

The potential of performance targets (*imihigo*) as drivers of energy planning and extending access to off-grid energy in rural Rwanda.

First author

Iwona Bisaga*, 0000-0003-4126-3408, Civil, Environmental and Geomatic Engineering, University College London, London, United Kingdom, i.bisaga.12@ucl.ac.uk

Second author

Priti Parikh, 0000-0002-1086-4190, Civil, Environmental and Geomatic Engineering, University College London, London, United Kingdom, priti.parikh@ucl.ac.uk

Third author

Yacob Mulugetta, 0000-0003-3191-8896, Department of Science, Technology, Engineering & Public Policy, University College London, London, United Kingdom, yacob.mulugetta@ucl.ac.uk,

Fourth author

Yohannes Hailu, Sub-regional Office for Eastern Africa, United Nations Economic Commission for Africa, Kigali, Rwanda, hailu15@un.org

Abstract

Rwanda has one of the lowest electrification rates in Sub-Saharan Africa and ambitious targets of boosting energy access, with an encouraged private sector involvement. However, barriers such as end-user awareness and participation in policy and business model design prohibit the pace of rural electrification. A case of Rwanda is analysed, pointing to the potential of the *imihigo* (performance contracts) framework. Given the adoption of household-level performance contracts, which can include energy access, it is proposed they could drive local participation among off-grid communities. Results of a survey with 218 users of Solar Home Systems in North-Western Rwanda and from five focus groups show that village-level energy targets impact on the prioritisation of energy target setting among households. Including off-grid energy options in the *imihigo* booklets distributed to households could influence awareness-raising and allow private sector providers to act in a more targeted way, prioritising areas with most prevalent energy targets. Additionally, community meetings (*umuganda*) tied to *imihigo* offer participatory spaces for information and feedback sharing. These will assist in the design of energy planning and business models which best fit local needs and respond to the challenges faced by the energy poor.

INTRODUCTION

The lack of access to modern energy services continues to be the reality for over a billion people worldwide¹. In Sub-Saharan Africa, 65% of the population (37% in urban and over 80% in rural areas) live off the grid² and have to rely on polluting, unsustainable fuels such as candles, kerosene or wood for lighting and cooking. With a growing recognition of the limitations to offering universal access to the national grid, such as high cost, remoteness of rural communities, and low levels of energy consumption among end-users^{3,4}, distributed renewable energy (DRE) solutions have become more prominent on the national energy planning agendas across the developing world^{5,6,7,8}. Off-grid solar services have recently gained momentum as a viable, clean and cost effective resource capable of addressing the vast gap of electricity provision, particularly for household-level needs, in what are often challenging, rural settings in low-income countries. Solar lanterns and Solar Home Systems (SHSs) have become some of the most prominent among standalone off-grid solutions, which also include bioenergy, geothermal, hydro, and wind^{9,10,11,12}. Even though their capacities rarely go beyond 100W, they offer clear benefits to the end-users, improving the quality of life by eliminating harmful smoke, extending light hours and thus productive time for income generation, allowing children to study longer, family members to charge their phones at home and getting access to information via radios and TVs- all at a cost comparable to that of previous expenses on alternative sources^{13,14}. Given the capital intensive nature of DRE which requires heavy up-front investment¹⁵, increased participation of the private sector in the planning and provision of off-grid solutions has begun to play an important role in places such as East Africa, Bangladesh and India, with other regions following suit. However, to design appropriate energy policies, business models and systems, it is necessary to ensure end-users' participation and consultation to understand their needs, aspirations and challenges which they face and which impact on their energy choices, and the eventual success or failure of the intervention^{16,17}.

Paper aim and structure

Rwanda is one of the countries with the lowest rates of electrification and some of the most ambitious targets for boosting access in the near future- going from 26% in 2016 up to 100% in 2024. The current electrification rate stands at 40.5% and is composed of 29.5% on-grid generation (mainly from hydropower, thermal (diesel and methane), and solar) and 11% off-grid (mainly from hydropower and solar)¹⁸. This paper introduces Rwanda's *imihigo* (performance contracts) which could act as a tool addressing questions of participation for energy policy making as well as for business model design among off-grid providers, and awareness-raising about off-grid energy thus contributing to demand activation and speeding up of electrification efforts. By examining how *imihigo* and, in particular, energy *imihigo* at various administrative levels impact on the adoption of off-grid solar systems, it argues that the *imihigo* framework could additionally be used to enhance the GoR's and the private sector's energy access efforts, offering more targeted and tailored off-grid electrification planning and provision. By investigating the challenges associated with the practical application and functioning of the *imihigo*, this paper also highlights what lessons can be learnt from it and how they can inform similar frameworks in other contexts. It draws on field research conducted in North-Western Rwanda between July and November 2016 with users of SHSs.

The paper is structured as follows: section 2 introduces the *imihigo* framework and its role in Rwanda's development planning; section 3 gives a brief overview of Rwanda's energy policy sector and the place of off-grid energy in the country's energy mix. Sections 4 and 5 describe the research methods and discuss the results. Section 6 focuses on the discussion and policy recommendations on what role tools such as *imihigo* can play in local and national energy planning and how they can contribute to improved awareness and end-user participation, in addition offering better targeted expansion opportunities to the private sector. Section 7 offers conclusions.

IMIHIGO (PERFORMANCE CONTRACTS)

Since 2001, local levels of government have been responsible for the implementation of development programmes as a result of Rwanda's decentralisation. This shift created the need to strengthen accountability mechanisms towards the central government and towards all the citizens. *Imihigo*, known as performance contracts in English, were introduced in 2006 to address that need. The word *imihigo* derives from Kinyarwanda verb *guhiga* and means competition and self-commitment to achieve¹⁹. In its singular, *umuhigo*, it signifies a vow to deliver. The concept stems from the pre-colonial cultural practice of individuals setting themselves targets for a specific period of time²⁰ and is one of Rwanda's Home Grown Solutions (HGSs)²¹. Performance contracts are signed every year between the President, the Ministries and local government institutions, binding all signatories to achieve the targets set for the given year. These targets must all fit with and contribute to the achievement of the Economic Development and Poverty Reduction Strategy (EDPRS II)²² and Vision 2020^{23,24}, and ultimately international goals under frameworks such as SDGs¹, which Rwanda also adheres to and has domesticated in the national development plans, including in the infrastructure sector⁶⁷. Targets are measured against a number of economic, social and governance indicators- the performance indicators²⁵. The same process is extended to all decentralised levels (districts, sectors, cells, villages (*umudugudu* in Kinyarwanda), and households), making the accountability both vertical and bottom-up¹⁹. In order to successfully achieve any set national target, all levels must work towards it. Participation and contribution of citizens, as well as other stakeholders and partners working with various levels of the government, are crucial²⁶ (see Figure 1). At the household level, families select a number of goals they want to achieve throughout the year (always starting in September). This can include installing a security light at the house, avoiding wasting family resources, or becoming a part of a cooperative. The number and type of goals is determined by HH members according to their priorities, the availability of resources and the capacity to achieve these targets.

¹ *Imihigo* and other planning strategies, including Vision2020 (GoR, 2000/2012), EDPRS II (GoR, 2013) and SE4All Agenda (SE4All, 2016) are set as either long-, medium- or short-term action plans. International frameworks would fall under long-term planning but they are not part of *imihigo* per se.

According to Klingebiel et al.²⁷, there are three forms of community involvement which help achieve *imihigo* activities: central government's poverty reduction strategies including *Ubudehe* - a participatory problem solving mechanism encouraging community involvement in decision making and Vision 2020 *Umurenge* Programme (VUP), set up to speed up poverty eradication; *Umuganda* - community work that takes place on every last Saturday of the month with the aim to make progress towards a specific target and offers citizens a space for discussion of achievements, challenges and priority areas for their village; and financial and non-financial contributions from the citizens, including *agaciro*- a HGS aiming to enhance domestic savings mechanisms towards self-reliance and lesser dependence on donor support²¹. This involvement is meant to enable the achievement of *imihigo* and strengthen the sense of ownership among all stakeholders. However, Hasselskog²⁸ has argued that *imihigo* targets derive from the state and in the process of their formulation there is little participation and consultation which limits *imihigo*'s local relevance and the feeling of empowerment among citizens, making the performance contracts a governing tool in the hand of the state. Hasselskog and Schierenbeck²⁹ have also criticised Rwanda's development programmes as being top-down rather than promoting local participation in the spirit of HGSs. Ansoms³⁰ further argues that even though in principle making local governments responsible for the implementation of the *imihigo* should allow for easier translation into the local context and thus more adaptive towards community needs, the fact that at district, sector and cell levels the administrative power lies with a person appointed by the central government and not the community limits the extent to which it actually happens. Accountability also becomes problematic as the responsibility is to the central government rather than the people (ibid.). Despite existing criticisms, Scher³¹ argues that the *imihigo* process has a role to play in delivering on the crucial development targets and McCord³² sees Rwanda's Vision 2020 programmes, including *imihigo*, as valuable programming options with more potential than other conventional Public Work Programmes (PWP) in the region.

The implementation of *imihigo* and the difficulties in monitoring and evaluation of targets as well as set targets being unrealistic, led the GoR to add the Results Based Performance Management (RBM) policy for Rwanda Public Service³³. This is intended to ensure timely implementation of national development objectives, as well as assist with national planning, monitoring and evaluation of targets, alignment of operations and evidence-based learning. Local participation and inclusiveness have been the guiding principles in the conception and implementation of the policy. The *imihigo* have continued to function and have been embedded in RBM policy as a tool to help with the planning, budgeting and policy review processes and various administrative levels (ibid.). According to Kamuzinzi³⁴, even though *imihigo* were initially conceived of as a HGS based on tradition, the combination of *imihigo* and RBM has turned into a hybrid management tool after the implementation of the RBM policy and now relies on the external control of performance which stems from the modern management philosophy.

Gaynor³⁵ sees Rwanda's achievements in pushing its development agenda and introducing measures stemming from culture and tradition to improve effectiveness in execution as what some call the "new African developmental state". He puts under question the legitimacy of the fast-track reform and transformation process that has taken place in the country in the last decade and along with it the role of local communities. Despite the highly praised decentralisation and its participatory nature, there have been arguments showing that the tendencies in the implementation of development programmes and various policies tends to be very centralised^{36,37}. Similarly, Mann and Berry³⁸ offer a critique of the Rwandan developmental state claiming that Rwanda is using "the developmental infrastructure to deepen state power and extend political control" (p.1).

However, as argued by Leal and Azevedo³⁹, setting targets is "[...] crucial to the definition, effort and investment implied in any plan" (p. 1). They are useful and, indeed, imperative for the achievement of broader goals, such as energy access, and provide a sense of purpose and direction for any given sector, allowing for the setting of frameworks for action⁴⁰. Central or bottom-up goals, and formalising of the social contract in the case of Rwanda, despite its centralisation, helps bring these targets to policy attention and management (eg.³¹).

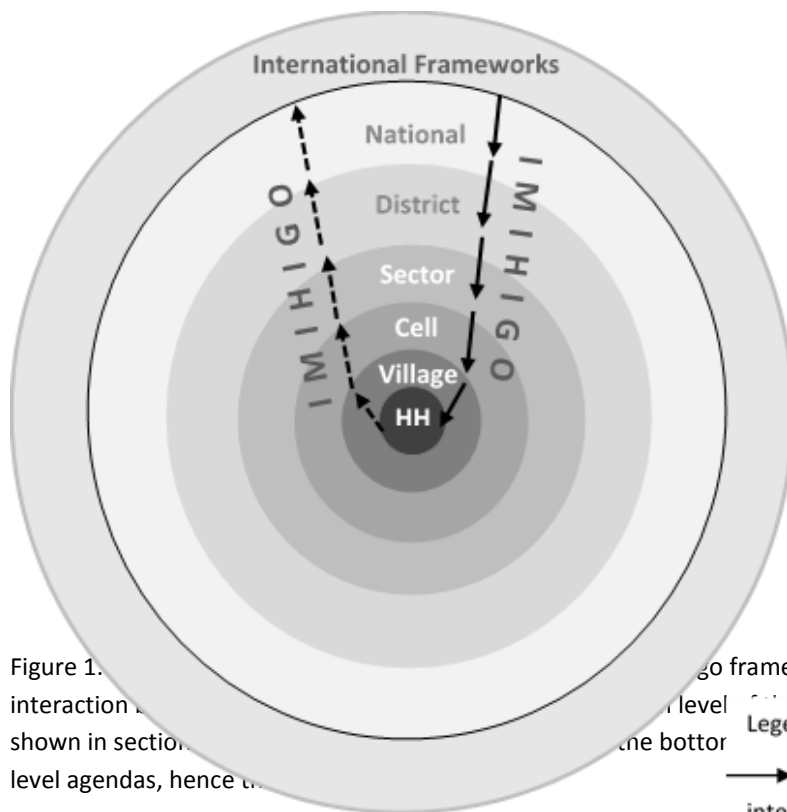


Figure 1. Multi-level framework. There should be a two-way interaction between all levels. The bottom level agendas, hence the bottom

Legend:
 ———> Direct, well-established interaction
 - - -> Interrupted interaction

ENERGY POLICY IN RWANDA

Despite its turbulent past, Rwanda has experienced a considerable developmental progress in the last two decades⁴¹. The positive trends in its continued growth have been accredited to socio-economic transformations and a strong political leadership, along with well-defined targets and aspirations of becoming a middle-income country by 2020^{42,43}. In regard to energy access, Rwanda is currently leading the way to achieve the fastest rate of energy access growth, however, a large proportion of its rural population remains without access and clear disparities exist between rural and urban areas¹. At 40.5% overall electrification rate in 2018, there is a lot of pressure to multiply both public and private sector efforts in order to achieve the planned 100% rate by 2024.

As early as in 2000 when Rwanda's *Vision 2020* was put together, some of the key building pillars for the country's development were "[...] infrastructure, entailing improved transport links, energy and water supplies and ICT networks" and "[the development of] an efficient private sector spearheaded by competitiveness and entrepreneurship"⁴⁴. Going against evidence from Mozambique and Tanzania by Ahlborg and Hanmar⁴⁵, who found that little interest of the private sector to invest in energy access and difficulties in planning were hindering progress, the case of Rwanda seems to point to the contrary. It has implemented short-, medium- and long-term planning strategies which include private sector's participation and aim to create a favourable business environment to attract investment, including in the energy sector. EDPRS (2008-2012) and EDPRS II (2013-2018) have both placed the role of infrastructure and energy access high on the priority agenda, with one of the four priority areas focusing on "Connect[ing] rural communities to economic opportunity through improved infrastructure" and acknowledging the need to meet the off-grid energy demand.⁴⁶

The Rural Electrification Strategy (RES), which came into force in 2016, and the Sustainable Energy for All (SE4All) Action Agenda⁵¹ provide the framework for rural electrification through renewable energy. Rwanda's SE4All Action Agenda outlines 9 high-level energy targets, among them "[...] 100% electricity access by 2030 in both urban and rural areas through a mix of on-grid and off-grid solutions" (p. i)⁵¹. This aligns with RES which specifically includes off-grid solar solutions (such as solar lanterns and SHSs) and private sector participation, not only through offering quality products but also by joining in the Rural Electrification Campaign launched by the Government of Rwanda as part of RES implementation. The campaign aims to raise awareness of most cost-effective energy access solutions among rural populations and promote off-grid systems for those unable to access the grid. Additionally, Rwanda has been selected as one of beneficiary countries for the Scaling up

Renewable Energy Programme (SREP) in Low Income Countries⁵². The programme aims to show the socio-economic and environmental viability of renewable energy for energy access and the creation of new economic opportunities to drive country's development⁵².

Energy access Imihigo

Energy access goals appear in all of Rwanda's key strategic plans, including Vision2020 which in its updated version⁴⁶ also covers off-grid solutions, and in EDPRS II, both of which dictate the development of action plans at lower administrative levels, among them District Development Plans (DDPs) and Sector Development Plans (SDPs). The annual action plans and *imihigo* are also set according to the national-level, long-term agenda².

At the highest level, energy access *imihigo* mostly fall under the responsibility of the Ministry of Infrastructure (MININFRA) and the Rwanda Energy Group (REG) with its subsidiaries: Energy Development Corporation Limited (EDCL) and Energy Utilities Corporation Limited (EUCL). Institutional *imihigo* are set individually by institutions while at the same time Joint Imihigo are set yearly as collaborative efforts among institutions to achieve certain targets. An example of REG *imihigo* 2016-2017 can be seen in figure 2. There are separate targets for on-grid and off-grid electrification with specified numbers of connections (e.g. over 255,000 for the year 2016-2017), quarterly targets and clearly outlined indicators.

REG IMIHIGO 2016/2017								
Output	Indicator	Baseline	Targets/Milestones				Activities to deliver output	Budget/Rwf
			Q1	Q2	Q3	Q4		
	Number of Households connected to the new grid electricity in east province	133,371 connections	2115 Connections	2115 Connections	2115 Connections	2116 Connections	1) Build small lines to connect located households MV line, Line TRANSFORMERS 2) Connecting located households	10600438702
Output 1.2 255,550 households connected with off-grid systems through partnerships with private companies	Number of Solar home systems installed in households	3,488 Mobisol Solar Energy Home Systems installed in households	Preparation and submission of the 3rd purchase order to Mobisol	1,400 Mobisol Solar Energy Kit Systems delivered	Preparation and submission of the 4th purchase order to Mobisol	1,963 Solar Energy Kit Systems delivered	Supervision of the Installed Mobisol Solar Systems Mapping of off-grid areas and share it with Mobisol for customer mobilization Coordination with the Government Local Authorities Supervision and reporting on the project progress status	1929988750
	Households with access to off grid solar PV systems	None	Determining the subsidy scheme to system beneficiaries	84,000 households connected to off-grid electricity	84,000 households connected to off-grid electricity	84,187 households connected to off-grid electricity	EDCL Mapping of off grid areas for project location Coordination with the Government Local Authorities Supervision and reporting on the project progress status Approving of subsidies for the system beneficiaries IPPs	Private

Figure 2. Rwanda Energy Group Imihigo 2016-2017. An example of institutional imihigo outlining electrification plans for 2016-2017 through both on-grid and off-grid connections with an explicit incorporation of partnerships with the private sector for off-grid energy provision. Source: adapted from GoR⁵³. RWF1000 = USD1.19 (Exchange rate from 10/10/2017).

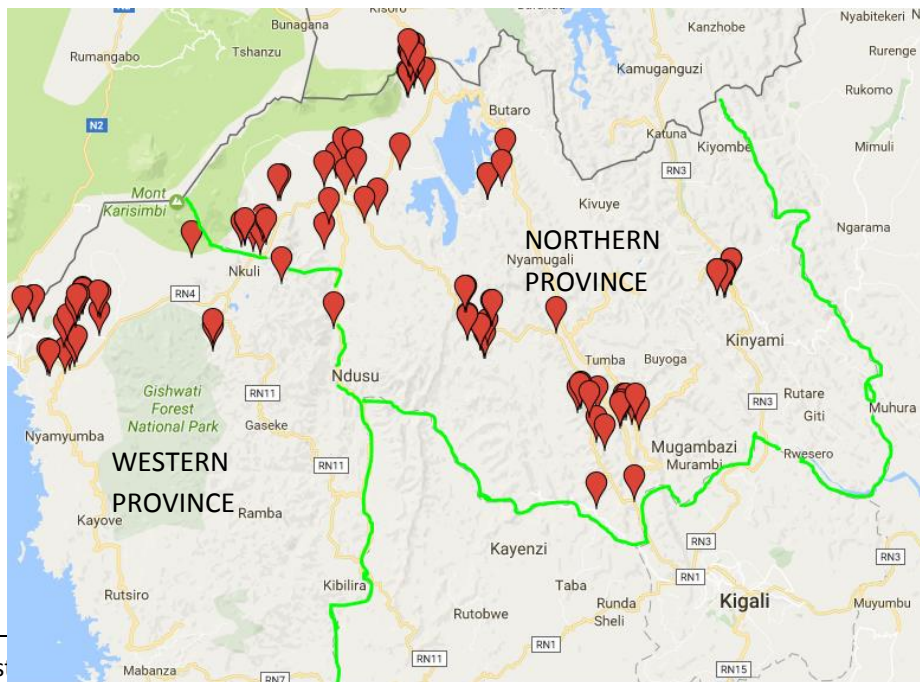
DDPs and SDPs will further include energy targets broken down according to the region. Most importantly, however, households adopt energy targets which are included in their yearly performance contracts (*Ikayi Y'Imihigo Y'Umurango*). These contracts, in a form of a booklet containing a list of 61 optional targets under

² Both Vision2020 and EDPRS II are here considered as long-term strategy plans.

three pillars (Good Governance and Justice, Family Economy, and Good Conduct) from which families can choose as many or as few as they wish, and to which they can also add their own targets, get distributed to all households on a yearly basis (MINALOC interview, 2016). There are no *imihigo* set as getting energy access per se but rather there is a number of individual targets which require access to energy, such as “To own a radio, a phone and a TV, and to be able to get access to other available technology and new products” and “To own a security light at each house” (both under the Good Governance and Justice pillars)⁵⁵. Another *umuhigo* which refers to energy is “To have biogas or other gas which can be found where you live” (under the Family Economy pillar) which refers to an energy source for cooking. While in this case a specific source is suggested (biogas or any other gas), in the case of the other two *imihigo* no energy access options are mentioned. The scope of the targets, however, seems to be compatible with what standard off-grid SHSs are capable of supporting: typically phone charging, powering a radio and a TV (optional and at a higher cost), and providing light, including outdoor security light. Smaller capacity solar lanterns (pico-solar systems) can also support lighting and phone charging, and in some cases a small radio.

RESEARCH METHODS

Primary research data utilised for the purposes of this paper have been collected as part of a wider study of SHS users in North-Western Rwanda, conducted in collaboration with BBOXX- a private SHS company operating in Rwanda, and in affiliation with the University of Rwanda College of Science and Technology. Both quantitative and qualitative research methods were used, with 266 surveys (97 in household and 169 over the phone) and five focus groups consisting of a total of 30 participants conducted with BBOXX customers in the period between July and November 2016. Focus groups aimed to explore, in more detail, the HH-level *imihigo* with the users of SHSs. All respondents came from the same area which encompassed 8 districts across Rwanda’s Northern Province and the Northern part of Western Province (hence broadly from the country’s North-Western region, see Figure 4). The choice of the two Provinces was dictated by the needs of the wider study which focused on the North-West of the country due to the highest number of users of SHSs in that region at the time of data collection³. Random sampling was applied to select customers for phone-based interviews. The number of in-household interviews was determined by customers’ availability and proximity to the roads. It proved challenging to reach more customers in their HHs in the given timeframe as majority live in places too remote to access. Because of that random sampling followed by convenience sampling was applied to in-HH interviews.



³ BBOXX s /estern Province. At the time of data collection, there was a higher concentration of company’s shops and therefore customers in the Northern Province than the Western Province, hence the uneven distribution across the two. However, they are topographically, socially and economically similar and no significant differences have been detected between customers from the two Provinces.

Figure 3. Location of the 97 in-household interviews (marked by pins) and 169 phone interviews (demarcated by the Province border lines).

All participating customers had purchased their SHSs between late 2013 and June 2016. From the total of 266 surveys, 218 included questions specifically focusing on the *imihigo* as the researcher learnt about the village and household-level energy targets in stakeholder interviews, after the surveys had already commenced, and the *imihigo* questions were added a few weeks into data collection. Additionally, a series of semi-structured interviews took place with some of the stakeholders involved in Rwanda’s energy sector, including the Ministry of Infrastructure, EDCL-REG, FONERWA, GIZ and Energising Development, and representatives of local administration and *imihigo* experts from the Ministry of Local Government, as well as a representative of the Rwanda Governance Board. A review of relevant documents concerning Rwanda’s energy policy and development planning has also been carried out. Among them, Rwanda’s Rural Electrification Strategy⁵¹, Rwanda’s Vision 2020^{23,24}, Ministry of Local Government, Ministry of Infrastructure and Rwanda Energy Group *imihigo* 2015-2016 and 2016-2017, and SREP Investment Plan for Rwanda⁵⁶.

RESEARCH RESULTS

Household and village level energy *imihigo*

218 users of SHSs (all of whom were BBOX customers at the time of data collection) took part in the survey. Questions were asked about household-level as well as umudugudu-level energy *imihigo*. First, participants were asked about whether there were household-level *imihigo* which focused on getting access to energy at the time when they purchased their SHS. As demonstrated in Figure 4, 41% responded yes versus 55% who responded that there were no household-level energy *imihigo*. 4% said that at the time there were no household-level *imihigo*. At the household level, *imihigo* adoption begun later than the national *imihigo* which were introduced by the GoR in 2006. Respondents reported adopting household-level *imihigo* between early 2012 and late 2014, depending on the sector they live in.

Household level energy *imihigo* at the time of purchasing SHS

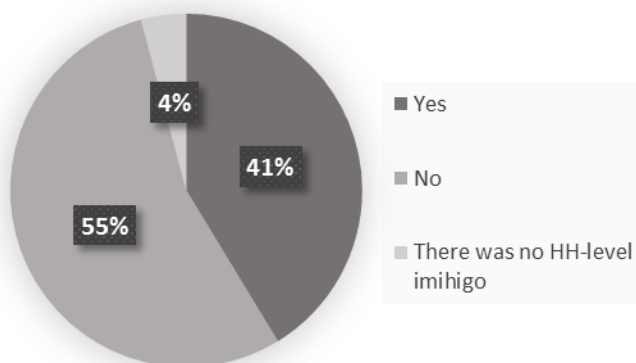


Figure 4. Percentage of interviewed BBOX customers whose households had energy *imihigo* vs those who did not have them at the time of purchasing a SHS. 4% did not have household-level *imihigo* at all at the time (i.e. they were not using the *imihigo* framework at all in their households).

Another two questions asked about umudugudu-level energy *imihigo* at the time of purchasing a SHS and umudugudu-level *imihigo* now (i.e. at the time of participating in the survey). As shown in Figure 5, there has been an increase of approx. 10% in umudugudu-level energy *imihigo* in the period between when customers purchased their SHSs and when the survey took place. The proportion of respondents who were not aware of

umudugudu-level energy *imihigo* dropped only marginally therefore with time there has been an increase in the number of imidugudu⁴ adopting energy access targets.

Umudugudu (village) level energy imihigo

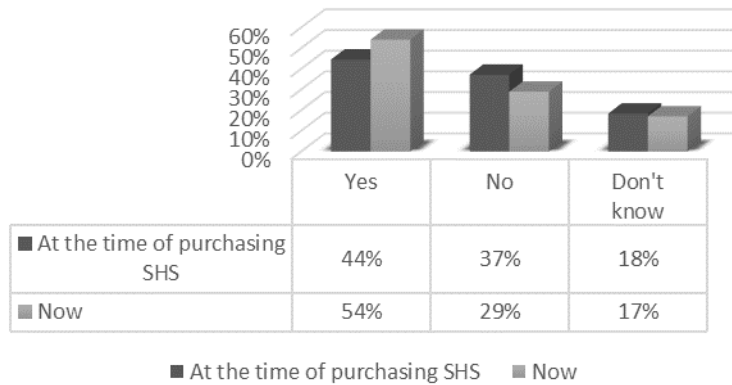


Figure 5. Umudugudu-level energy imihigo at the time customers purchased SHSs and now (July-Sept 2016).

Excluding those who reported not having household-level *imihigo* at the time of purchasing a SHS (a total of 9 respondents, making it a sample of n=209), households in villages where there were energy *imihigo* (and they were aware of them) were 56% more likely to have household-level energy *imihigo* than households in villages where there were no energy *imihigo* (Figure 6). They were also 27% more likely to have household-level energy *imihigo* than households unaware of whether or not there were village-level energy *imihigo* at the time they purchased a SHS.

Energy imihigo at village at HH level

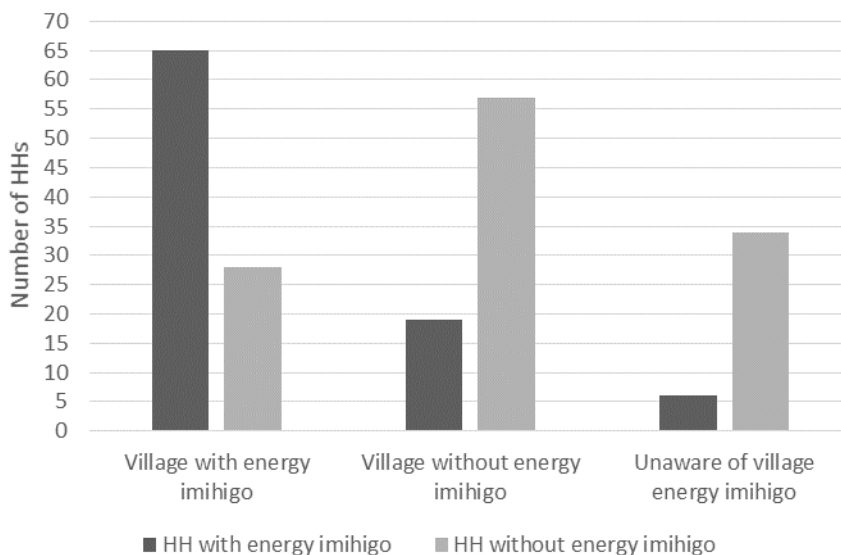


Figure 6. Energy imihigo at village and household level.

Awareness of village-level *imihigo* might be an important factor influencing people’s decisions regarding their own *imihigo* choices. Ensuring energy access (incl. off-grid options) is among them might help increase uptake. Existing spaces, such as *umuganda* are well-fitted to be the ground for community discussions and awareness

⁴ Plural of *umudugudu*.

raising. However, when asked about where the motivations to purchase a SHS came from, for only 1% of respondents was it a cell meeting.

The *imihigo* process

Five focus groups with a total of 30 BBOX customers (25 men and 5 women⁵, aged between 19 and 82) from different imidugudu were conducted as a follow up to the survey in order to further explore questions of energy *imihigo* in the SHS users' households and villages. There were four main topics of discussion: 1) how households decide on what *imihigo* to choose, 2) whom the households are accountable to and how the *imihigo* process works, 3) how common energy *imihigo* are and how/why they get chosen, and 4) how households decide on what energy sources to choose, and whether those decisions are influenced by the umudugudu-level *imihigo*.

There were three key factors influencing households' decisions on the choice of: how much one earns (financial), which was usually mentioned first, followed by what it is that a family would like to have in their household or what they believe is important or necessary to have in the coming year (needs and aspirations), and finally what is achievable throughout the year of new *imihigo* (achievability). The process of choosing and signing the *imihigo* that have been selected by households for each year did not appear to vary much across villages. The flow chart below demonstrates the steps as reported by focus groups participants:

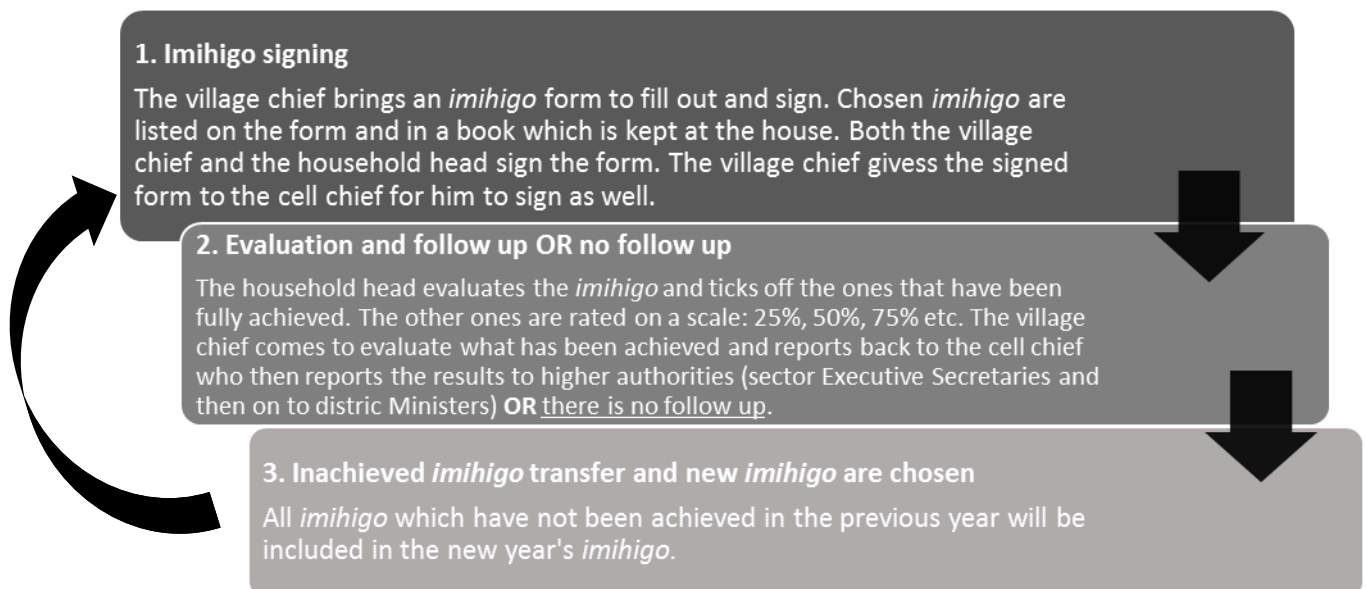


Figure 7. The *imihigo* yearly process as reported by the participants of focus groups.

The accountability appears to be vertical, as mentioned earlier¹⁹, first to the village chief who evaluates the achievement of household *imihigo*, and then the cell chief to whom the village chief reports. The cell chief then takes the evaluation reports to higher authorities (i.e. the sector office). In one focus group, participants said there was no follow up at the end of the year so that the accountability falls solely on the family members, whether or not they have achieved the set targets.

When asked about how common energy *imihigo* are, 93% of participants responded saying that energy *imihigo* were common in their villages. They are decided at the district level which is where the categorisation of various *imihigo* that are to be achieved throughout the year takes place. Included in the district-level *imihigo* are energy targets which then trickle down to the cells and villages. The form that is brought to the household by the village chief contains different categories of *imihigo* and, among them, there are energy *imihigo* as well.

⁵ SHS owners (officially registered in company's records) are predominantly men. Around the time of data collection female owners constituted 6% of the total number of customers. This resulted in a much smaller number of female participants in FGs, which would usually be attended by the owner.

Families then decide themselves whether or not to select the energy *imihigo* as one of their targets for the coming year, depending on the factors which have been mentioned above. If energy *imihigo* are adopted by the household, choosing the energy source is entirely up to the household members and it is never a decision influenced by the village-level decisions. Choosing what option of energy source to go for depends on a) what is available, b) whether it is a safe source, c) how much it costs and d) how much money is earned at the household.

What the participants kept stressing in the discussions was the flexibility of the *imihigo* and how the ones that have not been achieved in one year can then be transferred to the following year's *imihigo*. As much as the list of *imihigo* (both on the form brought by the village chief to sign and in the *imihigo* booklet which is kept at the house) is pre-determined, households are free to choose from various categories of targets and make those decisions themselves, with the option of making up and choosing their own *imihigo* which they can add on to the existing list. That flexibility aspect of the *imihigo* was what participants seemed to enjoy most and reported to be convenient for their households.

Focus groups discussions also confirmed the different times at which households started adopting household-level *imihigo*. Among those participating, they varied between early 2012 to late 2014.

End-user consultations

A series of short semi-structured interviews with seven of the key stakeholders in Rwanda's energy sector took place between June and November 2016. The interviews focused mostly on the level of understanding of, and consultation with, the end-users in the energy planning and provision, and on the role of *imihigo* for energy planning at various administrative levels.

On the one hand, a good overall understanding of what the end-users want and need was reported, particularly among the stakeholders working on the rural electrification strategy implementation and focusing on those still unelectrified. However, the consultations with end-users appeared to be limited and would often be as short as a couple or a few days. In spite of what seemed like a relatively short time spent on gathering end-users' feedback, "we know what people want" was a common response to the questions on how important understanding end-users' needs and aspirations is in the process of electrification planning. On the other hand, there was a sense of needing more understanding of the users of off-grid solutions as well as grid-connected rural households. Knowledge about whether or not their needs are satisfied and how energy is used in the households was limited as a result of little to no follow up on those who have been provided with connections, whether on or off the grid. Efforts to collect customer feedback from private providers, who have access to users of off-grid solutions have been stressed by stakeholders whose work in particular involves collaboration with the private sector. Gathering all that information in a systematic way and one which would allow to make it possible to include it into the planning and implementation strategies was reported to be challenging as private providers have distinct ways of collecting customer feedback and, most importantly, of sharing it.

Challenges and opportunities

The performance targets framework was also discussed with representatives of the Ministry of Local Government (MINALOC), in charge of it at lower administrative levels, including with experts focusing exclusively on *imihigo*, and with a representative of the Rwanda Governance Board, whose work spans Home Grown Solutions, research, political organisations and NGOs, as well as service delivery, policy advocacy and strategic engagement, including activities related to *imihigo*.

It was confirmed by MINALOC that not all households implemented *imihigo* at the same time and the speed of implementation varied across districts. One of the challenges brought up by MINALOC representatives was the difficulty with dissemination of *imihigo* booklets which do not reach all households either as a result of sector offices not being ready and operational at this point, and thus not having the capacity to deliver the booklets, or due to insufficient number of booklet copies being printed every year. There have been efforts to address this problem by providing sector offices with printers and paper to print out the booklets themselves and distribute in the areas they are responsible for. Regarding participation, according to MINALOC, villages and cells participate in the *imihigo* design process through planning and budgeting sessions, and their feedback is taken into consideration when deciding district-level *imihigo* for each year.

As previously mentioned, there are three pillars of *imihigo*: economy, social protection and governance, as well as three main types of *imihigo*: institutional, joint (which are collaborative and involve more than one institution), and district *imihigo*. In addition, since early 2010s, households have household-level *imihigo*. Access to energy (off-grid and on-grid) and the wider energy sector fall under the economy pillar within all types of *imihigo*. As was reported by MINALOC, the 2016/2017 target for off-grid electrification was to connect 40000-60000 households by 2018. For people without access to electricity who belong to Ubudehe 1 (programme) the government are supposed to provide access to off-grid solutions with a use of subsidies. However, not everyone is aware of which category of Ubudehe they belong to and, additionally, there have been attempts by those in higher Ubudehe to downgrade to Ubudehe 1 for the purposes of receiving free access through the subsidy scheme. This poses a number of challenges for the authorities to manage the process and ensure access is given to those who most need it and are unable to afford it. According to the Rwanda Governance Board, the Ubudehe 1 subsidy scheme is seeking to get contributions from international stakeholders in order to be able to provide off-grid electrification to the poorest as government resources are limited. The government, however, are doing more towards promoting off-grid electrification and helping reach the energy access targets. As part of biannual Governance Month, which each time has a different focus related to Rwanda's development, in September and October 2016 the Ministry of Infrastructure (MININFRA) and the Rwanda Governance Board (RGB) led a series of awareness-raising events held in the Western Province, in remote rural locations and the timing coincided with that of the launch of the Rural Electrification Campaign. It was stressed by the RGB that strong partnerships with private companies and collaborative and committed local authorities will be key to achieving the off-grid electrification targets. This opportunity has now been fully embraced in the scaling up of energy access efforts.

DISCUSSION AND POLICY RECOMMENDATIONS

DRE options, and among them SHSs and smaller scale distributed solar systems, already play an important role in Rwanda's electrification efforts and will continue to do so given the off-grid electrification targets. Research has shown that off-grid solar is increasingly showing a better cost-benefit performance than grid-based electrification in rural locations, therefore justifying its viability as a reasonable option to pursue¹⁴. Additionally, large-scale grid extension programme in Rwanda has seen an increase in the number of connections but the appliance uptake and energy consumption have remained low³ which provides another proof for the viability of utilising solutions such as SHSs. In order to achieve the 100% off-grid electrification rate by 2024, Rwanda will need to intensify its engagement with the private sector and international stakeholders. Moreover, it will also have to address a number of challenges to rapidly boost SHS uptake, including raising awareness and activating demand, nurture a participatory environment so that broader needs are represented, and trust in grid alternatives is fostered. According to COMESA⁵⁷, "[r]ural electrification must be public led, with adequate incentives for private sector and cooperatives participation" (p. 5).

Through government-led energy planning and implementation strategies and appropriate framework design assisted by international stakeholders, Rwanda has made a lot of progress conducive to energy poverty alleviation. The existing framework of *imihigo* -- now well-embedded in the strategic planning process -- could be additionally used to enhance the GoR's and the private sector's energy access efforts, offering better targeted off-grid electrification planning and provision.

Results of this research show that users of SHSs in villages which had energy targets set at the time they purchased their systems were more likely to have household-level energy *imihigo* than those users in villages which did not have such *imihigo* or where there was no awareness of them. Clearly set village-level *imihigo* therefore have the potential to impact on the prioritisation of gaining energy access among households. Knowing where there is a high prevalence of household-level energy *imihigo* could assist private sector providers of DRE to plan their market strategies in a more targeted manner and piggyback on the already existing demand for energy access instead of having to build it from scratch. Given that the *imihigo* booklets get distributed to all households and that options such as biogas are explicitly mentioned, adding off-grid solar solutions to the existing list of energy-related targets could further boost awareness and potentially grow demand. Additionally, as these contracts are official documents administered by the Government, the inclusion of off-grid solar solutions could also build trust and increase acceptance as they are a demonstration of the Government's support of these options (similarly to the case of biogas), as is the REC which actively promotes off-grid solutions among rural communities.

Moreover, *imihigo*'s consultative nature and their evaluation both at the village and household level provide an opportunity to gather feedback and learn more about people's energy needs and any access barriers they might encounter (e.g. financial) in case their energy targets are not met. Participation and bottom-up planning being challenging to design, the *imihigo* (along with *umuganda*) could also be used as a tool to drive the desired end-user consultation processes and feed into the planning at higher administrative levels, which is currently done to a limited extent. This would allow for an improved interaction between the households and villages, and sector and district energy planning, making it a two-way dialogue rather than a top-down one. This could in turn boost the sense of empowerment, ownership and create a more inclusive policy environment. As revealed by stakeholder interviews, the need to improve end-user consultation and understanding is still there.

In itself, the approach to designing the energy delivery model can determine attitudes of end-users and help address at least some of the key identified barriers to adoption, namely affordability, accessibility, availability, approval (or acceptance) and awareness^{58,59,18}. Openly sharing feedback, from both off-grid connected users as well as those still unelectrified, with the private sector could enable better business model design driven by the different needs, aspirations and realities, and provide guidance for the public sector as well.

However, in order to fully realise the benefits that could be drawn from the *imihigo* and the tools that they offer, it is important to address the distribution challenge head on which was mentioned by MINALOC for more effective dissemination. The issues of end of the year evaluation follow up by the village chief, which was reported absent in some villages, could also hinder progress as it implies a missed opportunity to understand what enables or prevents households from reaching their targets. Similarly, the village-level consultation processes feeding into the design of SDPs and DDPs appear in need of attention as research participants' understanding is that *imihigo* are decided by district offices and the sense of ownership does not trickle down. The strong dependence of the working of *imihigo* on the village chief points to the importance of his or her performance for the overall success of driving and monitoring electrification progress, and further to the need for adequate capacity building of strong local authorities and leadership³³. Including energy access discussions and targets into agendas for community meetings (at the village and cell level, including during *umuganda*) could contribute to further dissemination of information and, in turn, encourage consideration of off-grid electrification among greater number of those with no grid connection. Ensuring the voices of HHs and communities are taken up to higher administrative levels could help avoid the breakdown of bottom up participation (mentioned in section 1 and figure 1) and therefore the risk of HHs' needs, priorities and challenges not being taken into consideration when deciding on the yearly development agendas.

Learnings from Rwanda's approach and established mechanisms that carry the potential to speed up its rural electrification, as well as from similar approaches which have proven successful in assisting off-grid electrification, such as China's Results-Based Strategic planning and participatory governance practice^{60,61,62}, could be applied to other countries, both regionally and globally. Maximising their strengths and addressing the challenges could enhance the already favourable environment in which off-grid solutions are playing a role in last mile electrification.

Other examples of frameworks based on historically and culturally embedded philosophies (although not specifically comparable to *imihigo*) include the Sufficiency Economy in Thailand and the Gross National Happiness (GNH) development framework in Bhutan. The former is based on the Bhuddist tradition and promotes moderation, reasonableness and prudence in socio-economic and human development, encouraging everyone (individuals, groups, communities, businesses etc.) to follow the three domains through the principles of knowledge and virtue⁶³. Bhutan's GNH, on the other hand, consists of 9 domains and 33 sub-domains related to e.g. psychological well-being, time, education, health, as well as living standards within which included is access to electricity⁶⁴. Both have been supportive of bottom-up and resilient development, including energy access in Bhutan.

When designing similar frameworks, based on the learnings from Rwanda's *imihigo* approach, particular attention should be paid to the socio-cultural context and sensitivity which aids achieve high levels of acceptance. Transferability of this kind of framework can be either eased or challenged depending on whether or not there exists a culture of target setting in any given context. At the same time, other tools stemming from history or culture might be useful in driving the design of similar approaches and should be leveraged for the achievement of culturally appropriate solutions. Transparency in establishing accountability and commitment in managing the execution of processes, with a clearly defined participation and contribution of

individuals (and/or groups of individuals) throughout the administrative ladder are also crucial for ensuring that *imihigo* at lower administrative levels are fully incorporated into the multi-scalar planning framework. When focusing specifically on energy access policies, raising awareness of and providing education on available solutions, such as off-grid systems (whether solar-powered or otherwise), will enable faster and higher uptake among unelectrified households, thus speeding up electrification efforts. As advocated in this paper, approaches such as *imihigo* or similar (e.g. Thailand's Sufficiency Economy or Bhutan's Happiness Index) can also be used to that end.

CONCLUSION

Findings of this research, as outlined in the above sections, can inform areas of energy access policy and practice alike. In line with Sovacool⁶⁵ to address the energy poverty challenge, there is a need to not only focus "[...] on making high quality technology that works well, but also get the price signals and financing right, mould cultural values and expectations, spread awareness, align political regulations, and build institutional capacity" (p.280) (see also⁶⁶). This calls for a deeper and meaningful cooperation of multiple actors, with end-users at the centre of this process, supported by those with relevant skills in engineering and physical sciences, economics and sociology of energy access, and policy-makers and regulators. Rwanda has already made significant progress with political regulations and the building of institutional capacity, moulding cultural values and expectations into planning, which is partly reflected in the *imihigo* framework. Through REC it attempts to spread awareness and build trust and acceptance of off-grid solutions for rural electrification. However, the existing tool, which also draws on Rwanda's culture and history, could additionally be used for awareness raising and for gaining a better understanding of the needs and expectations of those still without access. By informing and involving the private sector, it could also enable better-tailored services for those relying on off-grid connections. Raising awareness about the household-level *imihigo* for the benefit of the private sector investment in energy would be valuable in that it could enable more targeted customer acquisition by providers thus helping reach the off-grid electrification targets set by the GoR. There is a clear need to raise awareness and enhance participation and end-user consultation for policy making, business model and technical system design, but there is limited evidence on the most effective ways to achieve meaningful participation. In this paper, we have argued that Rwanda is in a strong position to capitalise on this goal since it already has a functioning mechanism which is rooted in its history and culture. By making sure priorities of those at the bottom of the administrative ladder are considered and the sense of ownership and active participation are induced, Rwanda can maximise its opportunities for driving appropriate and sustainable energy planning and increased uptake among rural households. Through these means, there is a strong likelihood that Rwanda will ultimately reach and even exceed its national energy access targets.

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