Methodology for Solar PV Needs Assessment in Chikwawa, Southern Malawi
Dedicated Study

MREAP Strand: Renewable Energy Capacity Building Programme (RECBP)
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Abstract: WASHTED was subcontracted the MREAP to, among other activities, deliver a strategic energy project (SEP) in Chikwawa utilising solar photovoltaic technology. As part of this work stream, a needs assessment was conducted to determine sites and communities that would be included within the SEP. The needs assessment targeted health facilities and schools and it involved senior health personnel (i.e. clinical officers, medical assistants, nurses and/or senior health surveillance assistants (SHSAs)) and headmasters (or senior school masters) working in the health facilities and schools respectively. The learning report documents the needs assessment that was conducted, methodology, and results. Included within the appendices are the questionnaires used.
Solar Photovoltaic Needs Assessment in Chikwawa, Southern Malawi under the Malawi Renewable Energy Acceleration Programme

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Background

The Scottish Government commissioned a Scoping Study on Supporting Community Energy Development in Malawi in 2011, which was undertaken with significant contribution from several ministries and departments in the Government of Malawi (GoM). The outcomes pointed to different programme activities that the Scottish Government might support.

As one result of the Scoping Study, the Malawi Renewable Energy Acceleration Programme (MREAP) was commissioned by the Scottish Government with the aim of supporting several aspects of renewable energy development, community energy development, rural electrification, biomass and underpinning institutional support and capacity building. The proposal made the case for multiple sector development activities organised as a single programme with the overall objective to:

Support Government of Malawi energy strategy by accelerating the growth of community and renewable energy development in Malawi through multiple, targeted and coordinated activities with good potential to provide a platform for that growth.

The proposed programme had four main elements strongly linked to the recommendations of the Scoping Study and these were: Institutional Support Programme (ISP), Community Energy Development Programme (CEDP), Wind Energy Preparation Programme (WEPP), and Renewable Energy Capacity Building Programme (RECBP).

The centre for Water, Sanitation, Health and Appropriate Technology Development (WASHTED) was subcontracted by the MREAP to (1) undertake work and take responsibility for delivering renewable energy research collaboration, (2) conduct training programmes, (3) manage an entrepreneurship fund, (4) provide support to the Community Energy Development Programme, (5) participate in the coordination and management of the Malawi-REAP Programme, and (6) undertake work and take responsibility for delivering a strategic pilot photovoltaic (PV) project.

Before delivering a strategic pilot project under programme in (6) a needs assessment was needed to determine sites and communities that would be included in the pilot project to set up 10 PV installations with at least one additional enterprise activity enabled in each of the selected sites. The needs assessment was conducted for the whole district of Chikwawa in Southern Malawi targeting health facilities and schools and it involved senior health
personnel (i.e. clinical officers, medical assistants, nurses and/or senior health surveillance assistants (SHSAs)) and headmasters (or senior school masters) working in the health facilities and schools respectively. The aim of targeting health facilities and schools was to enable the health facilities and schools operate at night so that essential services such as birthing at can take place at night and students can spend more time studying so that they can improve on their performance in national examination results. The other minor aim was to improve rural health workers’ and teachers’ morale and to encourage more health workers (such as midwives) and teachers to migrate to these rural communities to provide the needed human resource that lacks in the communities due to, among others, poor living conditions.

Key informant interviews (KII) and focus group discussions (FGDs) were used in the assessment. The interviews and discussions were also administered to community leaders and teams of health surveillance assistants (HSAs) to determine their capability in various issues such as their ability to form various committees and their willingness to engage in self help activities among others. The assessment was conducted between July and September 2012. The objectives of the assessment were: (1) to identify the communities to be involved in the set up of 10 PV installations; (2) to determine if there is any potential in the communities to sustain energy projects; (3) to assess if the communities have the capacity to form and sustain energy committees, (4) to investigate potential PV applications in the communities, (5) to examine if the PV installations have a potential to assist reducing child and maternal mortality in the communities through enhanced maternal activities at the health facilities as a result of the PV installations; (6) to assess availability of cellular networks for purposes of remote monitoring exercises; and (7) to investigate if there was any likelihood that a national electricity grid will be established in the communities within the next five years.

**Methodology**

The Chikhwawa District Health Office (CDHO) was approached to help in the identification of several facilities in the district that have the most pressing energy needs with regards to energy, health, and low pass school rates. It was clearly pointed out to the CDHO that the facilities must be in areas where there is no national grid and there is no hope that in the next five years government will install a national grid in that area. The health facilities must be in communities with very low health indicators while schools must be in areas with low passing rates. Eleven health facilities and twelve schools were identified by the CDHO as having pressing needs and in rural remote communities where health indicators and literacy levels are very low. Since only ten facilities were required for the pilot project teams of WASHTED academic members of staff were dispatched to the sites to conduct a needs assessment to select ten sites amongst the twenty two facilities that would be best suited for the project. At each facility key informant interviews (KII) were conducted with senior health and school personnel such as medical assistants, clinical officers, nurses, HSAs, and school headmasters or senior teachers. Focus group discussions (FGDs) were also conducted with community leaders, teams of HSAs, and the marginalised. Direct observations of the
facilities to determine number of structures, level of care for the facilities, potential application of PV installations, availability of cellular networks etc were also recorded.

A team of WASHTED staff developed a set of questions that would help with the needs assessment as well as to probe underlying cultural beliefs and development activity practices in the communities among community leaders, teams of HSAs and the marginalised. The questions and guidelines were circulated to University of Strathclyde and Community Energy Scotland partners for their input. Before facilitating the KII and (FGDs)’s, the team reviewed the set of guiding questions and carried out a pre-test at Mfera Health centre and Chikonde Primary School in the same district of Chikhwawa. The exercise provided an opportunity to practice, clarify and amend some questions and shape the final set of guidelines as presented in appendices section.

The focus groups were each scheduled for one hour and two people facilitated each focus group, where one led the discussion and the other recorded and took down notes. The sessions were recorded using high powered journalist’s recorders.

Focus Group Composition
There were three FGDs at each facility and these included (1) community leaders FGD comprising traditional and village chiefs, teachers, religious leaders, health personnel, and influential personalities in the communities; (2) HSAs FGD, and (3) FGD comprising a mixture of carefully selected people mostly committee members (i.e. elders, the youth, women, and the marginalised). Each group had 8-10 participants so that a total of about one hundred and eighty (280) participants took part in the focus groups. The divisions were necessary so that people discuss freely and confidently. According to Malawian culture, community leaders and HSAs are well respected members of society based on their roles in traditional/cultural issues and healthcare delivery respectively such that ordinary people may not be free to express themselves in the presence of such leaders.

Key Informant Interviews
At each facility we held KII with the most senior health personnel or the most senior school master. In total we had about forty four (44) participants that took part in the KII.

Indicators used in assessing potential sites
To carry out the needs assessment, a clear scope had to be identified to classify which, out of the many health centres and schools and based on which PV technologies and applications, were to be considered for the pilot study. The needs assessment, therefore, examined the following attributes on the communities:

1. Potential to sustain energy projects
2. Capacity to form and sustain energy committees
3. Potential for radio, lighting use and other applications
4. Potential for health facility refrigeration
5. Potential to assist maternal activities at the health facilities
6. Ability to provide capacity for the PV systems when installed
7. Availability of cellular networks for purposes of remote monitoring exercises
8. No likelihood that national grid will be established in the area in the next five years or so, and
9. Availability of self-help energy activities in the communities

A combination of responses from the KII, FGDs, and direct observations were used to come up with weighted indicators that were used as proxies to the objectives of this study. The responses to the questions were given weighted points based on their perceived relevance and importance to the pilot project. The weighting ranged from 3 to 1 as follows:

1. To determine if communities have the potential to sustain energy projects we asked communities to explain the level of their involvement in projects being implemented in their communities. The levels were categorised as (1) identification, (2) planning, and (3) execution of the projects. Participation in these levels of project implementation showed that the communities are experienced in project cycles and are willing to participate in those projects, a good sign for sustenance of energy projects. If the communities were involved in all 3 levels they were scored 3, two levels scored 2, 1 level scored 1 and no involvement was scored zero.

2. To determine if the communities have the capacity to form and sustain energy committees we checked against the number of committees currently existing in the communities. We took existence of committees as an indicator that the communities have the capacity and are willing to form development committees in their areas. If the communities had 4 or more different committees they were scored 3, two to three committees was scored 2, 1 committee was scored 1 and no committee was scored zero.

3. Capacity to form and sustain energy projects was measured by counting the number of existing projects in the communities surrounding the facilities. More projects in an area was a sign that that community is hungry for more projects and has the experience to sustain them. Three or more projects was scored 2, 1 to 2 projects was scored 1, and no project was scored 0.

4. To check if there is potential for radio and lighting we checked the number of energy alternatives being used for lighting and powering radios at each facility. Three or more energy alternatives was scored 2, 2 alternatives was scored 1 and no alternative was scored 0.

5. To check if there is potential for refrigeration we scored one if a refrigerator existed and zero in none existed.

6. To check if there is potential to assist in maternal activities at the health centre we scored 1 if maternal services existed at the health centre and zero if they did not exist.

7. To determine if there is capacity to secure the PV installations we scored 2 if a community security committee exists at the facility and zero if it does not.

8. To assess potential for remote monitoring exercises we checked the number of cellular networks in the area. If there are 3 or more networks we scored 2, 1 or 2 networks we scored 1 and no network we scored 0.
9. To assess if there is potential for other applications other than lighting at the facilities we checked current energy services requirements other than lighting. These include water pumping, video shows, battery charging etc. If there are four or more energy service requirements we scored 3; two to three services was scored 2; one service was scored 1; no service apart from lighting and radio was scored 0.

10. Potential to sustain the energy projects and committees was also assessed by checking if current self help projects are available in the area. If they exist we scored 2 otherwise we scored zero.

11. Health facilities that were in close proximity to schools were scored 2 otherwise a zero.

12. Likelihood of a national grid in the next five years was checked against the remoteness of the area i.e. distance from the district headquarters. If an area is far away from the district headquarters and there is no national grid passing through near that area chances are that it will take time for a national grid to be connected unless something very dramatic happens in the area that may necessitate the introduction of a national grid line. If an area is nowhere near a national grid line and in furthest away from the district headquarters were scored as follows: More than 70 Kilometres was scored 2; 40 to 70 kilometres was scored 1; under 40 kilometres was scored 0.

13. Lastly, for schools, we checked enrolment levels of each school. Here we are interested in potential to help a lot of pupils per school. If a school 1000 or more pupils it was scored 2; 500 to 999 pupils was scored 1; and below 500 was scored 0.

**KEY FINDINGS**

**General observations**

In total twelve schools and ten health facilities were assessed (See Table 1). There were two schools and two health centres from Kapichira about 25 kilometres away from CDHO. Three schools and four health centres from Chapananga about 95 kilometres from CDHO. Four schools and two health centres and one health post from Ngabu which is about 70 kilometres from CDHO. And three schools, one health post and one health centre from Ndakwera area which is about 40 kilometres away from CDHO. Amongst these facilities eight schools and eight health centres were in close proximity. The rest were isolated health facilities or schools.

Chang’ambika and Gola Health Centres had previously been installed with PV systems for lightning and refrigeration. However, all the PV systems at these places are currently not working due to maintenance and security problems. When quizzed if they are involved in the management and security arrangements matters of the PV installations the participants to the needs assessment from Chang’ambika and Gola said they were not involved in the PV project because it was a government initiative. The health centre management is responsible for the management and security arrangements of the PV installations.

**Level of Community Participation in projects**

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When asked to explain at which levels of project implementation i.e. identification, planning, or running they are involved in most participants (15 health facilities and schools) said they participate in all the project implementation levels (Tables 2 and 3). However, participants around Dolo health centres said they are not involved in any of the implementation levels at the health centres. When quizzed during FGDs why they are not involved in the implementation of projects at the health facilities one participant said: “These projects come with government and we are never involved in government projects” Another participant said that: “Only our MP, the people he works with, and doctors (meaning medical assistants, nurses and HSAs) are involved in project implementation at the health facilities”. This revealed the fact that rural communities are not consulted or involved when designing and implementing government projects. It all also points to the fact that rural communities are not involved in the management of government projects when implemented.

Community committees

When asked to explain the number of committees found in the areas communities surrounding ten schools and health facilities had four or more committees while communities around Dolo health centre did not indicate whether they had any committee. The committees mentioned were varied depending on the area and nature of non-governmental organisations (NGOs) working in the area. Most of the committees were those established through local governance structures such (i) parent teachers association (PTA), (ii) school management committee, (iii) area development committee (ADC), (iv) village development committee (VDC), (v) village health committee (VHC), and (vi) water point committee (WPC) or those established with the assistance of local and international NGOs such as (i) forestry committee, (ii) finance committee, (iii) security committee, (iv) wild life committee, (v) school feeding programme committee, (vi) first aid committee, and (vii) safe motherhood committee.

Whether security committees exist at the schools or health facilities

Asked if they have any security committees Gumbwe, Thendo, Chang’ambika, Manderade, Ndarukera, and TBL schools and/or health facilities had security committees (Tables 4 and 5). The rest either did not have security committees or school/health facility management was responsible for providing security without involving the communities. Most participants were of the view that school or health facility security issues were a responsibility of government.

Community projects

On community projects only communities surrounding Dolo health centre and school indicated that they have 3 or more projects. The rest of the communities except Chipwaila Health Centre indicated that they have one or two projects in their communities.

The common projects that were mentioned are (i) water supply, (ii) safe motherhood and maternal health, (iii) wild life, (iv) solar energy, (v) disease protection and immunization, (vi) construction, (vii) nutrition and (viii) capacity building. Most of the projects mentioned are NGO driven

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Existence of self-help projects
From the FGDs on question 14 only communities surrounding Gumbwe, Kandewu, Chithumba, and Mphambe schools and health facilities are engaged in self-help activities. The most common self help projects mentioned included moulding bricks, mining sand, and drawing water for the construction of school blocks and teachers’ houses. Others included working on a community agricultural farmland for fundraising. When asked to explain how they raise funds to run their committees and the self help projects some FGD participants said “each household in this community contributes towards the running of the committees and self help projects” and others said they grow vegetables on a community piece of land which are later sold and the proceeds are used to run the committees and self help projects’.

Number of energy alternatives
Quizzed on the number of energy alternatives respondents from four health facilities of Gumbwe, Thendo, Chithumba and Chang’ambika indicated that they have 3 or more energy alternatives while the respondents from the rest of the health facilities said they have one or two energy alternatives. The most common energy alternatives mentioned for lighting were batteries for lamps, candles, and paraffin or kerosene for lamps. The most common energy alternatives used for powering radios were batteries and only communities from Dolo mentioned solar photovoltaic systems. Through focus group discussions some

Energy services requirements other than lighting at the facilities
According to FGDs on questions 10 and 12 communities around Gumbwe, Kandewu, Ndakwera, and Mphambe schools or health facilities had 4 or more energy service requirements other than lighting. Chipwaila, Chithumba, Gola, and Saindi schools or health centres had two more energy services requirements. The rest had either one or no extra energy services on top of lighting. The most common energy services requirements other than lighting were powering radios, television/video shows, barber shops, refrigerators, and charging phones. Most health facility managers emphasized the need for refrigeration of some medical equipment and drugs.

Existence of a refrigerator at health facilities
Asked if they had a refrigerator at their health facilities all respondents except those from Kandewu health facility indicated that they have at least one refrigerator at their health facilities (Table 6). However almost all health centres were using gas to power refrigeration at the facilities and that most refrigerators were not working either due to non-availability of gas which has to be bought kilometres away from Blantyre and depended on funds being available from the district health office which in most cases were not provided due to tight budgets which had other priority issues to consider.

Whether maternity activities exist at the health centre
Only five health facilities of Thendo, Chithumba, Chang’ambika, Ndakwera, and Dolo have maternity activities taking place (Table 7). Amongst these only Thendo is a health post and
the rest are health centres. Most of these health centres use either kerosene lamps or candles to deliver at night.

**Availability of cellular networks at the facilities**

According to responses from FGDs on question 20 no areas around any of the schools and health facilities visited had 3 or more cellular networks. Only communities surrounding Chipwaila health facility, Nsenjere and TBL Schools had two cellular networks in their areas. The rest of the communities had one cellular network except for those communities around Manderade and Dolo health facilities and Mphambe School that had no reliable networks. The most reliable networks in the Chikwawa communities are TNM and Airtel networks.

**Likelihood of a national grid in the area in the next five years**

Apart from assurances from the CDHO that there is no likelihood of the national electricity grid passing through the recommended schools and health facilities in the next five years we further added another requirement that may impinge on the likelihood of establishing a national grid in the sites. We used the distance which is a proxy for remoteness of an area from the CDHO. Thendo, Chithumba, Chang’ambika, Gola, and Dolo facilities are at a distance of more than 70 kilometres from the Chikhwawa district headquarters, while Chipwaila, Manderade, Nsenjere, and Saindi schools and health facilities are at a distance of between 40 to 70 kilometres. The rest are within the 40 kilometre radius of the district headquarters.

**Enrolment at recommended schools**

Finally we checked the enrolment levels at the recommended schools to estimate the number of pupils the project will be assisting when implemented. According to Table 8 only Gumbwe, Ndakwera, Dolo and Saindi schools had an enrolment of 1000 or more pupils. The rest of the schools had pupil enrolment of between 500 and 999 except for Kandewu and Mphambe that had an enrolment of less than 500 pupils. However in all these schools it was reported that students use candles or kerosene lamps for reading at night and they felt that this was one of the reasons for low pass rates when compared to schools in urban areas which had electricity from the national grid.

**Rankings of schools and health facilities based on weighted indicators**

Since remote monitoring is central to the pilot project Manderade, Dolo, Mphambe schools and health facilities which have no or no reliable cellular network coverage were dropped from the initial assessment leaving eighteen schools and health facilities to be assessed. Amongst those to be assessed Gumbwe, Chithumba, Chang’ambika, Ndakwera, and Thendo schools and health centres ranked highly (Table 9). Considering that the gap between those that have ranked highly and those that have been left out is considerable big (at least 4 points) it was decided that all those that ranked highly should be included in the pilot project.
DISCUSSION & RECOMMENDATIONS

As already pointed out this needs assessment wanted to establish if the communities around the health centres or schools have the capacity to form and sustain energy and security committees, have the potential to sustain energy projects in the communities, have potential for more PV applications, have reliable cellular networks for purposes of remote monitoring, have potential in reducing maternal and child mortality through improved health facility services and have no likelihood of being connected to the national electricity grid in the next five years or more.

Overall most of the projects are implemented by local and international NGOs who always involve the participation of communities in the identification, planning, and running of the projects. The only projects that do not involve or have little involvement of communities are those initiated by the central government and these rely on personnel running the schools or health facilities in the day to day running of the projects. This is evident in the solar PV panels that were installed by government at Dolo, Chithumba, Ndakwera, and Chang’ambika which were left in the hands of health centre personnel to run without involving the communities. As a result of this there were no security committees and the communities had no say or knowledge on how these systems were to be run or managed. The solar PV were not functional and were in a state of disrepair at the time of this needs assessment exercise. At Ndakwera it was actually reported that some of the systems were vandalised by the health personnel themselves who removed some of the PV components and installed them at their homes. It is being recommended that communities must be involved in any projects that may be carried in the identified sites to ensure checks and balances on how the systems are run and managed.

Although most of the communities around the health facilities and schools we visited had no energy or natural environment committees they had diverse nature of committees responsible for different projects and activities that were being implemented at the facilities. Some of the communities were even involved in self-help projects using funds generated amongst households in the communities. This was a clear indication that the communities were willing and were capable of forming and sustaining committees. However, the committees and type of projects were predominantly dictated by the nature of NGOs implementing the projects and the type of projects being implemented. It is being recommended that establishment of any committees under the MREAP project must work through existing structures already formed in the communities to ensure continuity and to avoid duplication of work and activities.

The most common source of energy for lighting in all the health facilities and schools was kerosene and candles and the most common for radios were batteries. As explained earlier most health facilities use gas for refrigeration which is mostly in short of supply due to financial problems. Gas, kerosene and candles are not only a health hazard but are also environmentally unfriendly and are relatively expensive to use by the rural communities whose majority are poor. Looking at these challenges plus the energy services requirements in the institutions, installation of solar PV systems would go a long way in assisting solve
some of the energy problems the communities are facing. Some of these problems include reduced passing rates by school students due to limited lighting in their classrooms, health problems by students arising from use of kerosene lamps and candles, environmental pollution from refrigerators that use gas at health facilities, delivery problems at health clinics due to the unavailability of lighting at night problems of installing medical equipment and drugs that require controlled temperatures.

Based on the analysis from this needs assessment exercise it is being recommended that five centres of Gumbwe, Chithumba, Chang’ambika, Ndakwera, and Thendo which have rated highly be considered for the pilot project. Some of the points in which these sites scored highly include existence of self help activities, more projects running and reliable committees including that of security. In addition these sites have a school and a health facility near each other a characteristic which is desirable in easy implementation of the pilot project whose results can have a visible impact. Further to these attributes health facilities in these sites have maternal activities taking place which is another priority area the pilot project will be addressing. The sites are fairly distributed across Chikhwawa District with all the Traditional Authorities that were recommended by the CDHO having at least a site making into the sample. Model for rural solar PV installations.
<table>
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<th>Proposed Site</th>
<th>Distance from Chikhwawa Headquarters (KM)</th>
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<td>Health Post</td>
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### Table 2: Community participation in the projects at health facilities

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<tr>
<th>Name</th>
<th>Identification</th>
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<th>Running</th>
<th>All of them</th>
<th>If not, Reason?</th>
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<td>✓</td>
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### Table 3: Community participation in the projects at schools.

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<th>Running</th>
<th>All activities</th>
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<td>Chithumba</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Dolo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gumbwe</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Kandewu</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
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<tr>
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<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mphambe</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ndakwera</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
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<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saindi</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBL</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Thendo</td>
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<td>✓</td>
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### Table 4: Committees found at the healthy facilities

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<thead>
<tr>
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<td></td>
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<tr>
<td>Gumbwe</td>
<td>✓</td>
</tr>
<tr>
<td>Thendo</td>
<td>✓</td>
</tr>
<tr>
<td>Kandewu</td>
<td>✓</td>
</tr>
<tr>
<td>Chithumba</td>
<td>✓</td>
</tr>
<tr>
<td>Chang’ambika</td>
<td>✓</td>
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<tr>
<td>Gola</td>
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</tr>
<tr>
<td>Ndakwera</td>
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</tr>
<tr>
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MREAP - Malawi Renewable Acceleration Programme

CEDP2 SEP: Needs Assessment for Solar Photovoltaics in Chikwawa
Table 5: Committees found at schools

<table>
<thead>
<tr>
<th>Nambe</th>
<th>PTA</th>
<th>ADC</th>
<th>VDC</th>
<th>FC</th>
<th>SC</th>
<th>Discipline</th>
<th>Other</th>
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<tbody>
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<td>√</td>
<td>×</td>
<td>×</td>
<td>√</td>
<td>×</td>
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<tr>
<td>Dolo</td>
<td>√</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>√</td>
</tr>
<tr>
<td>Gumbwe</td>
<td>√</td>
<td>×</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Kandewu</td>
<td>√</td>
<td>√</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Manderade</td>
<td>√</td>
<td>×</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Mphambe</td>
<td>√</td>
<td>×</td>
<td>√</td>
<td>×</td>
<td>×</td>
<td>√</td>
<td>×</td>
</tr>
<tr>
<td>Ndakwera</td>
<td>√</td>
<td>×</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Nsenjere</td>
<td>√</td>
<td>×</td>
<td>√</td>
<td>×</td>
<td>×</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Saindi</td>
<td>√</td>
<td>×</td>
<td>√</td>
<td>×</td>
<td>×</td>
<td>√</td>
<td>√</td>
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<tr>
<td>TBL</td>
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<td>×</td>
<td>√</td>
<td>×</td>
<td>×</td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>

VDC= village development committee; ADC=area development committee; VHC=village health committee; EC=energy committee; SC=security committee; WPC= water point committee; ENV=Environment committee; FC=finance committee; HCC=health centre committee; ADV= advisory committee

Table 6: Equipment (plus quantity) found at health facilities

<table>
<thead>
<tr>
<th>Name</th>
<th>Refrigerator</th>
<th>Communication radio</th>
<th>Phones</th>
<th>Microscope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chipwaila</td>
<td>√ (1)</td>
<td>√ (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gumbwe</td>
<td>√ (1)*</td>
<td>× (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thendo</td>
<td>√ (2)</td>
<td>× (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kandewu</td>
<td>√ (1)</td>
<td>× (1)</td>
<td>× (1)</td>
<td></td>
</tr>
<tr>
<td>Chithumba</td>
<td>√ (2)</td>
<td>× (1)</td>
<td>√ (6)</td>
<td></td>
</tr>
<tr>
<td>Chang’ambika</td>
<td>√ (1)</td>
<td>× (1)</td>
<td>× (11)</td>
<td></td>
</tr>
<tr>
<td>Gola</td>
<td>√ (1)</td>
<td>× (1)</td>
<td>√ (13)</td>
<td></td>
</tr>
<tr>
<td>Manderade</td>
<td>√ (1)</td>
<td>× (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ndakwera</td>
<td>√ (1)</td>
<td>× (1)</td>
<td>√ (1)</td>
<td></td>
</tr>
<tr>
<td>Dolo</td>
<td>√ (1)</td>
<td>× (1)</td>
<td>√ (27)</td>
<td></td>
</tr>
</tbody>
</table>

* Not working

MREAP - Malawi Renewable Acceleration Programme

CEDP2 SEP: Needs Assessment for Solar Photovoltaics in Chikwawa
Table 7: Type of rooms at the health facilities and whether maternity and waiting shelters are needed

<table>
<thead>
<tr>
<th>Name</th>
<th>Number of rooms</th>
<th>Maternity, if not is it needed?</th>
<th>Shelter, if not is it needed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chipwaila</td>
<td>1</td>
<td>No, needed</td>
<td>No, needed</td>
</tr>
<tr>
<td>Gumbwe</td>
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<td>No, needed</td>
</tr>
<tr>
<td>Thendo</td>
<td>7</td>
<td>Yes</td>
<td>No, needed</td>
</tr>
<tr>
<td>Kandewu</td>
<td>3</td>
<td>No, needed</td>
<td>Yes</td>
</tr>
<tr>
<td>Chithumba</td>
<td>9</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Chang’ambika</td>
<td>18</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Gola</td>
<td>18</td>
<td>No, needed</td>
<td>Yes</td>
</tr>
<tr>
<td>Manderade</td>
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<td>No, needed</td>
<td>No, needed</td>
</tr>
<tr>
<td>Ndakwera</td>
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</tr>
<tr>
<td>Dolo</td>
<td>17</td>
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<td>Yes</td>
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</table>

Table 8: Number of members of staff and students enrolment at recommended schools

<table>
<thead>
<tr>
<th>School</th>
<th>Teachers</th>
<th>students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>males</td>
<td>females</td>
</tr>
<tr>
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<td>1</td>
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<td>Dolo</td>
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</tr>
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<tr>
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<td>3</td>
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<tr>
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</tr>
<tr>
<td>Mphambe</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Ndakwera</td>
<td>9</td>
<td>3</td>
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<td>Nsenjere</td>
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<tr>
<td>Saindi</td>
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<tr>
<td>Thendo</td>
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</table>
### Table 9: Rankings of schools and health facilities based on weighted indicators

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>SCH/HF</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>Total</th>
<th>Rank</th>
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<td>Chipwaila (HF)</td>
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<td>3</td>
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<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>12</td>
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<tr>
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<td>Gumbwe</td>
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<td>3</td>
<td>1</td>
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<td>Ngabu</td>
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<td>2</td>
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<td>1</td>
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<td>1</td>
<td>0</td>
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<td>-</td>
<td>-</td>
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<td>5</td>
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<td>7</td>
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<tr>
<td>Chapananga</td>
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<td>1</td>
<td>20</td>
<td>1</td>
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<td>2</td>
<td>-</td>
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<td>20</td>
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<td>2</td>
<td>0</td>
<td>-</td>
<td>13</td>
<td>8</td>
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<td>-</td>
<td>2</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Ngabu</td>
<td>Mphambe (SCH)</td>
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<td>3</td>
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<td>0</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
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<td>Nsenjere (SCH)</td>
<td>0</td>
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<td>2</td>
<td>na</td>
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<td>1</td>
<td>9</td>
<td>13</td>
</tr>
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<td>Saindi (SCH)</td>
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<td>na</td>
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<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Ngabu</td>
<td>TBL (SCH)</td>
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<td>3</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

1. Existence of a school and a health centre at the same place
2. Level of community participation in projects
3. Committees found at the facility
4. Existence of projects at the facilities
5. Energy alternatives being used for lighting and powering radios at the facility
6. Existence of a refrigerator at the facility
7. Potential to assist maternal activities at the health centre?
8. Any security committee?
9. Availability of cellular networks
10. current energy services requirements other than lighting
11. No likelihood that national grid
12. Any self-help projects?
13. Enrolment at schools

HF= health facility; SCH= school, na = not applicable
Appendix 1: Health facility questionnaire

This questionnaire is administered to health facility administrator or senior medical officer to get data required to assess the energy service needs of Rural Health Institutions in Chikwawa District. We would like to assure you that all the information given in this questionnaire will be treated as confidential.

1. Type of health facility
   1. Clinic
   2. Health Centre
   3. Health Post
   4. Other

2. What is the number of staff
   Male: _____________________
   Female: ___________________

   Number of:
   1. Doctors
   2. Midwives/Nurse
   3. Clinical Officer
   4. HSA
   5. Medical Assistant
   6. Other

3. How many staff houses do you have _______________

4. Who is staying in those houses_____________________

5. List the health activities taking place
   1. Growth monitoring
   2. Immunization
   3. Family planning
   4. Antenatal care
   5. Health Education Care
   6. Maternity
   7. Admittance
   8. Outpatient

6. List the diseases treated in order of prevalence and the average number of patients treated per year
   1. Malaria
   2. Diarrhoea
   3. Dysentry
   4. TB
   5. HIV and AIDS
   6. Bilharzia
   7. Trachoma
   8. Respiratory
   9. Elephantiasis
   10. Cancer
   11. Headaches
   12. Abdominal pains
   13. Others
   Specify _______________

7. Quantify the following community health indicators
   1. Mortality rate _______________
   2. Morbidity _______________
   3. Antenatal visits _______________
   4. Qualification of medical practitioners

   ___________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________

8. What energy type do staff use for:
   Cooking: 1. Firewood
   2. Paraffin
   3. Gas
   4. Generator (Diesel/Petrol)
   5. Others

   Water heating: 1. Firewood
   2. Paraffin
   3. Gas
   4. Generator (Diesel/Petrol)
   5. Others

   Radio: 1. PV
   2. Batteries
   3. Grid
   4. Generator (Diesel/Petrol)
   5. Others

   TV: 1. PV
   2. Batteries
   3. Grid
   4. Generator (Diesel/Petrol)
   5. Others

   Lighting: 1. PV
   2. Batteries
   3. Grid
   4. Generator (Diesel/Petrol)

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5  Others (Specify) _______________________

10 Indicate energy services at school/health facility and their estimated cost per month:

(i) Cooking _______________________  Cost/month ______________________
(ii) Lighting _______________________  Cost/month ______________________
(iii) Water heating __________________  Cost/month ______________________
(iv) Drying food _____________________  Cost/month ______________________
(v) Others ______________________________________________________________________

11 Mention any projects previously carried out and/or current taking place in the area?
___________________________________________________________________________________
___________________________________________________________________________________
___________________________________________________________________________________

12 Who is the sponsor of the project/s

(i) Govt projects  ☐
(ii) NGO projects  ☐
(iii) Self help  ☐
(iv) Donors  ☐
(v) Other (specify) _________________________________________________________

13 Did the community participate in the projects

a. Identification  ☐
b. Planning  ☐
c. Running  ☐
d. All of them  ☐

If no to any, explain
___________________________________________________________________________________
___________________________________________________________________________________
___________________________________________________________________________________
___________________________________________________________________________________

14 Rate the level of community participation in each project

Project 1

(i) Excellent ☐  (i) Very good ☐  (iii) Fair ☐
(iv) Poor ☐  (v) Very poor ☐

Project 2

(ii) Excellent ☐  (i) Very good ☐  (iii) Fair ☐
(iv) Poor ☐  (v) Very poor ☐

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Project 3

(iii) Excellent □ (i) Very good □ (iii) Fair □
(iv) Poor □ (v) Very poor □

Project 4

(iv) Excellent □ (i) Very good □ (iii) Fair □
(iv) Poor □ (v) Very poor □

Others

(v) Excellent □ (i) Very good □ (iii) Fair □
(iv) Poor □ (v) Very poor □

15 Do you have these pieces of equipment and how many

1. Refrigerator
   Yes □ No □ If Yes, Number □

2. Communication radio
   Yes □ No □ If Yes, Number □

3. Phones
   Yes □ No □ If Yes, Number □

4. Microscope
   Yes □ No □ If Yes, Number □

16 What is the size of the health facility_____________________
(Note: To be measured by interviewer)

17 What is the number of rooms of the health facility

Number_________________

Type of rooms

1. Maternity wing
   Yes □ No □ If Yes, Number of rooms □
   If No observe if there is need for the above_____________________

2. Waiting shelter
   Yes □ No □ If Yes, Number of rooms □
If No observe if there is need for the above_____________________

3. Admittance wing
   - Yes  
   - No  
   - If Yes, Number of rooms

If No observe if there is need for the above_____________________

4. Kitchen
   - Yes  
   - No  
   - If Yes, Number of rooms

If No observe if there is need for the above_____________________

5. Consultation room
   - Yes  
   - No  
   - If Yes, Number of rooms

If No observe if there is need for the above_____________________

6. Laboratory
   - Yes  
   - No  
   - If Yes, Number of rooms

If No observe if there is need for the above_____________________

7. Administration
   - Yes  
   - No  
   - If Yes, Number of rooms

If No observe if there is need for the above_____________________

8. Storeroom
   - Yes  
   - No  
   - If Yes, Number of rooms

If No observe if there is need for the above_____________________

9. Offices
   - Yes  
   - No  
   - If Yes, Number of rooms

If No observe if there is need for the above_____________________

10. Toilets/Latrines
    - Yes  
    - No  
    - Number of rooms

If No observe if there is need for the above_____________________

11. Others  
    - Specify____________________

If No observe if there is need for the above_____________________

13. What is the source of water for the health facility
    - 1 Borehole  
    - 2 Well  
    - 3 Pond  
    - 4 River  
    - 5 Dam  
    - 6 Tap  
    - 7 Others  
    - Specify____________________

14 What type of village committees are available at the health facility
Appendix 2: Educational Institution Questionnaire

This questionnaire is administered to get data (from the Headmaster or the most next senior person) required to assess the energy service needs of Education Institutions in Chikwawa District. We would like to assure you that all the information given in this questionnaire will be treated as confidential.

1. What type of school
   1. Junior Primary
   2. Full Primary
   3. Secondary
   : Private
   Government
   Mission

2. What is the number of Teachers
   Male: [ ]
   Female: [ ]
   Non Teaching Staff: Male: [ ]
   Female: [ ]

3. What is the total enrolment
   Boys: [ ]
   Girls: [ ]

4. What is the average pass rate
   1. All
   2. Boys: [ ]
   3. Girls [ ]

5. Do students study at school at night:
   Yes: [ ]
   No: [ ]

6. What energy is used for lighting in the classrooms
   1. Firewood [ ]
   2. Paraffin [ ]
   3. Gas [ ]
   4. Generator (Petrol/Diesel) [ ]
   5. PV system [ ]
   6. Batteries [ ]

7. How much does it cost per month to use
   1. Firewood [ ]
   2. Paraffin [ ]
   3. Gas [ ]
   4. Generator (Petrol/Diesel) [ ]
   5. PV system [ ]

8. Do you have a school feeding program
   Yes: [ ]
   No: [ ]

9. What energy is used for cooking in (f):
   ________________________________
   1. PV [ ]
   2. Batteries [ ]
   3. Grid [ ]
   4. Generator (Diesel/Petrol) [ ]
   5. Others (Specify) _______________________

10. What energy type do members of staff use for:
    Cooking: 1. Firewood [ ]
             2. Paraffin [ ]
             3. Gas [ ]
             4. Generator (Diesel/Petrol) [ ]
             5. Others (Specify) _______________________
    Water heating: 1. Firewood [ ]
                   2. Paraffin [ ]
                   3. Gas [ ]
                   4. Generator (Diesel/Petrol) [ ]
                   5. Others (Specify) _______________________
    Radio: 1. PV [ ]
             2. Batteries [ ]
             3. Grid [ ]
             4. Generator (Diesel/Petrol) [ ]
             5. Others (Specify) _______________________
    TV: 1. PV [ ]
          2. Batteries [ ]
          3. Grid [ ]
          4. Generator (Diesel/Petrol) [ ]
          5. Others (Specify) _______________________

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Lighting: 1 PV ☐ 2 Batteries ☐ 3 Grid ☐ Generator (Diesel/Petrol) ☐

5 Others ☐ (Specify) _______________________

11. Indicate energy services at school/health facility and their estimated cost per month:
   (vi) Cooking _______________________ Cost/month ______________________
   (vii) Lighting ______________________ Cost/month ______________________
   (viii) Water heating ________________ Cost/month ______________________
   (ix) Drying food ____________________ Cost/month ______________________
   (x) Others ____________________________________________________________

12. Mention any projects previously carried out and/or current taking place in the area?
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________

13. Who is the sponsor of the project/s
   (vi) Govt projects ☐
   (vii) NGO projects ☐
   (viii) Self help ☐
   (ix) Donors ☐
   (x) Other (specify) _______________________________________________________

14. Did the community participate in the projects
   a. Identification
   b. Planning
   c. Running
   d. All of them

   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________

15. If no to any, explain_______________________________________________________

   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________

16. Rate the level of community participation in each project
   Project 1
   (vi) Excellent ☐   (i) Very good ☐   (iii) Fair ☐
   (iv) Poor ☐        (v) Very poor ☐

   Project 2

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(vii) Excellent □     (i) Very good □     (iii) Fair □
(iv) Poor □     (v) Very poor □

Project 3
(viii) Excellent □     (i) Very good □     (iii) Fair □
(iv) Poor □     (v) Very poor □

Project 4
(ix) Excellent □     (i) Very good □     (iii) Fair □
(iv) Poor □     (v) Very poor □

Others
(x) Excellent □     (i) Very good □     (iii) Fair □
(iv) Poor □     (v) Very poor □

11. Do you have these pieces of equipment at school and how many

1. Overhead projector
   Yes □  No □  Number □

2. Communication radio
   Yes □  Number □

3. Phones
   Yes □  Number □

4. Microscope
   Yes □  Number □

5. Others □  (Specify)________________________________________

12. What is the size of the school facility________________________________________

13. What is the type and number at the school

   Type______________ Number_________________

14. Does the school have the following

1. Library
   Yes □  Number of rooms □

2. Boarding facility
   Yes □  Number of rooms □

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3. Kitchen
Yes [ ] Number of rooms [ ]

4. Storeroom
Yes [ ] Number of rooms [ ]

15. What is the source of water for the school

1  Borehole  2  Well  3  Pond  4  River  5  Dam  6  Tap  7  Others  Specify __________________________

16. What type of committees are available at school

1  PTA  2  Area Development Committee  3  Village Development Committee  4  Fundraising Committee  5  Security Committee  6  Discipline  7  Others  Specify______

Appendix 3: Questionnaire - Focus Group Discussion (FGD)

This checklist is administered to get FGD data from community leaders and village committees required to assess the energy service needs of the schools and health facilities in Chikwawa District.

1. Name of institution/ organisation
2. What is your core function(s):
3. Type of existing committees available in the catchment area Village Health Committee
4. Briefly describe the activities in which you are involved at school or health centre.
5. What is the source of funding for your activities at school / health facility
6. What is your role in the organization:
7. What is the annual budget for your activities at your school/health facility
8. What are the current income generating activities:
9. How much income do you generate from these activities?
10. How is the generated income used?
11. What are the potential income generating activities?
12. What are your current energy services requirements?
13. Mention any projects previously carried out and/or current taking place in the area?
14. Who is the sponsor of the project(s)
15. Did the community participate in the projects
16. Rate the level of community participation in each project
17. Would your organization be willing to participate in any energy project in the community?
18. Would your organization be willing to pay for the energy consumed?
19. Has there been any case of vandalism or theft?
20. What type of cellular network is available in the area
21. What is the reliability
22. What are the sources of water for the following activities.

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