and better health care services.

To date, there are a total of 32 connections to the project that are as follows: one connection to Bwindi Community Hospital, one connection to the Bwindi Nursing School, and 30 connections to staff houses for the hospital and the nursing school.

4.3.2.2 Community organisation and participation

Both the community and a private company were involved in implementation of the project, with GIZ as the project funder. Similar to Suam, GIZ paid the company and the company was required to hire community members who worked in various capacities. The community paid for the land on which the scheme was built (UGX 4,000,000 (or £1,000)). The following tariff structure applied:

- Monthly tariff was based on meter connection UGX 450 per kWh (£0.12 per kWh)
- Wiring fee ranged from UGX 300,000³³ (£75) to UGX 500,000 (£125)
- Connection fee was UGX 350,00 (£87.50)

The wiring fee and connection fee, paid for by community members that had direct connections, were not reimbursed (or compensated) after the project was disconnected.

4.3.2.3 Perceived project limitations and benefits

During its initial setup of the ‘Bwindi Micro Hydro Power Project’, whereby both community and hospital benefited from the project, all interviewees perceived themselves as better off, as evident from the energy-specific interviews. Villagers describe the following improvements:

- access to information from radios and televisions;
- business opportunity through prolonged shop opening hours—most shops opened until midnight instead of only 8pm and some even operated 24h resulting in a wider customer intake;
- employment opportunity through energy related businesses;
- service delivery from new/improved businesses;

³³ To put this into context, the monthly income (median) in Bwindi is UGX 140,000 (£35).

- time and cost savings resulting from increased service delivery in the community;
- security and subsequent reduction in theft and mugging from street and security lighting; and
- access to educational services through prolonged study hours from improved lighting and boarding services started by schools.

Whilst the decision to disconnect the community was made by the community themselves, many villagers were frustrated as they lost their businesses and were unable to recoup investments into equipment:

Alice: “Income generation has totally declined because so many businesses are now closed due to a lack of power like salons, bars, cinema halls [...]. I am making losses because I had bought my machines to start the business but unfortunately they disconnected us from the power source. [...], I spent a lot of money on buying a Hoover, wire and television but later we were disconnected”.

Furthermore, interviewees agreed that the community experienced a decline in living standards:

Joseph: “It had reduced my expenditure on paraffin and we were informed on what is happening in the world but now we miss all this information. Personally I lost much: I lost news on televisions, light in our houses and music”.

Milton: “I am now becoming poor since the electricity was disconnected but I was becoming richer at the time it was on because I used to charge UGX 60,000 [£15] per month a room but now we only charge UGX 40,000 [£10]”.

Despite this dissatisfaction, some interviewees commented on the power benefit at the hospital to the community. This was described by Bert and Wilfred respectively:

“Now the hospital is working till morning, which never happened before as they used to complain about buying diesel for the generator to run it up to morning”.

“It has improved the standards of the hospital because they used to charge a lot of money to patients because they were spending a lot on buying diesel, but now the charges have decreased”.

Kizza described the benefit the electricity has on the health care services with regards to attracting skilled hospital staff and improved equipment. She stated:

“The hospital has got new doctors and nurses and also new equipment that is used in the hospital”

4.4 Western Uganda

Two villages in Western Uganda were studied, namely Mabwe and Bihondo.

4.4.1 Region background

The two study villages are located within Kabarole district of west Uganda—in the Rwenzori Mountains. It has two rainy seasons, from August to November and March to May. The area is ridden by political and ethnic conflict and is still seen as a ‘boiling point for conflict’. As a result of years of violence, the area is characterised by widows, orphans and desperate communities (Africa4Rafiki, 2016). Despite this, this region, in contrast to other areas in Uganda, is comparatively well off. This can be attributed to the thriving agriculture in the region.

7.6% of the 134,000 households in the district have access to the nation’s electricity grid. In 2012, the ‘100% renewables programme’ was launched to transform the energy supply in the city of Kasese and the surrounding districts by providing clean energy services for all domestic, productive and social needs in both rural and urban areas (Kime, 2016). Since the programme was launched, an estimated additional 26.8% of households have been connected to renewable energy sources (Climate Action Network, 2015).

4.4.2 Mabwe village

Mabwe Small-Scale Hydropower Project was commissioned in 2013 in the village of Mabwe. The power capacity of the project was 1.5 kW. The site is located 8 km from Buheesi trading centre from which an unclassified dirt road leads to the village. Mabwe is on a crossroad or T-junction where vehicles regularly pass through. It has two large schools, a clinic, various shops and a daily market. Mabwe is transitory place where many people rent living accommodation and buy food from shops.

4.4.2.1.1 Project background

The project was started as a result of meetings between the villagers of Mabwe and students and staff from the University of Warwick in 2010; however, these were meetings only to explain what could be done. The actual project construction only started in 2011; the project was completed and commissioned during Easter 2013. There are approximately 100 homesteads in the village (500 people). To date, there are about 68 households, ten shops, one church, one agricultural co-operative, two schools, a clinic and one video hall connected to the project. For reasons of transmission, the electricity is only available in close proximity to the trading centre {shown in Figure 17}.

Figure 17: Transmission line passing through Mabwe



4.4.2.2 *Community organisation and community engagement*

The discussions in 2010 and 2011 between villagers and Warwick University were to clarify with villagers how the management and organisation of project finance could be accomplished. A committee of villagers was elected in 2011 to interface between

Warwick students and staff and the village. It was decided that the following payment structure should apply:

- Registration fee UGX 20,000³⁴ (£5)
- Connection fee UGX 50,000 (£12.5)
- Monthly tariff for light only is UGX 3,000 (or £0.75) per month
- Monthly extended tariff including phone charging and television access UGX 10,000 (or £2.50) per month

4.4.2.3 Perceived project benefits and limitations

Villagers described the following key benefits resulting from the project:

- security improved because of the streetlights and as a result theft has reduced;
- there was improved service delivery—community members could access phone-charging facilities, salons, video halls and dental services;
- the rent and plot value in the trading centre increased;
- there was increased business opportunity as people are selling their products until late;
- reduced expenditure through a reduction of traditional fuels;
- there was improved entertainment through television and radio; and
- education improved from lighting at school.

Some of these were outlined in the below example statements of villagers:

Joakim: “I no longer buy dry cell batteries for use in the radio and I save this money for paraffin to use it for other things, and I also bought a satellite dish so people can watch football without going to Buheesi, which was expensive”.

Agnes: “I personally have benefited indirectly. At night, we have security lights and can sell until it’s late. It reduces on darkness in our area and I can charge my phone from the village instead of going far, and I also use the salons which have started around our area. There is a big change in the village with regards to income generation because people

³⁴ To put this into context, the monthly income (median) in Mabwe is around UGX 200,000 (£50).

work till late and we have two butchers and salons and people eat meat every day which they roast at night which they never used to do before”.

Despite the positive change in the community, many villagers were dissatisfied with the quantity and quality of power produced. Sometimes power was only available for four hours during the evening, but it was weak. The unreliable and intermittent power supply resulted in loss of income, repeated failure of appliances, decline in security and wellbeing and breakage of personal equipment. This was demonstrated by the sentiments below:

Merlin: “When it breaks, personally I can’t easily work at night in my tailoring shop, and at the butcher and this means no money made. Businesses decline and people waste a lot of cash on kerosene and taking phones to Rubona [trading centre] for charging”

Carter: “[when the power is] off and on, my bulbs burn and my radio even got burnt recently and this means my family can’t enjoy themselves. My children can get electric shocks”.

Wilton: “You find the whole area in the darkness and our businesses at a standstill. Children do not read books and security is poor”.

Furthermore, villagers commented on the lengthy repair time—up to two months—as the project was repeatedly overloaded and was regularly broken. The community was required to collect the money to fund the repair which caused delays as some community members were unwilling to contribute, despite benefiting from the project. This may have been linked to the fact that all interviewees believed that the implementer is the owner of the project, and was thus responsible for maintenance and repair—this was despite the vast number of public meetings (exceeding twenty) to explain the arrangements and responsibilities. Furthermore, there was great distrust in the project committee, as highlighted by Norah:

“The whole scheme is full of corruption and confusion so I don’t even want to associate myself with it at all, I only pray that the government brings us the national grid”.

The project continued to experience leadership issues with the project committee.

The majority of interviewed villagers in Mabwe saw themselves, as well as the community, as ‘richer’ because of the project.

Matte: “We have become richer, people come to charge phones, and use the salon they always come to this area which has made it urban. Permanent houses have been built. We never had health centres but we now have big clinics which gives services to the people”.

4.4.3 Bihondo village

Bihondo in the Rwenzori Mountains in western Uganda is home to the 1.1 kW ‘Muhingy Small-Scale Hydropower Project’. The village is located 10 km from Rubona trading centre at the end of a bad and infrequently used road. The majority of its 100 households rely on farming as their only income source. In the trading centre {shown in Figure 18} Bihondo has two small shops, a butcher, a hairdresser, a video hall and a pharmacy. People gather in Bihondo in the evenings for entertainment purposes and to attend the small market.

Figure 18: Bihondo village trading centre



4.4.3.1 Project background

In 2009, a small-scale hydropower scheme was initiated, designed and implemented by students from the University of Warwick, UK. The project was funded by a grant from the ‘Engineering and Physical Sciences Research Council’ (EPSRC) and the Arthur Shercliff travel scholarship. The project was implemented over a period of two months. The 1.1 kW of power were originally used to provide light to the shops at the main trading centre, a light at the market square and to power a battery-charging station as well as a ‘cinema’. Like in Mabwe, over the years the community experienced management issues during which large sums of money, intended for the operation and management of the scheme, were purportedly stolen.

After a new committee was elected, the project was developed further with support from Warwick University, resulting in its expansion. There are 54 households, four shops, one school, four churches, and one video hall connected to the project.

4.4.3.2 Community organisation and community engagement

The technical implementation of the project took approximately four weeks and was led by the team from the University of Warwick. The community contributed local labour in exchange for a salary equivalent to the average daily wage in the area. Despite the wage, the workforce attendance was unreliable. Additionally, locals were required to provide materials and give the land rights on which the project was constructed to the project. Throughout the project’s lifespan, the community was required to collect money to pay for the reoccurring repair of hydropower machinery—this is still applicable.

At present, to receive a connection, villagers are required to pay a UGX 50,000³⁵ (£12.50) connection fee as well as a UGX 5,000 (£1.25) monthly tariff. Some villagers criticised the high connection fee and monthly tariff, as they were unaffordable for the poorer households within the community. It is noteworthy that on average, people in Bihondo pay UGX 9,000 (£2.25) per month for paraffin.

³⁵ To put this into context the average monthly income (median) in Bihondo is UGX 168,000 (£42).

4.4.3.3 *Perceived project benefits and limitations*

There was a consensus amongst interviewees that the community had become better off since the installation of the project, and the village had undergone great change. Over the years, many new businesses had formed, such as a salon (offering hair shaving) phone-charging facilities, maize mills and music libraries, and existing restaurant businesses had improved. Further, the school started to offer boarding facilities which were utilised by many parents, as pupils could read at night which greatly improved performance.

Edward: “Our community improved because so many businesses have been introduced, like bars, and as you know drunkards like loud music so that they can enjoy their drink. We have boarding schools like Mitandi secondary school and Mitandi primary, and now they are able to study even at night. Nowadays health care has improved because before when it would come to 7:00pm we could not see any doctor because there was no doctor who would attend to you in the dark”.

Other benefits pertaining to the project included the following:

- ability to access news from television and radio;
- reduction of expenditure for paraffin and reduced fire risk;
- reduced time and cost to travel to the next trading centre to access services;
- development as the population increased, and people built permanent houses;
- new jobs were created;
- cold drinks became available; and
- improved health from a reduction in smoke.

These benefits were illustrated by the following representative examples:

Merlin: “The community has become a bit rich, because people have started building permanent houses; we never used to hear music as you are hearing now. New jobs have been created, my son got a job in someone’s salon”.

Wilton: “I can play music which I never used to do. I can save money that I used to spend on charging my phone. I no longer suffer from chest pain which was caused by paraffin smoke. Before, for us, we never had cinema walls but now they introduced them and we can also watch football, we are having tourists who come to visit the scheme. Everyone now has got a phone because it’s cheap to charge”.

Whilst, in general, the majority of people interviewed expressed their satisfaction with the project there were a number of limitations to the project, mainly relating to the limited power available resulting in intermittent supply. This in turn affected people's incomes:

Edward: "Most of the time when power goes off and on, my machines get burnt. I even do not get money because I do not work, like shearing hair and charging phones, hence losing customers".

Ezirone: "It is on and off, I do not have enough supply of electricity to charge people's phones which leads to the decline of my business. Electricity may easily burn me in case of a power cuts or touching uninsulated wiring. It is also very expensive in terms of paying bills".

4.5 Discussion case study analysis

The purpose of this section was to give an overview of the seven case study villages in Uganda, to inform the discussion and recommendation chapters {Chapter 1 and 7} and more specifically to answer the following research questions:

- What makes a project successful according to the perception of villagers?
- What is the influence of implementation procedures on project success?

These are answered based on the qualitative data discussed for each of the seven case study villages with a main focus on the beneficiaries' perception of how the project has impacted on their lives, a review of benefits and limitations related to the project, and the influence of different implementation methods as a key to project sustainability.

Understanding project success from the beneficiaries' point of view is important as project success is often based on the perception of development experts and their measure of success {Section 2.1.2.2} which can be different than the perceptions of the beneficiaries.

The data presented in this chapter is mainly from the energy-specific interviews but also draws on the non-energy-specific interviews described in Section 3.3.3 which are further summarised in Appendices I, II and III.

- **What makes a project successful according to the perception of villagers?**

The above discussion has shown that where income-generating activities were facilitated the villagers saw themselves as ‘richer’ as there was an improved service delivery in the village—not everyone interviewed has had a direct financial gain from the project. To illustrate, villagers made reference to the ‘improved entertainment’ and the feeling of ‘living in a city’. This was evident in the three villages (Suam, Mabwe and Bihondo). In contrast, in the villages where the community received lighting and mobile phone charging only (Toro-Ombokoro, Gwere-Luzira and Lama), villagers considered that they ‘remained the same’. This indicates that perceived wellbeing from the infrastructure may not always be a function of economic wellbeing.

The lack of correlation between perceived project wellbeing and economic wellbeing was also seen in the case of Lama village. Here villagers reported a decrease in spending on paraffin. Despite this, they did not see themselves as better off economically. This highlights the disparity between how the villagers perceive project success versus current mechanisms for interpreting the impact of a project—which is often in monetary terms.

– **What is the influence of implementation procedures on project success?**

It is widely believed that development approaches that facilitate participatory implementation and focus on capacity building and community mobilisation as part the implementation process are more likely to succeed {discussed in Section 2.1.2.1}. The comparison of implementation procedures across the different villages indicates that there was no direct link between how projects were implemented (i.e. with or without efforts for capacity building and community mobilisation) and their perceived success by beneficiaries.

Rather, it was found that projects that facilitated income-generating activities and went beyond the provision of electric lighting and mobile phone-charging facilities—thus creating value beyond existing services—are more likely to withstand project-related difficulties and be perceived as ‘successful’ by the beneficiaries. For example, in Gwere-Luzira the implementer placed great importance on capacity building, community participation and community mobilisation throughout the entire project cycle. However, shortly after the infrastructure was handed over, the community failed to undertake simple tasks such as emptying the trash rack of the small-scale hydropower plant—despite having operation manuals, a management committee and community support structures.

This led to project failure. A similar scenario could be observed in the small-scale hydropower project initially installed in Toro-Ombokoro before it was changed to SHSs. Although, here, it is important to note that the unfavourable river conditions were the main reason for eventual project shutdown. In contrast, the implementation in Bihondo followed a private sector approach and as such all cost of implementation was entirely carried by the implementer. Following the completion, the infrastructure was handed over to the community. Despite the lack of participatory approaches before and during the implementation the project remains community owned and operational.

A remarkable finding to emerge from the data was that even when villagers acknowledge project ownership, the transfer of responsibility from the implementer to the community was not ensured as the consequences of this ownership were not understood or acknowledged. This in turn threatens long-term project success. To illustrate, in almost all villages the villagers reported that they fully owned the system and knew the person to approach in case of failure. Nevertheless many villagers did not see themselves responsible for reporting a failure as ‘other people are also affected’. Furthermore, despite acknowledging the community as the project owner, in six of the seven villages (which the exception of Suam) almost all villagers believe that the initial implementer is responsible for repairing the system.

5 FRAMEWORK FOR USER- PERCEIVED VALUE

To understand the wide range of perspectives on what is important to lower-income markets, a user-perceived value (UPV) framework was developed. This technique is novel in the sense that it widens the focus beyond the specific development context (in the case of this research, rural electrification), and hence allows analysis of the language and the intrinsic priorities rather than taking what is said at face value. For the theoretical orientation and definition of UPV refer to Section 2.4.

Initially, based on a review of the literature a theoretical framework of UPV for rural electrification consisting of 39 UPVs was developed and was specific to rural electrification. The framework consisted of five pillars pertaining to emotional, epistemic, functional, essential human requirements and social significance. The framework, its pillars, their groups and values developed as part of the literature review provided a strong foundation for the final UPV framework developed in this chapter.

Using the data from the UPV game {for a description of the game see Section 3.3.2} the framework was developed further to be non-sector specific and potentially applicable to a variety of development contexts. Understanding UPVs beyond the sector of the project was necessary to uncover the wide array of motivators which can be influenced by feelings, concerns and preferences, and that can play an important role in project buy-in. The UPV game produced a total of around 6,700 UPV scores from 119 interviews conducted. From these, a total of 64 UPVs were derived and used in the final UPV

framework {for a description on the UPV analysis refer to Section 3.5.1}. The modifications made to the theoretical framework and the full extended framework are shown below.

It is important to note that the UPVs, their classifications and their use have a subjective element based upon the researcher's opinion. To ensure consistency of use, cross-sectional coding was applied {Section 3.5.1}. UPVs were then verified using expert validation {Section 3.3.4}. The framework was developed based on the case studies and therefore may be biased to some extent to the Ugandan context, but it is also widely applicable to other places. In this research the framework was used as a navigation and illustration aid to compare and contrast the data collected in the seven case study villages in rural Uganda, to answer the specific research questions of this research {Section 1.2}, and to draw out UPVs that are important to Ugandans living in rural areas.

Parts of this chapter have appeared in previous publications (Hirmer and Cruickshank, 2014b; Hirmer and Guthrie, 2016).

5.1 Development user-perceived value framework

There are a variety of different conceptual frameworks for value-theory available in the literature. However, no framework applicable to rural electrification was found. Consequently, in addition to the work discussed above, two comprehensive frameworks, separately developed by Boztepe (2007b) and Smith and Colgate (2007), provided the baseline for a framework applicable to rural electrification developed by the researcher. Both the frameworks of Boztepe (2007b) and Smith and Colgate (2007) have their conceptual roots in value-theory and focus on creating value for the customer. While the latter is of a more general nature in its application and development and has strong roots in theory, the framework of Boztepe was theoretically developed, tested and refined through ethnographic studies. Its focus was on the value of kitchen appliances and was part of a doctoral research programme. A summary of the 51 value-aspects identified for both frameworks is shown in Table 6.

Table 6: Comparison of existing framework's by Boztepe (2007b) and Smith and Colgate (2007).

Aspects pertaining to user-perceived value	Boztepe (2007b)	Smith <i>et al.</i> (2007)
Accessibility	x	
Aesthetics		x

Aspects pertaining to user-perceived value	Boztepe (2007b)	Smith <i>et al.</i> (2007)
Affection	x	x
Appropriateness	x	
Association		x
Avoidance of sensory unpleasantness	x	
Cognitive difficulty/ stress		x
Conflict		x
Convenience	x	x
Curiosity		x
Customisation		
Delivery and installation		x
Durability	x	
Effectiveness		x
Efficiency	x	x
Emotional	x	
Equity		x
Ethics		x
Face saving acts	x	
Flexibility		x
Fun/ play/ enjoyment/ pleasure	x	x
Good luck	x	
Group belongingness	x	
Human energy/ effort		x
Impression management	x	
Knowledge		x
Learning cost		x
Maintaining tradition	x	
Memorability	x	
Network benefits		x
Novelty		x
Operating cost		x
Operational benefit		x
Performance	x	x
Personal interaction/ ease of use		x
Physical compatibility	x	
Process cost		x
Purchase economy/ price/ direct cost	x	x
Quality	x	x
Relational benefits		x
Relational/ relationship cost		x
Reliability	x	x
Role fulfilling	x	
Safety/ security	x	x
Search cost		x
Service/ service support		x
Spirituality	x	x
Status/ esteem/ image/ prestige	x	x
Time/ time management	x	x
Training and maintenance		x
Use Economy/ financial benefit	x	x

Based on the available literature and, in particular, the frameworks presented by Boztepe (2007b) and Smith and Colgate (2007) a UPV framework specific to rural electrification was developed. The framework consisted of 39 UPVs, these are highlighted in green in Table 7. UPVs that did not feature in the initial theoretical UPV framework of rural electrification and were derived from the game are highlighted in grey in Table 7. The initial UPV framework for rural electrification is briefly discussed together with the final

framework {in Sections 5.1.1 to 5.1.6}. For UPVs that are exclusively derived from the interviews the discussion will only refer to the villagers statements—these discussions are, in contrast to those derived from the literature, non-energy-specific. For a detailed explanation regarding how the initial theoretical framework and its UPVs were developed refer to Hirmer and Cruickshank, 2014b.

For the purpose of classification and usability, the framework consists of a number of tiers. Note, whilst the categorisation is important, in this research tier 1 and tier 2 are mainly used as guides to improve the use of the UPVs by providing more detailed attributes and meaning at each subsequent level, as follows:

- Tier 1 represents the high-level value pillars: emotional value, epistemic value, functional value, indigenous value, and social significance value. These are shown in CAPITAL LETTERS.
- Tier 2 represents value groups, embracing a set of UPVs within the same value group. These are shown in **bold**.
- Tier 3 refers to the 39 UPV categories. These are depicted in *italics*.

To illustrate, the ‘tier 1’ EMOTIONAL VALUE pillar holds three ‘tier 2’ value groups, namely the **conscience**, **comfort** and **human welfare**. The latter in turn houses two ‘tier 3’ UPV categories: *safety* and *security*

UPVs are discussed within their tier 1 value pillar in Sections 5.1.1 to 5.1.6 below.

Table 7: 64 UPVs and their defining attributes and meaning.

EMOTIONAL VALUE	
Conscience	
- Harmony	Being at peace with one another.
- Preservation of environment	The preservation of natural resources and animals.
Contentment	
- Appeal (senses)	Being pleasing to the senses (taste and smell).
- Aesthetic (items)	Concerning the physical appearance of an item or person that is pleasing to look at.
- Contentment	The state of being comfortable leading to a positive feeling.
- Entertainment	Something affording pleasure, diversion or amusement.
- Memorability	Holding association with a past event of emotional significance.
Human welfare	
- Safety (from animals, items, nature)	The ability to prevent harm from injuries or accidents.
- Security (people)	The state of being free from danger and threat posed by other people.
EPISTEMIC VALUE	
Information	
- Information access	The ability to stay informed to current events (locally and globally).

Knowledge	
- Knowledge attainment	The ability to learn or being taught new knowledge.
- Skill attainment	The ability to learn a new skill.
FUNCTIONAL VALUE	
Accessibility	
- Access to area	Having uninterrupted access between local areas.
- Banking access	Having continuous access to banking services.
- Mobile phone access	Having continuous access to mobile telecommunication services.
- Mobility (of people)	The ability to physically move from one place to another.
- Transportation	The act of moving something between locations.
Convenience	
- Availability	The possibility to getting, finding, or buying something in the area.
- Communication	The ability to interact with someone who is far away.
- Multipurpose	The ability to fulfil a variety of uses.
- Portability	An item that can easily be carried, transported or conveyed by hand.
- Time benefit	The ability to accomplish a task with the least waste of time or minimum expenditure of time.
- Time management	The ability to work or plan towards a schedule.
- Unburden	Making a task easier by simplifying.
Cost economy	
- Capital cost	Fixed one-time expenditure incurred through the purchase of an item or service.
- Operational expenditure	The cost incurred during the operation of an item or service.
- School fees	Refers to the cost incurred in paying for school attendance/tuition.
Income economy	
- Asset	An investment with the potential for future return.
<i>Barter trade</i>	The ability to exchange goods or services.
- Business opportunity	The ability to make money which is beyond the normal occupation in the particular area.
- Income	The ability to make money from the sale of a good or service.
Quality and performance	
- Effectiveness	Accomplishing a purpose or producing the intended or expected result.
- Durability	Continuing or enduring for a long time.
- Productivity	Rate of output or means that lead to increased yield.
- Reliability	The ability to depend upon a service, or upon the function of an item.
- Usability	The physical interaction with the item—it being easy to operate, handle or look after.
INDIGENOUS VALUE	
Social Norm	
- Celebration	The activities associated with important events.
- Manners	Ways of behaving with reference to polite standards and social norms.
- Morality	Following accepted rules and conduct.
- Tradition	Expected customs embedded into the specific village culture.
Religion	
- Faith	Belief in a god, or in the doctrines or teachings of religion.
ESSENTIAL HUMAN VALUE	
Health	
- Longevity	Means that lead to an extended life span.
- Health care access	Being physically able to access medical services or medicine.
- Treatment	The ability to receive medical attention as a consequence of illness or injury.
- Preservation of health	Practices performed to prevent illness or injury.
Enabling environment	
- Education access	Being physically able to access educational services.
- Energy access	Being able to obtain energy services or resources.
- Food security	A reliable and continuous supply of a diverse variety of foods.
- Shelter	A place giving protection from weather or danger.

- Water access	Continuous access or availability of water.
- Water quality	To have clean water (purity/contamination, colour and taste).
Development	
- Community development	Improvement of services, or soft and hard infrastructure, for the benefit of a collective group or people.
- Personal development	Improvement of living conditions and personal wellbeing
SOCIAL SIGNIFICANCE VALUE	
Identity	
- Appearance	The act of appearing and making a public impression.
- Belongingness	Association with a certain group, their values and interests.
- Dignity	The state or quality of being worthy of honour or respect.
- Performance (personal)	The productivity which someone achieves in his or her work.
Status	
- Aspiration	Desire or aim to become someone better, or more powerful or wise.
- Modernisation	Transition to a modern society, away from a traditional society to the manner of a developed one.
- Reputation	Commonly held opinion about one's character.
Social Interaction	
- Altruism	The principle and practice of unselfish concern.
- Caring (family)	Displaying kindness and concern for people close to the individual.
- Role fulfilling	Duty to fulfilling the tasks or responsibilities associated with a certain role.
- Togetherness	Warm fellowship, as among friends or members of a family.

It should be noted that the act of categorisation is not an objective process especially due to the complexity of the UPVs. It is, therefore, unavoidable that different people may group UPVs differently than in this research. A potential example of this is the grouping of health-care access within the tier 2 value group **health**. This tier 3 category could potentially be grouped within **accessibility**. However in this research health-care access was seen as an enabler to improving human condition and as such was grouped within **health**. However, as mentioned above, whilst the categorisation is important, in this research tier 1 and tier 2 are mainly used as guides to improve the usability of the 64 UPVs.

An additional element of categorisation is that statements from which UPVs are derived have the potential for ambiguity or duality of meaning, as do the categorisation that is employed. The following description by Dudley of Suam provides a representative example:

“I can easily and quickly sell [the chicken] when I need money. “

In this research this was categorised under *income*, but the chicken could also be seen as an asset and could hence be categorised under *asset*. Similarly the difference in categorisation between *income* and *business opportunity* is small. Hence greater care

must be taken to ensure consistency in application—throughout the study the UPVs have been applied as consistently as possible.

5.1.1 Emotional value

The EMOTIONAL VALUE refers to non-cognitive and subconscious decisions that are made, such as those based on, for example, childhood experiences (Sheth *et al.*, 1991). From the literature, and relevant to rural electrification, there are three ‘tier 2’ groups that can be linked to emotional value. These are **conscience**, **contentment** and **human welfare**.

5.1.1.1 Conscience

Conscience may refer to the emotional moral sense embedded in the decision-making and may include the *preservation of the environment* and *harmony*.

<i>Preservation of environment</i>	The preservation of natural resources and animals
<i>Harmony</i>	Being at peace with one another.

While ‘*preservation of the environment*’ does not appear in Table 6, development initiatives are commonly linked to environmental benefits. In the case of rural electrification, the ‘*preservation of environment*’ is a UPV category that is commonly used as justification for energy access initiatives as it is seen to provide a more sustainable solution as traditional fuels are commonly linked to carbon emissions, deforestation and land-use change (Practical Action, 2016). However, *preservation of the environment* was rarely mentioned by villages.

From the UPV game, one additional tier 3 value category was identified, namely *harmony*. In the context of this research villagers referred to *harmony* with regards to avoiding conflict with family members as well as the wider community. This was illustrated by Michell from Bihondo, who selected a Quran:

“This religion or word of God helps me to calm down my anger or temper whenever I am offended by anyone”.

5.1.1.2 Contentment

Contentment refers to the emotional wellbeing and covers:

<i>Appeal (senses)</i>	Being pleasing to the senses (taste and smell).
<i>Aesthetics (items)</i>	Concerning the physical appearance of an item or person that is pleasing to look at.
<i>Contentment</i>	The state of being comfortable leading to a positive feeling.
<i>Entertainment</i>	Something affording pleasure, diversion or amusement.
<i>Memorability</i>	Holding association with a past event of emotional significance.

In rural electrification literature, the link to taste and smell [*appeal*] has received little attention. This contrasts with cooking stoves, where the lack of utilisation of more modern stoves is commonly linked to the change in taste of local foods through the reduction of firewood (Djédjé, 2010; Stenson, 2011). This shows the impact less tangible values, such as taste [*appeal*], can have on the decision-making. For rural electrification, *appeal* can be linked to the use of a fridge as a means to cool water for reasons of flavour, as described by Lona from Bwindi:

“If I have a fridge it can help me keep drinks cold for my husband and children because sometimes especially when I come out from the sunshine I prefer having a cold drink.”

The *aesthetics* of an alternative method (e.g. replacing kerosene lanterns with light bulbs) may be measured upon comparison with the traditional. This is particularly true for the quality of the light produced (e.g. kerosene lamps produce ‘warm’ light and LEDs give a ‘cold’ light). One field study in Uganda showed that rural customers made pico-Solar Home System (SHS) purchasing decisions based on their perceptions associated with the light output of the lantern (GTZ and GIZ EnDev, 2010). This is also the case in Uganda for many villagers *aesthetics* plays an important part of daily life. Throughout the UPV game, villagers frequently referred to phrases such as “looks good” and “beautiful”.

Contentment can, for example, be linked to rural electrification through an increased sense of stability (Yadoo, 2012), the positive feeling experienced from listening to music, watching television (Sovacool and Ryan, 2016) or the ability to study comfortably through improved lighting (Practical Action, 2016), as described by Lenny (Gwere):

“The radio is important for getting information and also entertainment through the music. This brings happiness in case of sadness.”

Entertainment can be seen as the entertainment experienced through the direct interaction with the object (either by oneself or with others). This in turn may lead

to memorable moments [*memorability*]. A representative example of this was given by Mireille from Mabwe:

“She can use it [the computer] as a source of entertainment by storing her music and memorable moments.”

5.1.1.3 Human welfare

In this research **human welfare** refers to the condition of being protected from something or the reduction in risk from danger or injury and can be separated into:

<i>Safety (from animals, items, nature)</i>	The ability to prevent harm from injuries or accidents.
<i>Security (people)</i>	The state of being free from danger and threats posed by other people.

For rural electrification, traditional means of lighting can pose a *safety* concern from a risk of fire caused by the use of kerosene lanterns, candles and open fires (Pereira *et al.*, 2011). While the risk of fire was rarely a concern of villagers, a more common threat was the safety risk through injury from objects or animals, as Eleonore (Toro-Ombokoro) highlights:

“The gumboots are important especially in agriculture because it helps in preventing the legs from cuts and worms that can enter the skin and cause disease.”

Additionally, electricity may provide improved *security* through improved lighting, particularly for women walking at nights (Abdullah and Jeanty, 2009; Lahimer *et al.*, 2013; Matinga and Annegarn, 2013). An example of the villagers’ value perception relating to *security* is given below.

“The solar lantern can be used for security at night which reduces threats posed by thieves in the community.” (Romana, Mabwe)

5.1.2 Epistemic value

EPISTEMIC VALUE is a branch of epistemology and refers to the ‘method or grounds of knowledge’ (OED, 2013, n. ‘epistemic’). According to Sheth *et al.* (1991, p. 162), “entirely new experiences certainly provide epistemic value”. Development interventions, such as rural electrification projects, are in line with this sentiment as they aim to provide electricity to remote areas. EPISTEMIC VALUE covers the following two categories: **information** and **knowledge**.

5.1.2.1 Information and knowledge

Information refers to the facts provided or learned about something or someone and covers *information access*.

<i>Information access</i>	The ability to stay informed to current events (locally and globally).
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Knowledge covers the following two value categories:

<i>Knowledge attainment</i>	The ability to learn or being taught new knowledge.
<i>Skill attainment</i>	The ability to learn a new skill.

Electrification requires skills [*skill attainment*] to operate and maintain a scheme or operate new machinery for farming or businesses (Chaurey and Kandpal, 2010; Yadoo, 2012). Further to this, such schemes also enable improved *knowledge attainment* and *information access*. This may be owing to:

- increased awareness from access to television and radio;
- extended access to education (schools are able to extend opening hours into the evening as a result of electric lighting); and
- exposure to standards of living associated with different cultures (users may relate electricity consuming activities to urban or 'western' demographics) as well as access to news channels [*information access*].

This was discussed in Section 2.1.

The examples below exemplify typical concerns of the villagers with regards to *information access*, *knowledge attainment* and *skill attainment*:

“The newspaper helps me to know what’s happening around the world.” (Michell, Bihondo)

“You are here because of this pen. If you did not have the pen you would not be here because I myself I use a pen to record my things. Just an example, they used a pen to write the bible if it was not a pen I would have not known what happened.” (Lona, Bwindi)

“The school helps in promoting skills and helps people to get jobs.” (Rosamaria, Gwere)

5.1.3 Functional value

The FUNCTIONAL VALUE pillar is concerned with “customers pay[ing] only for what is of use to them and gives them value” (Drucker, 2002, p. 172) and covers the main function of the product or service including utilitarian and physical attributes (Sheth *et al.*, 1991). In the words of Broekhuizen (2006, p. 48), the FUNCTIONAL VALUE can be understood as the “utility derived from the product quality and product performance”. The utility is the price and the quality, which are together described as the ‘worth’ (Woodall, 2003). This corresponds to the utility definition given by the Oxford English Dictionary (OED) “the fact, character, or quality of being useful or serviceable; fit for some desirable purpose or valuable end; usefulness, serviceableness” (OED, 2013, n. utility). In line with the utility value framework developed by Boztepe (2007b), the FUNCTIONAL VALUE applicable to rural electrification covers the following four value groups: **accessibility**, **convenience**, **cost economy**, **income economy** and **quality and performance**.

5.1.3.1 Accessibility

The UPVs pertaining to **accessibility** were exclusively identified from the UPV game and refer to the ability to be able to access certain services and regions as well as the ability to be easily reached. It holds five value categories: *access to area*, *banking access*, *mobile phone access*, *mobility* and *transportation*.

For many rural villagers having access to local regions or being easily reached [*access to area*] is a vital part of rural living as economic activities often takes part outside of the confinements of a village. This was illustrated in the below example:

“[The road] would bring [the people from] the government closer to us though it has not reached us”. Mixed Group Discussion, Suam

Having access to financial services [*banking access*] has become a vital part of rural living as it is an enabler for micro-entrepreneurship and fosters self-improvement (Meyer, 2014). With the proliferation of mobile phones, banking services have become much more accessible. In Uganda 35% of the adult population make use of mobile banking (Munyegera and Matsumoto, 2016). In line with this, mobile phones play a vital part in rural living as, in addition to mobile-banking, they reduce communication costs and enable access to markets and information (Aker and Mbiti, 2010). In this PhD research,

villagers commonly linked *mobile phone access* to the ability to charge mobile phones for continued usage.

Additionally *transportation* and *mobility* (people) were identified as two important value categories and were commonly mentioned throughout the UPV game. Both are discussed in detail in Sections 6.1.1.13 and 6.1.1.14 respectively.

5.1.3.2 Convenience

Convenience refers to the ability to proceed with something without difficulty and covers the following seven categories:

<i>Availability</i>	The possibility to getting, finding or buying something in the area.
<i>Communication</i>	Being able to interact with someone who is far away.
<i>Multipurpose</i>	Being able to be used for a variety of uses.
<i>Portability</i>	An item that can easily be carried, transported or conveyed by hand.
<i>Time benefit</i>	Being able to accomplish a task with the least waste of time or minimum expenditure of time.
<i>Time management</i>	Being able to work or plan towards a schedule.
<i>Unburden</i>	Making a task easier by simplifying.

For rural electrification the *availability* can refer to the technology itself or to the ability to access suitable equipment or appliances, with the latter being more crucial to the success of off-grid energy projects (World Bank, 2007; Barua *et al.*, 2011).

How availability can influence choice is illustrated by Ted from Toro-Ombokoro:

“I selected a charcoal stove as today firewood is scarce in our community.”

Communication can be linked to improved usage of mobile phones through local charging facilities (Paul and Uhomoibhi, 2013). The importance of being more easily able to communicate with loved ones was illustrated by Elvin (Suam):

“The mobile phone helps in communication and searching the market for my produce. It helps me to communicate with my family, relatives and friends when I am away.”

For *portability*, rural customers may prefer solar lanterns to solar home systems because of their portable nature and their subsequent *multipurpose* function allowing indoor and outdoor usage. An example of a villagers’ value perception relating to *portability* and *multipurpose* is given below.

“I use the solar lantern to give light because it is portable and thus the dangers of being attacked by wild animals and robbers are reduced.” (Elvin, Suam)

“A bed has many functions like sleeping on it and one feels relaxed. It is where children are produced from—on a straw mat you cannot turn around very well with your husband. It helps comfort ability issues and it helps them boost their sexuality hence production of children.” (Women Group Discussion, Bihondo)

For rural electrification time can be separated into the:

- (i) the time saved by the replacement of traditional fuels [*time benefits*]; and
- (ii) the planning required when using electricity [*time management*].

Time benefits occur when time consuming activities such as the collection of firewood are eliminated or processes are sped up because of the higher energy content of the replacement fuel (e.g. grinding) (Practical Action, 2012). This is also commonly associated with the reduction in labour-intensive tasks [*unburden*].

In contrast to *time management* which was of marginal importance, *time benefits* and *unburden* were frequently mentioned throughout the UPV game and are discussed in detail in Sections 6.1.1.7 and 6.1.1.16 respectively.

5.1.3.3 Cost economy

Cost economy refers to the cost associated with the use of the product or service and includes three value categories:

<i>Capital cost</i>	Fixed one-time expenditure incurred through the purchase of an item or service.
<i>Operational expenditure</i>	The cost incurred during the operation of an item or service.
<i>School fees</i>	Refers to the cost incurred in paying for school attendance/tuition.

According to the literature, upfront cost [*capital cost*] is a major barrier for the widespread diffusion of rural electrification technologies (Palit and Chaurey, 2011; Shrimali and Rohra, 2012; Sovacool, 2013). Consequently, product/project developers design solutions that resemble current spending patterns for kerosene or candles such as pay-as-you go or fixed monthly cost plans. Examples of projects utilising such business models are micro-finance with ‘Germeen Shaki’ (Reiche *et al.*, 2000), pay-as-you-go with ‘M-KOPA’ (Omwansa and Sullivan, 2013) and rental franchise with ‘Sunlabob’ (Schroeter, no date).

As an example of *operational expenditure*, off-grid energy solutions can reduce the monthly expenditure on fuels (Yadoo and Cruickshank, 2012). *Operational expenditure* is an important UPV category and is discussed in detail in Section 6.1.1.9.

The ability to pay school fees was identified as an important UPV of rural living. In six of the seven case study villages, school fee expenditure represented the single largest expense {further discussed in Section 6.1.1.6}. The issue of paying school fees was repeatedly referenced throughout the UPV game, even if the connection between the item and *school fees* was not immediately apparent. This was illustrated by the below example:

“If I had enough goats, they would help me in paying school fees for my children if they are at school”. Norbert, Bwindi

5.1.3.4 *Income economy*

Income economy refers to the actual financial benefits gained through the project, and includes the following three value categories:

<i>Asset</i>	An investment with the potential for future return.
<i>Barter trade</i>	The ability to exchange goods or services.
<i>Business opportunity</i>	The ability to make money which is beyond the normal occupation in the particular area.
<i>Income</i>	The ability to make money from the sale of a good or service.

In villages where rural electrification projects were implemented, the value of the house may increase. Thus it can be seen as an *asset*.

Barter trade remains a common means of exchange in Uganda. This is particularly true for basic commodities such as food items but also as a means of paying for services, as described during the Womens’ Group Discussion in Lama:

“If you want to build your house, you call people to come and work for you and in return you kill a goat for them.”

Development initiatives such as energy access projects can also greatly benefit the local service sector by providing electricity to hairdressers, beer halls, shops, kiosks and local repair and maintenance businesses for instance [*business opportunity*] (Brüderle *et al.*, 2011). This then increases the potential portfolio of entrepreneurship. Moreover, extended shop opening hours through electric light can result in more *income* from the

increased sale of goods or services. The importance of these UPV categories to villagers is further discussed in detail in Sections 6.1.1.5 and 6.1.1.1 respectively.

5.1.3.5 *Quality and performance*

Finally, **quality and performance** relates to the physical compatibility and ability to perform against its intended purpose and contains the following values:

<i>Effectiveness</i>	Accomplishing a purpose or producing the intended or expected result.
<i>Durability</i>	Continuing or enduring a long time.
<i>Productivity</i>	Rate of output and means that lead to increased productivity.
<i>Reliability</i>	The ability to depend upon a service, or upon the function of an item.
<i>Usability</i>	The physical interaction with the item—it being easy to operate, handle or look after.

Effectiveness in rural electrification refers to the availability of electricity meeting the specific needs of a community. A community, for example, that relies on metal processing for income generation may require a larger power output than a community that relies on agriculture. The following statement by the Women in Bihondo is a representative example for this.

“Electricity at school would enable children to study more in the night and improve on the academic levels hence things like computers would be introduced and thus advance technology in the community.”

Durability concerns the longevity of the equipment (such as hydropower turbines) as well as the electrical components (e.g. light bulb). Throughout the UPV game, commonly used expressions relating to *durability* include for example: “long lasting” and “durable”.

Small and medium enterprises (SMEs) that undertake labour-intensive activities such as milling or fruit and vegetable processing can greatly benefit from off-grid energy access through increased *productivity* resulting from, for example, electrically powered machinery. The perceived benefits pertaining to *productivity* are further discussed in Section 6.1.1.11.

The *reliability* may refer to the consistency of supply. Brownouts and blackouts are very common in developing countries, as supply cannot meet demand (Howe *et al.*, 2012;

Yadoo, 2012). Consequently, organisations deploy load-shedding³⁶ strategies to avoid unexpected shortfalls in power. Load-shedding is more common in larger electrification projects, as can be seen in the National Grid in Bangladesh (Rahman *et al.*, 2013) and Uganda (IMF, 2010). However, there are also cases in which load-shedding is used on smaller-scale hydropower projects, whereby mechanisms are installed to allow for battery charging during the day and lighting at night (Collings, 2011). The issue of unreliable power supply was also described by the Women in Bihondo.

“When electricity is not stable a candle is necessary for us because it provides light in our businesses to keep them operational. Candles are more affordable and easier to use due to the fact that electricity is not stable in our village.”

Usability refers to the ease of use of the product or service. This is particularly important for modern technologies as communities may not be familiar with their operation (Hirmer and Cruickshank, 2014a). Albeit infrequently mentioned, it was still important as described by the Men in Suam:

“A radio is very important as it is easy to use here in rural areas where we do not have electricity. It is cheap and we can use dry cell batteries—unlike TV which needs electricity or solar.”

5.1.4 Indigenous value

INDIGENOUS VALUE (or cultural value) refers to the “distinctive ideas, customs, social behaviour, products, or way of life of a particular nation, society, people, or period” (OED, 2013, n. ‘culture’). The term indigenous was chosen as the term culture typically refers to the macroscale and can be all-encompassing, whereas indigenous can be more focused on the micro-culture of a specific community or group of people. In line with this the indigenous values applicable to rural electrification covers two value groups: **social norm** and **religion**.

³⁶ Load-shedding refers to managed power cuts when demand exceeds power supply (Edenhofer et al., 2012).

5.1.4.1 Social norm

Social norm refers to the rules of behaviour that are considered acceptable in a group or society and in the context of development initiatives includes *celebration*, *manners*, *morality* and *tradition*.

<i>Celebration</i>	The activities associated with important events.
<i>Manners</i>	Ways of behaving with reference to polite standards and social norms.
<i>Morality</i>	Following accepted rules and conduct.
<i>Tradition</i>	Expected customs embedded into the specific village culture.

Uganda has a strong cultural heritage, and celebrations play an important part in traditional cultural practices and include rituals, festive events and rites, beliefs and both vocal and instrumental music (Bakaye, 2007). In line with this, interviewees commonly made reference to certain ceremonies such as funerals, Christmas and weddings [*ceremonies*].

“[The goat] is also good especially during funerals, especially the men who marry from your area bring goats. This depends on the person who dies. If a very big person dies you must produce a goat”. Women Discuss Male Choices, Gwere

The informal justice system is still common in many parts of the world where punishment is practised within the confines of a community (Röder, 2012). This is also the case in Uganda (UN, 2012). In these communities’ *morality* plays an important part of daily life. Throughout the UPV game, villagers frequently referred to phrases such as “helps to do the right thing” and “teaching us morals” or similar.

Manners refers to the polite and standard way of behaviour and includes acts of hospitality, as described by Genaro (Lama):

“If a visitor is coming, you slaughter a chicken in our culture”.

The findings regarding the importance of *manners* and *morality* in Ugandan society are consistent with a study conducted by UNESCO which investigated the guiding principles of Ugandans. They found that Ugandans place great importance on values such as respect for authority and elders, good human relations, hospitality, honesty, integrity, justice and fairness (Onyango, 2009).

Rural electrification is considered to fulfil the requirement for development intervention through, for example, improved health and education (IFC and Lighting Africa, 2010).

However, while the technology may act as an enabler of better health and education, *tradition* may be a barrier to its successful adoption as villagers continue to cook using firewood and children continue to collect the firewood as this is common practice in the society (Pereira *et al.*, 2011). The importance of *tradition* is exemplified in the following statements.

“In our culture of Bakiga a true man has to have a panga for protection.” (Willard, Bwindi)

“A goat is culturally used to cleanse women and also for helping home problems.” (Bobby, Lama)

This illustrates the importance of understanding the traditional context and its drivers when designing development projects to help embed the project in the community. In the context of rural electrification, this is, however, rarely considered in project design and implementation.

5.1.4.2 Religion

Religion is a particular system of faith (and worship).

<i>Faith</i>	Belief in a god, or the doctrines or teachings of religion.
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Religion is, according to Solomon’s evaluation of a wide range of literature on consumer behaviour, a determining factor of buying behaviour in consumers (Solomon, 1999). While religious convictions are declining in the developed world, religious beliefs remain high in the developing world (Norris and Inglehart, 2006; Shahid and Zuetzel, 2012). This was also evident from the UPV game. Phrases commonly mentioned by villagers included: “love one another”, “encourage”, “prevent from doing evil” and “provide wisdom”.

Understanding the role and importance of a project community is important as a set of religious beliefs may govern the role of women in society, the role of technology or technological advancement in society and locations of spiritual significance. This can affect decisions regarding the siting, modes, purpose and location of electrification schemes. *Faith* may include spirituality which can refer to material things or substances in a figurative or symbolic sense (Woodall, 2003; Ratner, 2004; Dahl, 2012). In rural electrification this could for example be significant when implementing hydropower

schemes. For instance, the Bujagali hydropower project in Uganda had to relocate spirits living in the waterfall before the scheme could be built. This required a ceremony to avoid upsetting the spirits (The Inspection Panel, 2009). On the other hand, people may be scared of ‘foreign’ technologies. To illustrate, during the early stages of rural electrification (20th century) in Europe and the US people feared electricity because they believed it would intervene with God’s order and was immoral (Peters *et al.*, 2009). To overcome this fear, operators led campaigns against traditional modes of lighting and promoted electric appliances [*ibid*].

5.1.5 Essential human value

ESSENTIAL HUMAN VALUE is a complementary tier 1 value pillar that was not previously included in the theoretical framework. This pillar is similar to the subsistence need identified by Max-Neef³⁷ as part of his concept of ‘human-scale development’ which houses certain satisfiers, such as shelter, food and health (Max-Neef *et al.*, 1991). In a similar sentiment, ESSENTIAL HUMAN VALUE refers to “intrinsic values relating to the need for subsistence living” and covers the following three categories: **health**, **physiological**, and **development**.

Health refers to the prevention of diseases and illnesses, prolonging life and promoting human health. Discussed below are four value categories.

Like in many other developing countries, and despite major efforts, the promotion of quality and accessible health care services remains poor across Uganda (Chandler *et al.*, 2013). Health centres are widely dispersed, often making them disproportionately inaccessible for the poorer members of a community. As one study points out, “[in Uganda] over 72% of the population lives within a recommended 5 km radius of a health

³⁷ Note, although reviewed as part of this research, needs theories such as those developed by Max-Neef and Maslow are not part of this thesis, which is not limited just to needs, but to a wider array of motivators for development communities. A shortcoming of these theories is that they lack flexibility. For example, under Maslow needs are sequential (hierarchical); however, this research has shown that the priorities of people can be different. For example, people may accept privation in favour of more subtle and strategic aims such as education and advancement. In contrast, Neefs’ needs matrix is limited through its rigid structuring, an outcome being that each attribute can only fall under one need category; whereas values can be more complex and not easily attributable to a single motivator.

facility, only 44.4% of expectant mothers deliver at health facilities and only 32.4% of pregnant women attend all four recommended antenatal visits” (Musinguzi *et al.*, 2017, p. 2). Further, appropriate treatments are costly (as evidenced by the level of expenditure pertaining to health {presented in the infographic, Appendix III}) and health care facilities can be inaccessible. This highlights the importance preventative methods play in prolonging life in rural areas.

Examples of the villagers’ value perception relating to the four value categories—*longevity, health care access, treatment and preservation of health*—are given below:

“Medicine helps in healing us [*Treatment*] and as such increasing our life span” [*Longevity*]. Dudley, Suam

“Health centres are far, so medicine in our community is not there” [*Health care access*]. Male Group Discussion, Gwere

“I think men have chosen the latrine because it is a necessity at home to prevent cholera” [*Preservation of health*]. Women Discuss Male Choices, Toro Ombokoro

Examples of the villagers’ value perception relating to the six value categories under **physiological**—*education access, energy access, food security, shelter, water access and water quality*—are given below:

“If schools were near here my children would have studied” [*Education access*]. Titus, Bwindi

“[The Machete] helps me to cut the trees for making poles to build my house [*Shelter*]. It also helps me to get firewood for using at home” [*Energy access*]. Merlin, Bihondo

“[The Machete] is useful because it helps me in preparation of where I can put the garden and plant my food so that my people cannot starve” [*Food security*]. Rosali, Suam.

“Water is source of life and for me water in the borehole is very clean [*Water quality*]. At first we like drinking from the spring which could dry away during the dry season and then there is no more water” [*Water access*]. Aaron, Gwere

Development is the general wellbeing of individuals and societies and has two value categories, namely *community development* and *personal development*. An example of *community development* as perceived by the villagers is given below:

“They chose [the road] because they know it can bring development in the area” Men Discuss Female Choices, Suam

In this research *personal development* refers to a good or satisfying living condition and personal wellbeing, as described by Marx (Gwere):

“My children teach me every evening on how to read and write. It’s ‘the sword of better life’”

5.1.6 Social significance value

SOCIAL SIGNIFICANCE VALUE (also referred to as identity value) relates to different social groups (in terms of status and identity) (Sheth *et al.*, 1991; Boztepe, 2007b) as well as the sensorial nature of the product or service (referring to the perceived feeling) (Smith and Colgate, 2007). The SOCIAL SIGNIFICANCE VALUE has three main value groups: **identity**, **status** and **social interaction**.

5.1.6.1 Identity

According to Holbrook (1999, p. 9) “value resides not in the product purchased, not in the brand chosen, not in the object possessed, but rather in the consumption experience(s) derived therefrom”. However, Holbrook’s statement, based on his ‘value-as-user-experience’ theory {Section 2.4.3}, fails to acknowledge the importance of **identity** and **status** {discussed as part of ‘value in sign’}.

For the purpose of this research the **identity** value refers to a person’s association with a certain group and covers three characteristics:

<i>Appearance</i>	The act of appearing and making a public impression (physical belonging).
<i>Belongingness</i>	Association with a certain group, their values and interests.
<i>Dignity</i>	The state or quality of being worthy of honour or respect.
<i>Performance (personal)</i>	The productivity which someone achieves in his or her work.

The link between rural electrification and *appearance* may be such that it allows beneficiaries to iron or wash their clothes and subsequently appear neat or smart in the eyes of the public. The importance of using irons has been recognised in recent literature (Pereira *et al.*, 2011; Akpan *et al.*, 2013).

Belongingness refers to the association with a specific group, their values and interests. For example, a person may accept a rural electrification project because of ‘conspicuous consumption’³⁸ rather than need. This has also been evident during the distribution of energy efficient biomass stoves in Sri Lanka (Leelaratne, 2003). A study, undertaken by the Shell Foundation, found that the uptake of improved cooking stoves increased because consumers followed their neighbours' trends (Pursnani, 2010).

The example below exemplifies a typical concern of the villagers with regard to *dignity*:

“Also for smartness, the clothes help us not to get ashamed by walking naked”. Men
Discussion of Female Choices, Mabwe

Performance (personal) refers to the ability to improve personal productivity. Rural electrification is commonly associated with improved performance at school, for example, as a result of improved lighting and the associated prolonged study hours {discussed in Section 2.1.1.2.1}.

5.1.6.2 Status

Status refers to the individual role and the impact of an individual on the wider group and covers three value categories:

<i>Aspiration</i>	Desire or aim to become someone better or more powerful or wise.
<i>Modernisation</i>	Transition to a modern society, away from a traditional society to the manner of a developed one.
<i>Reputation</i>	Commonly held opinion about one’s character.

Electrification schemes in rural remote areas can be seen as a novelty to replace traditional fuels and consequently people may strive for it [*aspiration*].

In a similar sentiment, *modernisation* may refer to the transition to a modern, developed society—away from a traditional one. For example in Kenya people felt a desire for Western lifestyle and longed for a light switch and a permanent bulb in their home (GTZ and GIZ EnDev, 2010). In line with this it is also a sign of wealth for the one who owns it and the subsequent prestige that comes with it [*reputation*]. For example, people may

³⁸ A term coined by the sociologist and economist Thorstein Veble, referring to people that benchmark their standards of living against their peers (Gali, 1994).

act as early adopters of the rural electrification scheme because of their need to distinguish themselves from the group, which is also linked to *aspiration*.

Both *aspiration* and *reputation* are discussed in detail in Sections 6.1.1.15 and 6.1.1.17.

5.1.6.3 Social interaction

Social interaction refers to the enhanced ability to positively interact with other people.

<i>Altruism</i>	The principle and practice of unselfish concern.
<i>Caring (family)</i>	Displaying kindness and concern for people close to the individual.
<i>Role fulfilling</i>	Duty to fulfilling the tasks or responsibilities associated with a certain role.
<i>Togetherness</i>	Warm fellowship, as among friends or members of a family

An example of *altruism* as perceived by the villagers is given below:

“A friend can help the other with bicycle to take a patient to the hospital” Men Discussion of Women Choices, Toro-Ombokoro

In rural electrification, the household head may install a solar home system with the aim of reducing the eye-strain of the children stemming from their time studying in front of poor light or the time-consuming tasks for women and children associated with traditional means of lighting [*caring*]. The perceived benefits of caring are further discussed in Section 6.1.1.19.

In a similar sentiment, *role fulfilling*, for example, refer to the ability to increase income through a wider portfolio of income-generating activities thus providing for one’s family and the subsequent ability to pay for school fees thus enabling children of the family to prosper. The importance of norms pertaining to roles within the community was highlighted during the men discussion of women item selection in Suam:

“The women choose the garden because they know this is where they get food from to feed their families, women stay in the garden all the time, it is like their destiny.”

Togetherness refers to the ability to feel closer to family members that are far away, improved through the utilisation of mobile phones, discussed as part of communication—as described by Jessica from Suam.

“The mobile phone helps me to communicate with my family, relatives and friends when I am away from home.”

5.2 Final UPV framework

Using cross-sectional coding, UPVs were revised multiple times, resulting in a total of 64 user-perceived values (UPVs).

UPVs are inclusive of a wide array of scenarios and are distinct from each other. The 64 UPVs shown in Table 7 are graphically represented in a ‘User-Perceived Value Wheel’ {Figure 19}. The benefit of the UPV wheel is that it can help to visually depict the UPVs (tier 3), but also the values across different tiers. Within the wheel, the UPVs can be scored and managed through computer-aided software developed by the researcher (Hirmer, 2016). This helps to quickly filter the survey results and represent them using different colour intensities to assist the researcher in identifying which values (tier 3) or value groups (tier 2) are of greater or lesser importance—the darker the colour the more important the UPV {see Chapter 8 for an example of a modified value profile}.

The UPV wheel is supported by a ‘Keyphrase-Wheel’ {Figure 20}. That wheel provides a comprehensive list of phrases (tier 4) that are nested under tier 3 UPVs. This second wheel is to collate the phrases used to identify the UPVs by allowing sentences (storytelling) gathered through the UPV game to be scored under certain values based on the underlying phrases and as such is a quick graphical demonstration of the coding process.

Similar to the standard employed throughout this research, the wheels can be categorised into multiple tiers as follows:

- Tier 1 represents the high-level value pillars: EMOTIONAL VALUE, EPISTEMIC VALUE, FUNCTIONAL VALUE, INDIGENOUS VALUE, ESSENTIAL HUMAN VALUE AND SOCIAL SIGNIFICANCE VALUE. These are shown as the outer ring of Figure 19 and Figure 20.
- Tier 2 represents value groups, embracing a set of UPVs within the same value group. These are shown as the inner ring on Figure 19 and are in bold.
- Tier 3 shows the 64 UPV categories. These are depicted, in italics, as the middle ring in both Figure 19 and Figure 20.

- Tier 4 houses the phrases used to score the different values (tier 3). These allow the consistent categorisation of stories [storytelling] into their respective UPVs and are shown in Figure 20 as the inner ring.

Figure 19: UPV framework graphically depicted in the ‘User-Perceived Value Wheel’

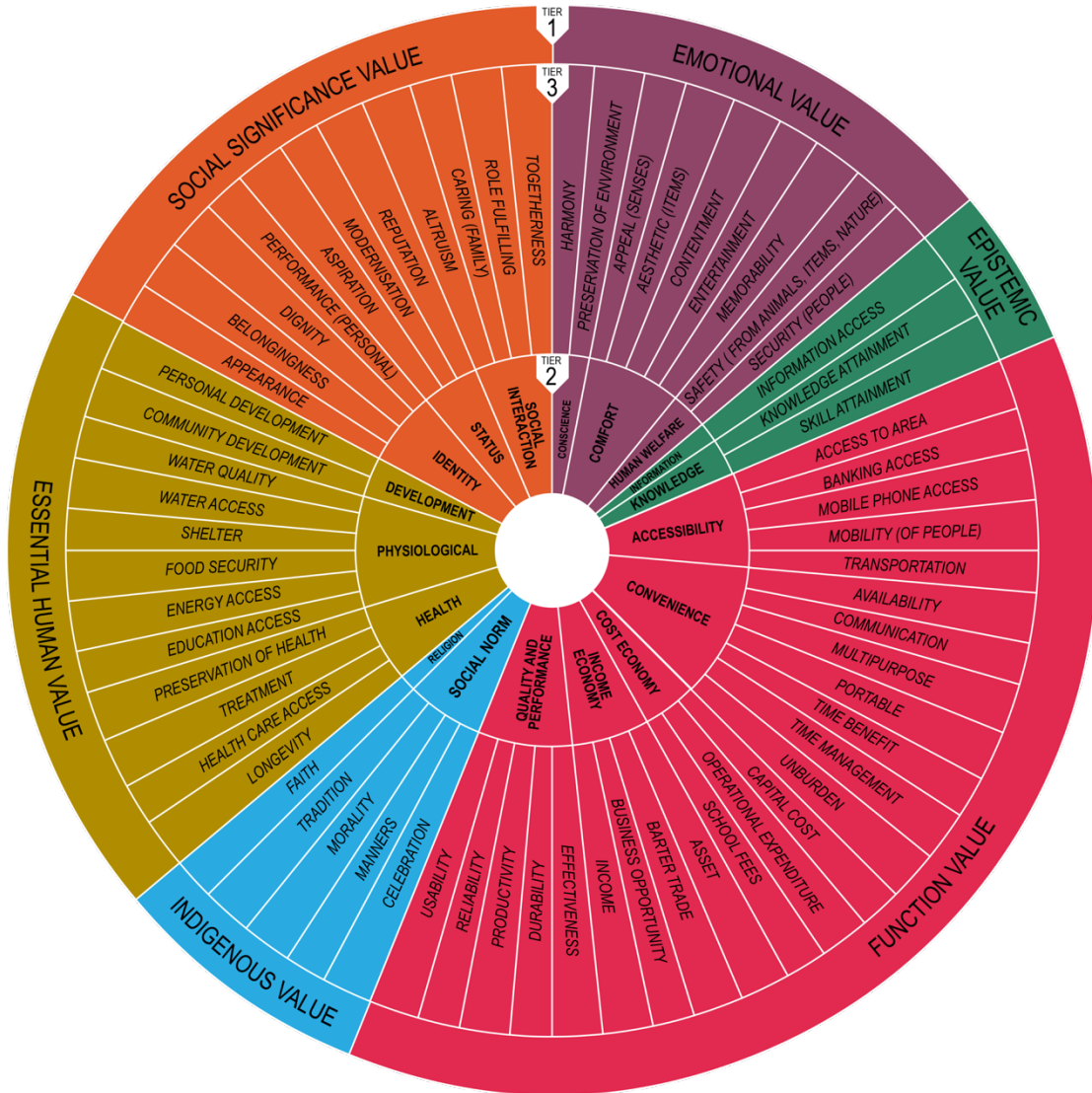
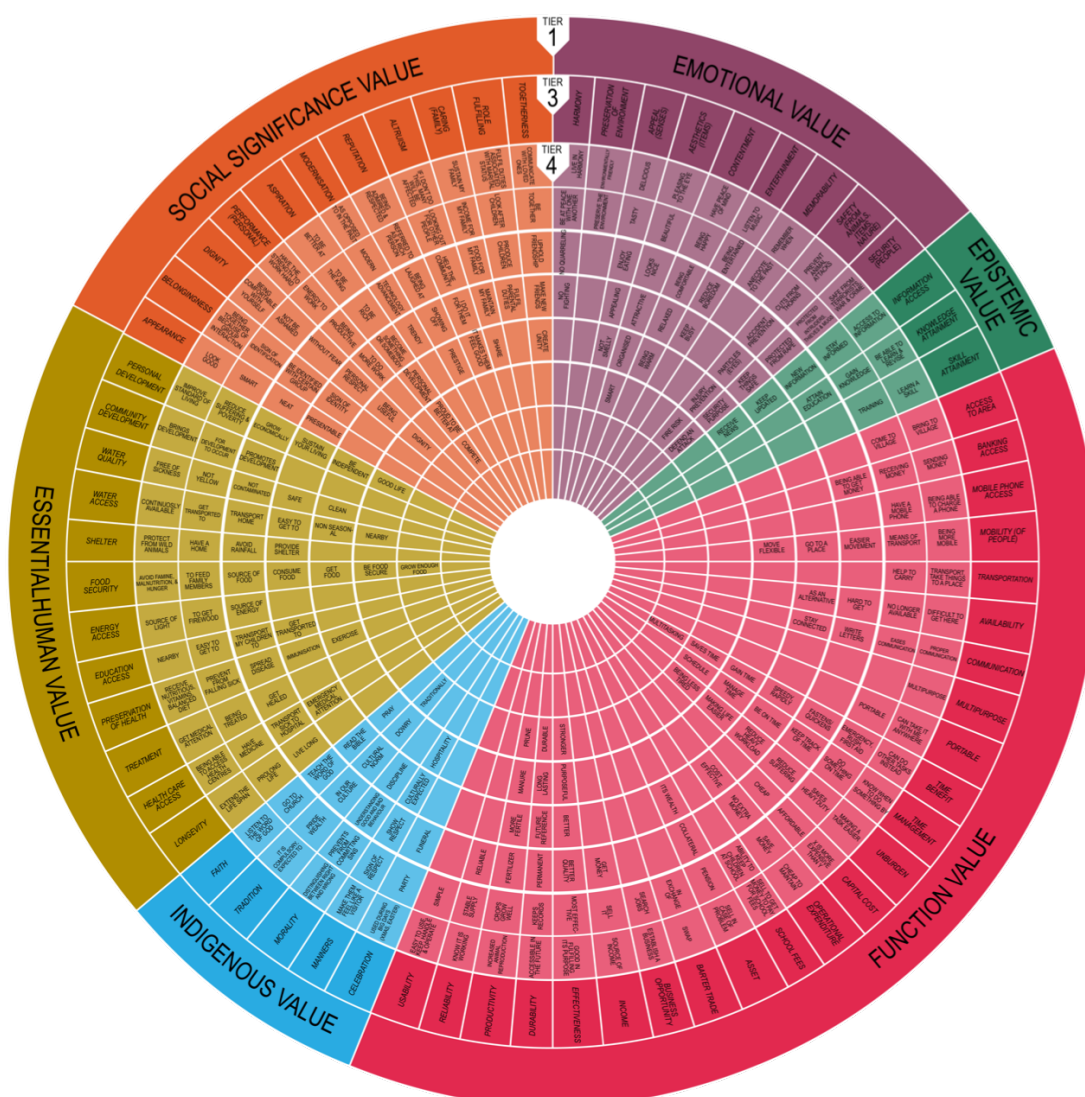


Figure 20: ‘Keyphrase Wheel’ to help align statements with UPVs



5.3 Summary UPV framework

The framework, as just described, was developed from a review of value theory literature, in particular the frameworks presented by Boztepe (2007b) and (Smith and Colgate, 2007), but tailored to an infrastructure context with specific regard to energy access.

Whilst value theory is an approach common in marketing and product design, until now the theory had not found a place in infrastructure developments.

In an initial review of the literature, a total of 39 values were identified. This theoretical framework of user-perceived values (UPVs) was modified using the data collected as part of the UPV game {described in Section 3.3.2} resulting in the final UPV framework consisting of 64 UPVs.

The framework is novel in the sense that it is wider than any one existing framework. Its main aim is to act as a tool for comparing and contrasting the data collected in the seven case study villages in rural Uganda and to answer the specific research questions of this study {Section 1.2}; as such, it can be seen as a navigation and illustration aid.

The framework consists of six ‘tier 1’ value pillars important for the success of rural electrification schemes. These are as follows: EMOTIONAL, EPISTEMIC, FUNCTIONAL, INDIGENOUS, ESSENTIAL HUMAN and SOCIAL SIGNIFICANCE VALUES. The success of a development intervention may be influenced by any of the pillars, their ‘tier 2’ value groups and ‘tier 3’ UPV categories.

The framework was graphically depicted as a UPV wheel which is used hereafter as the main aid to graphically depict the data sets. The main purpose of the secondary ‘Keyphrase Wheel’ was to support the researcher in the categorisation of statements into values and hence ensure consistency throughout this process. It is, therefore, not relevant for the illustration of data analysed in Chapter 6.

Whilst this researcher has attempted to create an exhaustive, objective list of beneficiaries’ values, there will be values that overlap depending on the context. The UPV framework in its final form is meant to be used as a guide rather than an instructive tool. Its use still requires human judgement and intellect, as well as occasional reassessment (individual values do not all fit a global model but rather consider specific local contexts). Moreover, this presents an opportunity to engage with communities, so that they can tailor projects to the specific values and context.

6 ANALYSIS CHAPTER: UPV COMPARISON

This chapter presents results for each of the research questions laid out in Section 1.2. To answer the four research questions pertaining to the UPV game, the Chapter is separated into four sections and in each of the sections, data is presented, analysed and discussed.

The chapter begins with a cross-case comparison {Section 6.1}. Here the results from the seven Ugandan villages are compared to one another and differences are highlighted {the data for each village, pertaining to the UPV game, is shown in at the end of Section 6.1 (page 167)}. The discussion focuses on the ten most important UPVs identified across the seven villages, resulting in a total of 19 ‘top 10’ UPVs {these are shown in Table 8 in Section 6.1.1}.

This is followed by a villager–expert case comparison {Section 6.2}. To do this, the data pertaining to these case study villages is collectively analysed {Section 6.2.1} and compared against what the experts with work experience in rural Uganda think is important to rural villagers {Section 6.2.2}. Gaps between experts’ opinion and villagers’ perception are highlighted {Section 6.2.3}.

A cross-gender analysis where the differences in UPVs between men and women are highlighted and compared is discussed in Section 6.3}.

Finally, in Section 6.4 the chapter finishes with a review of the benefits linked to the different energy sources as described by the villagers during the UPV game. Based on

this analysis section, recommendations for improved implementation are given in Chapter 7.

In line with the standard applied throughout this research, the following system for UPV categorisation applies: ‘tier 1’ pillars, ‘tier 2’ groups and ‘tier 3’ value categories are depicted in [CAPS], [**bold**], and [*italics*] respectively. Furthermore, UPVs can be primary, secondary or tertiary. For more information on this categorisation, refer to Section 2.4.3.1.

Throughout this chapter, example quotes from the villagers’ interviews (UPV game) are used to illustrate the discussions. Note, these quotes represent a small portion of the ‘storytelling’ data collected. To aid the discussion, the particular statistical characteristics for each village including socio-economic data is summarised in the infographic in Appendix III (fold out). Where applicable, a reference to the specific section will be made as follows: [infographic: column title: row title]. It is suggested that this chapter is read whilst viewing this infographic.

Parts of this chapter have appeared in the following publications (Hirmer and Guthrie, 2016, 2017).

6.1 Cross-case UPV analysis

One major output of this PhD research was to identify what is important to rural communities and to compare similarities and differences across rural villages in Uganda. The analysis revealed that there is similarity in the top UPVs across the seven villages; however, beyond these top UPVs there was a far greater degree of divergence in the ranking. Additional findings included that socio-economic data is an unreliable indicator regarding what is important, villagers’ perceptions differed even if they are in close proximity to one another and UPVs of an emotional nature were also important but harder to attribute to drivers {discussed in Section 6.1.2}.

The section starts by presenting the data for each of the seven villages collected from the UPV game—the data is based on a total of 17 interviews in each village. These are shown in the UPV wheels {shown at the end of Section 6.2 (page 167)}, each wheel depicts the complete UPV-profile for each village {for a description on the UPV wheel refer to Section 5.2}. The colour intensity of the wheel corresponds to the respective importance

of the UPV category (tier 3). The tier 1 pillar is kept consistent to give a colour reference point.

The individual village results are followed by a detailed comparison of the villages top UPVs {Section 6.1.1}.

6.1.1 Comparison UPVs

Based on the results shown in the case-by-case analysis, the table below {Table 8} illustrates the ten most important UPVs for each of the seven villages against the others—resulting in a total of 19 UPVs. These are then discussed in detail below {Sections 6.1.1.1 to 6.1.1.19}. The UPVs shown in Table 8 are in order of collective importance, starting from the most important to the least. UPVs of equal rank are marked with an ‘=’. The value ranking is out of the 64 UPVs shown in the UPV framework {for definitions refer to Table 7, Section 5.2}. The lower the number the more important the value.

The following discussions will be based on the earlier mentioned 19 UPVs and will draw up the findings based upon the case study analysis {Chapter 4} and the socio-economic data that resulted from the non-energy-specific interviews {shown in the Infographic, Appendix III}.

To guide the discussion, a fold-out page depicting the modified UPVs wheels for each village is found at the end of this section {p.166}. It is suggested that this section is read whilst viewing this fold-out page.

Table 8: UPVs identified across the seven villages resulting in a total of 19 ‘top 10’ UPVs

	Toro-Ombokoro	Gwere-Luzira	Lama	Suam	Bwindi	Mabwe	Bihondo
<i>Income</i>	1	1	1	2	2	4	2
<i>Preservation of health</i>	2	4	10	1	1	1	1
<i>Food security</i>	3	2	2	3	5	2	4
<i>Knowledge attainment</i>	9	6	9	9	3	3	5
<i>Business opportunity</i>	41	26	8	10	6	5	3
<i>School fee</i>	=10	=5	4	12	=8	16	=7
<i>Time benefit</i>	=10	12	=5	4	=8	10	11
<i>Contentment</i>	=7	9	11	=7	11	6	10
<i>Operational expenditure</i>	5	24	32	=7	4	=7	9
<i>Safety</i>	4	3	14	6	=21	41	27

	Toro- Ombokoro	Gwere- Luzira	Lama	Suam	Bwindi	Mabwe	Bihondo
<i>Productivity</i>	=22	7	3	5	12	20	32
<i>Energy access</i>	=7	=14	18	17	16	=11	=7
<i>Transportation</i>	=10	10	=5	25	36	=11	12
<i>Mobility</i>	13	13	15	23	=21	9	22
<i>Reputation</i>	17	34	32	19	7	=7	18
<i>Unburden</i>	=22	=14	7	15	31	26	27
<i>Aspiration</i>	37	17	21	18	=8	13	24
<i>Tradition</i>	6	8	16	48	18	36	46
<i>Caring</i>	31	47	45	37	27	28	6

6.1.1.1 *Income*

Income was ranked highly across all villages and in six of the seven villages it was within the top two UPVs. A reasonable explanation for this is that the ability to make money is an important part of life. The need to earn money is, for example, one of the main reasons for rural–urban migration (Brauw *et al.*, 2014). In 2002, labour influx in Kampala, Uganda, was 2.9% and 85% of these people came from rural areas (Andersson and Johansson, 2013). In six of the seven villages agriculture (crop farming and animal rearing) was the largest source of income [infographic: finances: income per sector]³⁹. This data was consistent with the average source of income of the working population in Uganda—the majority (72% in 2012/2013) engaged in agriculture, forestry and fishing (Uganda Bureau of Statistics, 2014). In line with this, *income* was commonly linked with horticultural items⁴⁰ such as a hoe or a garden, as well as livestock. For example, Launida of Bihondo highlighted that cows are important to her:

“When this cow gives birth, I would be able to sell it and get money to buy my other personal needs and basic needs for the home”.

In contrast to the other villages, in Mabwe *income* was prioritised to a lesser extent. This can be explained by the fact that, for the region, the people of Mabwe were more affluent [infographic: finances: median income].

³⁹ See fold-out infographic in Appendix III, references are as follows: [infographic: column title: row title].

⁴⁰ For the full list of items selected refer to Table 15 in Appendix I.

6.1.1.2 *Preservation of health*

In all villages *preservation of health* was amongst the top ten UPVs. It is interesting to note that in two villages in the West Nile Region it was of lesser importance. This might correlate with the fact that these villages did not have health care facilities in the confines of the village and targeted outreach regarding health care was found to be low. This is in contrast to Toro-Ombokoro that ranked *preservation of health* higher, where a strong community health team regularly informed locals on health issues and undertaking check-ups:

“Heath workers from the health centre usually tell us to have a latrine, go for HIV testing. Sometimes the Local Chairman and Village Health Teams come to check on us and go from one house hold to another.” Raymon, Toro-Ombokoro

An important part of health care facilities in Uganda is to educate villagers on aspects pertaining to the *preservation of health* (Hutchinson *et al.*, 1999), as such the two villages in the West Nile Region may be less educated about health care than those in the other case study villages.

What is surprising is that in Lama *preservation of health* was only ranked in tenth place. In this village, 100% of interviewees report monthly expenditure on medication or health care services [infographic: finances: expenditure]. The average percentage share of the income spent on medication and health care services was also higher in Lama than in other villages. There was no clear explanation for the disparity between the high expenditure and low value with regard to the *preservation of health* and this would require further investigation. However, one reasonable assumption might be that because of the difficulty to reach the village, Village Health Teams may visit less frequently thus awareness pertaining to health is lower.

The top three items linked to the *preservation of health* were pit latrine, cow and gumboots. The following provides a representative example:

“If you have a pit latrine, you have good health as all the faeces is kept inside the pit. If you don’t have one, it’s difficult because all the water will be dirty”. Mixed Group Discussion, Gwere

6.1.1.3 Food security

Food security featured in the top five UPVs across all villages. Despite much effort in the sector, Uganda is plagued by food insecurity. This is aggravated by environmental factors such as unpredictable rainfall and recurring droughts. In all seven villages, at least 25% of interviewees reported a loss from droughts. In addition, in the two villages in the West Nile Region as well as in Suam, villagers have suffered a loss of crops through flooding [infographic: emotional wellbeing: experience loss through]. A combination of these factors means that malnutrition continued to be a concern. This finding is consistent with the UBOS 2012/2013 household survey which states that “the most food insecure region of the country is the Northern followed by the Eastern region [...] the Eastern and Western regions had the poorest dietary diversity” (Uganda Bureau of Statistics, 2014, p. 230).

Therefore it is no surprise that *food security* was a concern and was commonly mentioned in combination with *preservation of health*; as described by Mariella from Bihondo:

“[The hoe] helps me in digging and this will help me get more food for my family which will lead to a balanced diet”.

6.1.1.4 Knowledge attainment

Knowledge attainment featured in the top ten values across all villages. While *knowledge attainment* was commonly linked to schools with regards to educating children, many villagers made reference to adult learning—further discussed as part of the comparison of experts’ opinion with villagers’ priorities {Section 6.2}—as well as *knowledge attainment* from television and radio. This is described in the Female Group Discussion in Bihondo:

“Radio helps in sensitising the nation on various issues like health, education, religious and political purposes”.

Knowledge attainment was slightly more important in Bwindi and Mabwe (UPV rank 3), and the reasons for this are discussed in combination with *aspiration* {Section 6.1.1.17}.

6.1.1.5 Business opportunity

There was a considerable divergence with regards to the importance of *business opportunity*, which ranked in the top ten UPVs in five villages but received a low ranking

in the other two, namely Toro-Ombokoro (rank 41) and Gwere-Luzira (rank 26). The findings of the UPV game are in line with the discussion from the case study analysis {Section 4.5} which found that in these latter two villages entrepreneurship, before and post infrastructure implementation, was low and no new businesses had formed post infrastructure implementation {see Figure 28, Appendix IV}. This is in contrast to the other villages where a significant boost post infrastructure implementation could be observed resonating with the high ranking of *business opportunity* seen in the same villages. These findings align with the language used to describe the benefits of the respective energy initiative. In Toro-Ombokoro and Gwere-Luzira benefits pertaining to the off-grid energy initiative rarely included aspects pertaining to income generation.

6.1.1.6 *School fees*

School fees can be seen as a secondary or tertiary value and as such its dominant link was with income {Section 6.1.1.1}. An example of this link is given below:

“I always get money out of the pigs. One time my daughter was sent away from school due to school fee problems and I sold [the pig] at UGX 200,000 and I was able to clear the balance”. Deborah, Gwere

In Mabwe (rank 16) *school fees* were prioritised to a lesser extent. This was noteworthy, especially when compared to the neighbouring village of Bihondo, where the average expenditure on *school fees* is almost three times lower (both villages are in the same region) [infographic: finances: expenditure].

The higher average expenditure on school fees might be explained by the fact that in Mabwe almost 58% of interviewees completed education beyond that of primary (double that of Bihondo) [infographic: education]. This indicated that a larger number of people in Mabwe attended higher forms of education, which correlated with the fact that 95% of interviewees were paying school fees in Mabwe [infographic: finances: expenditure]. A possible reason for the lesser importance given to *school fees*, despite the high expenditure, could be that the average income of villagers in Mabwe was comparatively high and as such the expenditure of *school fees* represented a smaller share of the average income (on average 42%) [infographic: finances: median income].

A limitation of the socio-economic data collected as part of this research is that the income data may represent household or individual (which was not entirely clear during data gathering), and multiple members of the household may contribute to paying school fees (or other costs). It was also noted that many interviewees paid school fees for relatives. Nevertheless, it was found that in Mabwe borrowing related to school fees is lower [infographic: finances: borrowing money], further substantiating the fact that the ability to pay school fees in Mabwe was much less of a concern to villagers. This also supported the idea that there is a link between the capability of paying school fees and the *school fees* importance ranking.

A more expected result was seen in Lama. Here *school fees* were of highest importance (rank 4), which can be attributed to the fact that 90% of interviewees paid school fees and the average income was considerably lower [infographic: finances: expenditure & median income].

6.1.1.7 *Time benefit*

Across all villages *time benefit* was an important UPV. Within this value category villagers made reference to being able to use this saved time for other activities, as illustrated by Mohammed of Mabwe who selected a motorbike for the following reason:

“Saving time is good because you can get many things done quickly”.

Reference to *time benefit* was often made in combination with *mobility*, *health care access* and *communication* and as such it was linked with a great variety of items, ranging from motorbike to mobile phone to plough. This complexity of *time benefit* made it difficult to link the greater prioritisation of this value in Lama (rank 5) and Suam (rank 4) to the reason it is considered as slightly more important. However, it is probable that the higher prioritisation of *time benefit* could be linked to the comparatively poor road infrastructure in both villages and the prolonged time it took to travel outside of the village {discussed as part of *transportation* and *mobility* in Sections 6.1.1.13 and 6.1.1.14 respectively}.

6.1.1.8 *Contentment*

In all villages *contentment* was ranked amongst the top eleven UPVs. This shows the importance of more emotional UPVs can play in the lives of rural communities. Like *time*

benefit, the value of *contentment* was linked to a great variety of different drivers and as such no single obvious link to explain its importance could be made. Comparing across the villages, *contentment* was ranked most highly in Mabwe (rank 6) and least highly in Lama and Bwindi (rank 11). For Mabwe, one possible reason for placing greater importance on *contentment* may be linked to the fact that Mabwe is more progressive.

The three most common items linked to *contentment* were bed, clothes and bible. An example of the link between bed and *contentment* is given below:

“If it was not for the bed some of us would not be here because I can never get the best sex while I am not on the bed. You will never feel pain when you have sex on the bed which has got a mattress and nice bed sheets”. Scola, Bwindi

6.1.1.9 Operational expenditure

Operational expenditure was ranked amongst the ten most important values in five of the villages but not in Gwere-Luzira (rank 24) or Lama (rank 32). *Operational expenditure* was linked to a great variety of items, namely solar products, mobile phone, vehicles and corrugated iron sheets. Furthermore it was found that the link between item and *operational expenditure* was dependent on the local context. To illustrate, Bernardo of Gwere-Luzira justified the importance of corrugated iron sheeting to him as follows:

“Termites eat and disturb our grass-thatched houses every year; getting corrugated iron sheets is good because they last for a long time. This helps us to save money that we would use to buy the now expensive grass”.

The issue of termites was only evident in the three villages in the West Nile Region (Toro-Ombokoro, Gwere-Luzira, and Lama) and as such a large number of Gwere-Luzira inhabitants made reference to it due to their village’s location. These same three villages provided another example where local context influenced the link between items and *operational expenditure*, as they made almost no link between mobile phones and *operational expenditure*. This contrasts with Bihondo, where the most common link to *operational expenditure* was mobile phones. A likely explanation for this is that Bihondo is far from the main road and thus transportation is expensive. To illustrate the selection of a mobile phone, when Carter of Bihondo was asked why a mobile phone was important to him, he stated:

“[The phone] cuts costs of movements from one place to another yet this can be solved via communicating on phone”.

In Lama *operational expenditure* ranked the lowest (rank 32). One possible explanation for this might be that the monthly expenditure on energy sources in Lama was considerably lower than in other villages [infographic: energy: source of energy/light]. In Lama only 40% of the people interviewed used paraffin for lighting to supplement their SHS. Similarly, in Gwere (*operational expenditure* rank 24) expenditure on energy sources was more than in Lama but considerably less when compared to other villages. However, one must note that there is a lack of evidence to support this claim, and it therefore has to be treated with caution.

Operational expenditure was ranked the most highly in Bwindi (rank 4) and Toro-Ombokoro (rank 5) and was spread across a wide range of items. There was no clear single connection between a particular item and *operational expenditure*. This would suggest that, across the board, villagers in Bwindi and Toro-Ombokoro were concerned with the personal costs they might be left to bear associated with a shared product or service.

6.1.1.10 Safety

The items most commonly linked to *safety* were gumboots, bed and machete. Safety concerns were the greatest in Gwere-Luzira (rank 3), Toro-Ombokoro (rank 4) and Suam (rank 6). The connection between *safety* and gumboots in these villages were linked to threats posed during physical activities:

“The benefit is that I use it to protect my feet from snake bite, thorns and sharp objects while digging”. Elijah, Toro-Ombokoro

In the same villages, an additional *safety* concern was the danger posed by animals during night-time. The men discussion of female choices in Gwere-Luzira was representative of the selection of a bed for the reason of *safety*:

“In case there are dangerous animals like scorpions or snakes that enter your room and find the bed is raised, you are saved but if you sleep on the floor, you can be affected”.

This would indicate that in the villages in the West Nile and Suam threats posed by animals were of greater concern. Additionally, it was noted that the villages who valued *unburden* relating to physical labour were also the ones that had a higher *safety* concern,

as most of the *safety* connections in these villages (Gwere-Luzira, Lama and Suam) were linked to physical activities pertaining to agriculture, discussed as part of *unburden* below {Section 6.1.1.16}.

In Mabwe (rank 41) *safety* concerns were significantly lower. This complements the findings throughout this analysis section whereby the villagers in Mabwe are, to a lesser extent, reliant on agriculture and thus there is less physical labour [infographic: finances: income]. This was discussed as part of *income* {Section 6.1.1.1}.

6.1.1.11 Productivity

Productivity was commonly linked to agricultural items and was of greater importance in Gwere-Luzira (rank 7), Lama (rank 3) and Suam (rank 5). There was a notable difference with regards to item selection in these villages. In contrast to the other villages where livestock was most commonly linked to *productivity*, in Gwere-Luzira, Lama and Suam a plough was the single most common link to *productivity*.

It can be reasonably assumed that *productivity* ranked highly in Gwere-Luzira and Lama and was predominantly linked to a plough because one person in Lama village owns a plough—both villages are near one another. Thus the fact there was a plough in the area would suggest an understanding of the benefits of owning a plough—i.e. an increase in productivity. This was also found to be true in Suam, here almost all people that selected a plough do own one. In contrast to the other villages where no one owns a plough, selection of a plough was negligible.

Comparing the above findings with the socio-economic data gathered as part of this research, no link between the importance of *productivity* and villages, where the predominant source of income is agriculture, could be made.

6.1.1.12 Energy access

There was inconsistency in the prioritisation of *energy access* across the seven villages. In Toro-Ombokoro and Bihondo *energy access* ranked relatively high (rank 7). In contrast, in Lama (rank 18) and Suam (rank 17) it ranked the lowest. As a consequence of the complexities pertaining to the energy initiatives and the sizes of the installed projects across the seven villages, no correlation could be observed. Furthermore, no link

in relation to energy expenditure [infographic: energy: source of energy/light] and its prioritisation in the villages could be deduced. However, what the variation in ranking showed is that *energy access* is not a high priority everywhere and development agencies should be cautious in making assumptions about how successful projects will be if the energy provided does not meet a more important need from the point of view of the beneficiaries.

Energy access refers to being able to obtain energy services or resources and as such it was most commonly linked to the following items: solar panel, candle and generator. For these, the most common reference was made with regards to the ability to have lighting. This is similar to the finding from the energy-specific survey {Figure 28, Appendix IV}, where the most common benefit perceived by interviewees pertaining to the energy initiatives was lighting. With regard to generators, benefits extended, in most cases, beyond lighting. A representative example of this was given by Ward from Gwere, who selected a generator for a multitude of reasons:

“The benefit of a generator is that it can be used to give light for children to read. It can be used for cooking and makes work easy. For example it is used to run televisions, and radios from which we can get news”.

The most prevailing secondary or tertiary value links were made to *operational expenditure, knowledge attainment* and *safety*. The benefits of energy sources as seen by villagers are discussed in more detail in the section dedicated to energy-specific analysis {Section 6.4}.

6.1.1.13 Transportation

Transportation refers to the act of conveying someone or something and was commonly linked to modes of transport and roads. There was a clear link between *transportation* and the need to travel outside of the confinements of a village to access services or markets. In Suam and Bwindi *transportation* ranked considerably lower with ranks 25 and 36 respectively, presumably because both villages had large trading centres providing a diverse range of services and a market. In contrast, Lama village, (rank 5), which had bad road access and a limited service infrastructure, *transportation* was ranked the most important amongst the seven villages.

Monroe of Suam was representative in his selection of a bike for the reason of *transportation*:

“It works as transport, I can use it to carry Matoke and Cassava to the market and sell them at higher prices than selling them in the village at low prices and that means I am making good money rather than if I was using my head because I cannot carry a lot to the market”.

6.1.1.14 Mobility

Mobility was commonly linked to road, motorbike and bike. As such there is no surprise that in Bwindi (rank 21) and Suam (rank 23) it was, similar to *transportation*, of lesser importance as economic activities inside the village are high and services are also present. In contrast, this would explain the higher importance of *mobility* in the villages in the West Nile Region where there are no education or health care institutions near the village—people have to move long distances. Comparing the two villages in the Rwenzori Mountains (Mabwe (rank 9) and Bihondo (rank 22)), which usually display close similarities in their value patterns, there was a strong discrepancy between the prioritisation of *mobility*. One can only speculate that *mobility* is of greater importance in Mabwe as it is a transitory place where many people rent living accommodation and work outside of the village. It is on a crossroad where motorbike taxis and vehicles regularly pass through. As such villagers rely on their personal ability to commute in order to get to their jobs. In contrast, in Bihondo the main source of villagers’ income is from agriculture [infographic: finances: income] and the village has a small trading centre providing a variety of services. Hence villagers are less dependent on traveling outside of the village; there is also a small market in the village.

6.1.1.15 Reputation

In Bwindi and Mabwe (rank 7), *reputation* was amongst the top ten UPVs. Similarly, *aspiration* was found to be considerably higher in these villages. Therefore reasons for the higher importance placed on *reputation* are discussed as part of aspiration {Section 6.1.1.17}. Both value strands are in line with the ‘value in sign’ and the prestige that comes from it {Section 2.4.3}.

The value placed on *reputation* can be reflected in the kind of *aspiration* people have in the village. This is because people often aspire to change their future reputations. *Aspiration* for some people is entirely linked to *reputation*. As such *reputation* can be a motivator of *aspiration*—being viewed as someone better results in the *aspiration* to become someone better.

Reputation refers to commonly held opinion about one's character. This is illustrated in the below examples:

“If I build a house with iron sheets, as a man I will be recognized in the village and people will call me a real man”. Carter, Bihondo

“I think men have chosen [a school] because if their children acquire education they will be known in the village. I think when you are known in the village you become famous”.
Women Discuss Male Choices, Suam

These last examples clearly illustrates the link between *aspiration* and *reputation*.

6.1.1.16 Unburden

In contrast to other UPVs, *unburden* was consistently linked to a large variety of different items ranging from mobile phones to ploughs to corrugated iron sheets. *Unburden* appears to be a value category that is more specific to an individual village or, in some instances, to a region.

Unburden ranked highest in Lama (rank 7), Gwere-Luzira (rank 14) and Suam (rank 15). In all these villages *unburden* was commonly linked to the selection of a plough. The reasons for this were discussed as part of *productivity* {Section 6.1.1.11}. In Lama *unburden* was, in contrast to other villages, commonly linked to *transportation*. The people of Lama placed a considerably greater importance on *transportation* for reasons discussed earlier {Section 6.1.1.13}. Only for Lama and Gwere-Luzira *unburden* was linked to corrugated iron sheets. In these villages, termites are a concern, requiring the frequent replacement of grass-thatched roofing. Juspina of Gwere-Luzira explained her selection of a corrugated iron sheet as follows:

“This is important because it's long lasting and I am tired of cutting grass for my roof. This iron would help me to stop looking for grass”.

In Bwindi and Bihondo *unburden* was most commonly linked to mobile phones. The description by Uzia of Bihondo was representative of the link between mobile phones and *unburden*:

“I chose a mobile phone because it’s a quick and easy way to communicate. It’s easy to speak to someone who is far “.

A suggested reason for its importance in Bihondo is presented in the section on *operational expenditure* {Section 6.1.1.9}. No obvious reason for this link could be seen for Bwindi.

6.1.1.17 Aspiration

Aspiration can be seen as a secondary value category and as such it was commonly mentioned in combination with values such as *knowledge attainment*, *personal development*, *wellbeing*, and *skills attainment*. In this research, these values, in addition to *reputation*, make up the motivating factors of *aspiration*.

Aspiration in Bwindi (rank 8) was much higher in contrast to other villages. One reason for this may be that Bwindi was frequented by domestic and international tourists, leading to a greater desire to become someone better. In a similar sentiment, in Mabwe (rank 13) access to the internet was considerably greater in contrast to other villages—50% of interviewees made use it [infographic: exposure: media]. Both tourism and internet access can be linked to exposure beyond regional confines, which indicates that there was a correlation between exposure and *aspiration* in the villages studied.

In addition, in Mabwe and Bwindi the educational level of interviewees beyond primary school was considerably higher in contrast to the other villages [infographic: education: education]. This aligned with the findings from *knowledge attainment* {Section 6.1.1.4} and as such educational aspects were contributing factors to *aspiration*. To illustrate, in Mabwe income levels were higher in contrast to the other villages studied in the same region [infographic: finances: median income], which would suggest that higher levels of education lead to increased wealth and subsequently wellbeing. This further substantiated the reason why *aspiration* ranked higher in Mabwe and Bwindi. This was illustrated by the following representative example:

“Woman selected a school because in this developing world its known that everyone needs to study and if it was not for studying you would not have come to this village, and all communication that is around is because of schools”. Men Discuss Female Choices, Bwindi

6.1.1.18 Tradition

Tradition was ranked highly in the villages across the West Nile Region, ranking the highest in Toro-Ombokoro (rank 6). This suggests that in this region traditional practices played a more important role; no additional evidence could be found in literature concerning Uganda to support this claim. However the West Nile Region of Uganda is less developed and it is reasonable to assume that traditional practices are lessened by development. Hence, tradition remains important in this region.

Tradition was commonly linked to livestock and the traditional practices associated with livestock. A representative example of this is the payment of a dowry using goats, as described by Todd from Bwindi:

“A goat helps a lot when it comes to cultural marriage. When I was marrying my wife they asked me to pay a dowry of eight goats, two cocks for the in-laws, cows and so many other things”.

6.1.1.19 Caring

There was a significant divergence in the importance of *caring* between Bihondo and the remaining villages, ranking much higher in Bihondo (rank 6). The following description provides a representative example of this:

“I use a hoe to dig and farm and take care of my family”. Carter, Bihondo

Comparing it with the case study analysis and the socio-economic data presented in the infographic {Appendix III} no obvious link could be made. Additionally a comparison against different UPVs (such as *faith*, *tradition*, and *manners*) did not provide further insight.

6.1.2 Discussion cross-case comparison

The aim of the cross-case analysis was to identify what:

- was important to rural communities in Uganda; and

- what were the similarities and differences of UPVs are between the seven case study villages studied as part of this research.

This section seeks to shed light on what was important to the different communities and how these values compare, as well as to identify if socio-economic data is a reliable indicator of what is important in rural communities.

– **What is important to rural communities in Uganda?**

From the comparison of the top ten most important UPVs, for each of the seven villages a total of 19 UPVs were identified—out of the 64 UPVs. These are listed in collective importance as follows: *income, preservation of health, food security, knowledge attainment, business opportunity, school fees, time benefit, contentment, operational expenditure, safety, productivity, energy access, transportation, mobility, reputation, unburden, aspiration, tradition and caring.*

The analysis of the seven villages revealed that the top UPVs such as *income, preservation of health, food security* and *knowledge attainment* were consistently valued across all the case study villages. They were important regardless of the specific situation in the villages, albeit some difference in their ranking could be discerned and attributed to local contexts. For example, *food security* was prioritised slightly more in villages where environmental shocks such as droughts and flooding were more common. While such nuances in ranking may be important, it was not always possible to discern the precise reason for slight discrepancies. But what the data shows is that these UPVs were important across the board, independent of the village context.

Beyond these top UPVs a far greater degree of divergence in the ranking was seen. A link between the more tangible UPVs and the socio-economic data was often clearer in these cases. For example the UPVs of *transportation* and *mobility* were less important in Suam and Bwindi. Both villages had large trading centres with a proliferation of services and markets, thus movement beyond the confines of the village was not a necessity.

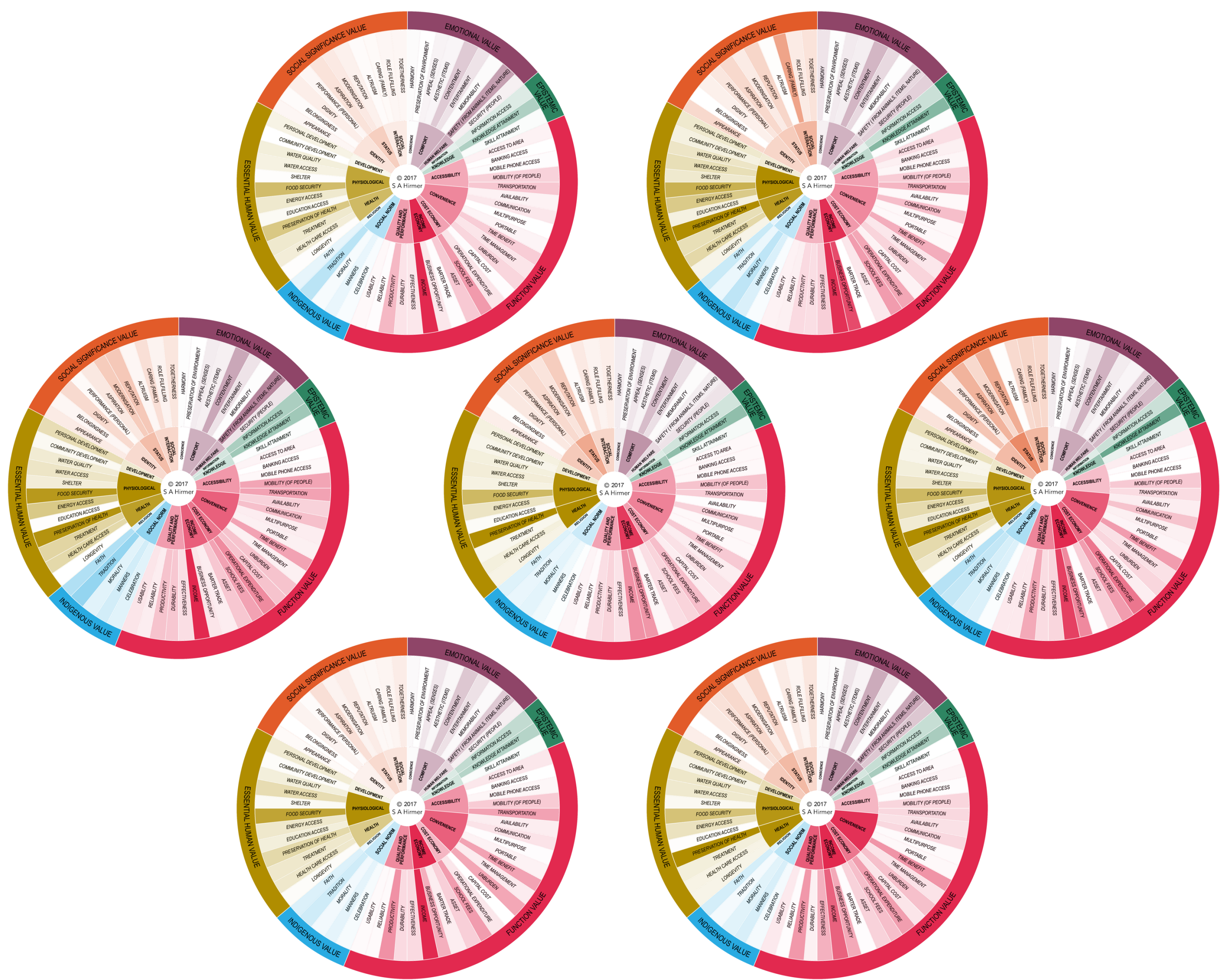
In contrast, in some instances UPVs were influenced by multiple factors within a community, and here the link to a single reason was not clear. An example of this complexity was evident in the analysis of *productivity*. While horticultural items were predominantly linked to *productivity* there was no correlation between the relative

importance of *productivity* and the extent the community relies on agriculture as a source of income [infographic: finances: income]. This shows that socio-economic data alone is not a good indicator of what is important to communities.

The disparity between the socio-economic data and the prioritisation of UPVs was more prominent for UPVs that could be attributed to a great variety of different issues. Here the link between item choice and UPV category was less clear as the categories were less attributable to a single cause. This was evident for the more socially- and emotionally-oriented UPVs, *contentment*, *tradition* and *caring* for example. These UPVs were important in some villages but a clear link as to why they were important could not be found.

Overall, it was difficult to capture and link the prioritisation of UPVs to the socio-economic data collected as part of this research. This suggests that socio-economic data is not a reliable indicator regarding how the relative importance of a UPV contrasts with other UPVs. One reason for this is that UPVs can be of a secondary or tertiary nature. To illustrate taking the example of a school; the primary UPV is the *knowledge attainment*. A secondary value of this could be the ability to earn more *income* because of the higher level of education. This in turn may result in a better *reputation* in the village (tertiary value). Thus it is important to consider the UPVs for each village together with the specific village context and socio-economic data in the design of projects.

UPVs Profile of the seven case study villages



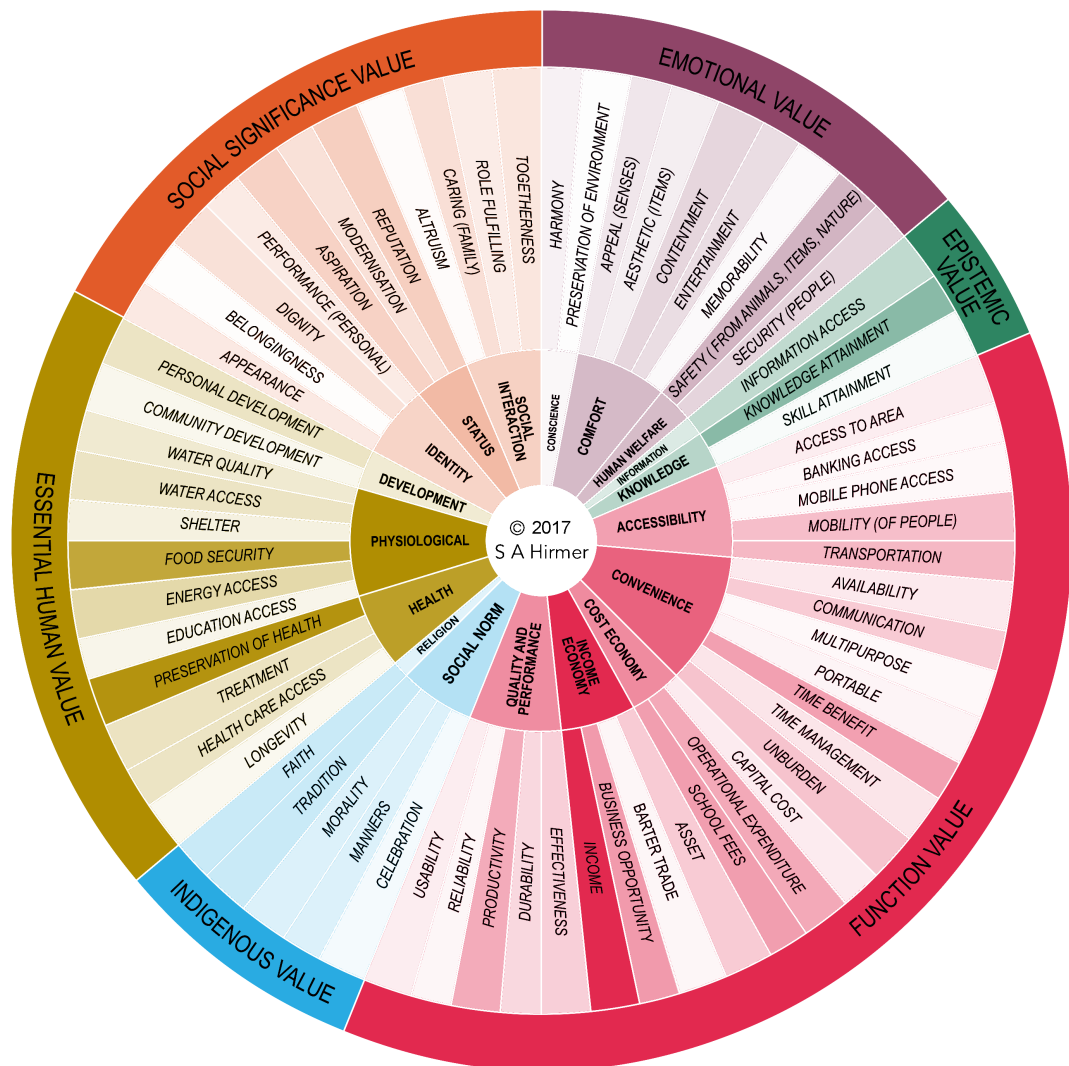
6.2 Villager–expert case analysis

This section seeks to address the research question pertaining to a comparison of experts' opinion with villagers' priorities in rural Uganda. To do this, the villager case results and the expert case results are firstly discussed separately and then compared with each other.

6.2.1 Villager case results

Figure 21 depicts what villagers across the seven rural villages in Uganda perceive as important. The ten most important values (tier 3) for villagers (in order of importance) are: *income, preservation of health, food security, knowledge attainment, business opportunity, school fees, time benefit, contentment, operational expenditure and safety.*

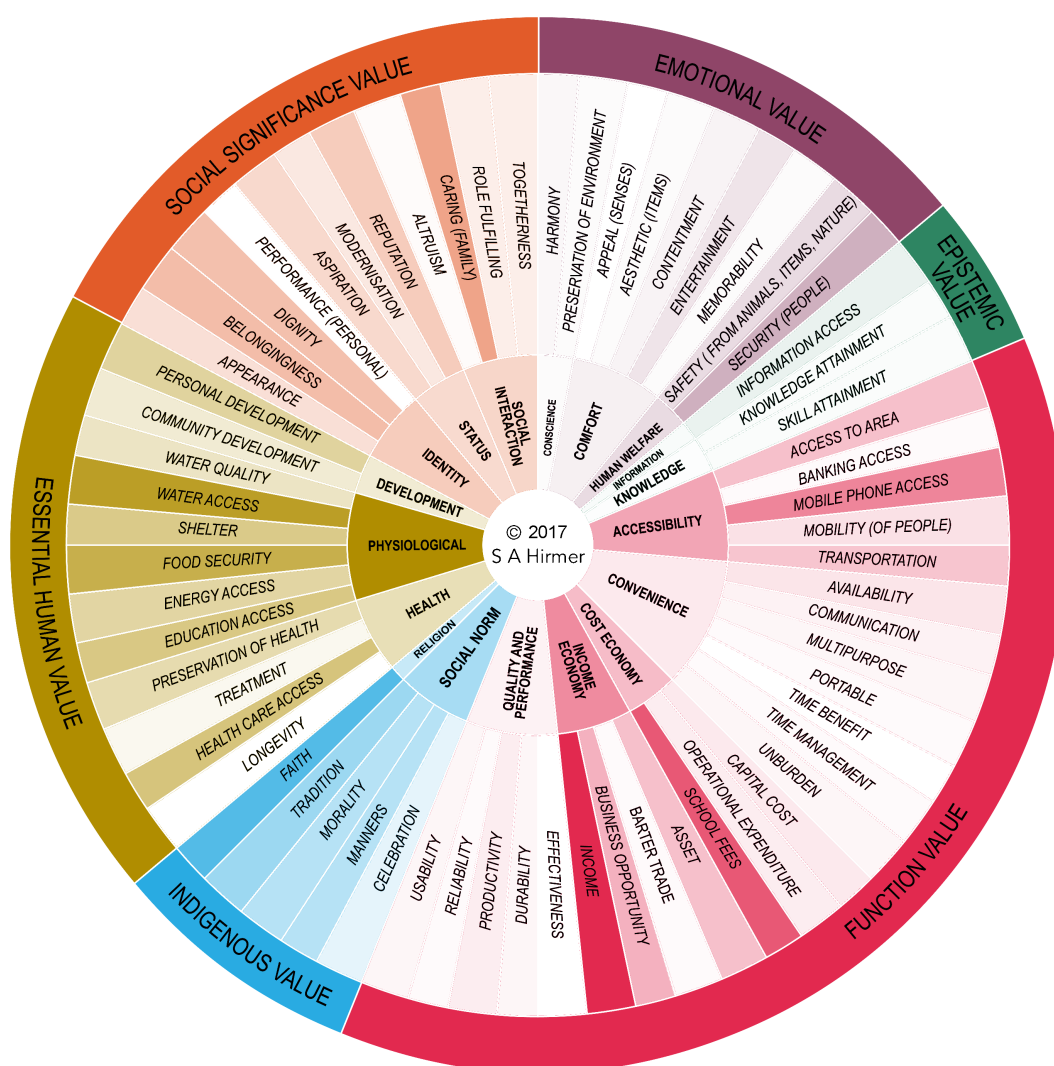
Figure 21: UPV profile of the seven case villages in rural Uganda



6.2.2 Expert case results

Figure 22 depicts the UPV profile of rural communities in Uganda as perceived by 70 experts with work experience in rural Uganda. The ten most important values are (in order of importance): *income, water access, faith, school fees, food security, mobile phone access, caring, health care access, education access and tradition*.

Figure 22: Beneficiaries' priorities as perceived by experts



For details on the experts, their background and sector refer to Appendix V; the data collection methodology and specific methods used to sample experts were outlined in Sections 3.3.4 and 3.4.4 respectively.

In addition to selecting ten values, experts were asked to give a rating of confidence for each value selected. This rating was not applied to the top ten priorities used for comparison, but instead used to assess how confident the experts were overall with their selections. For 6%, 25%, 42% and 28% of selected values, experts were not confident, somewhat confident, confident and very confident respectively. Hence, for nearly 70% of selected UPVs, experts were confident to very confident with their selection regarding what they perceived to be important to rural communities in Uganda. There was no clear

link between confidence rating and years of work experience in the sector, nor Uganda-specific work experience. It was found that even if experts had less than one year of Uganda-specific work experience they were still confident with the majority of their selections. This is shown in Table 9 where a positive scoring system was applied. This table shows that by weighting each result on a scale of 1 to 4, there was little variation in the total scores of each experience group, and for each experience level the average confidence level was closest to ‘confident’.

Table 9: Total score of data points by experience and confidence level

Level of confidence	Years of experience							Points Awarded
	<1 year	1–2 years	3–4 years	5–6 years	7–8 years	9–10 years	>10 years	
Not Confident	0.07	0.13	0.10	0.03	0.00	0.03	0.01	1
Somewhat Confident	0.33	0.29	0.44	0.57	0.50	0.87	0.47	2
Confident	1.80	1.24	1.33	0.96	1.43	1.20	1.20	3
Very Confident	0.67	1.26	0.96	1.46	1.10	0.53	1.42	4
Average confidence level	2.87	2.91	2.83	3.02	3.03	2.63	3.10	

This resonates with the belief that development workers have a presumptuous understanding of the needs of communities (Banks *et al.*, 2015). This was also highlighted by Perry (2015) following the UN General Assembly in New York: “while they [the aid workers] may differ substantially in motivation and intent, they share the presumption that they can tell Africans who to be and how to behave”.

This research found that experts did not have an industry bias. They selected values that were independent of their own sector and were impartial in this respect. This does not suggest that these experts saw their own sector as insignificant, but that there were other aspects that they considered to be more important for the villagers. To illustrate, the key informant survey revealed that whilst water access and education access were seen as very important by the experts, only three of the 70 experts worked in the field of ‘water and sanitation’ and another three in the field of ‘quality education’. In contrast, due to the researchers’ initial contacts, 27 of the experts had surveyed work in ‘affordable and clean energy’. Despite this, *energy access* was only ranked 17th. It was interesting to observe that for all three examples (‘water and sanitation’, ‘quality education’ and ‘affordable and

clean energy’) only around 30% of the UPVs selected by the experts were representative of their respective sectors. Additionally, there were six experts working on the promotion of ‘good health and well-being’. Those six experts selected the values *health care access*, *preservation of health*, and *personal development* two, three, and four times respectively.

6.2.3 Comparison of experts' opinion with villagers' priorities

A major outcome of this research was the identification of significant gaps between villagers’ UPV and the experts’ assessment of villagers’ perceptions. The comparison below is based on the data presented in the ‘Villager Case Analysis’ and the ‘Expert Case Analysis’ above. To look in further detail at this finding, Table 10 compares the top ten priorities as perceived by the villagers against the experts’ ranking for the same values. The last row of the table shows the divergence in prioritisation.

Table 11, in contrast, compares what experts see as important for villagers and compares these to the prioritisation of villagers. Note that the values highlighted in grey indicate that both villagers as well as experts perceived them as particularly important (i.e. ranked amongst top ten). Only these examples and values where the divergence in prioritisation is greater than 25 (highlighted in light orange) are discussed in further detail for brevity. They also sufficiently demonstrate the key facets of the comparisons. The examples where divergence is in prioritisation greater than 25 are:

- From Table 10 (in order of appearance): *knowledge attainment*, *time benefit*, *contentment*, and *operational expenditure*.
- From Table 11 (in order of appearance): *mobile phone access* and *education access*.

Table 10: Villagers’ prioritisation compared to experts’ ranking

Value	Villagers’ ranking	Experts’ ranking	Divergence in prioritisation
<i>Income</i>	1	1	0
<i>Preservation of health</i>	2	20	18
<i>Food security</i>	3	5	2
<i>Knowledge attainment</i>	4	49	45
<i>Business opportunity</i>	5	16	11
<i>School fees</i>	6	4	2
<i>Time benefit</i>	7	60	53
<i>Contentment</i>	7	41	34
<i>Operational expenditure</i>	9	39	30
<i>Safety</i>	10	27	17

Table 11: Experts' prioritisation compared to villagers' ranking

Value	Experts' ranking	Villagers' ranking	Divergence in prioritisation
<i>Income</i>	1	1	0
<i>Water access</i>	2	25	23
<i>Faith</i>	3	19	16
<i>School fees</i>	4	6	2
<i>Food security</i>	5	3	2
<i>Mobile phone access</i>	6	62	56
<i>Caring</i>	7	29	22
<i>Health care access</i>	8	25	17
<i>Education access</i>	9	47	38
<i>Tradition</i>	10	20	10

Table 10 and Table 11 show that there was a significant difference between the perceptions of the experts and the villagers. Looking at the ten most important aspects from both datasets, it was found that synergies could only be seen with regards to three values, namely *income*, *food security* and *school fees*. It may be noted that, whilst the ability to have access to food and to generate income are often mentioned in the literature as primary concerns, for most rural communities in developing countries the ability to pay school fees is particularly relevant to a Ugandan context (due to the relatively high cost of schooling) and is rarely discussed. This shows that the experts do have some understanding of the Ugandan context.

Nevertheless, even in cases where values of villagers aligned with experts' opinion, this does not necessarily mean the full context is understood. The connection between different UPVs and the local context is crucial to understanding the motivation of a village regarding the prioritisations shown in the tables above—this has been discussed as part of the cross-case analysis {Section 6.1}.

The greatest divergence in opinion between experts' and villagers' prioritisation could be seen with regards to the values *mobile phone access* and *time benefits*. While experts believed that *mobile phone access* was important for rural communities, ranking it in sixth place (of 64), it was perceived as trivial by the villagers and was ranked as second to last. This is not to say that villagers did not see mobile phones as important, as mobile phones were selected by almost all villagers during the UPV game, but that they were selected for different reasons, including: *ease of access*, *communication*, *time benefit* etc. In this

research *mobile phone access* refers to ‘having continuous access to mobile telecommunication services’.

One reason for the high selection of *mobile phone access* by experts’ may be the high mobile phone penetration rates across sub-Saharan Africa (41% of unique subscribers in 2015) (GSMA, 2015) and the related need to be able to charge mobile phones highlighted in various project reports (Etzo and Collender, 2010). This concern regarding mobile phone charge was also found in a few interviews with the villagers; however, it was exclusively linked to solar energy as a means to charge mobile batteries with an insignificant number of people referring to it. Given the above, the low ranking for villagers’ value-perception of *mobile phone access* may be an indicator that the need for mobile phone access has been fulfilled in the villages studied.

Unlike the value *mobile phone access*, *time benefit* was perceived as very important across the seven Ugandan villages (rank 7), but of low importance by experts (rank 60). This may be because of the contrast between how *time saving* is discussed in the literature versus its importance to villagers. To illustrate, a couple of recent studies have found that time-saving benefits do not automatically increase product and service uptake (Beltramo *et al.*, 2015; Yaqoot *et al.*, 2016) or the willingness to pay (WTP). For example, a study assessed the WTP for fuel-efficient cook stoves of rural Ugandan communities. Marketing messages emphasising time and money benefits did not increase the WTP of target communities (Beltramo *et al.*, 2015). In contrast, a study found that the introduction of an electricity scheme saved women time as they did not have to undertake the grain milling manually and subsequently visits to local health clinics increased (Kirubi *et al.*, 2009). That finding is in line with other literature, where the ability to save time through infrastructure improvements such as off-grid energy is repeatedly mentioned as a key benefit to rural communities (Fulkerson *et al.*, 2005; Asperen, 2010; Torero, 2014), although the extent to which this reflects the opinion of the participants is unclear. An example relating to this is given below:

“[A grain mill] saves time in homes wasted on grinding”. Mechelle, Bihondo

While villagers thought that *knowledge attainment* was important (village rank 4 and expert rank 49), experts perceived *education access* as more important (village rank 47 and expert rank 9). *Education access* in this research refers to ‘being physically able to access educational facilities’ whereas *knowledge attainment* refers to ‘the ability to learn

or be taught new knowledge'. While they are closely linked in their end goal, *knowledge attainment* goes beyond formal education and includes personal education for adults not only linked to educational institutions but instead to the wider benefits of teaching (lifelong learning). This was also emphasised during the interviews with villagers. A representative example of this was given by Calvin of Suam:

"I can, at times, read a book during my leisure time and thereby get new information or learn new things which I can apply in my daily life to improve it"

Nevertheless, this finding needs to be interpreted with caution. While key informants were provided with definitions for the 64 UPVs of which they were required to select ten, the distinction between *knowledge attainment* and *education access* may not have been entirely clear to them. The close similarity of these UPVs may have forced interviewees to prioritise the selection of one UPV over the other.

Experts ranked *operational expenditure* in 39th place. In contrast, villagers ranked *operational expenditure* in ninth place, and it is thus seen as more important by villagers, as illustrated by the following example:

[Corrugated Iron Sheets] "I cannot stay in an unroofed house. Rain cannot get my kids because when children are sick they are taken to hospital; this money can be used for other things". Genna, Bwindi

The lack of prioritisation given to *operational expenditure* by key informants is in contradiction with the literature on development projects. Here the cost savings achieved are frequently stated as key to project buy-in, particularly with regards to off-grid energy. See Section 2.1.1 for the discussion relating to the benefits of energy access as per literature. However, it should be noted that the way in which it is ascribed in literature is in most cases different to how villagers refer to it, substantiating the fact that messaging has to resonate with what is important to villagers.

6.2.4 Discussion comparison of experts' opinion with villagers' priorities

A major outcome of this research was to identify the gaps between villagers' value-perception and the experts' assessment of what villagers need. This was done through a comparison of experts' opinion with villagers' priorities. The findings from the comparison are summarised below.

– **What is the gap between experts' opinion with villagers' priorities?**

The findings from this research highlight a significant gap between villagers' value-perception and the experts' assessment of villagers' needs. Out of the ten most important UPVs {Table 10 and Table 11} examined for both villagers and experts, similarities could only be seen with regards to three, namely *income*, *food security* and *school fees*. Here the divergence in prioritisation was insignificant with 0, 2 and 2 respectively. Outside of these the divergence in prioritisation was considerably larger. The greatest divergence in prioritisation could be seen for: *mobile phone access* (divergence 56), *time benefit* (divergence 53) and *knowledge attainment* (divergence 45). Additionally it was found that experts tended to have a high confidence in their selections, even if they had less than one year of Uganda-specific work experience. This indicates that those with expert knowledge regarding rural communities may overestimate how well they understand the needs, values and wants of project beneficiaries.

The above discussion demonstrates the gap between experts' opinion and villagers' UPVs and highlights the subjective confidence regarding the values of rural communities of experts. The gap is significant enough to reassess the reliance on external expertise which is not tempered by investigation into UPVs or similar and therefore unlikely to lead to project success. This gap in understanding of rural communities clearly highlights the importance of a tool that helps to get a deeper understanding regarding what is important to rural communities.

6.3 Cross-gender comparison

This section seeks to shed light on what is important to both gender groups and the divergence between their UPVs. Consequently, this section compares and highlights the differences between the top ten priorities for the men and women of all case study villages. Table 12 below compares the top ten priorities as perceived by men against those of women. The last row shows the divergence in prioritisation. Table 13, in contrast, compares what women see as important with the prioritisation of men. Rows marked in orange indicate a divergence in prioritisation of greater than 5.

Table 12: Male prioritisation compared with female prioritisation

Values	Male UPV ranking	Female UPV ranking	Divergence
<i>Income</i>	1	2	1
<i>Preservation of health</i>	2	1	1
<i>Food security</i>	3	3	0
<i>Knowledge attainment</i>	4	4	0
<i>Business opportunity</i>	5	7	2
<i>Productivity</i>	6	11	5
<i>School fee</i>	7	8	1
<i>Operational expenditure</i>	8	10	2
<i>Contentment</i>	8	5	3
<i>Transportation</i>	10	13	3

Table 13: Female prioritisation compared with male prioritisation

Values	Female UPV ranking	Male UPV ranking	Divergence
<i>Preservation of health</i>	1	2	1
<i>Income</i>	2	1	1
<i>Food security</i>	3	3	0
<i>Knowledge attainment</i>	4	4	0
<i>Contentment</i>	5	8	3
<i>Time benefit</i>	6	13	7
<i>Business opportunity</i>	7	5	2
<i>School fee</i>	8	7	1
<i>Safety</i>	9	11	2
<i>Operational expenditure</i>	10	8	2

Table 12 and Table 13 show that the difference within the top ten UPVs between the two gender groups are marginal.

With a small divergence of five, the greatest difference in Table 12 (highlighted in light orange) relates to *productivity*—men placing greater importance on this than women. For both gender groups *productivity* was commonly linked to livestock for manure as well as horticultural equipment. An example of the most common link between item selected and productivity is given below:

“I use cow dung as manure in the farm to improve on my farm produce”. Calvin, Suam

A possible explanation for the lesser importance placed on *productivity* by women is that women in Uganda cultivate smaller plots in comparison to men (Ali *et al.*, 2015). There is also a gender gap in physical inputs to improve productivity with a greater percentage of men reverting to this [*ibid*].

Albeit small, the greatest divergence in prioritisation between the two gender groups could be seen with regards to *time benefit* and this is highlighted in orange in Table 13.

Women placed *time benefit* on rank six, in contrast men ranked it on place thirteen. For both gender groups, the most common link between item selected and *time benefit* was with regards to mobile phones and modes of transportation such as motorbike or bike, as illustrated in the below example:

“This helps me when I want to go very fast to distant gardens. It quickens movement and can be used to take produce to the market for sale”. Earlean, Gwere

Going beyond this, there were some notable differences between items selected and *time benefit*. Women for example more commonly linked *time benefit* to stoves for cooking as well as items pertaining to water access. In contrast, men referred to *time benefit* with regards to agricultural machinery (plough and grain mill). This link by men to agricultural machinery can be linked back to the greater importance placed on *productivity* by men and their cultivation of considerably larger plots (Uganda Bureau of Statistics, 2014). The greater importance of *time benefit* to women can be linked to the time and drudgery of women’s household tasks restricting their ability to perform other activities—this resonates with the findings from literature {Section 2.1.1}.

Going beyond the thirteen UPVs shown in Table 12 and Table 13 and extending the comparison to the top twenty UPVs, a prominent difference of prioritisation of UPVs between the two groups could be seen. For example, women placed greater importance on *unburden* and *aspiration* (female ranking 13, male ranking 23), and *treatment* (female ranking 17, male ranking 29). In contrast men placed greater importance on *tradition* (rank 16), *asset* (rank 18), and *caring* (19), all of which were ranked in 29th place by women. It is interesting to note that these UPVs more closely reflect the different gender roles. For example, in Uganda women spend more time undertaking laborious tasks and thus it is no surprise that *unburden*—making a task easier by simplifying—features more strongly as, like *time benefit*, it can be linked to the nature of women’s daily labour. In a similar sentiment, men placed greater importance on *caring*—displaying kindness and concern for family members. This greatly resonates with men being the household head—the majority of households in Uganda are male-headed (Uganda Bureau of Statistics, 2014). This was also evident from the data collected as part of the non-energy-specific interviews. Quotes of male interviewees commonly included: “taking care of my family”, “protect my family”, and “look after my family”. This highlights their perceived duty to take care of the family.

The evidence showed that for women *aspiration* was not just with reference to themselves but also, frequently, to aspirations for their children's future. This may of course be linkable to *caring* but cannot be replaced by it. In the context of the interviews conducted, *aspiration* relates to a longer-term view of success whereas *caring* reflects a desire to safeguard one's more immediate interests.

6.3.1 Discussion cross-gender comparison

This part of the PhD research set out to elucidate the similarities and differences between the UPVs of women and men. The aim is to help project developers to better understand the values of said gender groups and take these into account in project design and implementation.

– What are the similarities and differences of UPVs between men and women?

The comparison showed that when it comes to the top values there is only a slight difference between the top ten UPVs of women compared with the UPVs of men. The greatest divergence was with regards to *productivity* (male ranking 6, female ranking 11) and *time benefits* (female ranking 6, male ranking 13). Going beyond these two examples, differences were more pronounced and followed the pattern of gender dynamics in Uganda.

To illustrate, as is consistent with the literature on gender differences in agriculture (Peterman *et al.*, 2010; Ali *et al.*, 2015), the difference in *productivity* was suggestive of men's efficiency focus. Similarly, it was found that *caring* corresponds with the role of men as a caretaker in the family and thus was prioritised by men. The majority of households (61%) in Uganda are headed by males (Uganda Bureau of Statistics, 2014). In Uganda, women are less likely to have a profession—the majority are active in the household sector and thus it is not surprising that on average, two thirds of female Ugandans are responsible for collecting water and firewood [*ibid*] and thus *unburden* was prioritised significantly more by women.

These examples highlight the influence of gender roles on UPVs and underline the importance of considering gender dynamics. In rural Uganda gender roles are strongly defined and as such differing male and female experiences are relevant when thinking

about development interventions and should be taken into account. This is in line with the belief of Salas (2002), who undertook a gender map for energy access in the Philippines and found that the needs of both women and men need to be addressed in order to maximise the relative benefits. This is important when thinking of ways to get ‘buy-in’ of both men and women to a project—commonality is key to negotiation. Furthermore, while the differences in the UPVs between men and women may be nuanced, the linguistic phraseology used to describe these UPVs was different and corroborated with the different gender roles. The importance of this finding is that the project in itself may not need to be different for both gender groups but the way in which the benefits are communicated have to correspond with more gender-specific UPVs. Thus this finding is particularly relevant for project messaging—further discussed as part of the Recommendation 4 {Chapter 7}.

6.4 Energy source comparison

In this section, the UPVs pertaining to energy sources are discussed based on the villagers’ item selection and discussion. In addition to renewable energy sources (solar lanterns and solar home systems), and with the aim of better understanding villagers’ preference of traditional energy sources, the following energy sources were included in the discussion: a generator and traditional sources of light: a candle, a kerosene lantern and a torch.

Parts of this chapter have appeared in (Hirmer and Guthrie, 2017).

6.4.1 Review of UPVs of energy sources

Table 14 shows the principal benefits of energy access sources.

Table 14: UPV's pertaining to energy sources

Item (% selection out of 119 interviews)	User-perceived benefits (% selection out of interviews that had selected item)
Solar Lantern (36%)	<ul style="list-style-type: none"> - Energy access (95%); - operational expenditure (42%); - knowledge attainment (35%); - safety (35%); - mobile phone access (16%); - portability (16%); - security (14%); - contentment (9%); - preservation of health (7%); and - time benefit (5%).
Solar Home System (36%)	<ul style="list-style-type: none"> - Energy access (84%); - operational expenditure (56%); - business opportunity (37%); - knowledge attainment (35%); - preservation of health (19%); - mobile phone access (16%); - security (14%); caring (9%); - communication (9%); - aspiration (7%); and - information access (7%).
Candle (14%)	<ul style="list-style-type: none"> - Energy access (100%); - capital cost (47%); - knowledge attainment (29%); - operational expenditure (24%); - safety (24%); - business opportunity (18%); and - reliability (12%).
Generator (11%)	<ul style="list-style-type: none"> - Energy access (85%); - business opportunity (62%); - entertainment (23%); - knowledge attainment (15%); and - unburden (15%).
Torch (7%)	<ul style="list-style-type: none"> - Portability (100%); - safety (88%); - energy access (63%); and - security (25%).
Kerosene lamp (3%)	<ul style="list-style-type: none"> - Energy access (100%); and - knowledge attainment (75%).

In general the solar technologies garnered the same values. However, one notable disparity was the significant increase in the association of *safety* with solar lanterns. This may be due to the portable nature of solar lanterns [*portability*], which makes them useful when walking at night and threats to safety posed by injury and animal attacks are a significant concern. The concern pertaining to *safety* was evident in the cross-case analysis, here *safety* was of high priority particularly in areas where physical activity

linked to agriculture was high {refer to Section 6.1.1.10 for the full discussion on *safety*}. Frank of Bwindi is representative in his selection of a solar lantern:

“If snakes come you can also see it clearly when there is light [*safety*]”.

There was also a distinction between the nature of *business opportunities* and the *preservation of health* associated with solar home systems (SHSs). For SHSs *business opportunities* went beyond prolonged shop opening hours and the operation of a phone-charging station. It was also commonly linked to solar lanterns and included running a battery-charging station, a poultry farm and the operation of a mill for grinding maize and groundnuts. Similarly, with regards to the *preservation of health*, for SHSs the benefits went beyond improved lighting (commonly linked to solar lanterns) at health care facilities. The benefits linked to SHSs also included the usage of improved medical equipment, such as incubators, and the reduction of illnesses. This is exemplified by the description of the Female Group Discussion (Bihondo) regarding the benefits of an SHS:

“[Through] ironing of clothes to promote smartness and reduce diseases [*appearance*] [*preservation of health*]”.

After energy access, the second greatest reason (62%) why villagers selected a generator was the ability to run a business [*business opportunity*]. This is in comparison to an SHS, where this benefit was only referred to by 37% of villagers. Reasons may include the limited capacity of SHSs that are available to rural dwellers. For generators, *business opportunities* were more diverse than for SHSs and included mobile phone charging, running grinding mills, operating a hairdressing salon, running video halls, having a renting business for generators, husk cutting, operating workshops such as welding and timber cutting and operating entertainment systems in a bar. This is exemplified by Hagi’s reasoning (Mabwe):

“If I had it, I would hire it to people who have weddings and different party to use it since we don’t have electricity. I would rent disco systems, so it can be easy for me to get cash from them. By the way I can connect it to a radio or television in my bar to entertain my customers so that I can get more cash from them [*business opportunity*]. I can use it to light my house [*energy access*] and my kids can be able to read their books and perform well in class [*knowledge attainment*]”.

Furthermore, in contrast to SHSs, generators were commonly linked to powering entertainment systems such as a television. A television for watching football, for example, carries added (secondary) benefits such as *contentment* and *entertainment*.

In contrast to modern energy sources, traditional energy sources were often linked to affordability [*capital cost*] and *reliability*. Regarding *reliability*, for example, in Bihondo (Carter), villagers who selected traditional light sources made comments about the unreliability of electricity in comparison to kerosene lanterns or candles:

“Candles are cost effective compared to electricity, which not everybody can afford in the society [*capital cost*] and their regulation is stable [*reliability*]”.

In this vein it would then appear that the literature is misguided when it describes the *affordability* and *reliability* of modern energy sources as a key ‘selling- point’ {discussed in Section 2.1.1}. However, one possible explanation for this discrepancy could be related to the lack of *reliability* of the sample of energy initiatives reviewed as part of this PhD research, discussed as part of the case study analysis {Chapter 4}.

Further to this, the women valued the affordability of candles which are cheap to buy [*capital cost*]. As opposed to candles and kerosene lantern, the principal benefits associated with a torch were *portability* and *safety*, with respectively 100% and 90% of those selecting a torch making reference to those two benefits. This shows a clear correlation between *portability* and *safety*, which was illustrated by Tani (Gwere-Luzira):

“This is important because it helps me where a lamp can’t reach [*portability*]. This torch will also help in protecting us from snakebites [*safety*]”.

6.4.2 Discussion energy source comparison

To better understand the acceptance and utilisation of off-grid energy projects this research investigated the item selection of different energy sources. The study gave a brief account of the UPVs linked to modern energy sources (e.g. solar home systems, solar lanterns and generators). Where possible, reference was made to the traditional energy alternatives (e.g. candles), revealing the reasons why villagers frequently prefer traditional energy sources to more modern options. This is in synergy with the findings from the case study analysis which revealed that villagers continued to use traditional energy sources alongside the modern energy initiatives for lighting, and the majority of

people made use of multiple energy sources {Appendix III}. This is similar to the statistics published in the ‘Poor People Energy Outlook’ that suggest that two-thirds of the people who did have electricity continued to use traditional energy sources (Practical Action, 2016).

Whilst this can mostly be attributed to the unreliability of the modern energy sources, another reason for this might be that certain traditional energy sources fulfilled different roles or appealed to a personal preference. In line with this, this research seeks to discuss villagers’ perception of off-grid energy sources.

– **What are the perceived benefits associated with off-grid energy sources and how do traditional and modern energy sources compare?**

It was found that whilst most power sources (modern or traditional) were linked to the provision of light [*energy access*], a solar lantern and a torch were specifically valued for their *portability* and the associated protection from dangerous animals [*safety*] when walking outside at night. In contrast, a generator was linked to *entertainment* and a wide range of productive uses and solar home systems were mainly associated with powering a battery-charging station to charge mobile phones [*mobile phone access*]. This raises the question of whether the limited understanding of villagers regarding the benefits related to SHSs results in a lower uptake of products and a lower willingness to pay, as the secondary or tertiary benefits of these systems are not clear. This would suggest that more effort needs to be made post-infrastructure handover. This could be in the form of communication {Recommendation 4, Chapter 7} or post-infrastructure installation capacity building activities to support infrastructure utilisation {Recommendation 5, Chapter 7}.

Additionally it needs to be considered whether the commonly available capacity of SHSs are too low as currently the offer is not adequate to beat the existing traditional products. The SHSs available to the rural market tend to be of small power capacity and can thus power only smaller appliances. This was not examined as part of this research and is an opportunity for further investigation.

Nevertheless, it can be recognised that business opportunity act as an incentive for people. The fact that people recognise this value in SHSs is indicative that such projects are likely to be more successful, particularly when the business opportunities are manifest from

both sides (developer and beneficiary). With an increased understanding of the values of villagers, and the connection between said UPVs, it would be easier to convey the benefits of SHSs to the beneficiaries. The energy production could be related to business opportunities—a consistently important UPV for villagers. In this way projects are more likely to be willingly owned and maintained by the local end-users.

It was found that when comparing an SHS to a generator, the business opportunities afforded by a generator were more diverse than for SHSs and included mobile phone charging, running grinding mills, operating a hairdressing salon, running video halls, having a rental business for generators, husk cutting, operating workshops for welding and timber cutting, and operating entertainment systems in a bar. Although an SHS on the other hand can still enable extended shop opening hours through improved lighting and mobile phone-charging facilities (commonly linked to solar lanterns), its UPVs were limited to the likes of a battery-charging station, a poultry farm or a mill for grinding maize and groundnuts. Additionally, a generator was more often linked to entertainment systems such as a television to watch football.

7 RECOMMENDATIONS FOR IMPROVED PROJECT IMPLEMENTATION

In this chapter, the recommendations for improved project implementation are discussed {Section 7.1}, these are illustrated based on the case village of Lama.

7.1 Recommendations

From the analysis {Chapters 0 and 1} the following theories for more sustainable project implementation can be recommended. The recommendations in this section illustrate how the use of the UPV approach could help to improve the uptake of sustainable projects at different stages of a project implementation {discussed in Section 2.2.1} and are as follows:

- R1: Map UPVs to enable more responsible project planning.
- R2: Develop in-depth understanding of the local conditions.
- R3: Integrate project planning to facilitate sectorial integration.
- R4: Use appropriate messaging to increase project buy-in.

- R5: Conduct post-infrastructure installation capacity building activities to support infrastructure utilisation.

The five recommendations are then discussed in detail in the following sections.

For the purpose for illustrating the said recommendations, an example of project logic is given in Figure 23. The following legend applies:

- Project impacts are shown in blue and are based on the three most important aspects identified from the UPV game in Lama village {Figure 24}⁴¹.
- Project outcomes are shown in white and refer to components that are necessary, in a chain of cause and effect, to bring about the desired project impact and must be addressed.
- Assumptions are marked in red and refer to outcomes that may not be within the scope of the specific project. Because these areas are not addressed it is assumed that they are in place, or else it cannot be expected that project activities will lead to the desired impact.
- Project outputs and activities are marked in yellow and refer to key activities that need to be carried out by the project implementers.

⁴¹ The three most important UPVs of Lama village are *income*, *food security* and *productivity* with scores of 81, 64 and 42 respectively (mean: 14, median: 9) from a total of 895 scores across the 64 UPVs. For more detail on the village refer to Sections 4.1.4 and 6.1}. These UPVs provided the starting point for the design of the project logic. Note, for the purpose of illustrating the recommendations, the project logic is shown in its simplest form.

Figure 23: Project logic for rural electrification built on the three most important values of Lama village

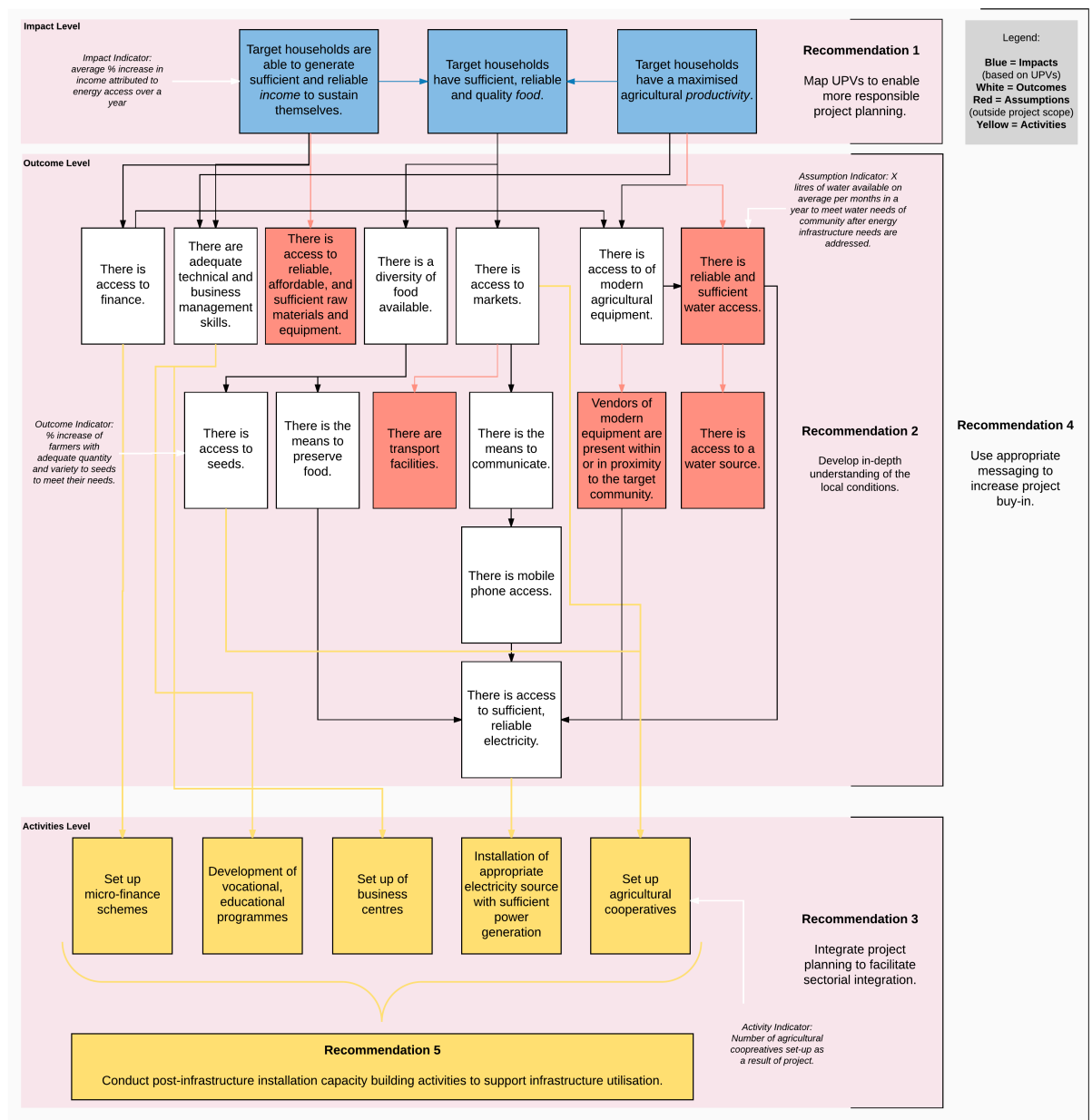
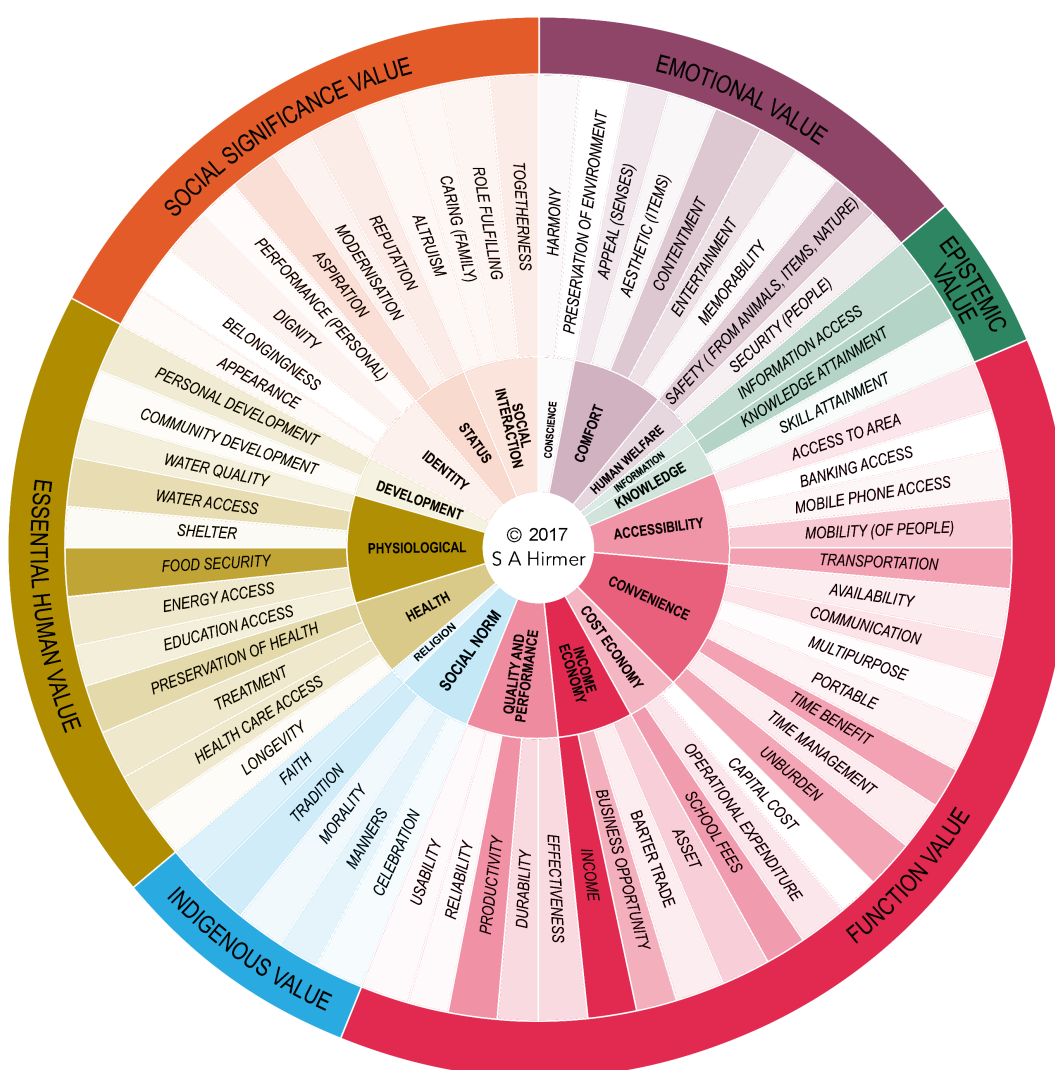


Figure 24: UPV profile for Lama village



Recommendation 1: Map UPVs to enable more responsible project planning.

Linking development projects to the UPVs of the benefiting communities is crucial for the uptake of the initiatives and to ensure that the projects addresses what is of greatest importance to said communities. In a traditional project, the design would start from the project goal: for the purposes of this example, energy access. In the proposed UPV approach, the design would begin from the overarching UPVs (these are translated into impacts and are signified in blue; see Figure 23). UPVs can provide a reference frame for project planning and thus can help developers to identify different intervention points

beyond those set out in the initial project, in this case *energy access*. Relating the energy access project to the values *income*, *food security*, and *productivity* (as shown in Figure 23) can improve project sustainability and meet the communities' biggest needs.

To do this, there is a need to map the UPVs of project communities and consider these in project planning. A UPV approach is appropriate to complement traditional needs assessments and experts' opinion—as both fail to gauge accurately what is important to project communities but do provide information on the socio-economic context of the village {Sections 3.3.2.1 and 0}. In light of this, and as part of this research, a UPV game was developed {Section 3.3.2}. This game enables project developers to take stock of a wide array of UPVs. The UPV approach facilitates a true bottom-up investigation which, in turn, allows project developers to place the needs of the community at the forefront of each development intervention and align projects with what communities truly value.

The ramifications of failing to account for UPVs can be illustrated through an example that was given previously {Section 1.1}. Here villagers did not adopt mosquito nets as they prioritised the feeling of comfort over the health benefits associated with the use of mosquito nets. It may seem somewhat surprising that comfort [*contentment*] is prioritised over the UPV health benefits [*preservation of health*]. However, this research found other similar examples. For instance, *contentment* was collectively ranked as the seventh most important value across all villages. Whilst in six of seven cases *preservation of health* ranked considerably higher than *contentment*, in Lama village they were considered of almost similar importance.

Ultimately, having a detailed understanding of the project community's values can help increase the project success rate as a larger set of UPVs can be addressed by the project which in turn will make people value the project more and ensure they care for it. Thus, in Lama village a project that focuses not just on improving health services but also on increasing the feeling of comfort for villagers would be better received and be more likely to succeed.

Using UPVs during project design facilitates more responsible project planning and can lead to more sustainable results.

Recommendation 2: Develop in-depth understanding of the local conditions.

As Figure 23 highlights, it is important to take stock of local conditions within a village, as these are key components of project planning and impact project design and influence the activities necessary to address the UPVs.

Assessing the local conditions and resources, and accounting for these in project design, is important as there is no clear link between UPVs and existing infrastructure. Infrastructure or the lack thereof may not be a good indicator regarding what is of value to the community. Therefore a UPV assessment must be conducted together with traditional needs assessments—enabling location-specific design. Understanding what is of importance to villagers in rural communities is inadequate unless this knowledge is combined with the detailed context and relationships between various UPVs and the specific environment.

This can be illustrated by taking the example of Bihondo and Gwere-Luzira villages. In both villages, *operational expenditure* was important; however, there was great divergence as to why. In Gwere-Luzira *operational expenditure* was commonly linked to the need to replace the grass-thatched roof due to a termite problem. In contrast in Bihondo reference to *operational expenditure* was commonly made with regards to reduced transport costs from improved communication—the village had a bad road infrastructure. This demonstrates that if the UPV *operational expenditure* is considered outside of the local context the actual issue may not be addressed adequately.

Mapping local conditions helps to fully consider the local context and identify additional important intervention points that might otherwise have been overseen.

Recommendation 3: Integrate project planning to facilitate sectorial integration.

Integrated project planning can help to coordinate inter-sectorial activities. This is important as development interventions must consider the wider development focus and consider the role of other sectors when it comes to project planning. This is particularly important for off-grid energy access, as energy is an enabler and not a means to an end.

Starting project implementation with UPVs facilitates bottom-up design and brings key community drivers to the forefront of the process, with multi-sectorial approaches coming together at the activity level {Figure 23}. Formulating projects based on the top UPVs

highlights overlapping intervention points and fosters greater cohesion between different sectors—when projects are considered in isolation the benefits cannot be maximised. The importance of this has been highlighted by Nenz (2017, personal communication)⁴²:

“In global policies and strategies an integrated approach is foreseen. However, in practice this may remain unaddressed and perhaps forgotten in the heat of resource competition and the pressure of project completion, where bridging silo effects is still a major issue”.

The example further demonstrates that in order to fully address the UPVs, the project must go beyond the actual project of rural electrification and include other sectors such as finance and education. These are elements that could be overlooked if the project was constructed from the assumption of a simple rural electrification project.

Furthermore, applying a UPV-based approach in the planning process may serve as a corrective measure and a reminder that can help to elicit unaddressed steps throughout project design.

Integrated project planning can help to coordinate inter-sectorial activities and provide opportunities for cost sharing and value exchange. While it is very difficult to fund a multi-sector approach as donors and governments usually allocate funding to individual sectors, there is a large opportunity for better utilisation of resources and value exchange if integrated project planning is used. The UPV-based approach allows for an easy way to see where different sectors are cross cutting and where cost sharing can be applied. For example, with a rural electrification project, utilising the power for water pumping and thus improving irrigation practices can provide opportunities for the water sector {Figure 23}.

Recommendation 4: Use appropriate messaging to increase project buy-in

Targeted project communication by project developers is a key component of project buy-in of beneficiaries.

The UPV reflective project logic can help to identify effective project selling points in a way that takes into consideration UPVs as well as the language used to describe them. It

⁴² Based on an email with D. Nenz, development expert Uganda, confirming the findings and recommendation on the 5 February 2017.

was evident from the comparison of female and male priorities that within each gender group there were subtle differences between preferences of UPVs {Section 6.3}. Targeted messaging can be an effective tool for considering these subtle differences and achieving project buy-in from both men and women. The effectiveness of targeted messaging was demonstrated in the ‘room-to-breath’ campaign {described in Section 2.4.2, page 40}. Although the UPV method was not directly used in this example, the same principles were applied and significant product uptake was observed once project messaging was adapted to what was important to the specific gender groups. This is an isolated example as current communication strategies pertaining to development initiatives have mainly focused on identifying the right communication channels such as radio, television commercials and road shows. The actual message, which is meant to trigger an understanding of how the product or service aligns with the beneficiaries’ needs, has mostly been neglected {Section 2.4.2}.

Additionally, project messaging may be of greater relevance when it comes to more emotional value categories (such as *contentment* or *aspiration*) as the link between these UPVs and the project may not be immediately clear. These kind of benefits may only be experienced at a later stage of continued project operation {as illustrated in the example below}.

To put the aforementioned communication strategy into action, improved project messaging can be illustrated with reference to Example 3 under Section 3.5.1 Data Analysis. For ease of illustration an individual’s UPV has been used as an example; see text box (below). However, the same principles can be applied to community UPV profiles in order to use appropriate messaging. This research has shown that within a community UPVs are fairly uniform.

Scola, a widow from the village of Bwindi in Uganda, selected a flush toilet over a pit latrine because she aspires to be a ‘king’ in her community. She also values security, thus with a flush toilet in the house she recognises the added personal value in not having to walk to the latrine at night. Furthermore a flush toilet can help guarantee the safety of her children, as they can no longer fall into the toilet. Using this insight to understand what Scola perceives to be of personal value, we can then determine applicable value categories. For the above example her response falls under the categories of *aspiration*, *security* and *safety*. If we now hope to market electric lighting to Scola, we may expect

she will be more likely to buy into the initiative if it is pitched by accentuating the benefits in line with her personal values.

Messaging which matches a power project with these UPVs will ensure the Scola also values the project. Thus, if electric lighting can be shown to symbolise city living it will correspond with *aspiration*, the provision of street lighting can provide a secure environment for her when walking to the toilet at night; and solar lanterns can provide a safer environment for her children to study because it reduces the risk of a house fire by eliminating open flames.

This gives helpful insight into the use of UPVs and how to translate them to an appropriate initiative (in this case electrification) through suitable messaging. Conducting appropriate messaging by linking UPVs to the project benefits can lead to more effective project utilisation.

Recommendation 5: Conduct post-infrastructure installation capacity building activities to support infrastructure utilisation

Although many projects have elements of capacity building and training within them, not enough is done to provide post installation support. For improved infrastructure utilisation, it is recommended that increased support is given regarding how the power can best be utilised by the project community by connecting project benefits to UPVs once the project is installed.

This research has shown that projects that facilitated income-generating activities are more likely to be successful in overcoming project-related difficulties (such as a lack of maintenance). The research has also shown that simply providing a community with a power project does not necessarily increase entrepreneurship in a community if the community is not already business oriented {Section 4.5}. For example, in the communities where a level of entrepreneurship was in existence prior to the project, shortly after the project was installed, new businesses started to form and old businesses improved their service delivery. The opposite was true for villages where entrepreneurship prior to project implementation was low. This would suggest that, in particular, communities with limited entrepreneurship activities prior to project implementation require more support post-project installation regarding how the infrastructure can be effectively utilised by the benefiting community.

Furthermore the research has also shown that there is a lack of knowledge regarding the understanding of modern energy sources {Section 4.5}. For example SHSs were most commonly linked to electric lighting. In contrast, generators were often connected to activities linked to income generation. This further substantiates the need for post-implementation effort, as the benefits of modern energy sources to the specific community may not be clear.

Currently continued support and communication post installation is limited. More needs to be done to demonstrate how project benefits can be effectively utilised by the benefiting community once the project has been installed. This is particularly important for communities with low entrepreneurship prior to the project and where technologies are unfamiliar, as outlined above. By taking a UPV approach throughout project design less effort regarding community engagement and capacity building to create project ownership is needed as the project is seen to have personal value to the beneficiaries—the overarching issues are addressed throughout project design {Figure 23}. These resources (money and time) can then be applied to post installation support to ensure the power is utilised.

8 CONCLUSIONS

Evidence from the study of seven villages in rural Uganda, all of which benefited from energy access initiatives, has led to the conclusion that the longevity of rural development project benefits remains a challenge. Energy access projects, by themselves, will not bring about universal access, and in some cases have left communities worse off by creating expectations that are not fulfilled.

This research stressed that communities need to be at the centre of interventions—and that those interventions have to go beyond community consultation to a position where what is important to communities is more fully understood and acted upon. Development organisations should see communities as being discerning and informed consumers who need to be offered an appropriate and reliable service that fulfils their needs *as defined by the community themselves*.

However, discovering these needs is not a straightforward process—the real needs of people are locked within the preferences of project beneficiaries. The review of needs assessment techniques conducted as part of this research showed that, despite the good intentions of development projects, the priorities of beneficiaries can often either be assumed or overlooked. The latter is due to current need identification methods failing to delve deeper into the complexity of motivators and priorities, and therefore being

ineffective in revealing real needs. Mapping community preferences requires indirect probing that is unassuming and focuses on the language used by the beneficiaries.

To respond to these shortcomings, a user-perceived-value (UPV) method, consisting of a UPV game and a UPV framework, was devised. The research demonstrated that by using the UPV method the benefits, concerns, feelings and underlying drivers that vary in importance and act as the main motivators in the lives of the people—as perceived and defined by the beneficiaries themselves at a given time—can be successfully uncovered. Taking this as a starting point for development initiatives, the community is more likely to continue to utilise the project and to care for its upkeep, leading to long-term project sustainability and benefit delivery. The UPV method is unique in the sense that it allows users to accurately capture the UPVs of project communities as well as engage with the language used by community members to describe their own UPVs.

8.1 Summary of key research findings and recommendations

The methodology enabled a number of key questions to be explored, each of which is overviewed below.

“What is important to rural communities and how do the different villages compare?”

One major output of this research has been to identify what is important to rural communities in Uganda, and to highlight differences and similarities. It was found that out of the 64 UPVs, 19 make the top 10 in total across all seven village groups, and approximately five are universally important. UPVs such as *income*, *preservation of health*, *food security* and *knowledge attainment* were consistently valued highly in all the case study villages with an insignificant difference in their ranking. This was regardless of the specific situation in the villages. Beyond these top values there was a greater degree of divergence in what is perceived as important across villages. These differences were particularly prominent for values of a social or emotional nature—values that the UPV game was designed to identify. This suggests that development projects, as a minimum, should try to understand and deliver on these five UPVs. However, to increase the chances of project success, more detailed consideration through the UPV method is necessary.

Further, this research found that it is difficult to capture and prioritise UPVs from socio-economic data. This suggests that socio-economic data is insufficient in capturing what is important and how the relative importance of a UPV contrasts with other UPVs. One reason for this is that UPVs can be influenced by multiple factors within a community hence the link to a single reason is not clear. Another reason is that humans are inherently unreliable at articulating what is important to them; something the UPV game was designed to overcome. This is particularly true for UPVs of a secondary or tertiary nature. To illustrate, taking the example of a school, the primary UPV is the *knowledge attainment*. A secondary value of this could be the ability to earn more *income* because of the higher level of education. This in turn may result in a better *reputation* in the village (tertiary value). Such categories are less attributable to a single cause and are linked to a great variety of different drivers, such as more socially and emotionally oriented UPVs.

“What makes a project or service successful according to the perception of villagers?”

The literature review highlighted a common belief of development practitioners that financial savings from development interventions lead to a perception of prosperity and wealth, thus making a project successful in the eyes of beneficiaries. However, the analysis in this research has demonstrated that this is not necessarily the case. In villages where the electrification project made provisions for income-generating activities the villagers saw themselves as ‘richer’ as a result of an improved service delivery in the village, despite not everyone interviewed having a direct financial gain from the project. To illustrate, villagers made reference to the ‘improved entertainment’ and the feeling of ‘living in a city’. In contrast, villages that reported a decrease in energy-related spending as a result of the project reported to have ‘remained the same’ post-project implementation when asked “as a result of the project do you see yourself as ‘richer’, ‘poorer’ or ‘remained the same’?”. Further, the savings on energy did not result in a perception of being ‘richer’. This finding would merit further investigation and research, but points to significant differences in the perceived value of financial benefits from the project and could influence the desire for infrastructure upkeep and use.

“What is the influence of participatory approaches on project success?”

The comparison of implementation procedures across the different villages found no direct link between how projects were implemented (i.e. with or without efforts for capacity building and community mobilisation), and their perceived success by beneficiaries. Rather, it was found that projects that facilitated income-generating activities and went beyond the provision of electric lighting and mobile phone-charging facilities—thus creating value beyond existing services—were more likely to withstand difficulties occurring after the project and be perceived as ‘successful’ by the beneficiaries.

“What is the gap between experts’ opinion and villagers’ priorities?”

A second major output of this PhD research has been an assessment of the ability of development experts with work experience in rural Uganda to accurately predict what is important to rural villagers in Uganda. A significant gap between villagers’ value-perception and the experts’ assessment of villagers’ needs has been identified. Synergies from the 64 UPVs identified through this research, could only be seen with regards to three values: *income*, *food security* and *school fees*. Thus, whilst the opinion of development experts is heavily relied upon, this research has shown that there is a significant gap in what development experts and the rural community in Uganda perceive as important. This demonstrates the gap between experts’ opinion and villagers’ UPVs, and highlights the need to undertake a UPV investigation (or similar) to complement expert knowledge prior to project design.

“What are the similarities and differences of UPVs between men and women?”

A further part of this PhD research set out to elucidate the similarities and differences between the UPVs of women and men to help project developers better understand their values. The comparison found that when it comes to the top values there is only a slight difference between the top ten UPVs of women as compared with the UPVs of men. Going beyond the top values there are subtle differences in the prioritisation between men and women influenced by the strongly defined gender roles in rural Uganda. Here it is important to note that while the UPVs were similar, the ranking and the linguistic phraseology used to describe these UPVs was different and corroborated with the different gender roles. As such differing male and female experiences are relevant when

thinking about development interventions and should be taken into account. The differing roles, the subsequent differences in the UPVs, and the different language used underlines the importance of considering gender dynamics in project design, implementation and messaging.

“What are the perceived benefits from the perspective of the beneficiary associated with off-grid energy sources and how do traditional and modern energy sources compare?”

The comparison of the perceived value of modern and traditional energy sources has shown that there is a limited understanding of villagers regarding the benefits of modern energy sources (such as solar home systems (SHSs)), despite community awareness-raising and capacity building activities during project implementation. This was particularly true for secondary or tertiary UPVs. UPVs linked to traditional energy sources, especially when comparing the UPVs linked to SHSs with those of a generator, revealed that UPVs associated with a generator were more diverse and were linked to a wider array of income-generating activities. This highlights the need for increased effort to communicate the benefits and capabilities of modern energy services.

In light of these research findings, a number of recommendations can be made, which may be summarised as follows:

- Using UPV-centred project design will facilitate the introduction of more appropriate energy services (including the necessary quantity, reliability and form), which will lead to more sustainable results.
- Developing an in-depth understanding of the local conditions together with UPVs can fully ascertain local context so as to identify additional important intervention points that might otherwise have been overlooked.
- Multi-sectoral project planning can offer more holistic solutions to address community needs and provide opportunities for cost-effectiveness and improved value creation from additional benefits. A UPV-centred approach prioritises values and thus needs of the community, rather than sector or donor agendas, and in turn provides project objectives and targets which inherently require a multi-sectoral approach. This helps to identify synergies between sector interventions and enable better utilisation of funds.

- Developing a UPV-centred communication strategy, in combination with UPV-centred project design, can ensure that the benefits of a project resonate with the priorities of target communities thus increasing likelihood of continued infrastructure use and maintenance post-project.
- Capacity building and awareness-raising post infrastructure installation is critical and should demonstrate how project benefits address the community UPVs. Particularly where entrepreneurship prior to the project is low. This is more important in communities where entrepreneurship prior to the project is low.

These recommendations will help project developers to implement more sustainable projects while placing what is of importance to the community at the centre of the development initiatives.

8.2 Recommendations for future research

As suggested above, there is a need to improve the understanding of what is important to rural communities. The UPV method, proposed as part of this PhD research, must be tested outside of the case study country to assess its applicability beyond the Ugandan context and if necessary modify it in a way that is more widely applicable. This will give further insight into motivators of rural communities.

It has been found that villagers can have a limited understanding regarding the benefits and capacities of modern energy sources. One reason for this might be that the power capacity of modern energy sources (such as SHSs) currently available to the low-income market is too low and is not adequate to beat the existing traditional products. The small power capacity can thus only power smaller appliances and as such has lower benefits. This was not examined as part of this research and requires further investigation.

The assessment of implementation approaches has shown that for the case study villages there was no link between long-term infrastructure use post project and initiatives that included participatory approaches (such as capacity building and awareness-raising). It was further found that even when villagers acknowledge project ownership, they did not acknowledge the transfer of responsibility for maintenance from the implementer to the community, with the consequences of this ownership not being understood or

acknowledged. However, this was not directly studied as part of this PhD research and would benefit from further investigation.

To learn and apply lessons from commercial approaches, there needs to be an emphasis on seeing beneficiaries as customers. This may require a shift of mind-sets of development workers or the industry as a whole. This change would require further investigation.

One suggested recommendation is the use of improved communication strategies for creating buy-in of infrastructure services resulting from the project that resonate with the UPVs. It is suggested that a UPV-led communication campaign is set-up to test this recommendation. This should also reflect on the gender-specific differences, particularly the difference in language that resonates between male and female users.

There was much more richness in the data than the researcher could assess or analyse during the given time, and as such the data provides potential for further studies.

8.3 Concluding comments

By not fully considering what is important to users in design, development initiatives fail to maximise the benefits a project provides to intended beneficiaries. An objective method for understanding UPVs is particularly important as project beneficiaries often cannot articulate and prioritise what they value and project developers can unwittingly influence beneficiary responses contributing to poorly conceived designs.

This research points towards the use of UPV mapping to enable a project to be designed - including activities, objectives, targets, indicators and marketing - with a focus on fulfilling priority values as defined by the beneficiaries.

The insights from UPV have the potential to reduce intervention failures by transforming projects with limited short-term success to schemes which install valuable and long-lasting infrastructure. This promotes a positive feedback loop; the community prospers from and hence values the infrastructure, takes ownership of the project and invests in maintenance and continued use.

This study takes important steps towards an understanding of UPVs and contributes to an improvement in the sustainability of rural electrification schemes in Uganda by capturing

value for rural communities. The results presented in this study are encouraging and provide opportunity for further research into UPVs to bring about a positive change in the lives of people impacted by development interventions.

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APPENDIX I: UPV GAME

Figure 25: List of participants of UPV Game and ‘non-energy-specific interviews’⁴³

Participant Name	Gender	Age	Marital Status	Participant Name	Gender	Age	Marital Status
Toro-Ombokoro				Bwindi			
Tomika	Female	49	Married	Lona	Female	34	Married
Lilli	Female	74	Widowed	Genna	Female	35	Married
Argelia	Female	49	Divorced	Carlyn	Female	39	Married
Eleonore	Female	41	Married	Oda	Female	36	Married
Diedre	Female	64	Married	Latrice	Female	32	Married
Arminda	Female	52	Separated	Scola	Female	30	Widowed
Lavern	Male	42	Married	Willard	Male	41	Married
Elijah	Male	63	Married	Norbert	Male	49	Married
Guillermo	Male	73	Married	Titus	Male	75	Married
Ted	Male	36	Married	Todd	Male	73	Married
August	Male	29	Married	Eddie	Male	32	Married
Murray	Male	60	Married	Young	Male	72	Married
Gwere-Luzira				Mabwe			
Earlean	Female	46	Married	Lena	Female	26	Never Married
Cuc	Female	26	Married	Socorro	Female	35	Never Married
Gwendolyn	Female	37	Married	Mireille	Female	20	Never Married
Rosamaria	Female	50	Married	Melany	Female	52	Married
Marx	Female	54	Married	Loria	Female	40	Widowed
Deborah	Female	50	Married	Romana	Female	18	Married
Filiberto	Male	38	Married	Gabriel	Male	25	Never Married
Arron	Male	57	Married	Adam	Male	32	Married
Bernardo	Male	63	Married	Mohammed	Male	30	Married
Will	Male	50	Married	Jefferson	Male	29	Married
Ward	Male	58	Married	Bill	Male	36	Married
Lenny	Male	29	Married	Claudio	Male	60	Married
Lama				Bihondo			
Renae	Female	24	Married	Mariella	Female	35	Married
Janae	Female	43	Widowed	Mechelle	Female	-	Married
Renata	Female	43	Widowed	Evelia	Female	40	Married
Mercedes	Female	24	Married	Louvenia	Female	28	Never Married
Sigrid	Female	52	Widowed	Kimberley	Female	-	Married
Lovie	Female	39	Married	Michell	Female	40	Married
Rogelio	Male	36	Married	Terrance	Male	40	Married
Luciano	Male	28	Married	Noel	Male	29	Married
Genaro	Male	46	Married	Carter	Male	45	Married
Bobby	Male	30	Married	Wes	Male	62	Married
Lawrence	Male	25	Never Married	Wilton	Male	37	Married
Whitney	Male	26	Married	Merlin	Male	45	Married
Suam							
Arlena	Female	45	Married				
Jessica	Female	44	Married				
Fatima	Female	32	Married				
Pamelia	Female	38	Married				
Kesha	Female	44	Divorced				
Rochelle	Female	34	Married				
Keneth	Male	80	Widowed				
Dudley	Male	39	Married				
Calvin	Male	58	Married				
Everette	Male	35	Married				
Sylvester	Male	51	Married				
Elvin	Male	51	Married				

⁴³ To conceal the identity of participants, pseudonyms were used.

Figure 26: Items used in the UPV Game



Improving the sustainability of rural electrification schemes: Capturing value for rural communities in Uganda

Table 15: Item selection per village—percentage split of items already owned by villager⁴⁴

Item	Total % Split	TORO-OMBOKOR		GWERE-LUZIRA		LAMA		SUAM		BWINDI		MABWE		BIHONDO	
		✓	×	✓	×	✓	×	✓	×	✓	×	✓	×	✓	×
		58%	42%	59%	41%	50%	50%	65%	35%	55%	45%	51%	49%	60%	40%
Cow	75	3	7	6	6	5	7	6	5	5	4	2	9	3	7
School/Education	68	7	1	6	4	8	2	6	2	10	0	8	3	8	3
Hoe	68	10	1	12	0	10	0	9	0	11	0	6	1	8	0
Chicken	67	9	1	8	3	8	4	8	1	3	4	6	2	8	2
Machette	60	8	0	12	0	4	2	10	1	8	0	5	0	10	0
Mobile Phone	58	5	5	1	3	3	5	8	1	6	3	6	2	10	0
Goat	53	5	1	5	4	6	2	1	3	6	3	7	1	8	1
Wellington Boots	52	3	5	5	5	1	7	4	3	3	2	4	3	6	1
Clothes	52	6	1	4	0	6	0	7	0	8	0	9	1	10	0
Bible	52	7	1	3	3	4	4	9	0	5	1	7	1	7	0
Motorbike	51	0	5	0	5	1	6	1	5	1	8	1	8	0	10
Radio	48	6	2	5	3	1	5	5	1	5	3	3	4	5	0
Bicycle	47	6	4	7	3	3	5	0	1	1	4	0	7	4	2
Medicine	47	4	5	1	5	3	5	0	5	2	4	3	3	0	7
Bed	47	3	3	9	0	4	2	8	1	7	0	4	0	6	0
Road	46	6	2	4	1	6	2	6	1	5	0	5	1	5	2
Crops/Garden/Land/Farming	45	7	1	9	1	9	0	7	0	4	0	3	1	3	0
Well/Borehole	42	1	6	6	2	9	2	4	0	0	4	0	3	1	4
Pens/Pencil	42	4	0	5	1	4	1	6	0	6	1	4	4	6	0
Wheelbarrow	38	2	6	1	4	1	6	3	3	3	1	0	5	1	2
Corrugated Iron Sheet	36	3	5	1	4	0	4	2	0	2	1	4	2	7	1
Clock/Watch	35	1	3	1	6	0	3	2	4	0	2	2	5	1	5
Solar lantern	30	2	3	1	1	2	4	0	5	1	4	0	4	0	3
SHS	28	4	2	0	1	1	2	0	5	2	2	1	4	0	4
Toothbrush	27	1	2	4	0	0	1	7	0	4	0	5	1	2	0
Plough	25	0	1	0	4	1	9	5	4	0	0	0	1	0	0
Latrine/Pit latrine	23	3	2	2	1	0	0	4	0	2	1	3	1	4	0
Pig	22	0	2	4	1	3	3	1	0	1	1	2	2	1	1
Rainwater tank	19	0	2	0	2	0	0	1	4	1	4	0	3	0	2
WaterJug	19	3	0	2	0	1	0	4	0	2	1	2	1	1	2
Grain Mill	17	0	0	0	2	0	3	0	2	0	1	0	3	0	6
House	16	0	1	0	0	0	4	0	2	0	7	0	1	0	1
Dishes/Utensiles	16	3	0	3	0	0	0	3	0	4	0	3	0	0	0
Sunglasses/Glasses	14	2	5	1	1	0	1	1	1	0	1	0	0	1	0
Saw	14	0	1	1	3	0	3	0	1	1	3	1	0	0	0
Ball	13	1	0	1	3	0	0	0	1	1	1	1	2	0	2
Stove (charcoal)	13	3	1	0	1	0	0	1	0	1	1	1	2	1	1
Computer	12	0	0	0	1	0	1	0	1	0	2	1	3	0	3
Candle	12	0	1	1	2	1	0	0	1	0	2	3	0	1	0
Straw Mat	12	1	2	2	1	1	2	1	0	1	0	1	0	0	0
Book	11	0	0	0	3	0	0	0	0	0	6	0	1	0	1
Sheep	11	0	1	0	2	0	1	1	2	0	1	0	2	1	0
Newspaper/Book	11	0	0	0	0	1	1	3	2	0	0	1	2	0	1
Irrigation System	11	0	1	0	0	1	1	0	2	0	2	0	1	0	3
Shoes	11	2	0	1	0	0	0	2	0	2	0	2	0	2	0
Blanket	10	1	0	0	0	2	0	1	0	1	0	3	0	1	1
TV	10	0	0	0	0	0	4	1	1	0	1	0	1	0	2
Soap	10	1	0	0	0	2	0	2	0	1	0	0	0	4	0
Streetlight	9	0	1	0	0	0	0	0	1	0	1	1	1	0	4
Generator	9	0	0	0	1	0	1	0	0	0	2	0	2	0	3
Gas Stove	9	0	1	0	0	0	0	0	3	0	3	0	1	0	1
Furniture	9	0	0	1	0	0	0	3	0	1	0	0	2	2	0
Bedsheet	9	1	0	2	0	2	0	0	0	1	0	0	1	2	0
Jerry Can	9	1	0	1	0	3	0	0	0	0	0	2	0	2	0
Fridge	8	0	0	0	1	0	1	0	0	0	1	0	4	0	1
Kerosene Lantern	8	1	1	1	1	0	0	0	0	1	1	0	0	2	0
Rice	8	1	2	0	1	1	0	0	0	0	0	0	1	0	2
Toilet (Flush)	8	0	0	0	0	0	1	0	2	1	2	0	1	0	1
Sugar	7	2	0	1	0	1	1	0	0	1	0	0	1	0	0
Torch	6	0	0	1	1	1	0	2	0	1	0	0	0	0	0
Washing Line	5	0	0	0	0	0	0	0	4	0	1	0	0	0	0
Hospital/Health Centre	4	0	0	0	0	0	1	0	1	0	2	0	0	0	0
Drum	3	1	1	0	1	0	0	0	0	0	0	0	0	0	0
Quoran	3	0	0	0	1	0	0	0	0	0	1	0	0	0	1
Money	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Tab	2	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Alcohol	2	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Chair	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Saucepan	2	0	0	0	0	0	0	0	0	1	1	0	0	0	0

⁴⁴ Items are listed based on the number of selections (highest first). It is worth noting that there are more items than pictures because villagers could suggest additional items, items selected once were excluded.

APPENDIX II: NON-ENERGY-SPECIFIC INTERVIEWS

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Table 16: ‘Non-energy-specific’ interview questionnaire

	Personal Information
1.1	What is your village?
1.2	What is your name?
1.3	What is your age?
1.4	What is your gender? <input type="radio"/> Male <input type="radio"/> Female
1.5	What is your marital Status? <input type="radio"/> Never Married <input type="radio"/> Separated <input type="radio"/> Divorced <input type="radio"/> Widowed <input type="radio"/> Married
1.5	How many children do you have?
	Household Information
2.1	What type of dwelling do you live in? <input type="radio"/> Mud hut <input type="radio"/> Semi-permanent <input type="radio"/> Permanent <input type="radio"/> Other _____
2.2	How many dwellings does your household consist of?
2.3	How many people live in your household?
2.4	What is the ownership of your dwelling? <input type="radio"/> Own it fully <input type="radio"/> Own it, on mortgage <input type="radio"/> Rent it <input type="radio"/> Complimentary dwelling _____
	Water & Sanitation
3.1	What kind of toilet does your household use? <input type="radio"/> Flush toilet <input type="radio"/> Pit latrine <input type="radio"/> Community toilet <input type="radio"/> Bucket <input type="radio"/> None, use field
3.2	What is the source of water most often used in your household for drinking, bathing and washing clothes? <input type="radio"/> Piped (kiosk, free) <input type="radio"/> Piped (kiosk, paid) <input type="radio"/> Piped (external tap) <input type="radio"/> Piped (internal tap) <input type="radio"/> Well <input type="radio"/> Borehole <input type="radio"/> River <input type="radio"/> Spring
3.3	How long do you have to walk to get to the nearest water source (one way)? <input type="radio"/> < 20m <input type="radio"/> 20m to < 50m <input type="radio"/> 50m to < 100m <input type="radio"/> 100m to < 500m <input type="radio"/> 500m to < 1km <input type="radio"/> > 1km
3.4	Does the water used for drinking come from the same source as the water used for other purposes like bathing and washing clothes? <input type="radio"/> Mostly yes <input type="radio"/> Sometimes <input type="radio"/> No
	Energy
4.1	What is the household’s main source of energy for cooking? <input type="radio"/> Wood <input type="radio"/> Paraffin/Oil <input type="radio"/> Coal/Charcoal <input type="radio"/> Gas <input type="radio"/> Dung <input type="radio"/> Electricity <input type="radio"/> Other _____

Chapter 10: Appendices

	Energy continues
4.2	<p>What is your main source of energy/light?</p> <p> <input type="radio"/> Open fire <input type="radio"/> Candle <input type="radio"/> Torch <input type="radio"/> Paraffin/Oil lantern <input type="radio"/> Solar lantern <input type="radio"/> Generator <input type="radio"/> Solar Home System <input type="radio"/> Hydropower <input type="radio"/> Other _____ </p>
4.3	<p>What is your monthly expenditure for any of these?</p> <p> _____ Open fire _____ Candle _____ Torch _____ Paraffin/Oil lantern _____ Solar lantern _____ Generator _____ Solar Home System _____ Hydropower _____ Other _____ </p>
	Education
5.1	<p>What is your Education Status?</p> <p> <input type="radio"/> Never enrolled <input type="radio"/> Completed school <input type="radio"/> Currently enrolled <input type="radio"/> Not completed </p>
5.2	<p>What is your highest grade completed in general education?</p> <p> <input type="radio"/> Primary school <input type="radio"/> Secondary school <input type="radio"/> Tertiary school <input type="radio"/> University education <input type="radio"/> Not completed any </p>
5.3	<p>Do you or did you attend any vocational training?</p> <p> <input type="radio"/> Yes <input type="radio"/> No </p>
	Finances
6.1	<p>What are the sources of income of your household?</p> <p> <input type="radio"/> Animal rearing <input type="radio"/> Crop farming <input type="radio"/> Labourer <input type="radio"/> Sale of goods <input type="radio"/> Non-agricultural employment <input type="radio"/> Business owner <input type="radio"/> Unemployed <input type="radio"/> Student <input type="radio"/> Other (State) _____ </p>
6.2	<p>What are your monthly earnings for any of the following:</p> <p> _____ Animal rearing _____ Crop farming _____ Labourer _____ Sale of goods _____ Non-agricultural salary _____ Business owner _____ Unemployed _____ Student _____ Other (State) _____ </p>
6.3	<p>All things considered, how satisfied are you with your current work?</p> <p> <input type="radio"/> Extremely satisfied <input type="radio"/> Somewhat satisfied <input type="radio"/> Neither satisfied nor dissatisfied <input type="radio"/> Somewhat dissatisfied <input type="radio"/> Extremely dissatisfied </p>
6.4	<p>What are your monthly financial commitments for any of the following?</p> <p> _____ School Fees _____ Services _____ Food _____ Household _____ Health _____ Rent _____ Other _____ </p>

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Finances continue					
6.5	All things considered, how satisfied are you with your financial situation? <input type="radio"/> Extremely satisfied <input type="radio"/> Somewhat satisfied <input type="radio"/> Neither satisfied nor dissatisfied <input type="radio"/> Somewhat dissatisfied <input type="radio"/> Extremely dissatisfied				
6.6	Has anyone in the household borrowed money from any of the following in the past year? <input type="radio"/> Bank <input type="radio"/> Friend/Relative <input type="radio"/> Local money lender <input type="radio"/> Other _____ <input type="radio"/> Not borrowed				
6.6.1	If borrowed, how much has the household borrowed in total (the total debt owed to others)?				
6.6.2	If borrowed, what is the main purpose for current borrowing? <input type="radio"/> Current consumption needs <input type="radio"/> Purchase assets <input type="radio"/> Medical expenses <input type="radio"/> Wedding costs <input type="radio"/> Funeral Costs <input type="radio"/> Education <input type="radio"/> Business related borrowing <input type="radio"/> Other <input type="radio"/> Not borrowed				
Exposure					
7.1	Have you ever been to a major city in Uganda? <input type="radio"/> Yes <input type="radio"/> No				
7.2	Have you been to another country (if yes, where)? <input type="radio"/> Yes _____ <input type="radio"/> No				
7.3	How often do you use any of the below, mark for each?				
		Radio	Television	Newspaper	Internet
	Every day	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	2-3 times a week	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Once a week	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Occasionally	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Never	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Emotional wellbeing					
8.1	Has the household suffered from any serious loss of assets/income through any of the following in the past year? <input type="radio"/> Loss of employment/income <input type="radio"/> Fire <input type="radio"/> Flood <input type="radio"/> Drought <input type="radio"/> Earthquake <input type="radio"/> Theft <input type="radio"/> Accident <input type="radio"/> Illness/Injury <input type="radio"/> Arrest Eviction <input type="radio"/> Other _____ <input type="radio"/> Not suffered				
8.2	Has anyone in the household suffered any serious injuries or illnesses in the past year? <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Still is				
8.3	Generally speaking, to what extent can others be trusted? <input type="radio"/> Most people can't be trusted <input type="radio"/> One should trust but needs to be careful <input type="radio"/> You can't trust anyone				
8.4	When comparing wellbeing with other people, whom do you compare yourself with? <input type="radio"/> With people more fortunate than me <input type="radio"/> With people less fortunate than me <input type="radio"/> With people similar to me				

APPENDIX III: INFOGRAPHIC CASE STUDY CONTEXT

Improving the sustainability of rural electrification schemes: Capturing value for rural communities in
Uganda

June 2018



APPENDIX IV: ENERGY-SPECIFIC INTERVIEWS

Improving the sustainability of rural electrification schemes: Capturing value for rural communities in
Uganda

Table 17: 'Energy-specific' interview questionnaire

	Personal Information
1.1	What is your village?
1.2	What is your name?
1.3	What is your age?
1.4	What is your gender? <input type="radio"/> Male <input type="radio"/> Female
1.5	Are you the head of household?
1.6	How many children do you have?
	Understanding of electricity
2.1	What is electricity to you (describe in your own words)?
2.2	What does it or can it do?
2.3	What would you use each of the following items for/what can it do? A Solar Lantern _____ B Candle _____ C Diesel Generator _____ D National Grid _____ E Hydropower _____ F Torch _____ G SHS _____ H Kerosene Lantern _____ I Other _____
2.4	Which of these provide electricity? <input type="radio"/> A Solar Lantern <input type="radio"/> B Candle <input type="radio"/> C Diesel Generator <input type="radio"/> D National Grid <input type="radio"/> E Hydropower <input type="radio"/> F Torch <input type="radio"/> G SHS <input type="radio"/> H Kerosene Lantern <input type="radio"/> I Other _____
2.5	Which of these would be of greatest value to you and why? <input type="radio"/> A Solar Lantern _____ <input type="radio"/> B Candle _____ <input type="radio"/> C Diesel Generator _____ <input type="radio"/> D National Grid _____ <input type="radio"/> E Hydropower _____ <input type="radio"/> F Torch _____ <input type="radio"/> G SHS _____ <input type="radio"/> H Kerosene Lantern _____ <input type="radio"/> I Other _____
	Personal Energy Access
3.1	What is your monthly expenditure for any of these items? _____ A Solar Lantern _____ B Candle _____ C Diesel Generator _____ D National Grid _____ E Hydropower _____ F Torch _____ G SHS _____ H Kerosene Lantern _____ I Other
3.2.1	Do you have electricity? If YES, what is the source of electricity? If NO why not? <input type="radio"/> Yes, Solar Lantern <input type="radio"/> Yes, Diesel Generator <input type="radio"/> Yes, National Grid <input type="radio"/> Yes, Hydropower <input type="radio"/> Yes, SHS <input type="radio"/> No, State _____ <i>(move to section Q6.5)</i>
3.2.2	If YES, during what hours do you use the electricity? <input type="radio"/> Morning <input type="radio"/> Lunchtime <input type="radio"/> Afternoon <input type="radio"/> Evening <input type="radio"/> Night-time
3.2.3	And what do you use the electricity for (commercially and privately)?
	Personal energy access continues
3.3	When did you get electricity at home? (month/year)
3.4	Describe YOUR electricity system in your own words

Chapter 10: Appendices

	Project ownership and community engagement																																								
4.1	Who owns the electricity system?																																								
4.2	Would you like to co-own the system and why? <input type="radio"/> Yes _____ <input type="radio"/> No _____ <input type="radio"/> Already an owner _____																																								
4.3	Who is responsible for fixing it?																																								
4.4	Who do you think should be responsible for fixing it and why?																																								
4.5	What did you contribute to the installation/purchase of the system?																																								
	<table border="1"> <thead> <tr> <th></th><th>Financial</th><th>In kind</th></tr> </thead> <tbody> <tr> <td><input type="radio"/> Labour</td><td></td><td></td></tr> <tr> <td><input type="radio"/> Materials</td><td></td><td></td></tr> <tr> <td><input type="radio"/> Money</td><td></td><td></td></tr> <tr> <td><input type="radio"/> Time</td><td></td><td></td></tr> <tr> <td><input type="radio"/> Other</td><td></td><td></td></tr> <tr> <td><input type="radio"/> Nothing</td><td></td><td></td></tr> </tbody> </table>		Financial	In kind	<input type="radio"/> Labour			<input type="radio"/> Materials			<input type="radio"/> Money			<input type="radio"/> Time			<input type="radio"/> Other			<input type="radio"/> Nothing																					
	Financial	In kind																																							
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<input type="radio"/> Other																																									
<input type="radio"/> Nothing																																									
4.6	If you didn't pay for it, who did?																																								
	Project availability and reliability																																								
5.1.1	Does your electricity system work? Yes No																																								
5.1.2	If NO how long has it been broken for and why is it not being repaired? If YES when was the last time it broke and how long did it take to get repaired?																																								
5.2.1	Why did it break and why did it take long to repair?																																								
5.2.2	If broken, how often has it broken in the past? For each time how long did it take to repair?																																								
	<table border="1"> <thead> <tr> <th>Amount broken</th><th>A few days</th><th>A week</th><th>Several weeks</th><th>A month</th><th>Several months</th><th>A year</th><th>Still broken</th></tr> </thead> <tbody> <tr> <td>1–2</td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td></tr> <tr> <td>3–4</td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td></tr> <tr> <td>4–5</td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td></tr> <tr> <td>> 5</td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td></tr> </tbody> </table>	Amount broken	A few days	A week	Several weeks	A month	Several months	A year	Still broken	1–2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	3–4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	4–5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	> 5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Amount broken	A few days	A week	Several weeks	A month	Several months	A year	Still broken																																		
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3–4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																																		
4–5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																																		
> 5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																																		
5.3	When it breaks, what do you do/how do you react?																																								
5.4	When it breaks, what inconveniences does it cause you/your family OR how does/could breakage affect you/your family and why?																																								
5.5.1	Do you report the failure of the system? If yes to whom, if no why not? <input type="radio"/> Yes _____ <input type="radio"/> No _____																																								
5.5.2	If YES, do you approach them (Yes/No) If yes after how long, if no why not																																								
	<table border="1"> <thead> <tr> <th></th><th colspan="5">If Yes</th><th colspan="3">If No</th></tr> <tr> <th></th><th>Few hours</th><th>A day</th><th>Few days</th><th>A week</th><th>> A week</th><th>Don't know whom</th><th>Not responsible</th><th>Don't care</th></tr> </thead> <tbody> <tr> <td>Yes</td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td></tr> <tr> <td>No</td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td></tr> </tbody> </table>		If Yes					If No				Few hours	A day	Few days	A week	> A week	Don't know whom	Not responsible	Don't care	Yes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	No	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				
	If Yes					If No																																			
	Few hours	A day	Few days	A week	> A week	Don't know whom	Not responsible	Don't care																																	
Yes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																																	
No	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																																	

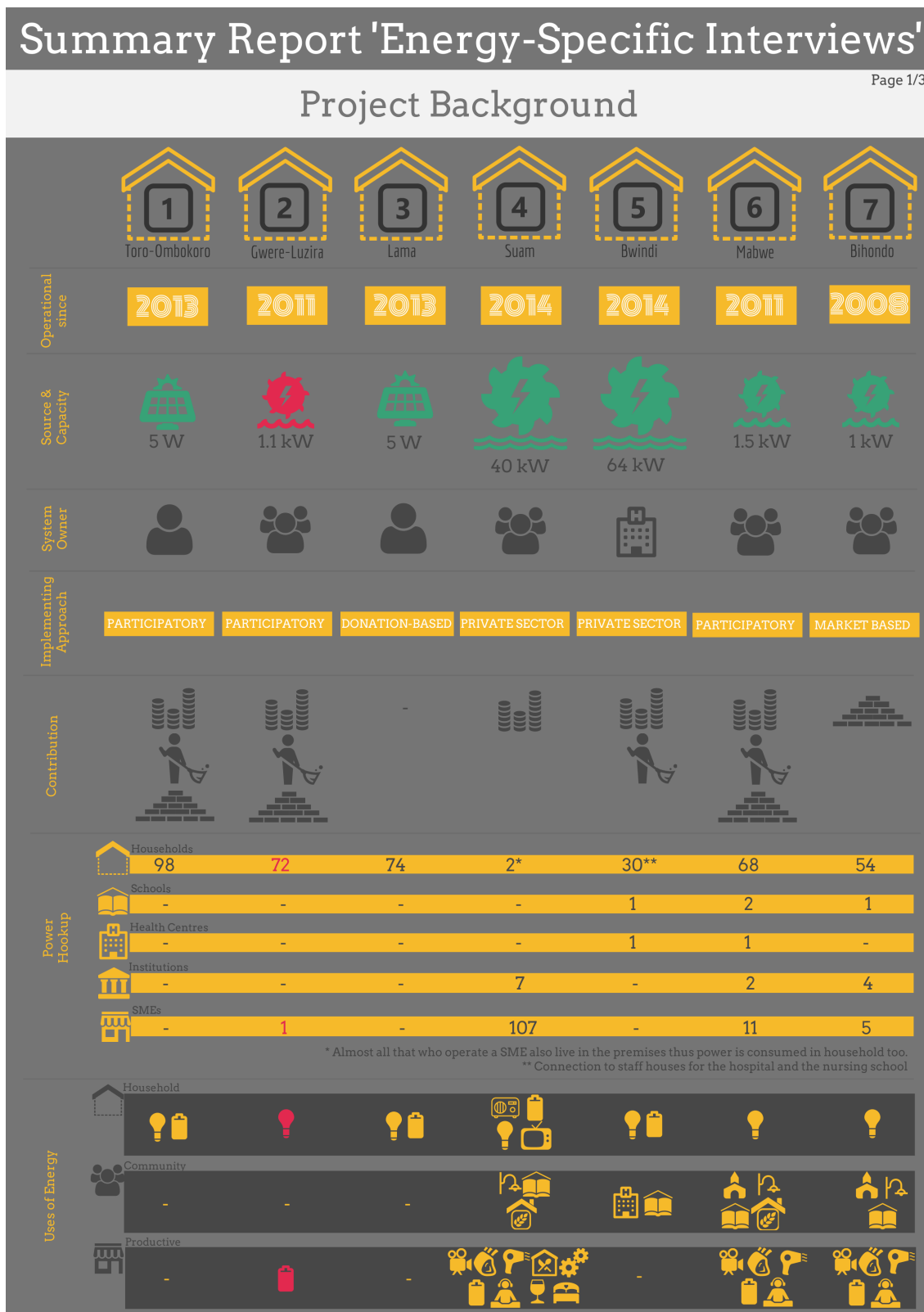
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Project availability and reliability continues				
5.6	During what hours is it available to you? Is it non-stop or intermittent?			
	Availability		Reliability	
		Time of day	Non-Stop	Intermittent
	Morning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Lunchtime	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Afternoon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Evening	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Night-time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.7	If intermittent, how does it affect you and would non-stop power supply be of value to you and why?			
Perceived project limitations and benefits				
6.1	Are you satisfied with your current electricity supply? (Why?)			
	<input type="radio"/> Yes _____			
	<input type="radio"/> No _____			
6.2	In what way could your electricity access be improved?			
6.3	What are the benefits of YOUR electricity system to you/your family?			
6.4	What are the limitations of YOUR electricity system to you/your family?			
6.5	Has the project made a difference to you, what? If no, what would it do?			
	<input type="radio"/> Yes _____			
	<input type="radio"/> No _____			
6.6	How have you personally benefited from the electrification project (from installation to now)? If you have not benefited, state why not (this could be from the electricity itself or involvement during implementation).			
6.7	What changes have you observed since the project has reached your village? (general or personal change)			
6.8	How has the project (electricity or during implementation) POSITIVELY and NEGATIVELY impacted you or your family? (State both)			
	<input type="radio"/> Don't know/Don't have			
	<input type="radio"/> Positive _____			
	<input type="radio"/> Neither positive nor negative _____			
	<input type="radio"/> Negative _____			
6.9	What is the observed change in the village with regards to income generation?			
	<input type="radio"/> Yes _____			
	<input type="radio"/> No _____			
6.10	Which businesses have formed/been improved since the project? Refer to the following:			
	<input type="radio"/> What has changed?			
	<input type="radio"/> What services are new?			
	<input type="radio"/> What services have improved?			
	<input type="radio"/> What are the improvements to the community?			
	<input type="radio"/> Do you use these improved services?			
	<input type="radio"/> If yes, what did you do before?			
6.11	Have you become poorer/richer/or remained the same because of the electrification project? (Explain)			
	<input type="radio"/> Don't know/NA			
	<input type="radio"/> Poorer _____			
	<input type="radio"/> Remained the same _____			
	<input type="radio"/> Richer _____			
6.12	Have the community become poorer/richer/or remained the same because of the electrification project? (Explain)			
	<input type="radio"/> Don't know/NA			
	<input type="radio"/> Poorer _____			
	<input type="radio"/> Remained the same _____			
	<input type="radio"/> Richer _____			
6.13	Have community services like education and health care improved because of access to electricity?			
	Don't Know/NA			
	<input type="radio"/> Yes _____			
	<input type="radio"/> Maybe _____			
	<input type="radio"/> No _____			

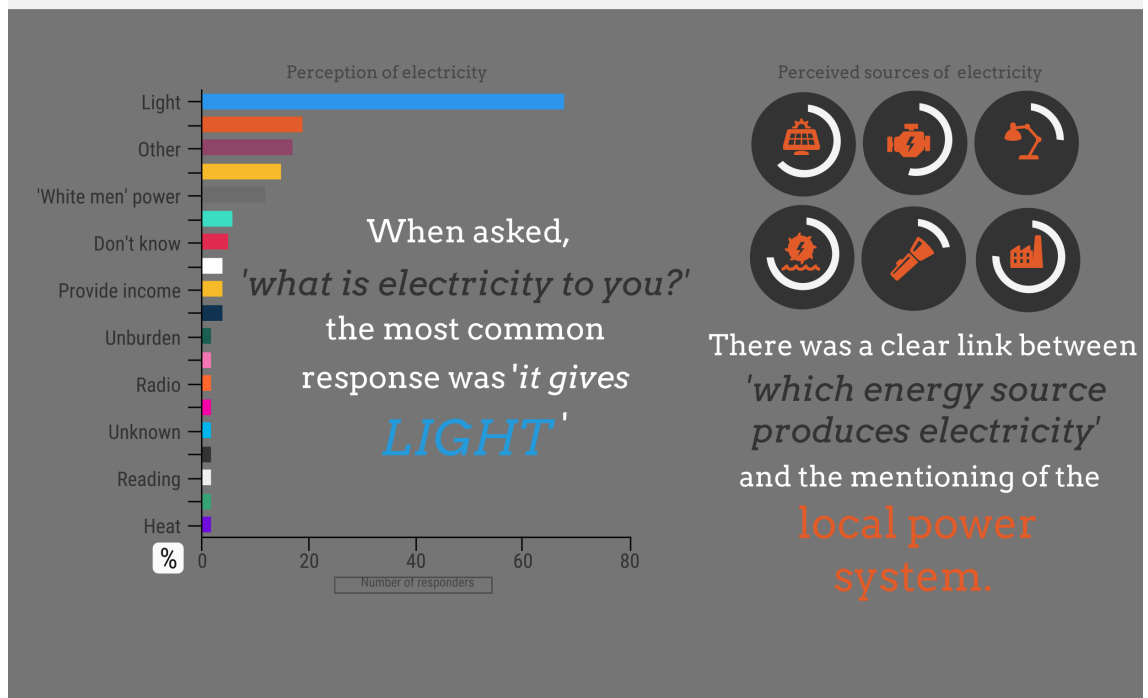
Figure 27: List of participants of ‘energy-specific interviews’

Villager Name	Gender	Age	Household Head	Marital Status	No. Children
Toro-Ombokoro					
Night Christine	Female	21	No	Married	0
Madira Godfrey	Male	-	Yes	Married	3
Amazu Joel	Male	-	No	Not Married	0
Oguzu Albert	Male	19	No	Not Married	0
Sunday Rokoni	Female	21	Yes	Married	1
Alizuku Emmanuel	Male	31	Yes	Married	1
Aida Azon	Female	48	No	Married	4
Omviru Celina	Female	34	No	Married	4
Jiribia William	Male	56	Yes	Married	4
Felemina Onziru	Female	30	No	Married	1
Ofuti Matia	Male	56	Yes	Married	3
Drijaru Joice	Female	58	No	Married	5
Anyinga Blanco	Female	50	Yes	Divorced	1
Andama Robert	Male	37	Yes	Married	5
Anguzu Hillary	Female	23	No	Married	1
Patrick Azon	Male	27	Yes	Married	2
Onizuyo Rita	Female	52	Yes	Divorced	3
Orionzi Albert	Male	35	Yes	Married	0
Apadriku Charles	Male	32	Yes	Married	3
Bako Aisha	Female	26	No	Married	0
Gwere-Luzira					
Lagu Godfrey	Male	25	Yes	Married	2
Hebo Thomas	Male	33	Yes	Married	2
Adndevuku Sunday	Female	24	No	Married	1
Rebecca Otua	Female	47	No	Married	3
Adrupio Dominica	Female	34	No	Married	3
Izaruku Michael	Male	64	Yes	Married	3
Drale Ceasarino	Male	68	Yes	Married	5
Lada Dodfrey	Male	26	Yes	Not Married	0
Akello Nancy	Female	21	No	Married	1
Concy Odego	Female	55	No	Married	4
Nyumaa Mary	Female	30	No	Married	3
Jereima Fortunate	Female	21	No	Married	1
Obuttre Ceasar	Male	34	Yes	Married	4
Flora Dracho	Female	50	No	Married	7
Anyama Innocent	Female	19	No	Not Married	0
Drapari Onarato	Male	52	Yes	Married	6
Iziku Sharon	Female	28	Yes	Married	2
Aiga Simon	Male	33	Yes	Not Married	1
Lejoruku Denis Addi	Male	28	Yes	Married	1
Itse Benedict William	Male	52	Yes	Married	5
Lama					
Madrama Michael	Male	52	Yes	Married	3
Betty Sabuni	Female	46	No	Married	4
Komaa Satina	Female	47	Yes	Married	6
Tabo William	Male	34	Yes	Married	6
Munduku Henry	Male	30	Yes	Married	3
Vuni Albino	Male	41	Yes	Married	4
Madrama Kerubino	Male	38	Yes	Married	6
Amadio Patricia	Female	21	No	Married	2
Agnes Dranzoa	Female	28	No	Married	2
Izaruku Gaudensio	Male	52	Yes	Married	2
Amu Zakeo Draju	Male	53	Yes	Married	3
Tiondi Peter	Male	36	Yes	Married	6
Agnes Vuciri	Female	30	No	Married	4
Lina Pili	Female	53	No	Married	3
Amafeku Charles	Male	39	Yes	Married	6
Anzelina Edea	Female	33	No	Married	2
Anzoo Zaitun	Male	28	No	Married	3
Tonya Centina	Female	51	Yes	Married	4
Lindryo Magret	Female	19	No	Not Married	0
Vucia Celetina	Female	50	Yes	Married	5
Suam					
Chebet Hellen Misca	Female	28	No	Married	3
Chemutai Sharon	Female	21	No	Married	2
Peter Ngania	Male	40	Yes	Married	2
Simon Chemarum	Male	38	Yes	Married	5
Kimutai James	Male	39	Yes	Married	2
Robert Musani	Male	33	Yes	Married	5
Chebet Moses	Male	38	Yes	Married	3
Kaunda Rodgers	Male	29	No	Single	0
Sabila Henry	Male	57	Yes	Married	6
Karim Kittis	Male	52	Yes	Married	4
Nachenyi Faima	Female	22	No	Single	0
Cherop Emily	Female	29	No	Married	1
Macharia Sarah	Female	24	No	Married	1
Faith Chepkemai	Female	34	No	Married	2
Malewa Paul	Male	60	Yes	Married	6
Masha Moses	Male	34	Yes	Married	1
Musau Ismail	Male	43	Yes	Married	6
Nyongeza Emmanuel	Male	52	Yes	Married	4
Samuel Wodeya	Male	34	Yes	Married	2
Mwanga John Faris	Male	55	Yes	Married	7
Bwindi					
Nahabwe Sadayo	Female	31	No	Married	4
Turyatamba Esaho	Male	18	No	Single	0
Kiiza Guard	Male	32	Yes	Married	2
Nkazarwa Amos	Male	32	Yes	Married	4
Tusasiirwe Oscar	Male	22	No	Single	0
Tumusime Constance	Female	45	Yes	Widow	4
Kyasimire Alice	Female	26	No	Single	1
Ampire Martin	Male	38	Yes	Married	4
Monday Tito	Male	24	Yes	Married	1
Tusiime Angela	Female	25	No	Married	3
Atuhurire Polito	Male	32	No	Married	2
Kyalisiima Marriam	Female	31	No	Married	2
Ngabiran Joseph	Male	32	Yes	Married	2
Bariganira Noria	Female	38	No	Married	5
Bagoleka Militon	Male	60	Yes	Married	6
Mpirirwe Musa	Female	40	Yes	Married	5
Tukamushaba Prudence	Female	-	No	Married	0
Agaba Samuel	Female	24	Yes	Married	0
Muhwezi James	Male	20	No	Single	0
Kyomugisha Shillan	Female	25	No	Married	2
Mabwe					
Masiko Scovia	Male	22	No	Single	0
Matte Yonah	Male	33	No	Married (2 Wives)	7
Biira Agnes	Female	30	No	Married	3
Mitawan Tom	Male	40	Yes	Married	5
Mbusa Joakim.	Male	28	Yes	Married	5
Bikanza M. Harrison.	Female	25	Yes	Married	2
Nagujja Claire.	Female	24	No	Single	1
Biira Esteri	Female	60	No	Married	10
John Mubende	Male	39	Yes	Married	3
Katusabe Charles	Male	49	Yes	Married	4
Kibwana Norah	Female	48	Yes	Married	4
Peluci Hangi Gloria	Female	35	No	Married	7
Staloza Muhindo	Female	28	No	Married	6
Sarah Syabu	Female	28	Yes	Married	3
Baguma Musanja	Male	27	Yes	Married	2
Zakie Philly	Female	18	No	Single	0
Grace Muhindo	Female	28	No	Married	7
Ndungu Joakim	Male	36	Yes	Married	6
Mbabazi Toepista	Male	33	Yes	Single	3
-					
Bihondo					
Bwambale Edward	Male	18	No	Single	0
Muhindo Yasita	Female	30	Yes	Divorced	0
Muhindo John	Male	50	Yes	Married	5
Kabugho Violet	Female	27	No	Married	2
Bwambale Koloneri	Male	45	Yes	Married	4
Kule Milton	Male	19	Yes	Single	0
Bwambale Ezirone	Male	27	Yes	Married	1
Judith Birra	Female	50	No	Married	9
Ngamuha Molis	Female	34	No	Married	8
Junior Kabugho	Male	30	Yes	Married	3
Musoke Alice	Female	65	Yes	Widow	5
Kibijyabo Augustine	Male	37	Yes	Married	6
Masika Dina	Female	30	No	Married	2
Baluku Rogers	Male	20	No	Single	0
Hope Maureen	Female	19	No	Single	0
Mbubu Chris	Female	35	No	Married	3
Moses Muhindo	Male	24	Yes	Married	1
Sibanza Mweru	Female	23	Yes	Single	0
Muhindo Wilson	Male	23	Yes	Married	2
-					

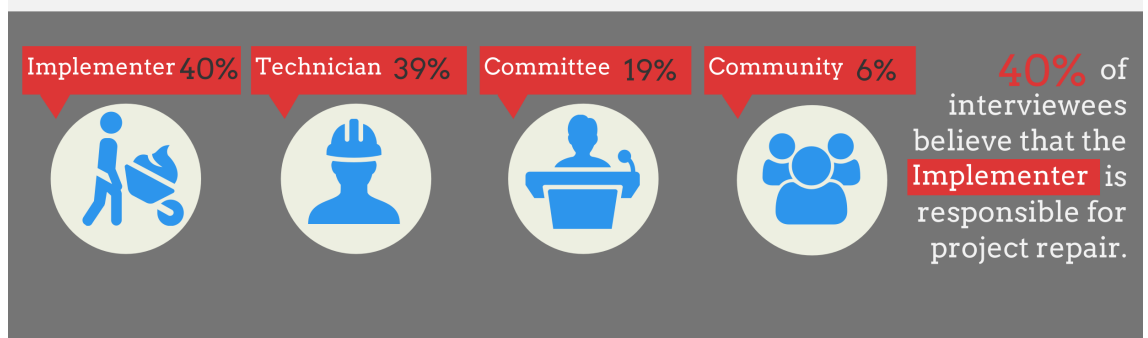
Figure 28: Summary report 'energy-specific interviews'



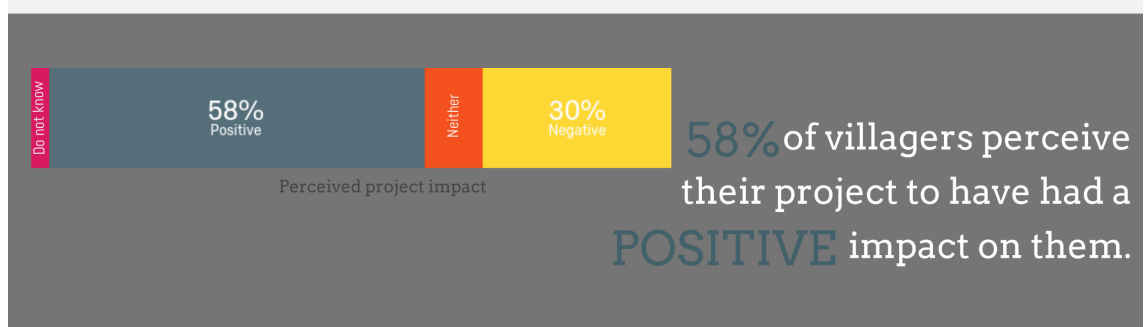
Understanding of Electricity

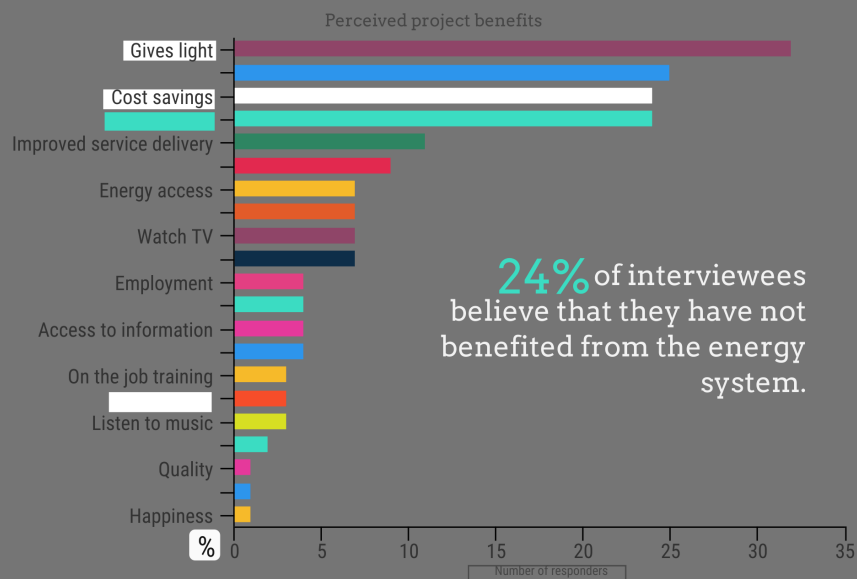


Perceived Project Responsibility



Perceived Project Benefits

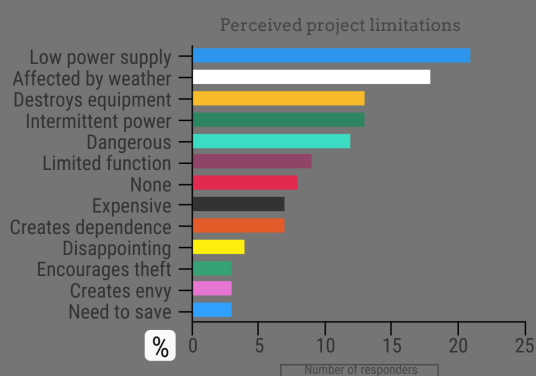




Darkness, the resulting increase in expenditure and the lack of security are the biggest inconveniences described during power outage.

Perceived inconveniences after power outage

Perceived Project Limitations



Across all villages, there is consensus that the systems need to be **BIGGER** to:


- Power heavy machinery
- Have continuous supply
- Make it available to everyone

APPENDIX V: KEY INFORMANT INTERVIEWS

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Table 18: ‘Key informant’ interview questionnaire

	Personal Information
1.1	What is your gender? <input type="radio"/> Male <input type="radio"/> Female
1.2	What is your age? <input type="radio"/> Under 15 years <input type="radio"/> 15 to 24 years <input type="radio"/> 25 to 34 years <input type="radio"/> 35 to 44 years <input type="radio"/> 45 to 54 years <input type="radio"/> 55 to 64 years <input type="radio"/> 65 years and over
1.3	What is your nationality?
1.4	In which country do you reside?
	Work Experience
2.1	What sector do you work in (Select ALL that apply)? <input type="radio"/> Public Sector <input type="radio"/> Private Sector <input type="radio"/> NGO <input type="radio"/> Social Enterprise <input type="radio"/> Research Institution <input type="radio"/> Other _____
2.2	With which of the 17 Sustainable Development Goals does your field of work align the most? <input type="radio"/> 1 No Poverty <input type="radio"/> 2 Zero Hunger <input type="radio"/> 3 Good Health and Well-Being <input type="radio"/> 4 Quality Education <input type="radio"/> 5 Gender Equality <input type="radio"/> 6 Clean Water and Sanitation <input type="radio"/> 7 Affordable and Clean Energy <input type="radio"/> 8 Decent Work and Economic Growth <input type="radio"/> 9 Industry, Innovation and Infrastructure <input type="radio"/> 10 Reduced Inequalities <input type="radio"/> 11 Sustainable Cities and Communities <input type="radio"/> 12 Responsible Consumption and Production <input type="radio"/> 13 Climate Action <input type="radio"/> 14 Life Below Water <input type="radio"/> 15 Life on Land <input type="radio"/> 16 Peace, Justice and Strong Institutions <input type="radio"/> 17 Partnerships for the Goals
2.3	How many years of experience do you have in this field of work? <input type="radio"/> < 1 year <input type="radio"/> 1 – 2 years <input type="radio"/> 3 – 4 years <input type="radio"/> 5 – 6 years <input type="radio"/> 7 – 8 years <input type="radio"/> 9 – 10 years <input type="radio"/> > 10 years
2.4	What is your job title?

Uganda-specific work experience					
3.1	Which places in Uganda have you worked in [click on map (max 10 selections)]?				
					
3.2	Total time spent working in Uganda? <input type="radio"/> N/A <input type="radio"/> < 1 year <input type="radio"/> 1 – 2 years <input type="radio"/> 3 – 4 years <input type="radio"/> 5 – 6 years <input type="radio"/> 7 – 8 years <input type="radio"/> 9 – 10 years <input type="radio"/> > 10 years				
3.3	How many years of experience do you have working with rural communities in Uganda? <input type="radio"/> N/A <input type="radio"/> < 1 year <input type="radio"/> 1 – 2 years <input type="radio"/> 3 – 4 years <input type="radio"/> 5 – 6 years <input type="radio"/> 7 – 8 years <input type="radio"/> 9 – 10 years <input type="radio"/> > 10 years				
3.4	How confident are you in your understanding of the Ugandan context?				
		Not Confident	Somewhat Confident	Confident	Very Confident
	Social	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Ecological	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Political	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Economical	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Cultural	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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	User-perceived value and confidence
4.1.1	Which of the following are perceived as most important by those who live in Uganda's rural settlements? Please tick the 10 topics/benefits that you think people value most (see attachment for full definition). How confident are you with your recommendations?

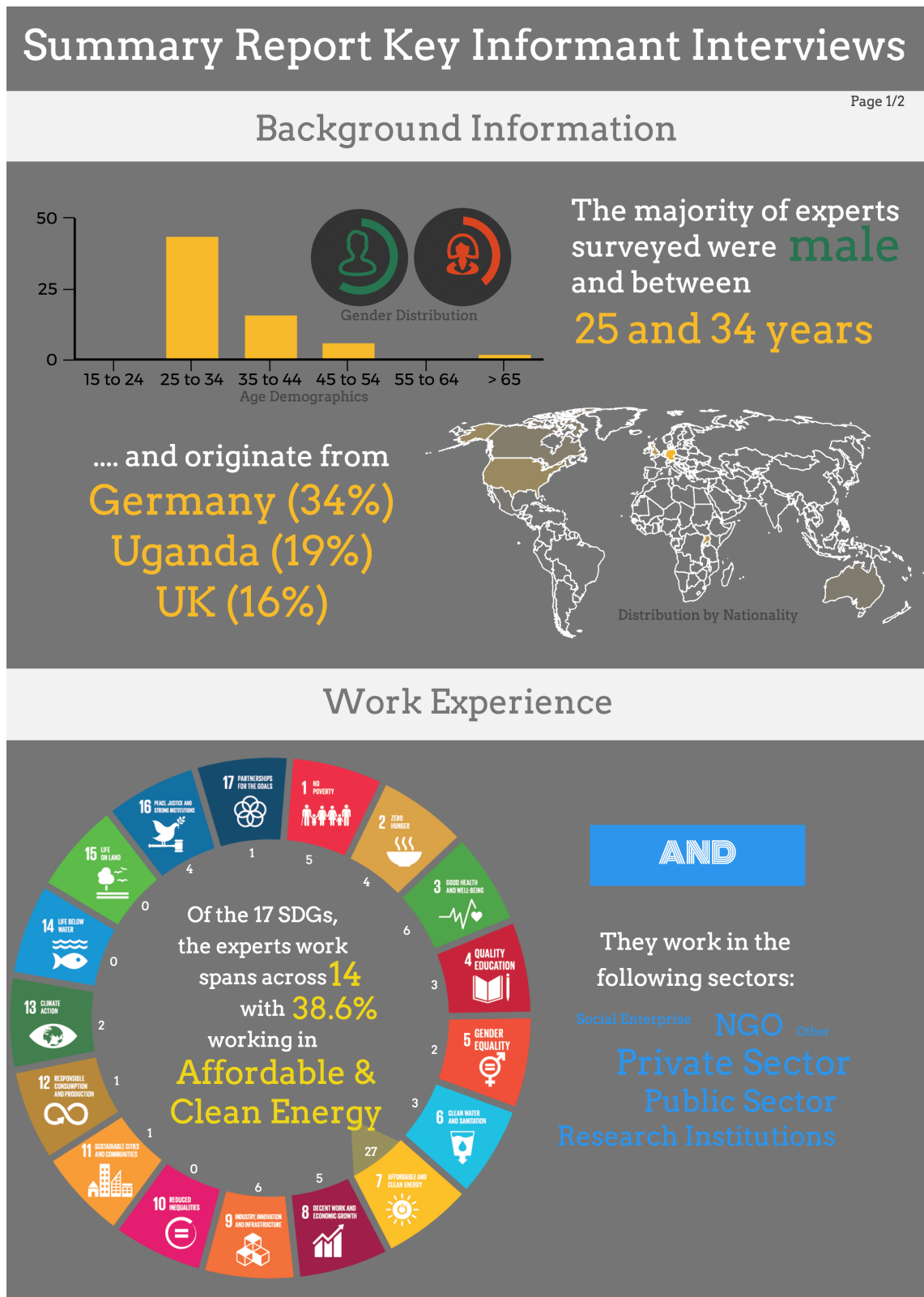
Chapter 10: Appendices

	Not Confident	Somewhat Confident	Confident	Very Confident
Access to Area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aesthetic (Appearance item/place)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Altruism (Unselfish concern)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Appealing (Taste and smell)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Appearance (Personal)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aspiration (Be someone)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asset (Future benefit)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Availability (Local)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Banking Access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Barter Trade (Non-monetary)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Belongingness (Certain group/values/interests)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Business Opportunity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Capital Cost (One off expenditure)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Caring (Family)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Celebration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comfort (Positive feeling)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Community development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dignity (Being worthy of honour/respect)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Education Access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Effectiveness (Fulfil intended purpose)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Energy Access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Entertainment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Faith (Religion)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food Security	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Harmony (Being at peace)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health Care Access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Income (Make money)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information Access (Stay informed)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowledge Attainment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lastingness (Goods/service)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Longevity (Extended life span)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Manners (Ways of behaving)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Memorability (Associated with past)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Telecommunication Access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mobility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Modernisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Morality (Follow rules/conduct)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Multipurpose (Multitude of purposes)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Operational Cost Savings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Performance (Personal)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Portability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preservation of Environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preservation of Health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Productivity (Rate of output)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reliability (Operation/function)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

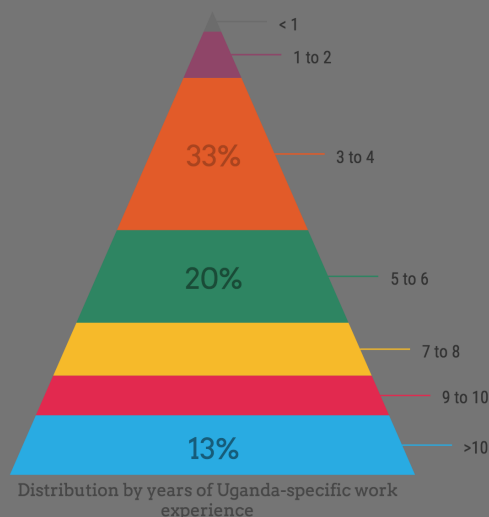
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	Reputation (Held opinion)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Role Fulfilling (Personal responsibilities)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Safety (Animals, Items, Nature)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	School Fees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Security (Danger/threat People)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Shelter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Skill Attainment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Time Benefit (Minimise time wastage)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Time Management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Togetherness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Tradition (Embedded village behaviour)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Transportation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Treatment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Unburden (Simplifying a task)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Usability (Physical interaction with item)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Water Access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Water Quality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Wellbeing (Living condition)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.1.2	Other (not stated but important topic/benefit)?				
4.1.3	Rank selection in order of highest [1] to lowest [10] priority for rural villager.				

Figure 29: Summary report 'key informant' interviews

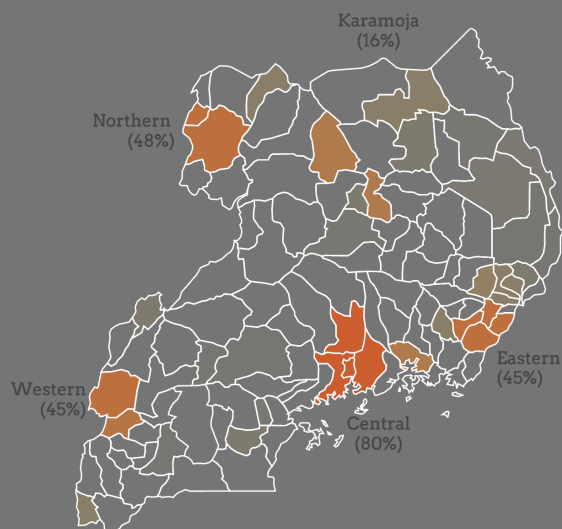


Uganda-Specific Work Experience



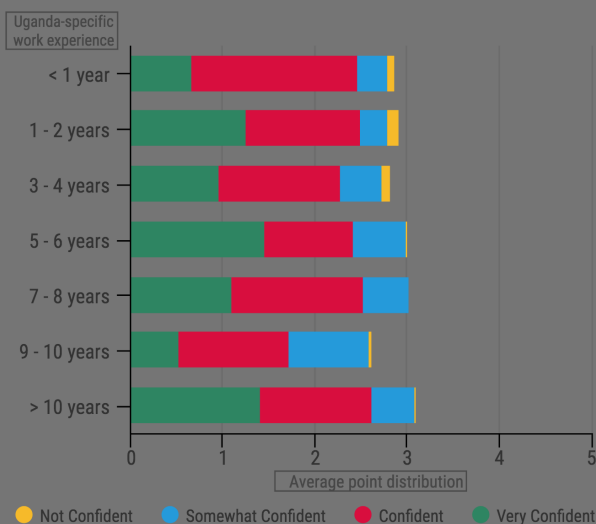
The greater number, **33%**, of experts have **3 to 4 years** of Uganda-specific work experience.

Their work experience spans across five regions:



*Note, the map is an approximation; other regions represent 26%.

Confidence in Recommendations



The level of recommendations given by the experts is classified, on average, as **CONFIDENT** on average, regarding 'what is important to rural communities in Uganda'.

*The data was analysed using a positive point system 1 to 4.

APPENDIX VI: INTERVIEW CONSENT FORMS

Figure 30: Consent form for UPV game and non-energy specific interviews

Participants Consent Form

Village & District:	
Date:	
Facilitator:	
No. of Participants:	

Read out loud:

We are a group of researchers and we have come to your community to undertake Focus Group discussions to better understand what is important for rural communities. The participants understand that the images shown are only for the purpose of the research and do NOT reflect upon any items brought to the community at a later stage – (*Emphasise that*) NONE of these items will be brought to the community at a later stage. The participants agree that they are here on their own free will and were not forced to participate. The participants understand that the Focus Group will be recorded and notes will be taken. At the end of the Focus Group, the participants will receive a small compensation for their time and work loss.

Sign:

#	Participant Name	Signature
1		
2		
3		
4		
5		
6		

Figure 31: Consent form energy-specific interviews

1. Consent Form	
Interviewee	_____
Interviewer	_____

We are a group of researchers and we have come to your community to undertake Interviews to be understand what is important for rural communities. You,

_____ (Name)

understand that anything discussed is only for the purpose of the research. You agree to answer an the questions truthfully. You agree that you participate on your own free will and were not forced participate. You understand that the interview will be recorded. Also notes and pictures will be ta for the use of the researcher. At the end of the interview, you will receive a small amount of compensation for your time and work loss

of UGX _____ only.

I, _____ (Signature)

agree.

I, _____ (Initials) received the compensation.

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June 2018

APPENDIX VII: LIST OF PROJECT DOCUMENTS

– **Suam:**

- GTZ (2010), Suam Summary Report
- GTZ (2008), Proposed Suam Community Micro Hydro Power Project: Project Brief
- Ministry of Energy and Mineral Development (2006). Proposed Pilot Micro Hydro Power Project Interim Feasibility Study Report
- GTZ (2009), Bidding Document for Construction of Suam Micro Hydro Power Scheme

– **Bwindi:**

- Ministry of Energy and Mineral Development PREEEP (2009) Presentation: Progress Update Presentation on Micro Hydro Power Projects [Suam and Bwindi] Supported by GTZ
- GTZ (2007), Proposed Bwindi Community Micro Hydro Power Project: Project Brief
- GTZ (2010), Project leaflet. Hydropower in Uganda: The Bwindi Community Micro-Hydropower Scheme
- Schragl, Peter (2008) Diplomarbeit. Panning of a Micro-Hydropower Scheme for Rural Electrification near Bwindi National Park, Uganda.

– **Gwere-Luzira:**

- Gwere-Luzira Committee and GIZ (2010). The Constitution of Gwere-Luzira Self-Help Hydro Electricity Project
- GIZ (2010). ‘Gwere-Luzira Self-Help Pico-Hydro Electricity Project’ Pico-Hydropower Scheme Maintenance Manual.
- GIZ (2012). Hydropower in Uganda: A Community Pico Hydro Scheme in Gwere-Luzira
- GTZ (2010), Gwere-Luzira Self-Help Pico-Hydro Electricity Project’ Project Report

– **Lama:**

- Ministry of Energy and Mineral Development PREEEP (2010) Community Micro-Hydropower Project Fofu: Project Brief
- Ministry of Energy and Mineral Development PREEEP (2010) Community Micro-Hydropower Project Fofu: Project Presentation

– **Bihondo:**

- Bihondo Committee (2008). The constitution of Muhingyi Hydro Power Scheme: Bihondo village

– **Personal Communication:**

- Owino, Evace; GTZ Project Engineer Suam and Bwindi
19 March 2014
15 June 2016
02 January 2017
- Akwero, Betty; GIZ Head of Programme West Nile Region
31 December 2016
21 June 2015
- Oram, Colin; Implementer Projects Bihondo and Mabwe
10 March 2017
24 February 2017
16 June 2016
19 November 2014

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