THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF ENERGY

EVALUATION OF REA-FUNDED PROJECTS REPORT

Prepared by EcomResearch Group
P.O. Box 33178 DSM
info@ecomresearch.org

June 2018



List Abbreviations

AMCOS	Agricultural and Marketing Cooperative Society
CBO	Community Based Organisation
CSO	Civil Society Organisation
EWURA	Energy and Water Utilities Regulatory Authority
FBO	Faith Based Organisation
FGD	Focus Group discussion
HQ	Head Quarters
IA	Implementing Agency
ICT	Information and Communication Technology
IGA	Income Generating Activities
LGA	Local Government Authority
MDA	Ministry Department and Agencies
NGO	Non-Governmental Organisation
OECD	Organization for Economic Cooperation and Development
PSLE	Primary School Leaving Examination
REA	Rural Energy Agency
REB	Rural Energy Board
REF	Rural Energy Fund
SHS	Solar House System
SPSS	Statistical Package for Social Sciences
TANESCO	Tanzania Electric Supply Company
TOT	Training of Trainers

Executive Summary

Introduction

The Rural Energy Agency has been implementing various energy projects in Tanzania since its inception in 2007. More than 42 energy projects were implemented and completed during this time by the Agency. The broad project categories implemented under REA ranged from grid and off grid extensions for electrification of rural areas, solar packages, energy efficiency, technical assistance and capacity building to project developers. This evaluation report presents the outcomes and impacts of the REA-funded projects in Tanzania and seeks to document achievements, failures, challenges as well as lessons for improving its future performance in reaching more people in rural areas.

A team of consultants carried out evaluation of REA projects by travelling to all the project sites and carried out interviews under evaluation, observations and verification of the outcomes and impacts of the projects. The team developed an evaluation model for the analysis of the outcome and impacts based on the OECD project evaluation approach. The evaluation classified the beneficiaries into households, business enterprises and public service outlets. The benefits of the projects were then evaluated for each category of the beneficiaries.

Findings of the Evaluation

Despite of significant regional variations in the rate of electricity connectivity by households and business enterprises, the attainment of the objectives of the projects is significantly high. Overall, 82.1% of all the project set-targets on connecting rural households to electricity were met. This is a big rate of implementation efficiency. Mbeya and Morogoro regions were leading in the implementation efficiency whereas Mwanza and Katavi regions were a bit low in meeting their set targets.

The findings of the evaluation show that implementation of the REA projects was hampered by large number of customers than what the projects could afford, land disputes, low awareness and thus low response on the side of rural people, difficulties in reaching some of the communities due to bad roads, and delays due to long process of compensating those affected by the new grid lines.

Despite of the few challenges encountered, the total number of new customers making connection to electricity every year had reached 30,357 by 2017 and majority (95%) of them are reported to pay their electricity bills on time. However, isolated cases of theft of grid line (wires, earth rods) transformer oil and uprooting of service line materials were reported in evaluation survey.

The evaluation results point to a long array of benefits accruing to users of REA-funded electricity. The benefits range from increased self-employment opportunities, increase working hours especially for people with small scale businesses, increased study time for students and hence increased pass rates, reduced illness resulting from low use of kerosene and candles and availability of clean and safe water. Also, the time for fetching water and firewood collection has been reduced.

The onset of the REA electricity projects has led to profound impact on rural household business enterprises. The average earning per business has increased by 40%; also employment has shoot up. Therefore, there has been a positive impact on rural livelihoods and diversification in economic activities in general. Rural electrification has created opportunities and alternative sources of income for rural people.

At the community level, provision of public services has improved in district headquarters, water supply, primary and secondary schools, health facilities –particularly maternal health services, and security in general. School performance at primary and secondary level has increased. Patient attendance in health facilities has also increased by 31% with the onset of the REA projects. As such, the REA-funded projects have been very relevant to the needs of the people and their communities. Also, at the policy level, implementation of the REA projects and their results are fully consistent and well aligned with the Vision 2025 and the national development policies.

The noted improvement in livelihoods and the decreasing consumption of environmentally-unfriendly sources of energy is an attainment of the objectives of REA. To this effect, the results and outcomes of the REA-funded projects are to a large extent fulfilling the objectives of the establishment of the Agency.

The REA projects, however, had a few negative outcomes including sleeping in darkness and spoiling of food when there is power cut, moral decay on the side of youth because of loitering around and exposure to bad behavioural practises, noise pollution from bars and shops which close late at night, and insects hanging around and bite people when lights are on. Other negative effects include risks from unattended loose connections, low voltage, and the tendency of children to spend too much time on TV and Radio.

With regard to sustainability of the achievements, the outcomes and achievements of the REA Projects are generally sustainable and continuous provided a few shortfalls relating to the security of gridlines, maintenance of the off grid installations – the solar power units in particular, and cost issues related to biomass and biogas plants.

Lessons Learned

i. The demand for connectivity to electricity is higher than anticipated in some of the areas. This has been a challenge on the side of the contractors and TANESCO to meet the demand. The premier connectivity while the contractor is on site works well if the down payment is made on time; otherwise, connectivity when the contractor has left becomes exorbitantly expensive to poor households. Also, awareness campaigns before and during implementation of REA projects in rural areas is vital to increase

people's awareness of the benefits and thus their positive participation in the projects.

ii. Timely solutions to land disputes and processes of compensations in paving way to install gridlines is paramount I ensuring timely and less costly delivery on the side of both REA and contractors.

iii. The current prices of electricity are generally affordable, but majority of customers are price sensitive; any price increase is likely to reduce consumption of electricity. Currently, majority of the poor people are paying an average of TZS 5,000 per month. Meanwhile, the extreme poor cannot afford connectivity to electricity even at the current rate of TZS 27,000 for installation when the contractor is on site. This is only connection fee let alone wiring and other cost of electric fixture. Special attention is needed to this group to resolve affordability and connect them to electricity.

iv. Connectivity to REA funded electricity does not depend on the quality of houses; as such, and in principle, there are no denials to electricity connectivity because of the quality of the respective house. This is creating an outright opportunity to most poor households to have access to the national grid line.

v. Electrification of rural areas has stimulated growth of enterprises including small scale industries. This has created employment opportunities to peoples and at the same time increase rural incomes.

vi. Rural electrification is reducing consumption of biomass and diesel but at a small pace. However, the decrease in the consumption of kerosene is significant.

vii. With electricity, demand for women's labour in firewood collection and fetching water is on the decrease. This is because electricity is now being used for in-house and space lighting instead of firewood. This is likely to give girls more time for study.

viii. Rural electrification is improving school performance in exams. With electricity, both teachers and pupils have more time to work, and the use of school laboratories has become more effective.

ix. The consumption of charcoal and diesel has marginally increased because of growth in business enterprises while consumption of kerosene and firewood sold in bundles has marginally declined at household level.

x. The biogas and biomass technologies are good and effective but expensive to the target beneficiaries. The roll out scale has been nil or too small.

Recommendations

i. Determine to increase household connectivity to grid electricity during and after contractor has left the site by addressing the issues related to affordability and awareness creation. This needs close cooperation with TANESCO and other stakeholders.

ii. Work with other MDAs to ensure timely settlement of land disputes and timely compensation to avoid unnecessary delays in implementing the rural electrification projects.

iii. Carry out promotive campaigns to encourage more usage of electricity and connectivity including other sources of modern energy, incentives and use of energy-efficient appliances to replace old sources of energy. In particular, encourage communities to connect their schools and health facilities to modern sources of energy.

iv. Carry out more research on either scaling down the costs of installation of the biogas and biomass technologies, or device a mechanism of increasing access to the technologies in rural areas by targeting appropriate customers.

v. Determine to minimize if not to eliminate negative outcomes from the REA projects by advising or working together with TANESCO. These include frequent power cuts, risks from unattended loose connections, low voltage, and timely connectivity to applying customers in the project areas.

vi. Determine to address all unfinished business in all the REA projects. REA's performance is outstandingly notable, but there exists a few minor gaps to sought in most of the projects to iron out peoples' complains – some are just providing them with the right information on the projects' performance relative to their expectations.

vii. Encourage contractors to work closely with beneficiary communities and their leaders during implementation. There should be effective campaigns and local participation throughout.

viii. Device an effective mechanism/system of ensuring that rural people have access to affordable technical backstopping services for the REA projects and the appliances/usage emanating from the energy sources.

ix. Connectivity of villages to electricity should go together with increased connectivity by rural households, institutions and business enterprises, and increased usage of the energy sources at all levels. A multi objective strategy should be in place. Put special emphasis on usage by small and medium industries in rural areas to underscore the on-going government effort to industrialize Tanzania.

Table of Contents

List of Figures

List of Tables

1 Introduction

This Report is an evaluation of the outcomes and impacts of the REA-funded projects in Tanzania, since its inception in 2007. With more than 42 energy projects funded by REA as of December 2017, the Agency seeks to document its achievements, failures and challenges as lessons for improving its future performance in reaching more people in the rural areas.

Against this backdrop, the evaluation report has five chapters. The first is the introduction which sets the contextual background, objectives and methodology of the evaluation. The second chapter is an analysis of the findings. It uses statistical techniques in SPSS and EXCEL computer software to bring out the outcomes and impacts of the REA-funded projects in Tanzania, and gauge the benefits enjoyed by people living in rural areas. In the third chapter, the report gives a summative synthesis of the outcomes and impacts of the REA-funded projects. Since the energy projects have been implemented under a range of policies seeking to improve livelihoods in rural areas, the report makes an assessment of the extent to which the achievements are aligned with the policies, in chapter four. Also, included in the assessment of the alignment with government policies in the chapter, is the extent to which the achievements are sustainable. Chapter five, the last one, draws the lessons learned and gives recommendations for improvement forward.

1.1 Background

The main objectives of the National Energy Policy is assurance of availability of reliable and affordable energy supplies and promoting efficient energy use, so as to support the national development goals. The policy recognizes that private initiatives and investments are key ingredients in exploiting local energy sources. In line with the Energy Policy and the new approach to modern energy in rural areas of Tanzania, the government has committed itself to develop and implement the new strategy to address modern energy needs of over 75% of Tanzanians living in rural areas.

In order to fast-track rural electrification, the Rural Energy Board (REB), the Rural Energy Agency (REA) and the Rural Energy Fund (REF) were established and entrusted with the role of promoting, stimulating and facilitating improved access to modern energy services in rural areas. This entails empowerment of private and public sector participation to improve energy supply in rural areas; and ultimately improve the livelihoods of the rural population including the attainment of sustainable economic growth.

The vision of REA is to become a model of excellency for promotion and facilitation of modern energy services in rural areas. Its mission therefore is to promote and facilitate improved access to sustainable modern energy services in the rural areas to foster socio-economic

development. The core function of REA is to promote and facilitate rural energy development by working in partnership and collaboration with the Non-Government Organizations, Community-Based Organizations, Government Agencies and the Private sector. Therefore, REA works to:

- Promote rational and efficient production and use of energy, and facilitate identification and development of improved energy projects and activities in rural areas;
- Finance eligible rural energy projects through REF;
- Prepare and review application procedures, guidelines, selection criteria, standards and terms and conditions for grants allocation;
- Facilitate preparation of bid documents for rural energy projects;
- Build capacity and provide technical assistance to project developers and rural communities;
- Promote, stimulate, facilitate and improve energy modern access for productive uses in rural areas in order to stimulate rural economic and social development.

The Rural Energy Act no.8 of 2005 gives REA the mandate to undertake its functions. Synonymously, as an autonomous body, REA's power emanates from sector legislations. The Electricity Act of 2008 gives REA power in terms of principal legislation in the electricity sector while the Petroleum Supply Act of 2008 also gives REA power in the petroleum sector. Moreover, REA works with the energy's multi-sectoral regulatory authority (EWURA) which is responsible for Tanzania economic and technical regulation of the water and energy sectors. Since its establishment in 2007, REA has implemented various programmes and projects as aligned to its organisation strategic plans. Since its establishment, REA has supported more than 42 projects in the following broad categories:

(i) Grid extension; for the electrification of villages, district headquarters and economic centres along the national grid;

(ii) Off-grid and green field; promote private participation and public-private sector partnership in rural energy sector development;

(iii) Solar Packages; promote and facilitate the distribution of Solar Home Systems (SHS) and support the distribution of solar lighting systems to replace the use of kerosene and wick lamps in rural areas;

(iv) Energy efficiency; promote energy efficiency and energy use conservation projects

(v) Technical Assistance to project developers; and

(vi) Capacity Building to project developers; enhance technical capacity to project developers.

The projects include electrification of primary and secondary schools, health facilities, district headquarters and villages. The projects also included installation of biogas and energy-efficient biomass facilities in selected schools and communities.

1.2 Objectives of the Evaluation

The over hatching objective of the evaluation of the REA-funded projects is to draw lessons learned with regard to achievements, setbacks and challenges in respect to what works, and under what conditions and why. More specifically, the evaluation sought to assess the following:

i. The extent to which the objectives of the programmes have been met, focusing on intended outcomes; -

ii. The factors, internal and external, which have influenced the fulfilment of the objectives;

iii. The extent to which rural electrification programmes have contributed to socio-economic development and poverty reduction;

iv. The extent to which there have been intended and unintended effects emanating from the implementation of the programmes;

v. The extent to which the REA projects conformed to the needs and priorities of the target groups of the projects in rural areas;

vi. The extent to which the programmes have been in line with government policies;

vii. The extent to which electrification programmes have interacted with other factors to achieve socio-economic development and poverty reduction;

viii. Sustainability of the projects implemented by REA and the main risks thereof;

ix. The extent to which the implementation of the REA projects has been efficient; and

x. Notable differences between the performances of the different projects implemented by REA.

1.3 Approach and Methodology

The evaluation of REA-funded projects started with a kick off meeting with the REA management team in Dar es Salaam for an in-depth discussion on the implementation of the assignment leading to the preparation and presentation of an inception report.

1.3.1 Framework of the evaluation

Based on world-wide literature review of best practices on evaluation of rural energy projects, the evaluation team developed a conceptual framework which in the first place showed all the projects to be evaluated and categorized them by the major activities of REA – the first and the second row of Figure 1.1. The third row of the figure indicates the type of energy generated while the bottom row shows the target beneficiaries of each type of energy – and thus of each category of projects. The framework provided a simplified classification of projects by the type of energy generated and the beneficiaries thereof.

The conceptual framework was used to develop an evaluation model of causation linking REA activities and outputs to desired outcomes and impacts. Figure 1.2 shows the inputs, outputs, desired outcomes, outcome areas and the ultimate impact areas of energy projects. It is a theoretical model which was used to prepare study instruments and identify respondents with a view of gauging the outcomes and impacts of the REA-funded projects. This is a model of linking REA projects' outputs to desired outcomes including household health, environment, education, income and/or energy cost saving, etc. Taking a household as an example, the model envisages that access to improved sources of energy would increase household income; reduce expenditure on traditional energy sources such as kerosene and fuel wood. Also, with the onset of new and modern sources of energy, study time at home for school children would increase due to better lighting. This would improve school performance. With better and reliable lighting, there would be lower incidences of crime and reduction of crop damage by wild animals. Also, it was anticipated that REA would have a positive impact on gender empowerment by redressing gender roles. These are just some of the expected outcomes of rural electrification.

The evaluation model used recall method for respondents to gauge the situation before and after REA projects. This was fairly plausible because many of the projects were implemented a few years ago – not too long to forget the past. The approach was made robust by employing triangulation methods to gauge the benefits. The specific details of the analytical techniques used for each identified impact and outcome are further expounded in the analysis and discussion of the finding in Chapter Two of this report.

1.3.2 Data collection instruments

Data collection tools were designed for selected respondents of each category of the REA-funded projects. The categories of respondents were those enlisted under outcomes in Figure 1.2, and the different institutions responsible in the supply or implementation of the projects and oversight role. As such, the following questionnaires were developed and administered to the selected respondents, respectively: Households, business enterprises, schools (primary and secondary), health facilities, TANESCO offices, District headquarters, FGD for selected women, and community leaders (ward and village). The list of the instruments is separately available as an annexure to this report.

1.3.3 Sampling framework and field work interviews

The study team travelled to all the 42 REA project sites starting from the project headquarters to regions, districts, villages, groups/associations/business entities and households. The sampling approach was stratified by the major categories of source of energy, type of project and type of beneficiaries including location. This permitted data analysis by different approaches including project category, location, type of beneficiaries, source of energy, etc. All the schools and health facilities involved in REA projects were visited and staff interviewed. All regions/district TANESCO offices with grid extension projects funded by REA were interviewed. All villages with REA-funded projects were visited for assessment; in which randomly selected interviews (about 20 per village) for households connected to electricity were administered. In each selected village, about ten business entities were randomly selected for interview; these were in addition to those gauged by the household interview questionnaire. The complete framework of the sampling protocol is provided in Appendix One of this report.

1.3.4 Data Processing and Analysis

The survey data were processed and analyzed in SPSS/PC and EXCEL. Qualitative data were compiled from the narratives of the interviews which were transcribed and coded for analysis. Data analysis which involved cross tabulations, frequencies, descriptive statistics and indices ensured disaggregation by location (regions or districts) and gender where applicable.

Figure 1-1: Conceptual Framework of Evaluation or REA=funded Projects

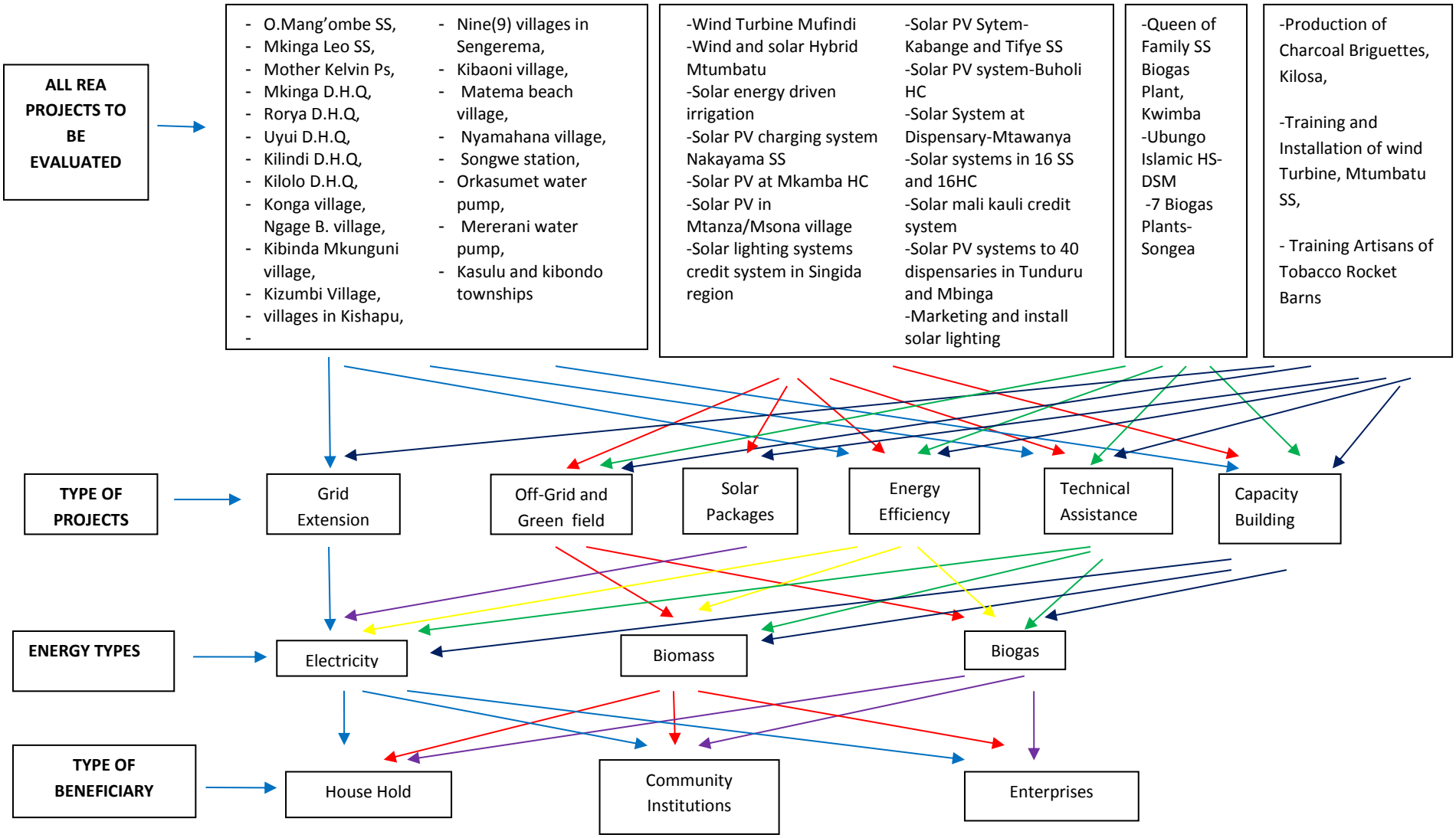
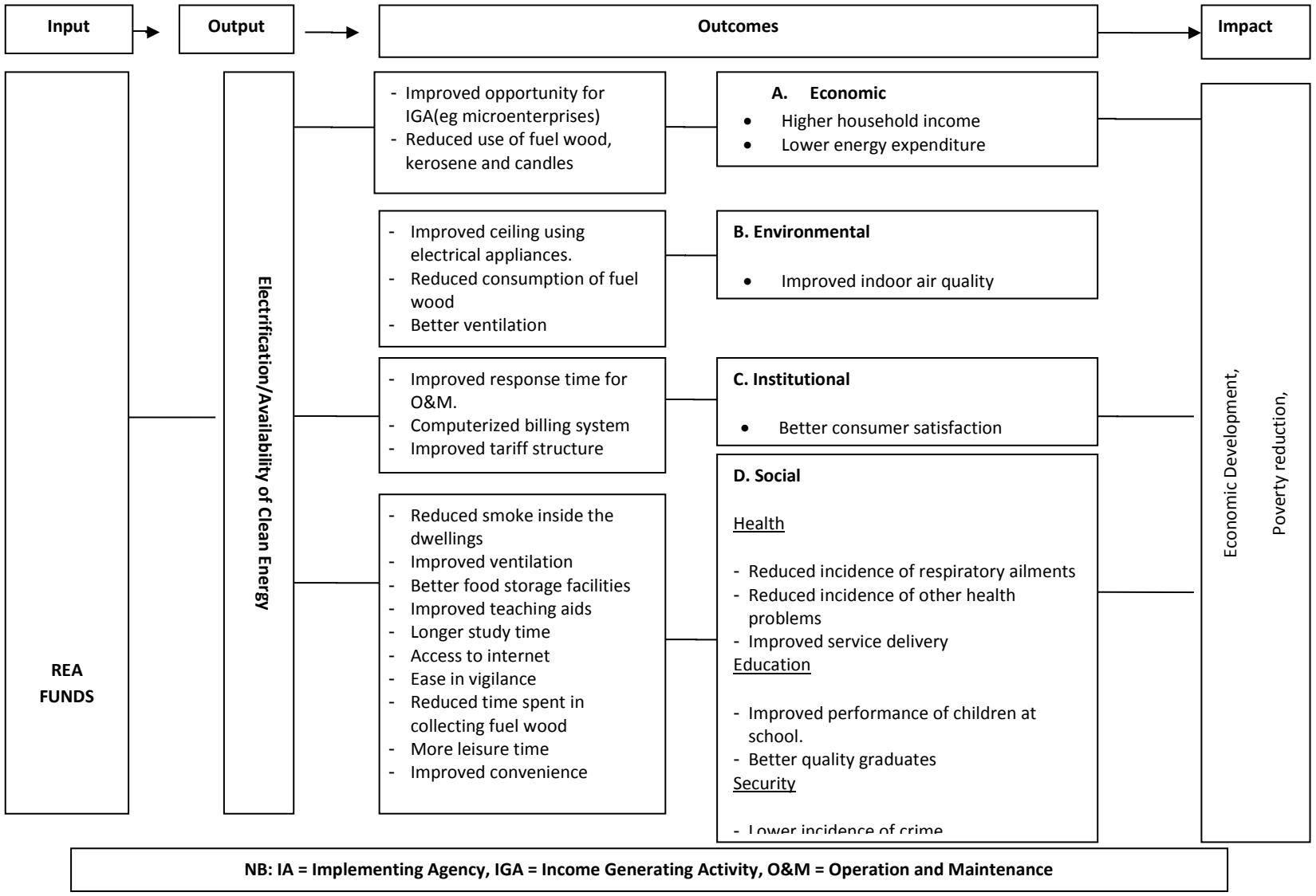


Figure 1-2: Logic Model for the Evaluation of the Outcomes of REA-funded Projects



2 Findings of the Evaluation of REA-funded Projects in Tanzania

The discussion of the findings of the evaluation of the REA-funded projects in this report is organized into general and specific findings on outcomes and impacts of the projects. As such, there are three categories of beneficiaries of REA projects including households, business enterprises and rural communities (public service outlet units). These were the target respondents of the evaluation survey because they are the users of the energy emanating from the REA projects.

As indicated earlier on, REA projects include grid extension, off-grid and green field projects, solar packages, energy efficient appliances, technical backstopping and capacity building. These were the projects which were implemented in selected regions and districts to improve access to, and usage of modern energy in rural areas. The projects were implemented in different timelines and different locations; implying that the outcomes and impacts of the projects are subject to those differences.

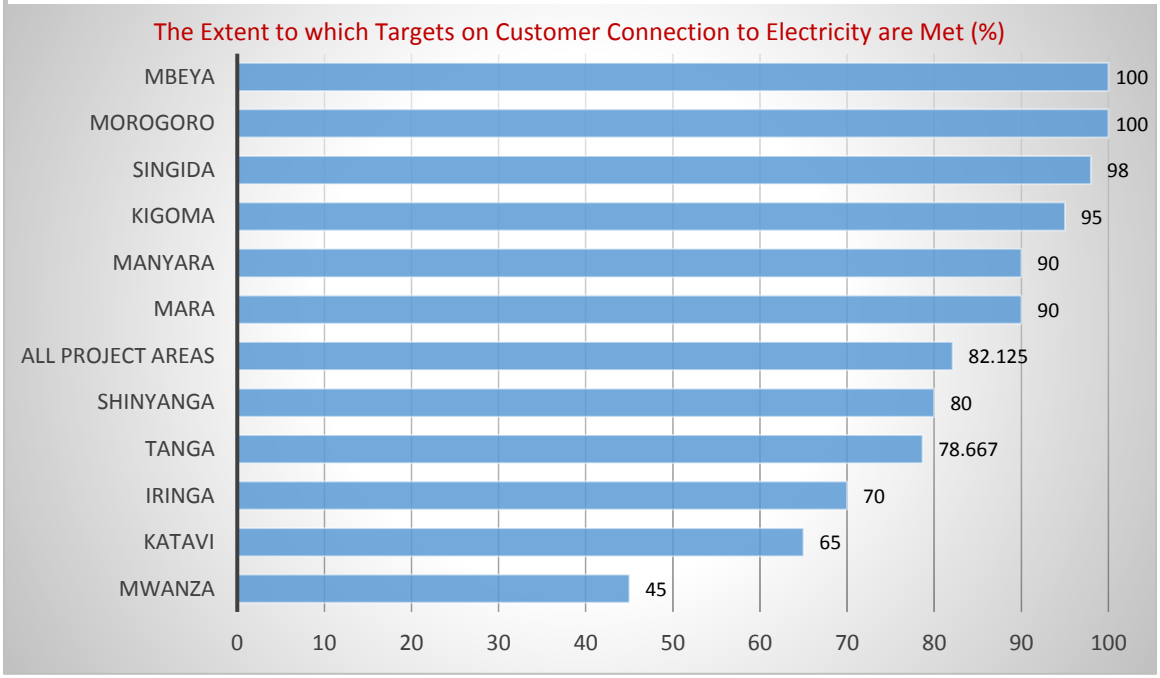
2.1 General Findings on REA-funded Projects

The evaluation study began with a general assessment of the extent to which REA had managed to attain its objective of reaching rural communities and provide them access to modern sources of energy, particularly connection to electricity. In doing so, the evaluation study also probed on the facilitating and de-facilitating factors or problems encountered in the course of increasing access to, and connectivity to electricity in rural areas.

2.1.1 Assessment of the Implementation Efficiency

Figure 2-1 is an assessment of the extent to which targets on connecting rural households and business enterprises were accomplished, according to data sourced from TANESCO regional and district offices. Overall, 82.1% of all the project set-targets on connecting rural households to electricity were met. This is depicting a very high rate of implementation efficiency, although there are significant variations between regions as indicated in the figure. Mbeya and Morogoro have an excellent performance – they have been able to meet their targets on electricity customer connection. Other very good performing regions include Singida, Kigoma, Manyara and Mara. On the contrary, Mwanza and Katavi were far below in meeting their set targets on electricity connectivity in rural areas.

Figure 2-1: Assessment of the Implementation Efficiency of REA Electricity Connectivity Projects

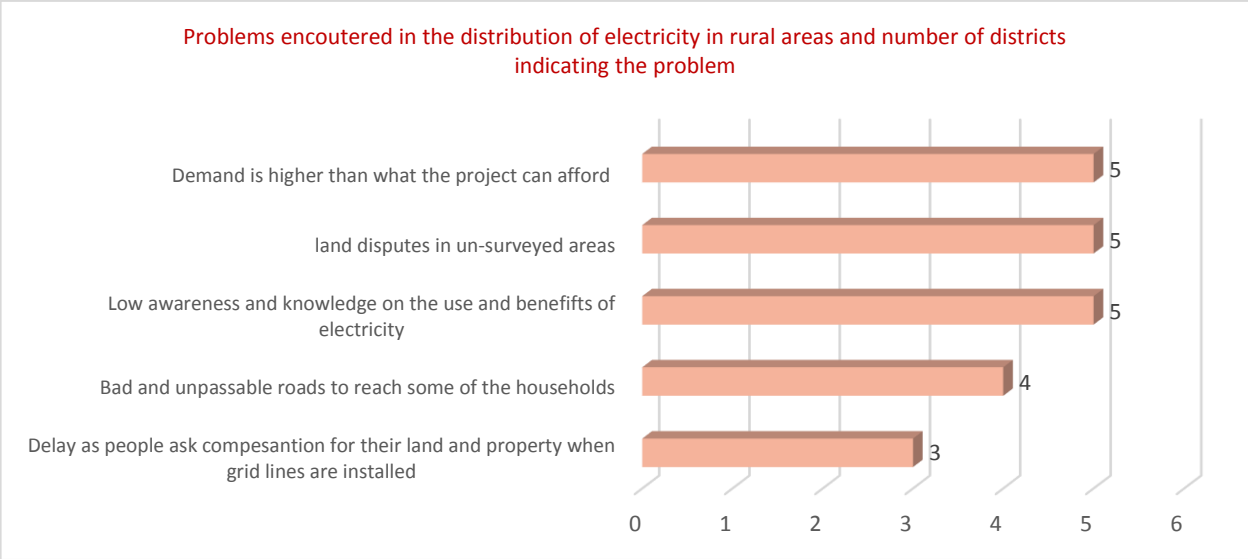


Source: TANESCO Regional and District Offices

2.1.2 Problems encountered in connecting rural households to REA-funded electricity

Further in Figures 2-2& 2-3 is analysis of the reasons behind low connectivity to REA-funded electricity distribution in rural areas. The reasons include those narrated by TANESCO – the managing custodian, and reasons given by council management teams. In Figure 2-2, TANESCO indicated that, of the problems explaining low connectivity to REA-funded electricity, the major ones include a higher number of customers than what the projects could afford (Morogoro, Rorya, Kibondo, Iringa Rural and Kishapu); land disputes (Morogoro, Singida, Mkinga and Pangani); low awareness and thus low response on the side of rural people (Shinyanga, Kilindi, Pangani, Iringa Rural and Kishapu); difficulties in reaching some of the communities due to bad roads (Mkinga, Simanjiro and Kilolo); and delays due to long process of compensating those affected by the new grid lines (Sengerema, Rorya, Kasulu, Kilolo and Tunduru).

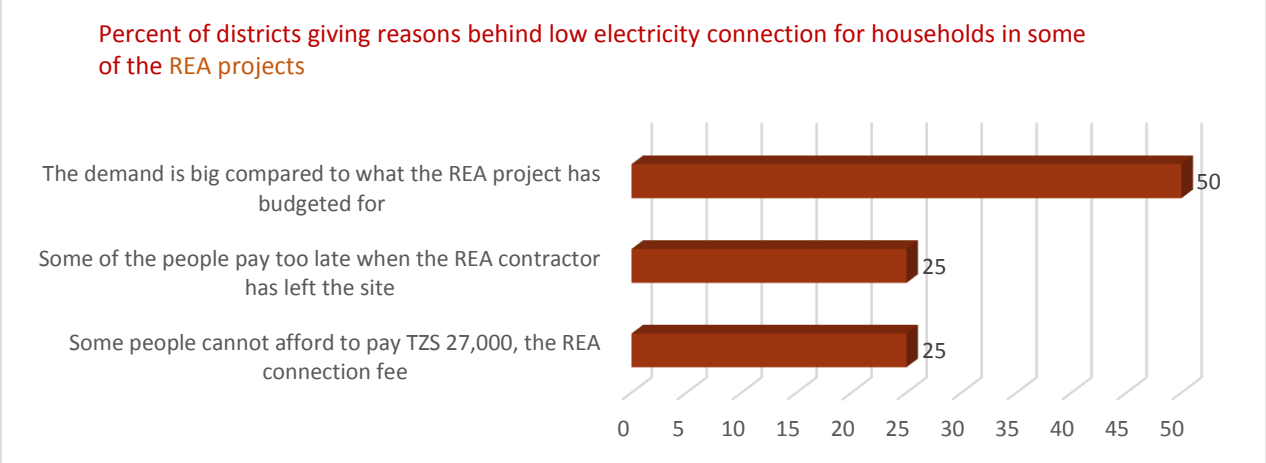
Figure 2-2: Problems Encountered in the Distribution of Electricity in Rural Areas (As indicated by TANESCO)



Source: TANESCO Regional and District Offices

Figure 2-3 shows the reasons for low household electricity connectivity rate as explained by the council management teams of the districts benefiting from the rural electrification projects. In general, the main reason for low connectivity to electricity is higher demand from households compared to the planned resources – which is consistent with the explanation from TANESCO as indicated earlier. This affected about 50 districts as depicted in Figure 2-3. Other hindrances of connection to electricity include delayed applications by households who made such applications when the contractor has left; and also, some of households found the preferential connection fee of TZS 27,000 too high to afford.

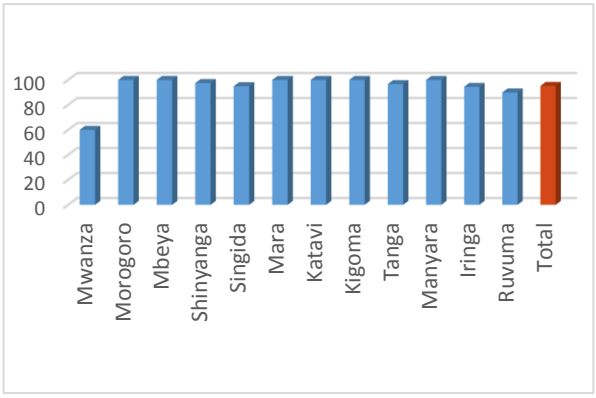
Figure 2-3: Reasons for Low Household Electricity Connectivity Rate (as indicated by district councils)



Source: Council Management Teams

Clearly, the findings on the overall implementation efficiency indicate the need for a follow up strategy to increase connectivity to electricity in those communities delaying to do so; and at the same time devise measures for ensuring satisfactory rates of connectivity during

implementation of the projects – i.e. before the contractor leaves the site. The problems are not universal in all project sites; they are found in specific district locations for which follow up strategies can be designed and implemented accordingly. These would scale up the benefits emanating from REA projects.



2.1.3 New Customers Applying and Getting Connection to Electricity Every Year

Despite of the few problems encountered in distribution and connection of rural communities to electricity, the total number of new customers making connection to electricity every year had reached 30,357 in the surveyed districts (Table 2-1). The customers included both for domestic use and business; but indicatively, domestic use was the majority.

Table 2-1: New Customers Applying and Getting Connection to Electricity Every Year (n=16)

District	Total Number of New Customers Applying and Getting Connection to Electricity Every Year		
	Domestic Users	Business Enterprises	All Users
Sengerema	No separated data	No separated data	1920
Morogoro	No separated data	No separated data	12960
Kyela	28	2	30
Shinyanga	No separated data	No separated data	1750
Singida	3856	1440	5296
Rorya	1016	53	1069
Mlele	310	105	415
Kibondo	900	150	1050
Kasulu	1500	298	1798
Kilindi	480	60	540
Mkinga	480	48	528
Simanjiro	240	48	288
Pangani	420	20	640
Kilolo	1350	21	1371
Iringa Rural	No separated data	No separated data	162
Kishapu	360	180	540
Total	**10940**	**2425**	**30357**

It is further depicted from the table that the annual rate of connectivity to REA electricity differs by districts. For example, Singida had relatively very big number of customers every year while Kyela had the lowest. Nevertheless, some of the districts did not have decomposed data to distinguish between customers applying connection for domestic versus business uses.

In terms of payment of the monthly electricity charges, about 95% of all customers pay their bills on time (Figure 2.4). This is so for many of the customers of the REA-funded projects,

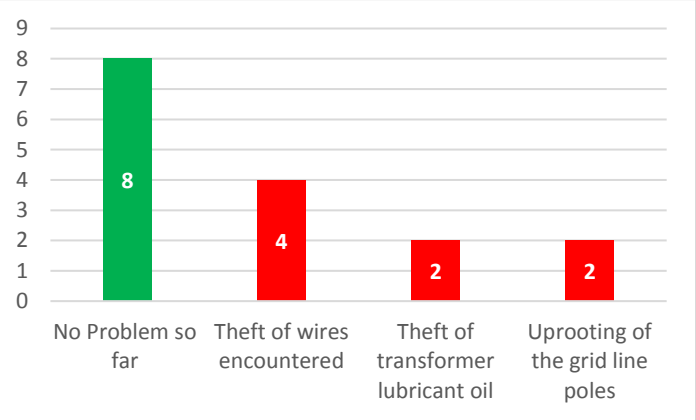
except for Mwanza region where delay in paying the monthly bills was reported by more than 50% of the respondents. Overall, then affordability and payment of bills on time is very good. The use of LUKU system is the reason for the improved on time repayment.

2.1.4 Assessment of the Security of Electrical Equipment in the REA-funded Grids

The evaluation survey sought to assess the security of the grid lines by asking respondents from TANESCO offices in the respective project areas to indicate the extent to which security threats have been encountered.

Majority, as indicated in Figure 2-5, did not indicate any security threat by then; a few of the responding districts indicated that there had been theft of the grid line wires (Mwanza. Shinyanga and Tanga), theft of the transformer lubricant oil (Singida and Mara) and uprooting of the gridline poles (Morogoro and Manyara).

Figure 2-4: Assessment of the Security Status of the Electrical Equipment in REA Projects: Number of Districts Indicating the Problem



Source: TANESCO Regional and District Offices

2.2 Findings on Electricity Use, Outcomes and Impacts on Rural Households

In Section 2.1, it was found that the majority of new customers applying and connecting to REA-funded electricity grids are households. As such, the evaluation study set out to bring out the household uses of electricity, outcomes and impacts on rural households. Nevertheless, household-based business enterprises are separately analysed in the next section.

2.2.1 Main characteristics of the respondents

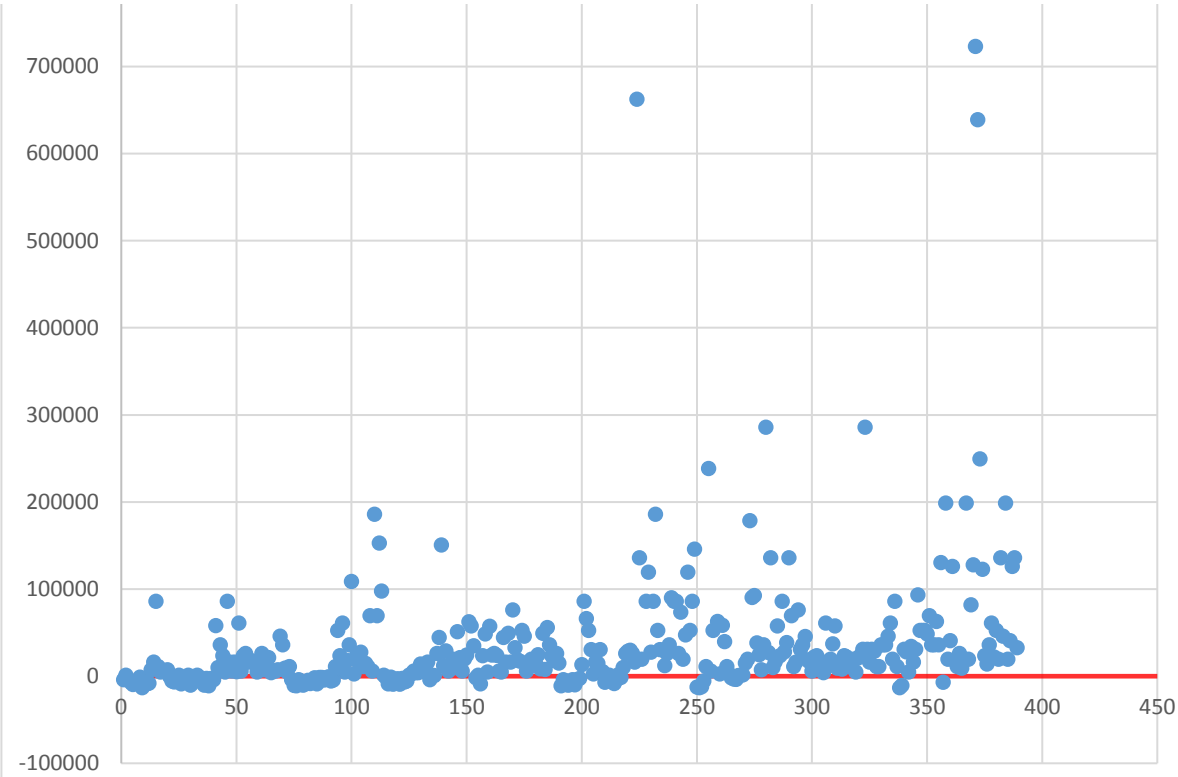
As indicated earlier on, the evaluation study carried out about 389 random interviews of households with electricity connectivity in the REA project villages. Of all the interviewed heads of households, 71% were males and 29% were females. Age wise, about 84.2% were between 18 and 40 years.

Also, the evaluation study compiled the incomes of the interviewed households and gauged the respective poverty levels. This was accomplished using the 2012 National Poverty Line of TZS 36,482 and applying annual inflation rates to update it to 2017. As such, the inflation-updated poverty line for Tanzania was found to be TZS 48,898 for the year 2017. The updated poverty line of TZS 48,898 was set as the baseline, i.e. not poor – not rich or zero line, so as to find out and plot the extent to which the households deviate from the poverty line. In essence the approach wants to establish whether a given household consumes above or

below the poverty line – and by how much. The technique allowed categorization of the sampled household respondents into poor versus rich households using the national basic needs poverty line.

The results of the household poverty analysis are depicted in Figure 2.6, in which 21.9% of all the interviewed households fall below the poverty line – i.e. they are basic needs-poor; the rest, or 78.1% are non-poor. The red line or the X-axis in the figure is the 2017 basic needs poverty line of TZS 48,898. The households, plotted in blue dots, with per capita consumption above the line, or right on the line, are non-poor; and those with income below the line are poor. The figure shows that majority of the households are either marginally above or below the poverty line; implying that extreme poverty is ruled out in our sample of respondents.

Figure 2-5: Households Below and above the 2017 Inflation-updated Basic Needs Poverty Line of TZS 48,898

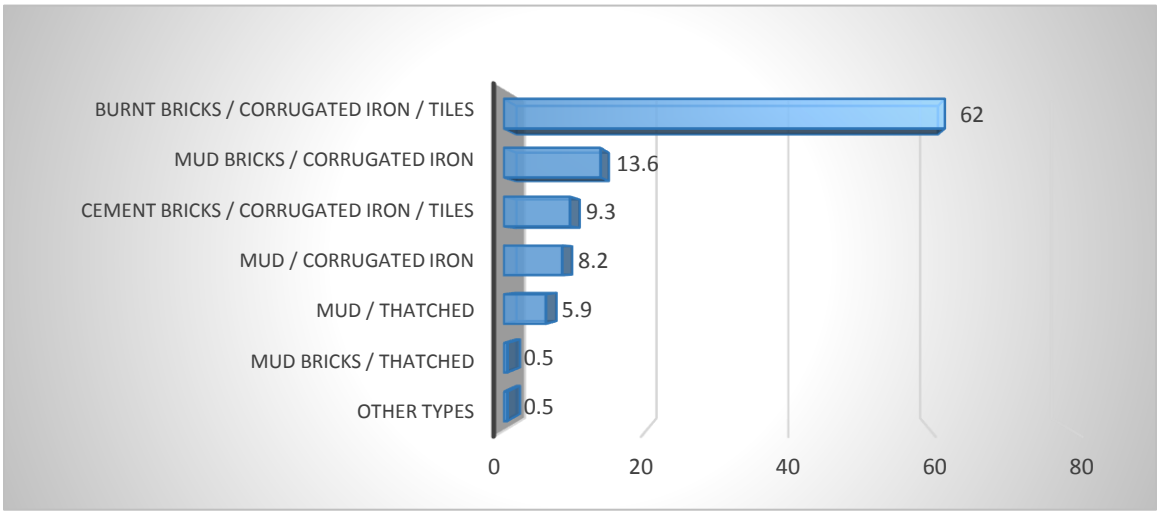


By implication, the results of the poverty analysis indicate that both basic-needs poor and noon poor households can afford connectivity to REA-funded electricity. However, the extreme poor, in particular the food poor households are unlikely to connect to electricity – simply because they cannot afford it, as indicated earlier in section 2.1.

The evaluation also examined the type of houses connected to electricity. The summary of the findings is depicted in Figure 2.7, in which 62% had improved houses with hardened clay bricks with corrugated iron sheets; and some of them had tiles. About 9.3% had houses built by cement blocks thatched with corrugated iron sheets, while 13.6% had houses built from mud blocks and thatched with corrugated iron sheets. Overall therefore, about 84.9% of the households with electricity had good houses –i.e. fairly long-lasting improved houses. Also, 8.2% had mud houses thatched with corrugated iron sheets. The rest, 6.9%, had mud houses thatched with grasses. Vividly, it means willingness and ability to apply and get connected to

electricity rather than the applicant's type of house per se; matters connection to electricity does not depend on the quality of the house as such.

Figure 2-6: Percent of Respondents Indicating Type of House



A house and shop at Mtanza Msona village Rufiji

Table 2-3 shows further the distribution of houses connected to electricity by regions. Iringa and Mbeya has relatively very good houses connected to electricity compared to Tanga and Coast Regions, which have mainly mud houses thatched with either iron sheets or grasses.

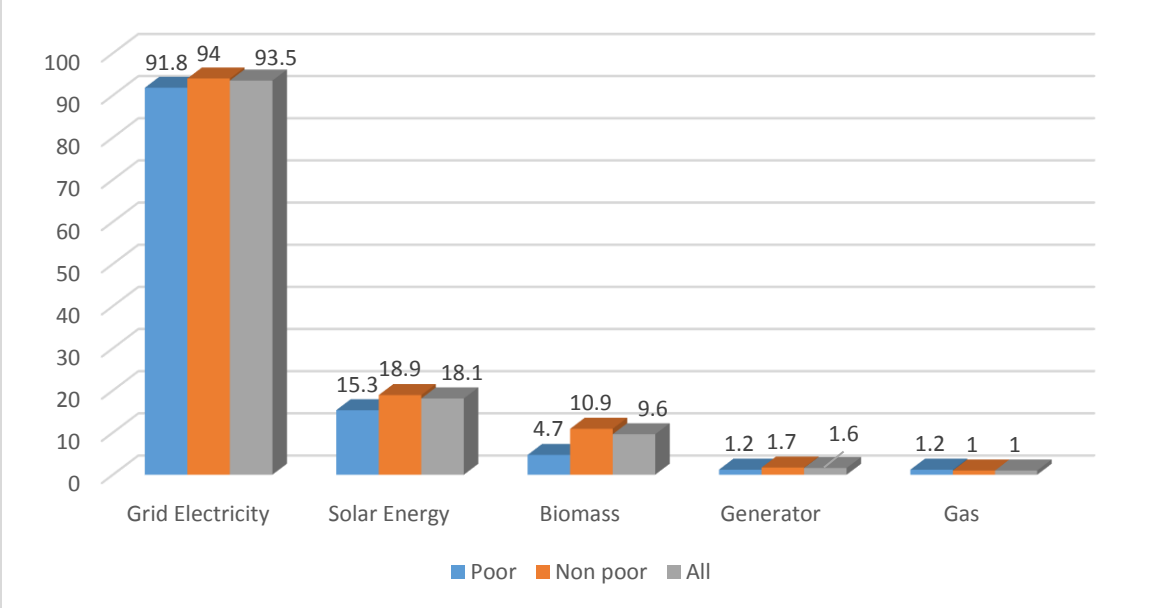
Table 2-2: Type of Houses Connected to REA-funded Electricity

Name of Region	Percent of Respondents Indicating Type of House							
	Mud / Thatched	Mud / Corrugated Iron	Mud bricks / Thatched	Mud bricks / Corrugated Iron	Burnt bricks / Corrugated Iron / tiles	Cement bricks / Corrugated Iron / tiles	Other types	Total
Mwanza			5	10	75	10		100
Shinyanga	5.7	3.8		41.5	37.7	11.3		100
Mara	7.5	2.5		7.5	82.5			100
Singida				55	25	20		100
Katavi	5%				90	5		100
Kigoma		5.4			91.9	2.7		100
Tabora				15.8	84.2			100
Iringa					100			100
Mbeya					100			100
Tanga	17.7	40.3	1.6	3.2	29	4.8	3.2	100
Coast	18.2	18.2		27.3	9.1	27.3		100
Morogoro	10.5			15.8	42.1	31.6		100
Manyara	3			12.1	54.5	30.3		100
All	**5.9**	**8.2**	**0.5**	**13.6**	**62**	**9.3**	**0.5**	**100**

2.2.2 The Use of REA-funded Sources of Energy by Households and Impact on Environment

An assessment of the type of energy used by households in villages with REA-funded energy projects in Figure 2-8 shows that grid electricity is the main source of modern energy, for more than 90% of households, for both poor and non-poor households. With regard to use of solar energy, it was used by about 18.1% of all households from the responding villages; it is also used by relatively rich people, though with a marginal difference. Analogously, biomass

Figure 2-7: Type of Energy Source Used versus Level of Poverty: % of Respondents Indicating Energy Source



is used by a few households, and mainly by non-poor households. The rest of the sources have very few users.

Following rural electrification through REA projects, it was expected that the use of other sources of energy would go down as households replace low and inefficient sources of energy with modern and efficient sources of energy – which is characterized with convenience and somehow relatively low cost. As such, the evaluation study sought to gauge the extent to which the use of modern sources of energy had started replacing inefficient and environmentally hazardous sources of energy. This is analysed in Table 2-4 which shows households' consumption of selected different sources of energy before and after the incoming of REA projects and the changes since then.

Table 2-3: Household Consumption of other sources of energy before and after REA

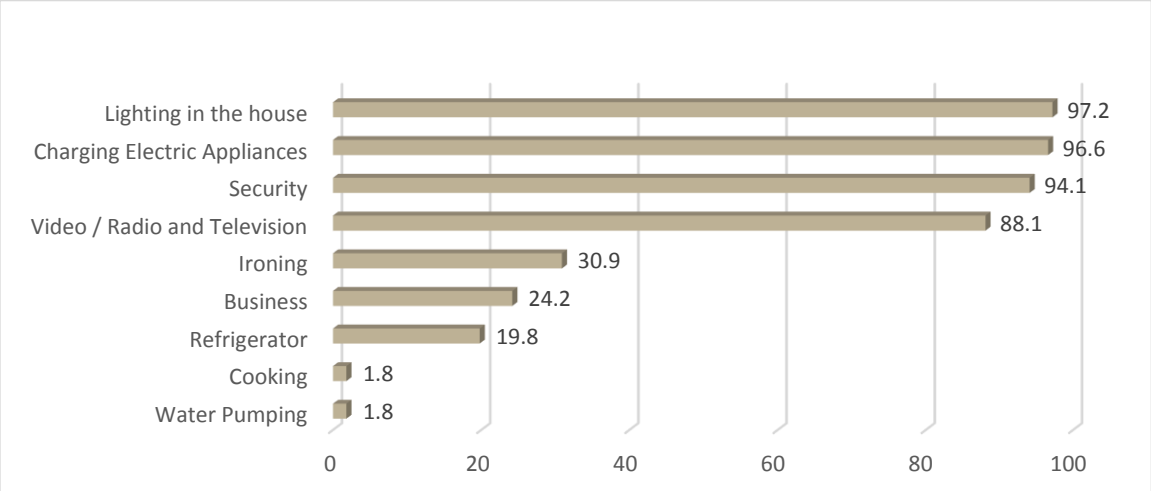
Type of Energy source	Average HH Consumption before electricity	Average HH Consumption after electricity	% change after electricity
Firewood (bundles)	2.47	2.26	**-8.5**
Kerosene (litres)	1.56	0.66	**-58**
Diesel (litres)	6.05	10.65	**+76**
Charcoal (tins)	12.86	12.31	**-4.3**

The results of the analysis show a general declining trend in the use of inefficient and environmentally-hazardous sources of energy including Firewood, Kerosene, Diesel and Charcoal. The use of Kerosene recorded the highest decrease in consumption by about 58% followed by firewood (8.5%); and so with the use of charcoal. Consumption of diesel, however, has increased; may be because of the increase in the use of generators due to power cuts, etc.

2.2.3 Type of Uses of Modern Energy in REA-funded Projects

In Section 2.2.3, the report showed the different sources of modern energy emanating from the REA-funded projects and the extent to which rural households rely or use the sources. In Figure 2-9, the report shows the different household uses of the energy supplied from the REA projects. It is depicted that there are four main household uses of modern energy in order of priority as follows: lightning, charging of electrical appliances, security, and video/television and radio. Use of modern sources of energy beyond the aforesaid uses is small at less than 30%. The use of modern energy for cooking is limited to less than two percent of all households.

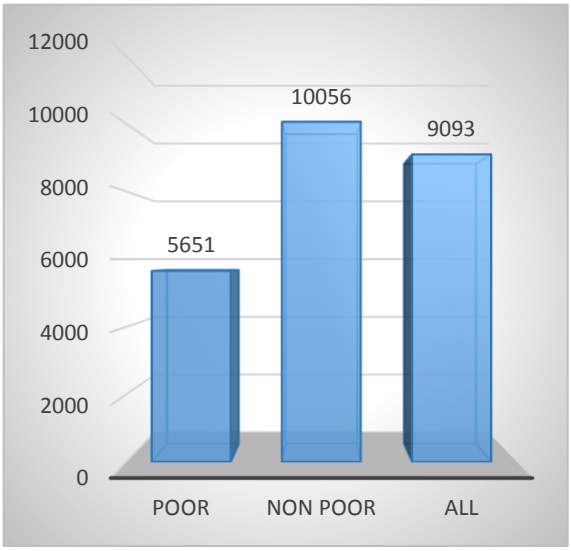
Figure 2-8: Percent of Respondents Indicating Type of Use of Energy



2.2.4 Energy Consumption, Payment of Bills, Affordability and Willingness to Pay More

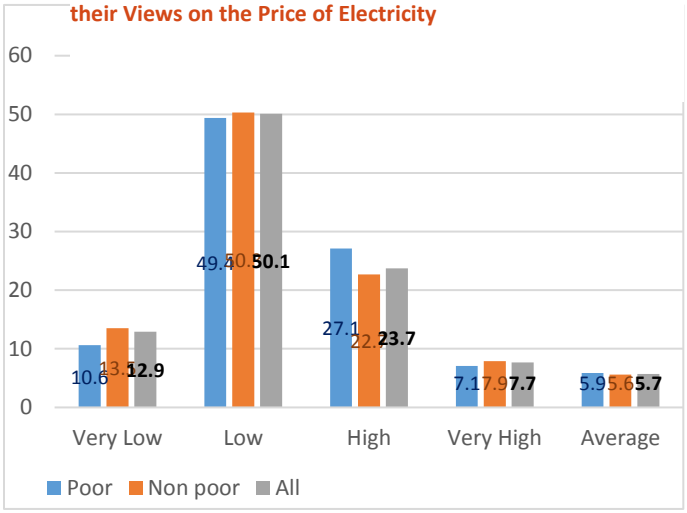
Analysis of household energy consumption as measured by monthly bills in Figure 2.10 shows that non-poor households consume more energy than poor households – somewhere twice as much. The average consumption of energy in money value per month for poor households is TZS 5,651 per month while for the non-poor is TZS 10,056. The average consumption of energy by all households in the REA projects is TZS 9,093 as depicted in Figure 2-10. Considering the inflation-updated basic needs poverty line of TZS 48,898 as depicted earlier, and the household size of 5.5 for Tanzania (2012 national population census); it is found that consumption of modern energy costs about 3.4% of the basic needs consumption. And since many of households consume around the poverty line, they strive to pay their bills.

Figure 2-9: Average Monthly Electricity Bill In TZS



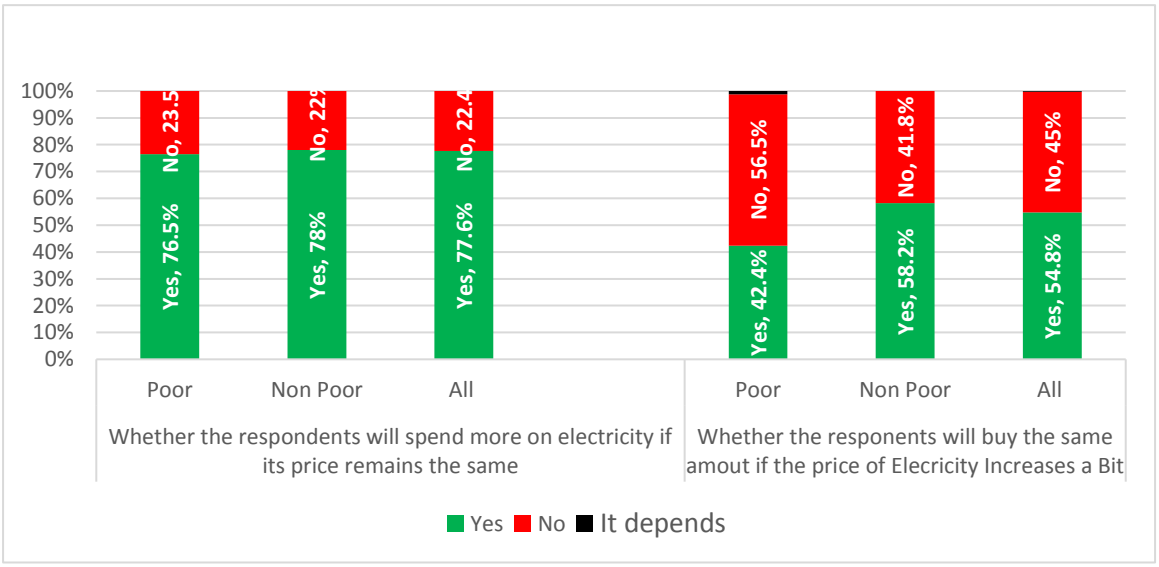
The evaluation study went further and asked households whether the current price of electricity is affordable to them. This was gauged by probing on whether the price is low or high. The results of the assessment are depicted in Figure 2.11. Firstly, there is no much difference between poor and non-poor households as far as opinion on the current price of electricity is concerned. About 70% of all respondents, either by poverty level or without, opined that the current price of electricity is either low or average; and more specifically, about 60% indicated that the price is either low or very low. Intuitively, many of the households connected to electricity in rural areas do not consider price of energy to be high.

Figure 2-10: Percent and Category of Respondents Indicating their Views on the Price of Electricity



Although a good number of the respondents opined that the current price of electricity is somehow low, the evaluation study was further interested in establishing the consumers' price sensitivity. This was accomplished by including questions on contingent demand in the evaluation survey. The findings of the analysis of price sensitivity are shown in Figure 2.12, which depicts two scenarios on whether consumers will consume more or less electricity energy if price remains constant versus a marginal increase. If price does not change, as depicted in the first three bars on the left side of the picture, majority of both the poor and non-poor, at more than three quarters, indicated that they would consume more energy. Therefore, with a marginal increase in price, there would be a price sensitivity in which the consumers would be somewhere around fifty-fifty between those who would consume more and those who wouldn't.

Figure 2-11: Assessment of the Respondents Elasticity with Respect to Contingent Changes to the Price of Electricity



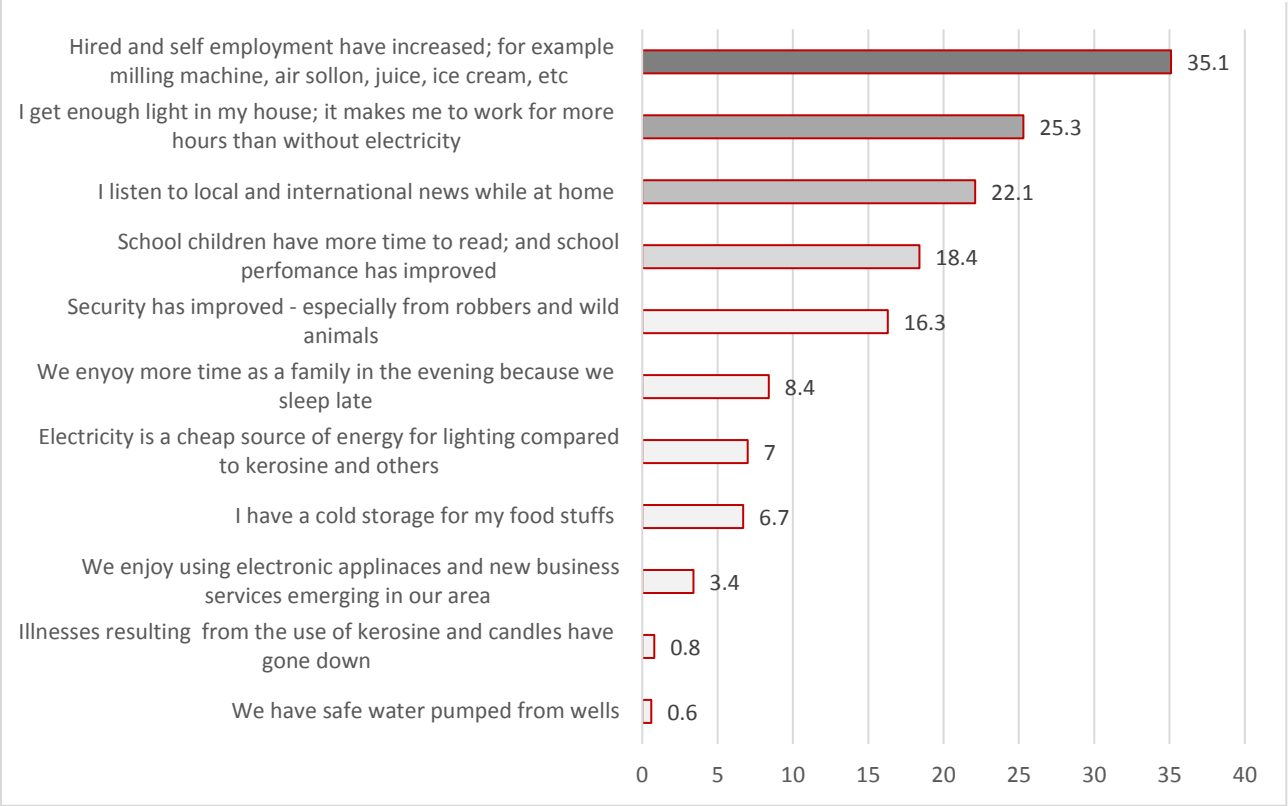
2.2.5 Outcomes and Impacts of REA-funded Projects on Rural Households

In the preceding sections, the findings of the evaluation have shown that there are many households applying and getting connection to electricity including the use of other sources of modern energy. The incoming of REA projects in the rural areas has increased access to and consumption of modern sources of energy. As such, there have been general outcomes and specific outcomes and impacts at various levels. These are analyzed in two stages to

include households' general assessments of the benefits they attribute to the REA project at the household level, and the benefits emanating from business enterprises, institutions and public services as a result of specific REA projects which were specifically undertaken for them. Therefore, specific impacts on school performance, health services and water services will come as separate discussions in the next sections of this evaluation report. The benefits of REA projects at household level are general and based on their views before we gauge specific outcomes and impacts at sectoral level.

Figure 2.13 shows the general outcomes of the REA-funded projects as narrated by households during the evaluation survey. The main outcomes include the following.

Figure 2-12: Percent of Households Indicating the Benefits Enjoyed from Rural Electrification



Increasing employment in rural areas

About 35.1% of households in the evaluation survey indicated that the incoming of REA project in their village has increased employment opportunities. These include milling machines, Hair salons, juice and ice cream making, etc. This is the outcome rated first my many of the interviewed households; and it will be further expounded in the next sections on impact on business enterprises.

Space Lighting has increased working and family togetherness and security

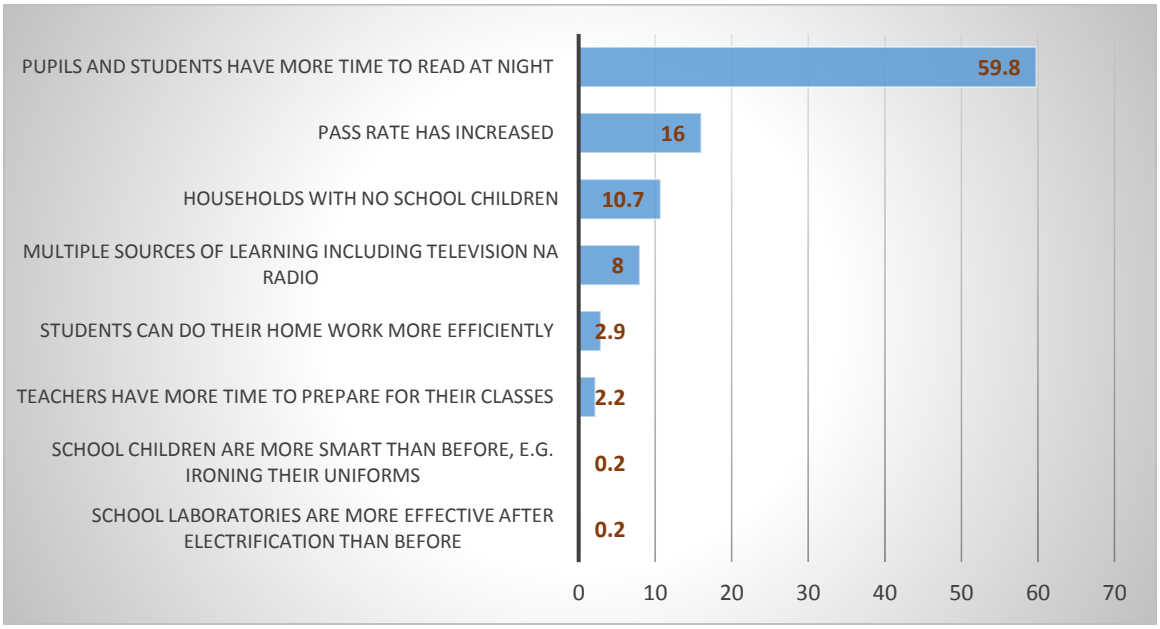
With electricity houses have lights inside and outside. This has made households to work for more hours than before. This has provided school children with more time to read and do their homework; and also, families cum households have more time together in the evening

before going to sleep. Space lightning has improved security especially from robbers and wild animals.

The learning environment for children at home has improved

Majority (59.8%) of the surveyed households indicated that their children have more time to study at night with the incoming of the REA project. Figure 2-14 is an elaborate of Figure 2-13; it shows the various school-related benefits emanating from rural electrification.

Figure 2-13: Percent of Households Indicating Benefits of Electricity on School Children within Households



The benefits include more reading time for pupils at home, increased pass rates, new sources of leaning including television, more time for teachers to prepare their classes, improved pupils cleanness, and improved laboratories for schools.

Use of electrical appliances/equipment has increased access to local and international news

With electricity households are making use of electrical appliances and equipment including mobile telephones, televisions, video, other domestic appliances, etc. These have improved not only communication between people, but access to local and international news by rural dwellers. This is likely to lead to socio-economic and cultural transformations in the long term.

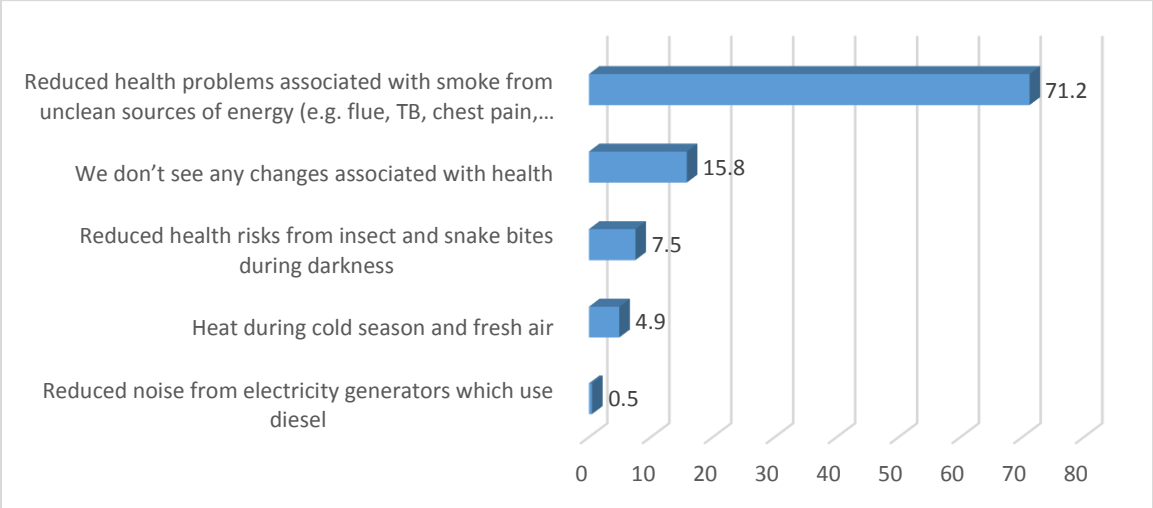

Mud house/shop Mtanza-Msona Rufiji

Improved health environment

With lightning from electricity, the use of kerosene and candles as sources of lightning have gone down. This has reduced smoke and related health risks, as households enjoy fresh and less-smoky air in their houses as reported by households in the survey. However, many of the

Figure 2-14: Percent of Households Indicating Health Benefits from Rural Electrification

households still use firewood as source of cooking energy – this produces smoke and compromises the benefits enjoyed from space lighting in the houses. More specifically are the health benefits as reported in Figure 2-15, which is an elaborate of Figure 2-14 on health benefits.



Electricity has also reduced health risks from insect and snake bites during darkness; it also helps to regulate heat and coldness. The incoming of REA electricity reduced the use of generators and thus noise from them – it is benefiting very few people.

Improved water services

The outcome and impact of REA projects on water services is significant on the respective households and communities. The incoming of the projects has enabled use of electric water pumps, making it possible to pump more water including moving the service close to people.

Figure 2-15: Improvement in the Time for Fetching Water for Households after REA Projects (N=189)

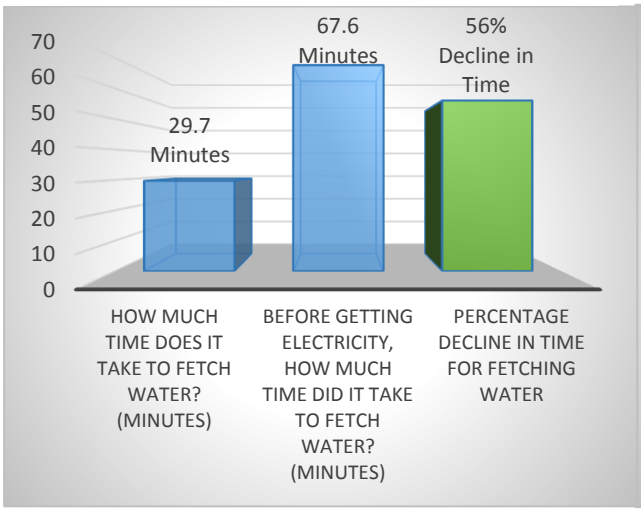


Figure 2-16: Percent of Households Indicating Improvement in Water supply after REA Project (N=189)

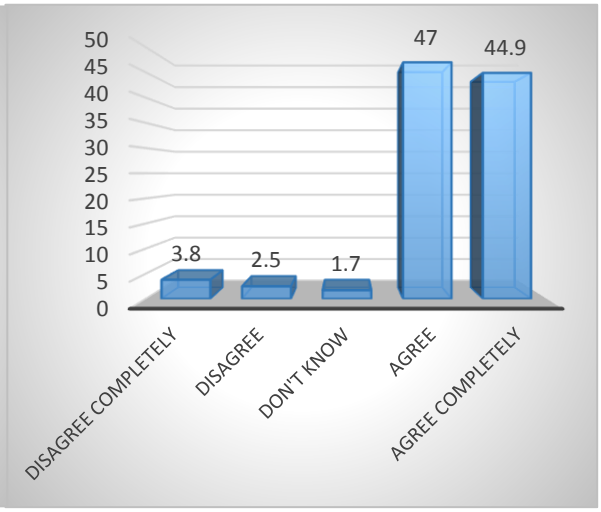


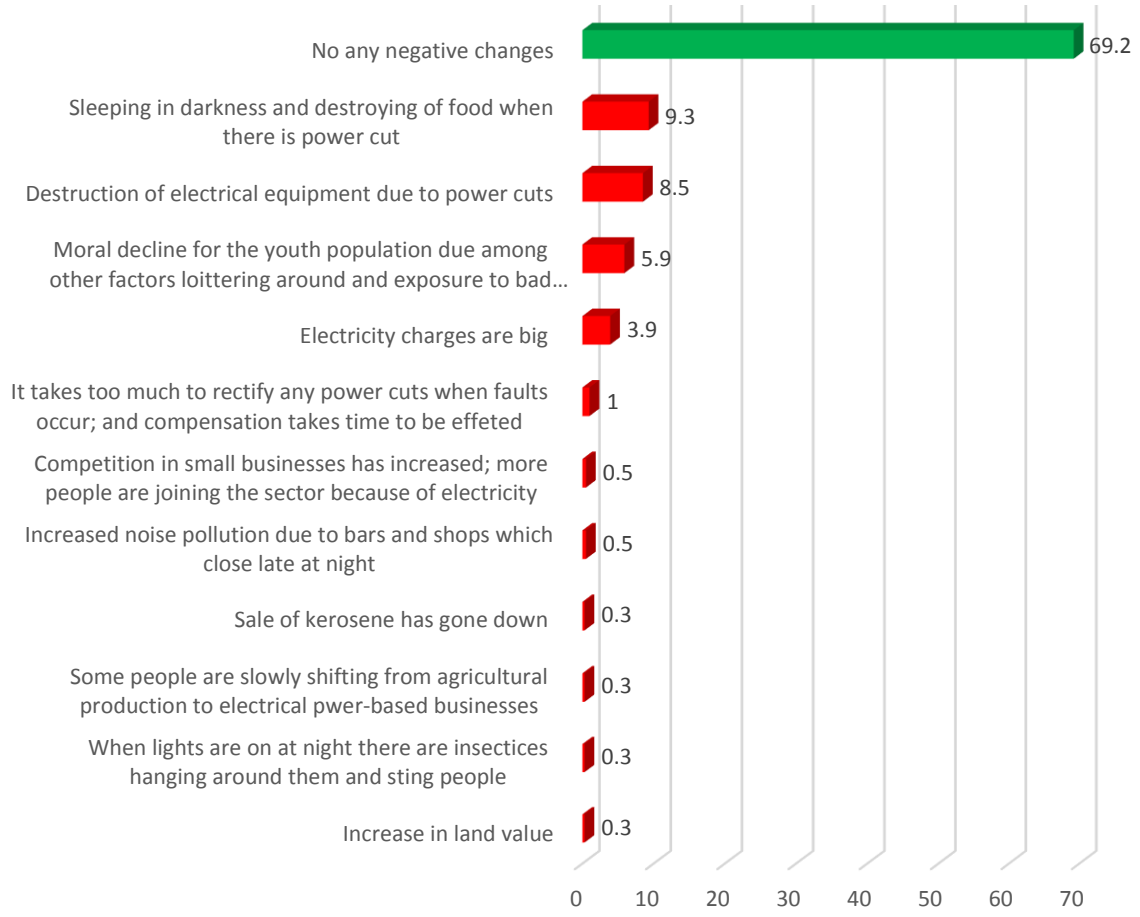
Figure 2-16 shows that before REA projects, the average time used by the respective households to fetch water was 67.6 minutes – more than one hour; but after the REA projects, the time used has gone down to only 29,7 minutes – about half an hour, which is a decreased by 56%. This is a profound impact on water services for households.

Figure 2-17, the households indicated satisfaction with the improvement made in water services; more than 90% either agree completely or just agree that with REA projects water supply has improved.

2.2.6 Negative Outcomes of REA Projects at Household Level

Of all the interviewed households in the evaluation survey, 69.2% did not report any negative outcome relating to the incoming of the REA projects in their villages. However, 30.8% did report a number of negative outcomes as analyzed in Figure 2-18.

Figure 2-17: Percent of Respondents Indicating Negative Changes Due to Rural Electrification in their Area



Among those reporting negative outcomes, the main concerns which are essentially relating to power cuts were sleeping in darkness and destroying of food when there is power cut, destruction of electrical equipment due to power cut and moral decay on the side of youth because of loitering around and exposure to bad behavioural practises. Others include big

charges of electricity, increased business competition, noise pollution from bars and shops which close late at night, reduced kerosene business, shift from agriculture to other businesses, insects hanging around and bite people when lights are on, and increasing price of plots after electrification of rural areas. The reported disadvantages are not all hazardous, some are consequential by default – for example increasing business competition and price of land are automatic results from modernization. Therefore, hazardous outcomes should be limited to sleeping in darkness and destroying of food when there is power cut, moral decay on the side of youth because of loitering around and exposure to bad behavioural practises, noise pollution from bars and shops which close late at night, and insects hanging around and bite people when lights are on.

2.3 The Outcomes and Impact of REA Projects on Rural Business Enterprises

The onset and completion of REA projects led to expansion and establishment of new business enterprises in rural areas. The total number of small and medium enterprises doubled from 82 to 163 in the evaluation sample of business enterprises as indicated in Table 2-5, which shows distribution of old and new business enterprises after REA projects.

Table 2-4: Old vs New Business Enterprises after REA

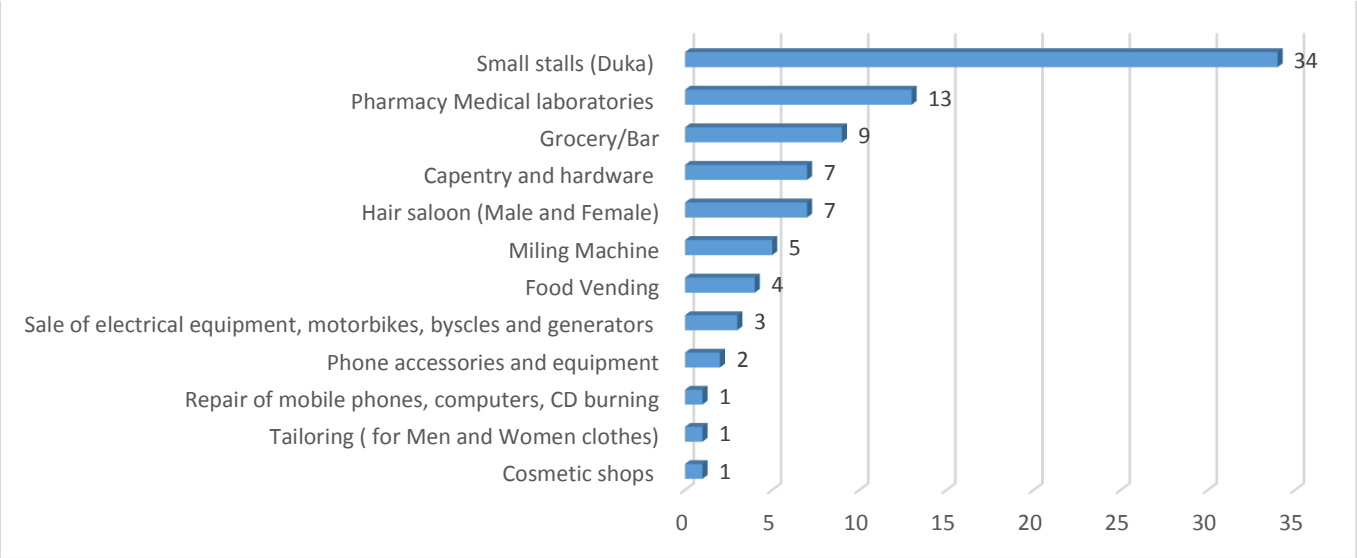
Old versus New Business Enterprises after REA			
Region	Old Business Enterprises	New Business Enterprises after REA	Total
Mwanza	4	6	10
Shinyanga	12	14	26
Mara	15	5	20
Singida	0	3	3
Katavi	7	3	10
Kigoma	8	7	15
Tabora	6	5	11
Iringa	10	9	19
Mbeya	4	4	8
Tanga	8	10	18
Morogoro	5	5	10
Manyara	3	10	13
Total	82	81	163

Source of Data: Business Enterprise Survey in Communities with REA Projects

2.3.1 Types of new business enterprises established after REA projects

Further in in Figure 2.188 is analysis of the different new business enterprises which have been established after REA projects. These include, by their order of magnitude, small stalls, pharmacies and medical laboratories, groceries and bars, carpentry and hardware, hair salons, milling machines, food vending, sale of motorbikes, bicycles and generators, phone accessories and equipment, etc.

Figure 2-18: Number of New Businesses by Type Established After REA Projects



Source of Data: Business Enterprise Survey in Communities with REA Projects

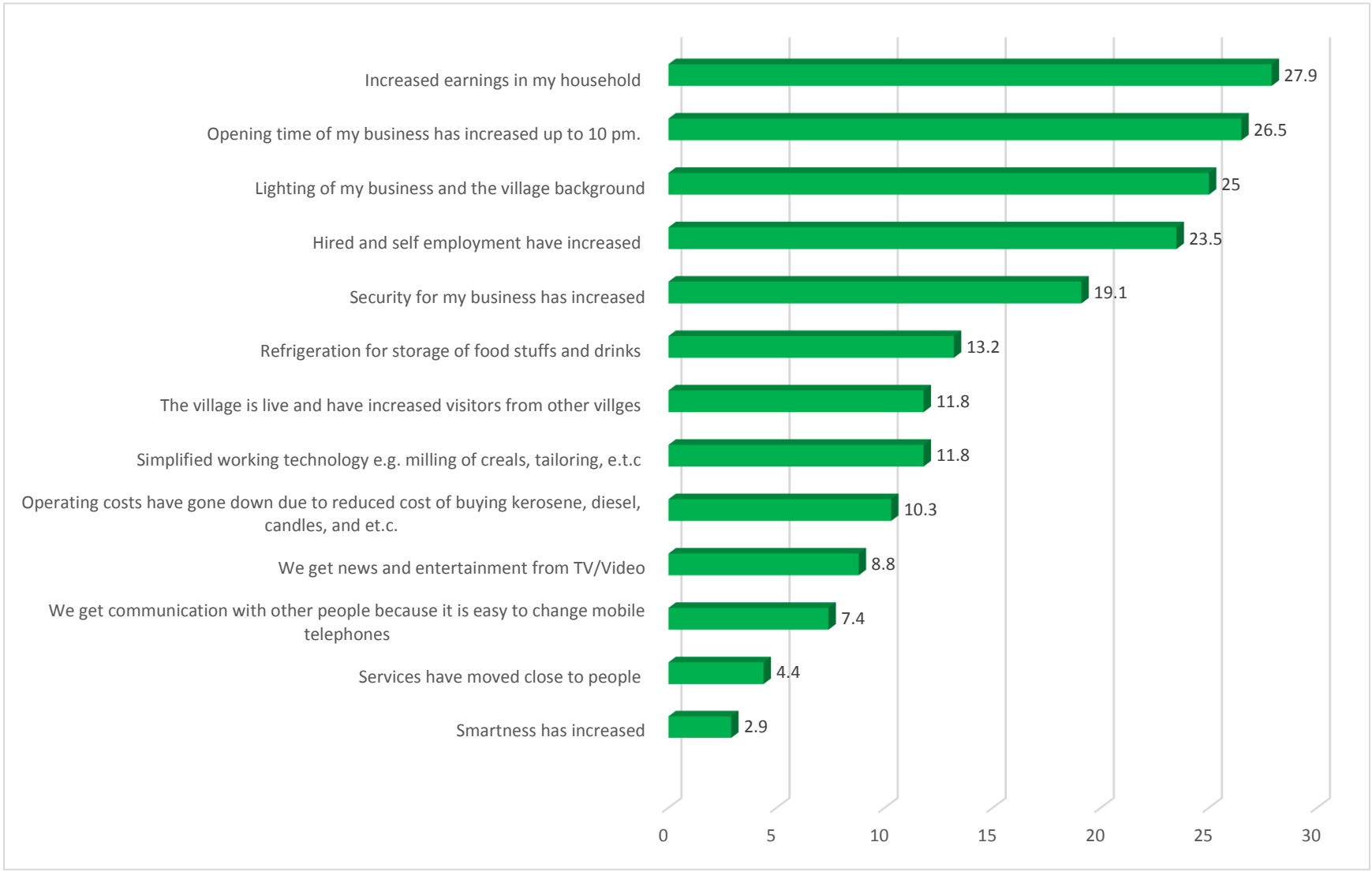
2.3.2 Benefits of REA Projects to Rural Enterprises

The evaluation survey interviewed selected new and old business enterprises in villages with REA projects to indicate the benefits emanating from the projects. The results of their response on the benefits are presented in Figure 2-20, which shows the type of indicated benefit and the per cent of enterprises responding in favour of each reported benefit.


A carpentry Workshop at Lyagolo Village in Rorya


Milling machine in Mandewa village Singida

Figure 2-19: Percent of Business Enterprises Indicating Benefits from REA Electricity (n=162)



The benefits, in order of the proportion of the reporting enterprises, include increased household earnings, increased opening hours of the business, space lightning, increased employment, increased security, use of refrigeration, increased visitors from neighbouring villages, emergence of small industries like milling machines, reduced consumption of kerosene and candles and entertainment. The evaluation report sought to work out selected impacts on the business enterprises for which the findings are presented next.

2.3.3 Impact on Enterprise sales, employment and profits

The summary of the analysis of the impact of the REA projects on sales, employment and profits is depicted in Table 2-6, which shows average weekly sales for business enterprises, average employment and profits, all before and after REA projects. The last column of the table shows the changes which have taken place since the onset of the REA projects. Surely, there is a set of enabling factors rather than REA alone, but to a large extent, as seen from the narrated benefits in Section 2.3.2, it is very plausible that the only major source of the changes in business performance is REA projects.

Table 2-5: Performance of Business Enterprises before and after REA

Description	Before REA	After REA	% Increase after REA projects
Average weekly sales (TZS)	197,110	279,726	42%
Employment (Average no. of persons working in the business)	1.7	10.4	4.77 times or 477%
Profits (TZS)	569,863	807,865	41.8

Table 2.6 shows that weekly sales for business enterprises increased by 42% after REA. Employment in terms of the number of people working in the businesses increased more than four times; and profits shot up from an average of TZS 569, 863 per business to TZS 807,865, and increase by 41.8%. Therefore, the impact of REA projects on business enterprises has been outstandingly big.

2.3.4 The Use of REA-funded Sources of Energy by Business Enterprises and Impact on Environment

Unlike the case of households for which consumption of modern sources of energy has impacted positively on environment, the impact emanating from business enterprises is somehow the opposite. The results of the analysis of energy use by business enterprises in Table 2-7 does not show significant reduction in consumption of environmental-unfriendly sources of energy except for diesel. Obviously the new businesses have increased kerosene consumption when there are power cuts, while grid electricity has reduced use of generators in business enterprises. But the major concern is whether business enterprise will make use of modern sources of energy beyond lighting to include cooking which consumes a big volume of biomass; if they do so, the impact on environment would be profound.

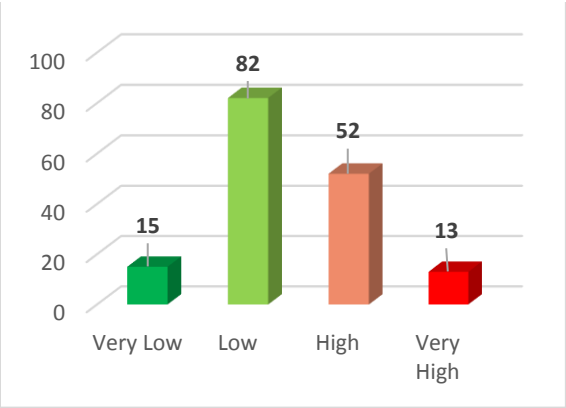
Table 2-6: Changes in energy consumption by Business Enterprises after REA

Description of consumption of energy	N	Mean values	
		Before REA	After REA
Consumption of Firewood in bundles	1	0	2 (+)
Consumption of charcoal in tins	5	2.3	2.08 (-)
Consumption of Kerosene in liters	38	2.5	2.63 (+)
Diesel consumption in liters	9	21.3	10 (-)

2.3.5 Views on the current price of electricity and assessment of enterprises' price sensitivity

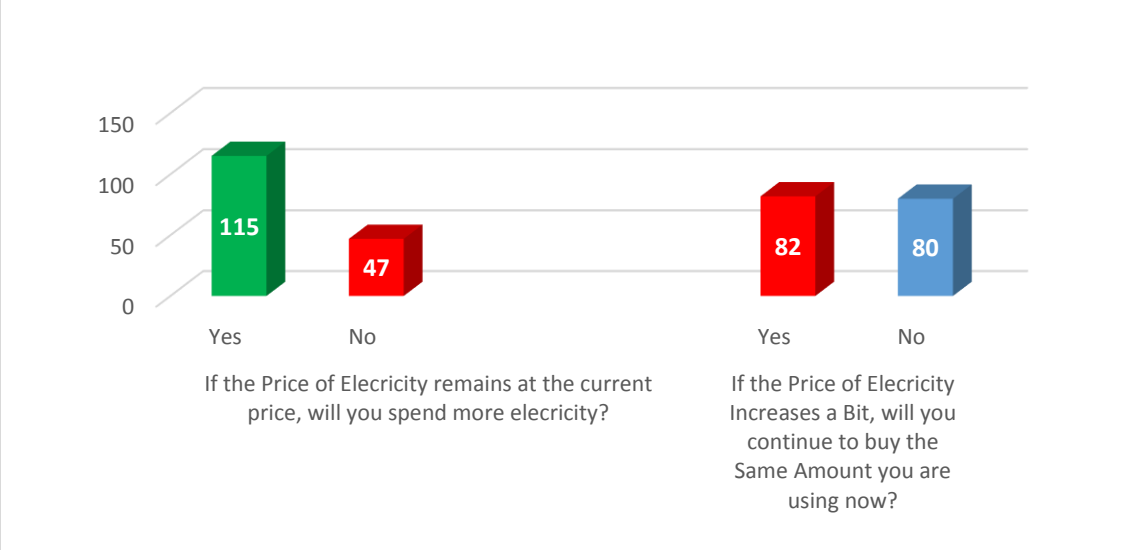
The evaluation survey sought to assess the views of business enterprises as to whether the current electricity charges are low or high to them. As indicated in Figure 2.21, the proportion of enterprises indicating that the current price is either low or very low is slightly above half (97) of all the respondents. The rest opined that the price is either high or very high. Therefore, the results do not show a general trend that the current price is outright affordable by many of the business enterprises.

Figure 2-20: Views on the Price of Electricity: Number of Enterprises Indicating (N=162)



Further in Figure 2-22, is an analysis of the price sensitivity of the business enterprises interviewed in the evaluation survey. There are two panels in the figure; the left side is an assessment of whether enterprises will spend more on electricity if the current price remains the same; and the right side is an assessment of whether a marginal increase in price will affect consumption of modern energy. The results asserts that a handful of the enterprises will not consume more even if price remains unchanged; but if there would be a marginal increase in price, the divide would be fifty-fifty, implying that half of the respondents wouldn't consume more energy. The results are inconclusive with regard to price sensitivity because overall, the consumption by the enterprises would be indifferent, given a marginal price increase, with some buying less and others buying more.

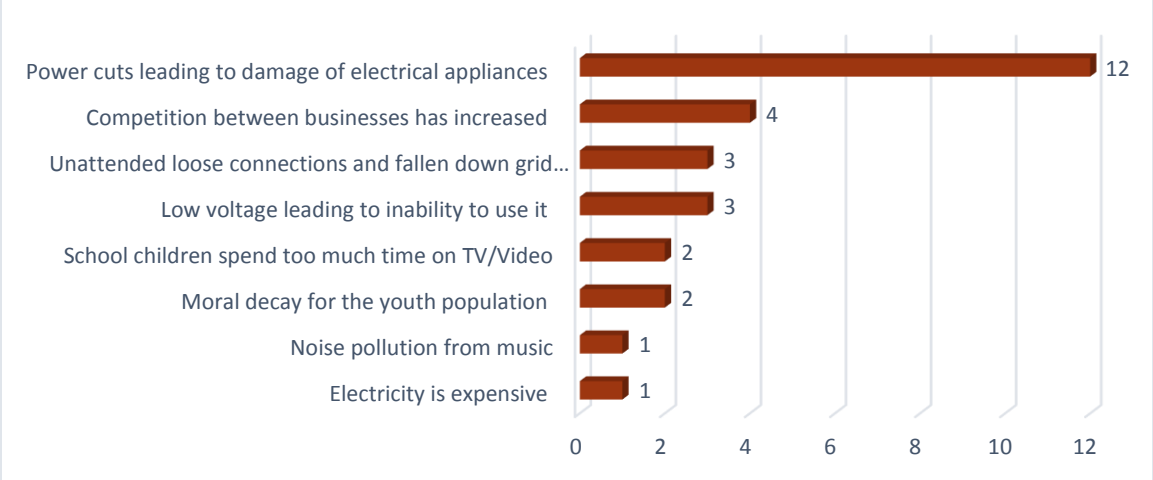
Figure 2-21: Assessment of Business Enterprises Elasticity with Respect to Contingent Changes to the Price of Elasticity (Number of enterprises responding: N=162)



2.3.6 Negative Outcomes of REA Projects at Business Enterprise Level

The coming of REA projects is also associated with negative aspects, just like the unwanted changes enlisted at household level earlier on in this report. Figure 2-23 shows a summary of the negative effects of the REA projects, in order of the magnitude, at business enterprise level and the number of indicating enterprises. The most mentioned negative effects include damage of electrical appliances due to power cut, competition has increased due to incoming new businesses and improved performance of the existing ones, risks from unattended loose connections, low voltage, and the tendency of children to spend too much time on TV and Radio. Others include moral decay for the youth population, noise pollution from music and

Figure 2-22: Number of Business Enterprises Indicating Disadvantages of Rural Electrification



also the burden of paying electricity bills.

Despite of the few disadvantages narrated by business enterprises, the impact of the performance of the business sector is outstanding and consistent with the on-going government effort to diversify rural economies and also to establish small, medium and large industries in the economy.

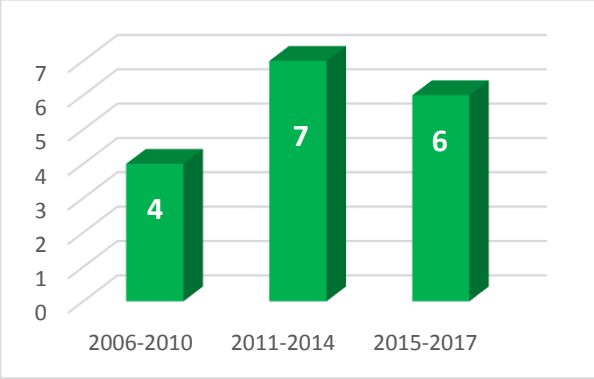
2.4 The Outcomes and Impact of REA Projects on Delivery of Public Services

Phase One of REA included several projects in schools, health facilities, district headquarters and villages. The projects included connectivity to grid and solar electricity, biogas and biomass. This section of the report analyses the benefits and impacts emanating from the projects, whose objective was to improve service delivery. The discussion is organized in three subsections to cover outcomes and impact on district headquarters, schools and health facilities.

2.4.1 Outcomes of REA Projects in District HQ

With Phase One of REA projects, seventeen district headquarters were electrified between 2006 and 2017. This was implemented in phases as depicted in Figure 2-24, which shows the number of district HQs electrified and the respective time period of implementation. Many of the projects were completed after 2010.

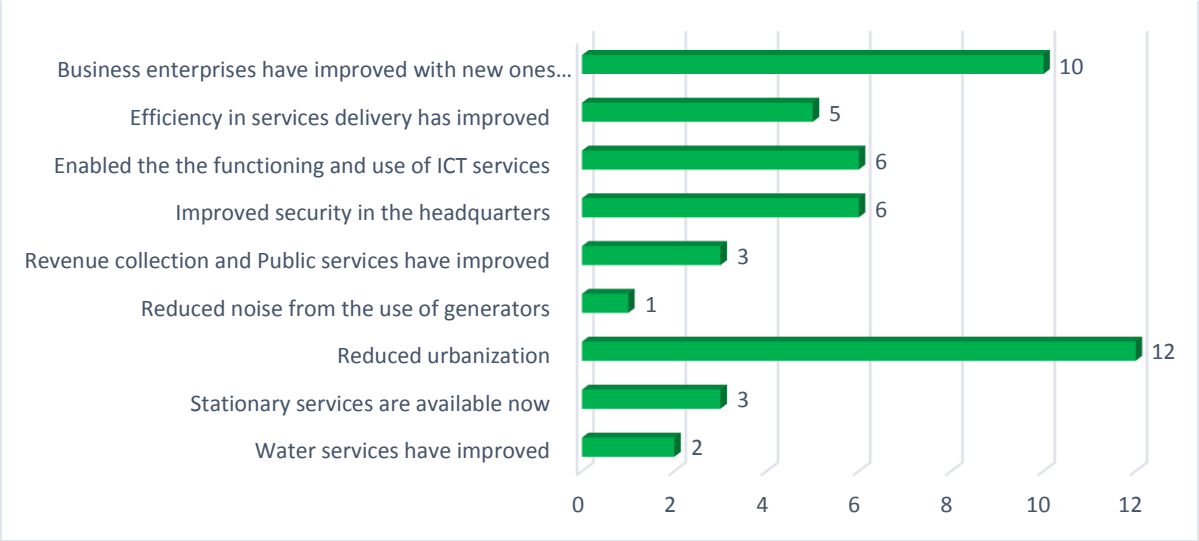
Figure 2-23: Number of District Headquarters Connected to Electricity by Period of Years



Electrification of district HQs through connectivity to grid lines has had impact on not only the HQ offices, but also households, schools, health facilities and business enterprises surrounding the area. Since the rest of the benefits are discussed in separate sections in this report, the focus here is outcomes at the HQ offices.

The benefits emanating from electrification of district headquarters are depicted in Figure 2-24; which shows the most frequently reported benefits and the number of districts indicating them. On the top of the list is reduced urbanization; which implies that a grid line has to pass through several rural villages before reaching the target HQ; and in doing so, the villages in which the grid line pass through are automatically electrified, leading to creation of potential economic opportunities and enhanced livelihoods and living environment, which discourage rural-urban migration.

Figure 2-24: Outcomes of the Electrification of District HQs: Number of Districts Indicating Benefits



We depict from Figure 2-25 that, with the onset of electricity, district offices got convenient connection to ICT services which has improved working efficiency. The working environment has also improved due to reduced noise from generators, improved water services and security at night. Stationary services including photocopying are easily available. It was also reported that revenue collection has improved in some of the districts because new business enterprises have been established and some of the old ones have improved as indicated earlier on. Overall, therefore, electrification of district HQs has improved service provision around the HQs on one side; and also improved performance of the surrounding business enterprises and livelihoods on the other side.

2.4.2 Outcomes and Impact at School Level

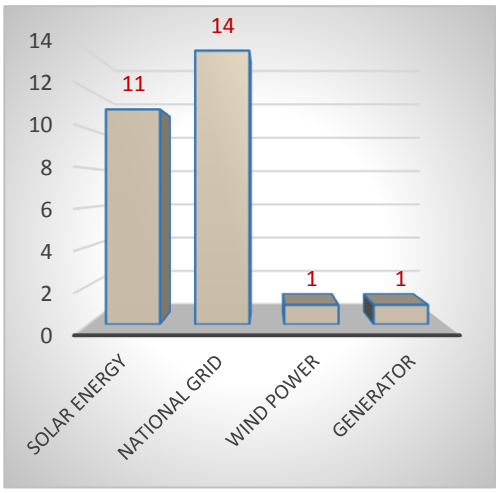
Phase One of REA came with eight school-level projects including Electrification of Oswald Mang'ombe Secondary School; Electrification of Mother Kelvin Primary School; Electrification of Mkingaleo Secondary School; Installation of Solar PV charging system at Wama Nakayama Girls Secondary School-Coast Region; Installation of Solar PV System Kabangwe and Titye Secondary Schools in Kigoma Region; Construction of Biogas plant in Queen of Family Girls Secondary School; Construction of biogas plant at Ubungo Islamic High School in Kinondoni District; Training, Supply and Installation of 1kW Wind Turbine and 80W Solar Hybrid System at Mtumbatu Secondary School. However, with the incoming of electricity, several other schools connected to electricity.

The projects supplied schools with different sources of energy as indicated in Table 2-8 and further in Figure 2.26. Many of the schools were connected to the national grid while 11 got solar power, one wind power, and one got a generator. Most of the beneficiaries were government secondary schools. It was observed that some of the schools had benefited from installation of solar power projects but later on were connected to the national grid. As such, some of the schools benefited from more than one source of modern energy.

Table 2-7: Distribution of the Beneficiary Schools of REA Projects by Source of Energy

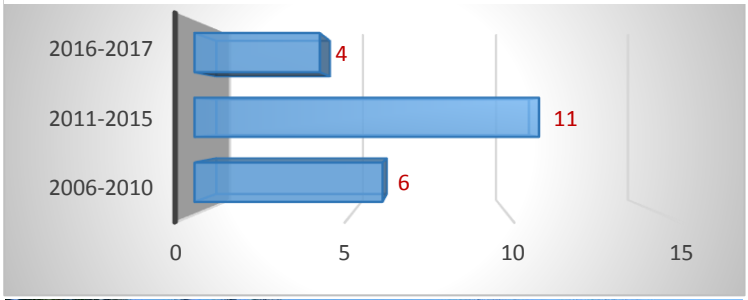
Type of School	Source of Energy Used by Schools				Total
	Solar Energy	National Grid	Wind Power	Generator	
Government Primary School	1	2	0	0	3
Private Primary School	1	1	0	0	1
Government Secondary School	8	8	1	1	13
Private Secondary School	1	2	0	0	2
Higher education	0	1	0	0	1
	11	14	1	1	20

Figure 2-25: Number of Schools Using Source of Energy



The schools started to benefit from REA projects since 2007 when phase one began. Schools were connected to electricity at different period of time as depicted in Figure 2.27, in which between 2006 and 2010, 6 schools got electricity; between 2011 and 2015 were 11 schools; and 4 schools were connected between 2016 and 2017.

Figure 2-26: Number of Schools Getting Electricity by period of Years



The schools used energy for various purposes ranging from lightning, facilitation of teaching, refrigeration, pumping water, heat and security (Figure 2.27). The outcomes of the use of electricity in schools are depicted in Figure 2.28. The responses were compiled from the interviews made with school head teachers and one selected member of staff for each school. The reported benefits from REA projects include increased working hours for teachers and students, increased school performance in exams, security due to robbers and wild animals, increased use of ICT, improved water services, and reduced costs of stationary in schools. Other benefits include enhanced support services to students, access to local and international news, increased use of electrical appliances, and reduced smoke and noisy from diesel generators in schools.

Figure 2-28: Number of Schools Indicating How Energy/Electricity is used

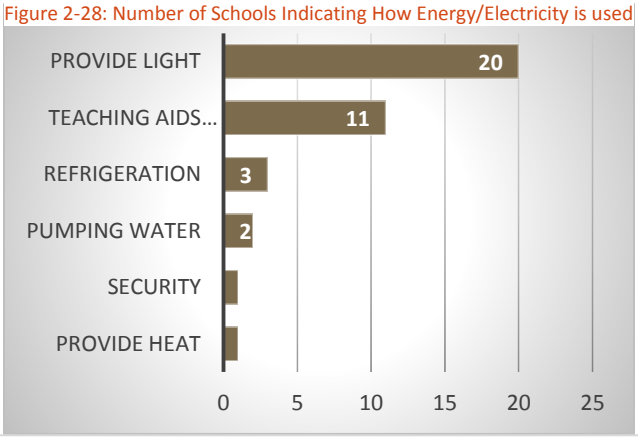
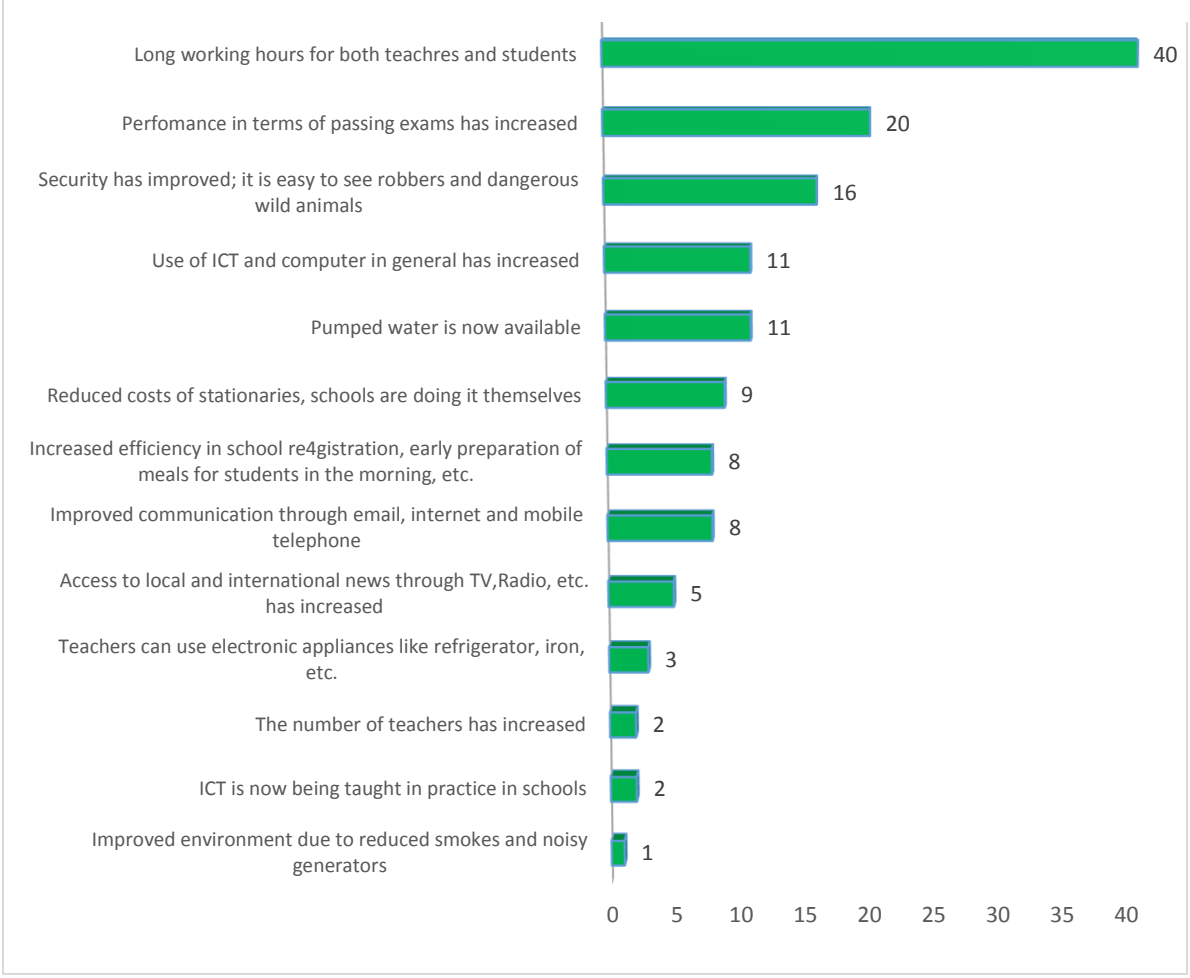


Figure 2-27: Figure Number of Respondents Indicating Benefits of Electricity

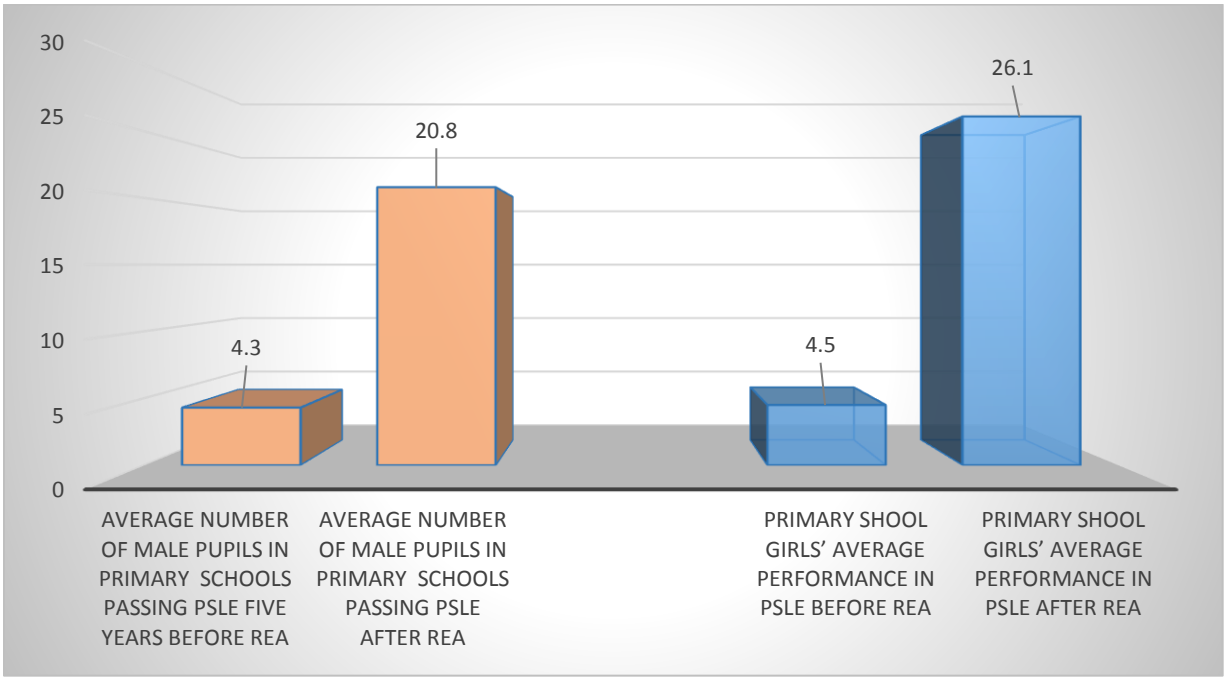


2.4.3 Impact on primary school performance

In order to gauge the impact of the REA projects on school performance, the evaluation study collected information on the number of pupils and students passing final stage exams in both primary and secondary schools for five years before the REA project and same data after the project. The evaluation study worked out the five-year average number of pupils/students passing the exams for each category of students per school, primary versus secondary schools, before the REA projects. Also, the average number of students passing the exams per school for each category, was computed for all years covering the period after the REA projects. The two scenarios of performance before and after REA projects were then compared with gender taken into consideration.

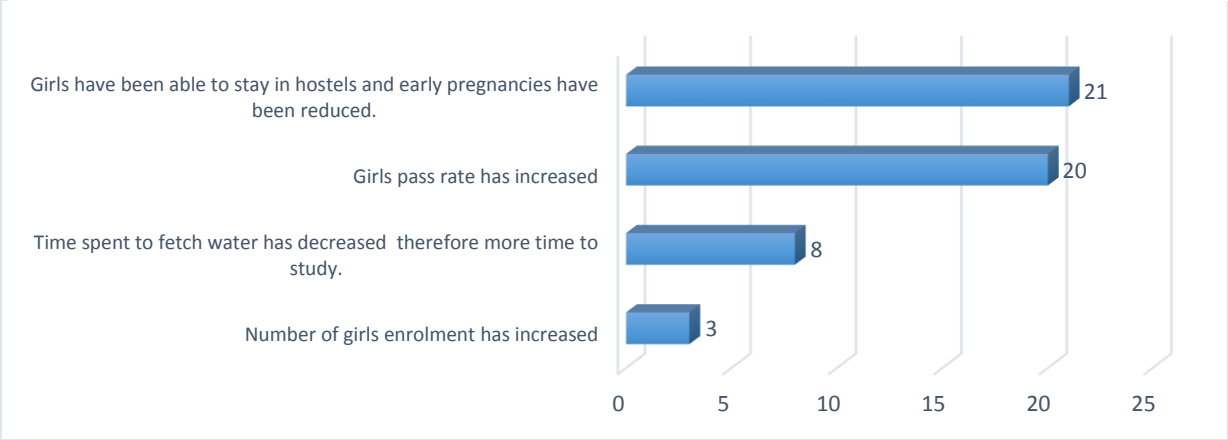
The evaluation results shows that on average, the number of male pupils passing PSLE, five years before REA, was 4.3; after the REA projects, the average number of pupils passing the exam went up to 20.8 as shown in the left panel of Figure 2.29. Analogously, the average number of female pupils passing the PSLE per school increased from 4.5 to 26.1. Therefore, the impact of REA on school performance is consistent with the reported benefits of school electrification as enlisted and expounded earlier on in the previous sections. Primary school performance in exams has increased with the onset of the REA projects.

Figure 2-29: Change in Primary School Performance after REA Project



There are several facilitating factors for female pupils as narrated by the schools during the interviews. The factors are summarized in Figure 2-30, which shows that with electricity, girls have been able to stay in hostels and early pregnancies have been reduced; time to fetch water has declined in favour of more time to study; and girls' enrolment in schools has also increased.

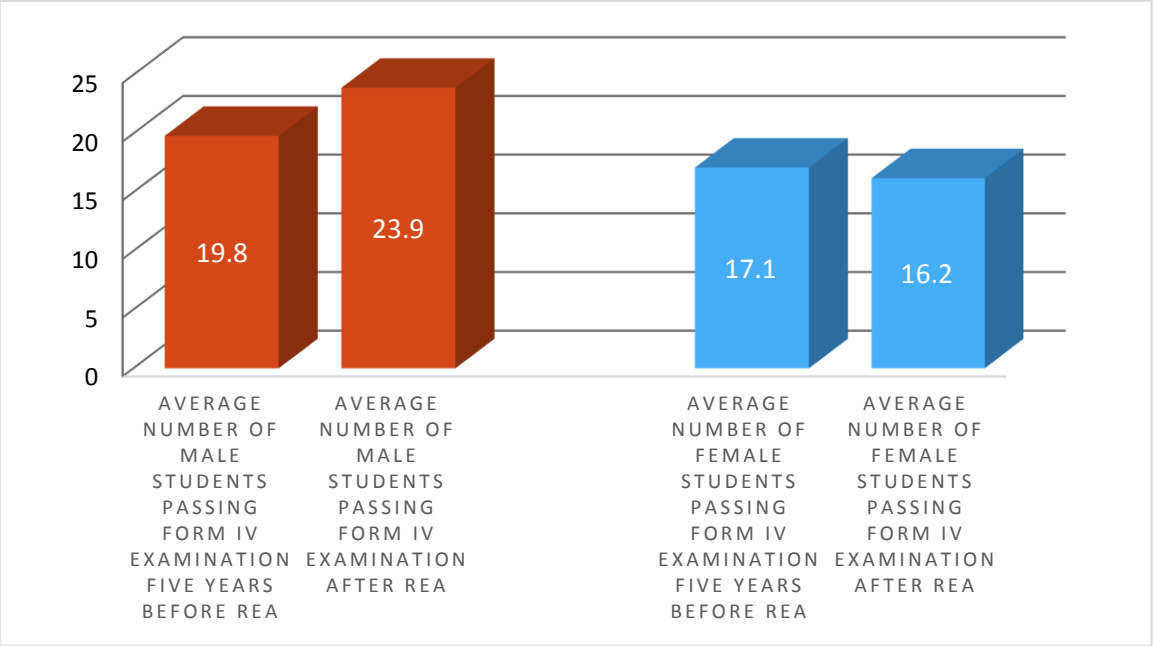
Figure 2-30: Number of Respondents Indicating Benefits of School Electrification to Girls



2.4.4 Impact on secondary school performance

The impact on secondary school performance is depicted in Figure 2-31, which shows two panels for boys and girls performance, respectively. The left panel of the figure indicates that the average number of male students passing form exam per school has increased from 19.8 before REA projects to 23.9 after the projects. However, the same average number for female students declined marginally from 17.1 to 16.2 during the period. Although the decline in girls' performance is marginal, still the results are paradoxical; presumably, secondary school girls are vulnerable to modernity compared to boys.

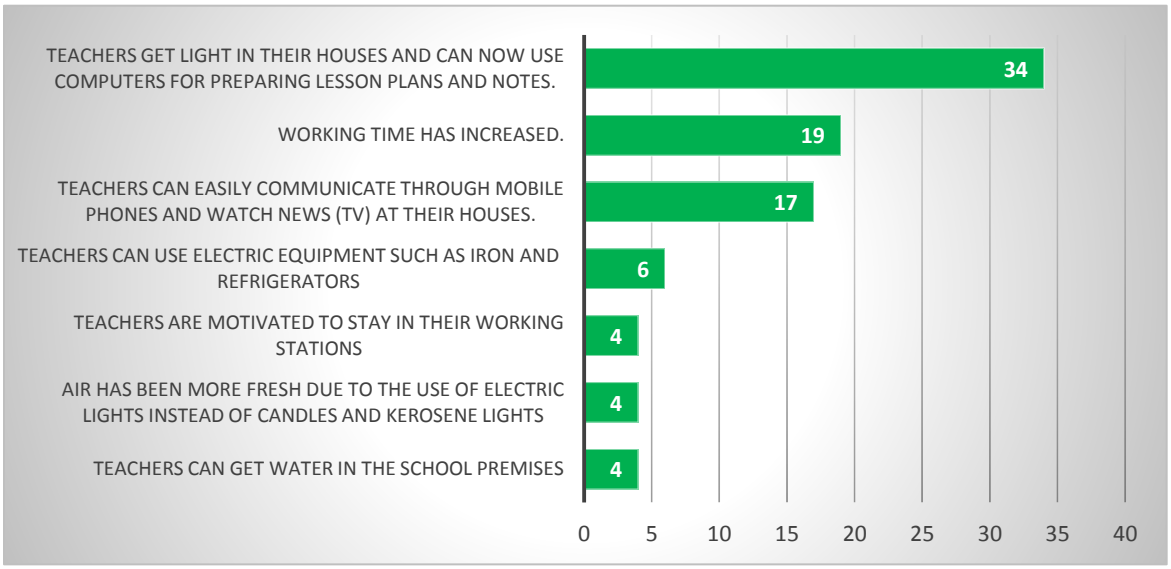
Figure 2-31: Change In Secondary School Performance After REA Project



2.4.5 Benefits of school electrification to teachers

The onset of REA projects in schools saw teachers benefiting from several improvements in their working conditions as analysed in Figure 2-32. With electricity, teachers have improved space lightning in their houses and can use electrical equipment for preparation of lessons; working time has increased, communication and access to news and information have been

Figure 2-32: Number of Respondents Indicating Benefits of School Electrification to Teachers

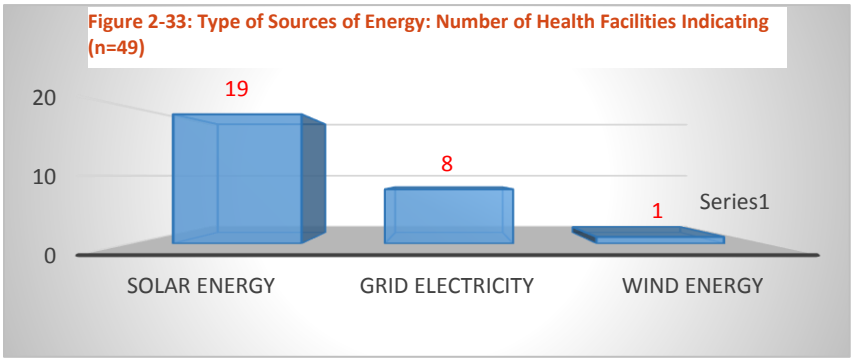


eased; they have fresh air in their houses due to reduced smoke pollution, they have water in their houses, etc.

In general, with the onset of connectivity to electricity (both solar and grid) teachers are now motivated to stay in their work stations compared to the situation before. The respective schools have more attractive working environment which motivates teachers and their students not only to stay in school, but also to work hard.

2.4.6 Outcomes and Impact on Health-service Delivery

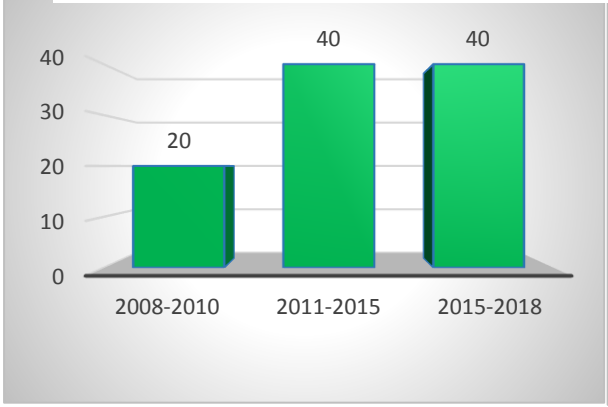
Phase One of REA involved six projects of supplying health facilities with solar power, grid extension and wind energy. These were Installation of Hybrid System Solar (320WP) and Wind (1KWP) at Mtumbatu Dispensary in Kilosa District, Morogoro Region; Supply and Installation of Solar PV Systems at Mkamba Health Centre, Mbezi Msufini and Panzuo Kibuyuni Dispensaries; Supply and Installation of PV System at Bukoli Health Centre in Geita Region; Supply and installation of distribution networks for power supply and dispensary at Mtawanya Village in Coast Region; and LRTC 2010: Installation of Solar PV Systems to 40 Dispensaries in Tunduru and Mbinga Districts in Ruvuma Region.

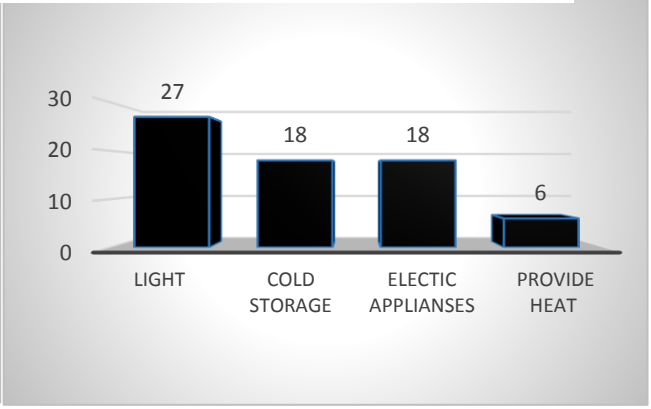


The evaluation survey visited 28 health facilities which were the beneficiaries of the REA projects, including solar power (19), grid (8) and wind energy (1) (Figure 2-33). The beneficiary health facilities include public hospitals, government dispensaries and a private dispensary. The evaluation study found that the health facilities started to benefit from REA projects since 2007; but many of the facilities got electricity after 2010. In particular the period 2011-2018 is the time when most of the health facilities started to benefit from REA electricity according to the analysis depicted in Figure 2-34.

Figure 2-34 further shows type of uses of modern energy in health facilities with electricity from REA. The main uses include space lightning, cold storage, electric appliances and provision of heat. Availability of electricity in health facilities brought profound changes to the facilities as expounded next.

Figure 2-34: Percent of Health Facilities Indicating Period Of Connectivity to Electricity





Availability of Medicine has improved after the REA projects

There are certain medicines line Oxytocin which need cold storage throughout. This is possible if the respective dispensing health service outlet is well equipped with cold storage facilities with connectivity to reliable source of power. REA projects has made this possible and sustainable in health facilities which had no power supply before.

Solar batteries at Mkamba health centre

Improved Availability of Medical Equipment after REA

The connectivity to electricity has improved availability of electricity-powered medical equipment in the health facilities. These include equipment for CD4, Blood Rotation, Oxygen,C entrifuge, Hemocure, Sterilization, Computer, Microscopes, Refrigerators, Examination lamps, Quality control reagents, Air conditions and fans, photocopy machines, and electric jags for boiling water.

Medical equipment's in Mkuranga health centres

Safe motherhood after REA Project

Of all the benefits of REA projects in health facilities, the main one, as emphasized by health facilities, is on the maternal health care. With connectivity to electricity, expectant mothers are no longer asked to come to health facilities with kerosene lumps and candles during delivery. All the necessary vaccinations during pregnancy and after delivery are now available and delivered on time. Delivery services are available throughout even at night because of electricity, and therefore home deliveries have been reduced. As such, maternal and child mortality are decreasing.

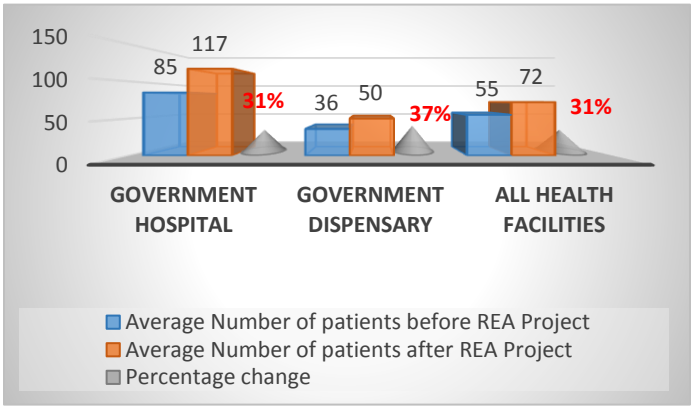
Health facilities' medical and clinical staffs have been motivated

The evaluation study found that medical and clinical staff working in health facilities with electricity from REA projects have been motivated because of among other incentives, the following: the working environment has good lights and (air condition/Fan) with improved security; working medical equipment have increased, and residential houses for medical staff have electricity.

Impact on patients' attendance in health facilities

With improved health services due to the REA projects, patients' attendance for medical consultations in health facilities increased by 31% in all the beneficiary facilities as depicted in Figure 2-35. This appears to be more-or-less the same change in all the categories of health facilities with REA projects. The number of in-patients admitted to health facilities has also increased.

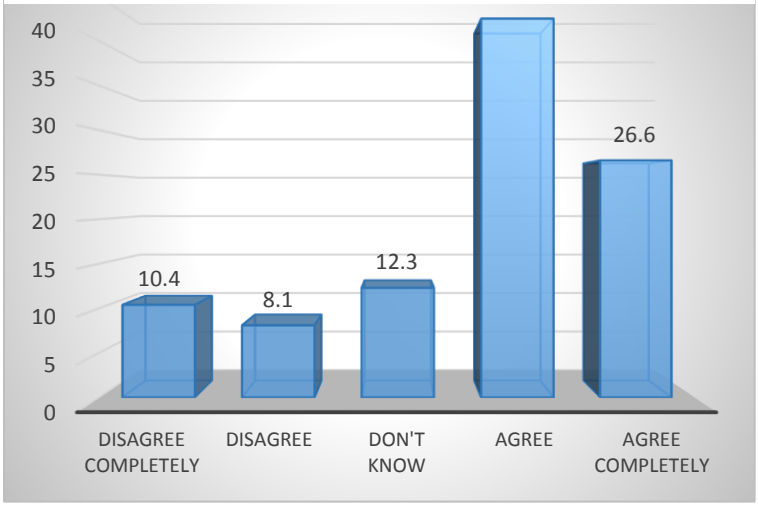
Figure 2-35: Changes in the Average Number of Patients Attendancy in Health Facilities after REA Project



Households' general assessment of the health facilities after the REA projects

The evaluation study interviewed households in villages with health facilities, which benefited from REA projects, to indicate the extent to which health services had improved as a result of the projects. The interviews were general, in which respondents were asked to agree or not agree that health services in the respective health facilities had improved – of course there was no a control mechanism for those who have not consulted for medical care since the incoming of the REA projects – which introduces a bias. However, the results of the analysis depicted in Figure 2.36 show that about 69% of the responding households indicated that there has been improvement in health services after connectivity to modern sources of energy.

Figure 2-36: Households' General Assessment of Whether Health Services Have Improved After REA Project (% Responding)



2.5 Findings on Biogas and Biomass Projects

Between 2011 and 2017, REA financed construction of biogas plants in Kwimba, Kinondoni and Songea districts. During the same period, the Agency provided training on production of charcoal briquette in Kilosa district; and training on construction of rocket tobacco bans in Tabora Region. The projects were undertaken with an objective of enhancing utilization of energy-efficient technologies in rural areas.

2.5.1 Training on Construction of Biogas Plants

As part of its capacity building activities, REA undertook training on construction of biogas plants in selected rural areas. In doing so, the Agency constructed biogas plants in Queen of Family Girls Secondary School in Kwimba district, Ubungo Islamic High School in Kinondoni district, and seven biogas plants in Songea Rural. The evaluation survey found that all the plants constructed by REA were operational, except for Ubungo Islamic school which had problems with its neighbouring community with regard to environmental and hygienic issues partnering to leaking water – claimed to be contaminated.

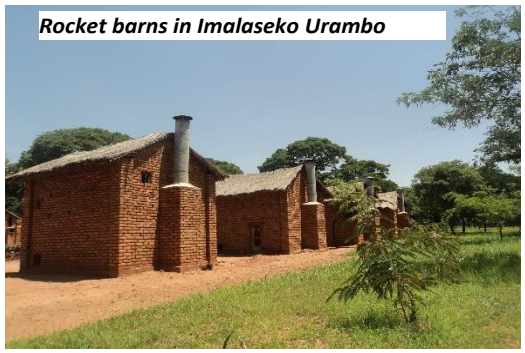
The rest of the plants in Kwimba and Songea Rural were smoothly operational, in which the beneficiaries were using the gas produced for cooking and lighting. The operational costs for the maintenance of the plants were considered reasonable and small by the beneficiaries. The interviewed beneficiaries of the biogas plants said that the use of biogas has reduced the costs and side effects associated with the use of charcoal and fire wood. With the use of biogas, cooking has been made easy, efficient and less costly. Also, as result of using biogas,

respondents reported that they had made financial savings which would otherwise be spent on gas bills and other sources of energy. The use of biogas has been associated with several health benefits including reduced red eye and inching problems from firewood and charcoal smoke, respiratory issues of inhaling dirty air from smokes, headache from stimulating wood and dangers from firewood collections. Other benefits are environmental such as reduced tree cutting for firewood and charcoal which contribute to the efforts of reducing climate related changes from deforestation.

The broader objective of the projects was to develop and put in place the technical capacity needed to construct and maintain biogas plants in the selected regions and districts. The spread of the technology and construction of such plants has been very limited; mainly due high initial costs of construction, of about TZS 1.2m – 1.8m, needed to put a plant in place. In fact, earlier on in this report, it was found that an ordinary household consuming just on the basic-needs poverty line needs about TZS 2.9m per year to survive; implying that about 50% of the household annual income would be needed to construct a biogas plant. This is ideally too much to afford for many of the households in the beneficiary districts.

2.5.2 Training on Construction of Rocket Tobacco barns in Tabora Rural District

Training on construction of rocket tobacco barn in Tabora Rural District aimed to increase use of improved Tobacco Curing barns through building local capacity on construction and correct use of the Rocket barns. The objectives of the project was to reduce the rate of tree-cutting to meet energy demand for curing tobacco leafs, without neither reducing productivity nor compromising the quality of Tobacco leafs. As a result, a number of tobacco farmers were selected for the training and diffusion of the technology.


Rocket barns in Imalaseko Urambo

The evaluation survey visited four beneficiary farmers in Isikizya Primary Society in Uyui district, three farmers in Ilalwansimba Primary Society and three in Wakapenda Agricultural and Marketing Cooperative Society (AMCOS). Following the construction of the barns and adoption of the tobacco drying technology, the beneficiaries reported that the quality of tobacco leaves had improved in quality and price; there has been time saving because of the efficiency of the barns which do not require frequent attention once lightened up. Also, the new technology uses less fuel wood preserve fire/heat longer than the traditional barns.

Nevertheless, the technology has not been popular yet, because it is said to be expensive as it requires about 2,000 burnt clay bricks to construct one barn. This amounts to an average cost of TZS 300,000; and including construction costs of about 30%; it comes to total costs of construction of about TZS 390,000. This has to be spent in a short period during construction; most of the farmers say that it is expensive. Consequently, the technology of the rocket barn has not spread widely as expected.

2.5.3 Training on Production of Charcoal Briquettes

During phase one, REA conducted training to Trainers of Trainers (TOT) on production of charcoal briquettes. This was intended to inspire the participants to engage in the production of charcoal briquettes and at the same time train their colleagues from the participating groups on the same. REA had planned to give the successful learners some initial capital for establishing the production.

The evaluation interviewed some of the participants, who opined that the training was successful, but the seed money was delayed too much, to the extent that some of the trainees had lost hopes and engaged in other activities –and some had forgotten the skills they had acquired. When the funds were made available; it was only two groups which could reconvene, although they could not effectively engage in charcoal production because they needed retraining – which wasn't there. They then opted to carry out agribusiness in horticulture. As a result, production of charcoal briquettes as a business did not take off under REA initiatives.

3 Summary of the Outcomes and Evaluation of the REA-funded Projects

The previous sections of this report have shown the results and outcomes of the implementation of phase one of REA projects at household level, business enterprises and public service delivery outlets. This section presents analysis of the overall effectiveness, efficiency, relevance, impact and sustainability of the results and outcomes of the implementation of the projects.

3.1 Relevance of the REA projects

The findings of the evaluation have indicated that the total number of customers applying for electricity in the visited sites had reached an average of 30,000 per year; these include households, business enterprises and public service delivery outlets. The benefits emanating from the REA projects are enormously outstanding and highly addressing the local needs of people and their communities. At the household level, the living environment has improved with the onset of space lightning from REA projects, reduced smokes from reduced use of kerosene and candle lights has improved health status of people; also, the home studying environment for children has improved. It has been found that time for fetching water has decreased leading to lees workload to girls. With the same effect, though small, is the reduced consumption of firewood by households in which women and girls in particular, are disproportionately involved as source of labour. As such, the two effects have given girls more time for schooling. These are just a few of the outcomes of REA project discussed earlier in this report.

The onset of the REA electricity projects has led to profound impact on rural household business enterprises. The average earning per business has increased by 40%; also employment has shoot up. Therefore, there has been a positive impact on rural livelihoods and diversification in economic activities in general. Rural electrification has created opportunities and alternative sources of income for rural people.

At the policy level, implementation of the REA projects and their results are fully consistent and well aligned with the national development policies. As such, an exhaustive discussion will amount to a complete length separate document; but a few key policies are worth mentioning here to underscore the linkages and relevance to the outcomes of REA projects.

3.1.1 Alignment with the Vision 2025

The results of the survey have shown considerable improvements in the quality of living in the survey rural areas which have been beneficiaries of the REA projects as shown by indicators such as mushrooming of rural enterprises, substantial increase in peoples' incomes, increasing employment, availability of services like water, electricity and education. These outcomes are in conformity with the Vision 2025, which aims at improving the lives of people particularly the rural population to reach the level of a middle income country.

3.1.2 The Rural Development Policy

The findings of the evaluation have shown significant improvement in the livelihoods of rural communities including discouragement of rural-urban migration. This is well consistent with the country's Rural Development Policy. By realizing affordable and reliable electricity in rural areas, the development process has been speeded up.

3.1.3 The Youth Development Policy and Programmes

Electrification of rural households has led to mushrooming of rural enterprises with potential opportunities for youth. The incoming of REA projects has improved education services to benefit the youth population at large.

3.1.4 The Education Sector Policy

Electrification of rural households and schools as a result of REA funded projects have proved to contribute significantly in the improvement of working and studying environment for both teachers and students in schools. These improvements are confidently related to analysed results on the improvements of the performance of students in primary and secondary schools. These results are considerably aligned to the country's education sector policy in Tanzania. One of the sector's goals is to increase the number of students and their transition from one level to another; implying that students must pass their examinations at the different levels. REA projects have been a complement to these initiatives.

3.1.5 The Health Sector Policy

Electrification of rural health facilities has enhanced service provision to patients and working environment of the health sector workers. Currently, services such as cold storage of vaccines, medicines and safe blood which could not be provided because of the lack of electricity are being provided. Also, obstetric care services have been improved significantly because of electric light where women can access 24hrs maternity services more safely, and thus reducing mortality and morbidity rates in the supported areas. Also, it is now possible to use several electricity-driven medical equipment, which have increased and improved medical services in those facilities. These outcomes are clearly in line with the efforts of the Tanzania's health sector policy aimed at, among other things, providing quality health care services to its citizen in rural and urban areas.

3.1.6 The Environment Protection Policy

Promotion of energy-efficient technologies such as construction and use of rocket tobacco barns and biogas through REA projects have reduced use of firewood for drying tobacco and cooking, which are consequentially likely to reduce deforestation. These outcomes are in line with the policies aimed to promote sustainable use of the environment to a large extent.

3.1.7 The Private Sector Development Policy

Mushrooming of rural enterprises particularly establishment of small industries such as carpentry, milling and tailoring and service-related businesses such as groceries, pharmacy stores, air saloon, phone accessories have considerably promoted the development of the

private sector in the country. The findings of the evaluation are considerably in line with the current government efforts of promoting industrialization.

3.2 Effectiveness of the REA projects

The Rural Energy Agency (REA) and the Rural Energy Fund (REF) were established and entrusted with the role of promoting, stimulating and facilitating improved access to modern energy services in rural areas. This entails empowerment of private and public sector participation to improve energy supply in rural areas; and ultimately improve the livelihoods of the rural population. Looking on the results of the analysis of the evaluation survey data, a considerable proportion of the targeted communities and households have been given access to electricity; and about 30,000 new customers are been connected every year. This achievement is well aligned with the REA's objective of promoting, facilitating and stimulating access to modern energy in rural areas. The noted improvement in livelihoods and the decreasing consumption of environmentally-unfriendly sources of energy is also an attainment of the objective of REA. To this effect, the results and outcomes of the REA-funded projects are to a large extent fulfilling the objectives of the establishment of the Agency.

The REA projects on promotion of energy efficient technologies is also significant, although it is slow in adoption by the target communities. This is where REA will focus its efforts once a community has already been connected to electricity. But even though, there are tangible benefits which have already been reported in this report; they are results of the on-going efforts to promote energy-efficient technologies, training and the technical backstopping provided through REA.

However, some of the projects have not performed so well. The charcoal briquettes projects have not delivered according to their objectives; there were delays in execution and weak follow ups. Some of the energy efficient technologies are expensive to the target beneficiaries; and not all households are getting connectivity to electricity – the extreme poor are completely excluded. These are challenges ahead, which will have to be addressed with a view of maximizing the anticipated benefits.

3.3 Efficiency in the Implementation of the Projects

Of the planned and implemented 42 projects of REA during its Phase One, 36 of them or 86% were completed while the rest, or 14%, were implemented with some gaps and underperformance. The completion of projects enabled connectivity to electricity of about 82.1% of all the targeted customers in rural areas during phase one of REA, the use of biogas in selected schools, and the use of energy-efficient technologies in biomass. Therefore, phase one of REA was 86% effective in completing the installation of the planned projects and 82.1% in achieving connectivity to electricity for targeted customers during implementation. There are significant variations between regions, in which some regions had as low as 50% achievement rate in electricity connectivity.

3.4 Impact of the Projects

The results of the evaluation survey data have indicated that there have been significant impacts on rural livelihoods, family and social life, environment and public service provision. Employment and incomes from household business enterprises have increased, and people are now enjoying life than before because of space lightning. The impact on environment in terms of reduced consumption of energy from inefficient sources is notable. School performance has increased while health services have improved with patients' attendance increasing by 30%. Water services have recorded significant improvement – time for fetching water has declined by more than 50%. This impact combined with the reduced time to collect fire wood has potentially reduced workload for women and given girls more time to study. Therefore, the impact of the REA projects is outstanding.

3.5 Negative/Unintended Outcomes of the REA Projects

The REA projects, however, have had a few negative outcomes as noted in the analysis of the evaluation survey data. These include sleeping in darkness and spoiling of food when there is power cut, moral decay on the side of youth because of loitering around and exposure to bad behavioural practises, noise pollution from bars and shops which close late at night, and insects hanging around and bite people when lights are on. Other negative effects include risks from unattended loose connections, low voltage, and the tendency of children to spend too much time on TV and Radio.

3.6 Sustainability of the REA Projects and the Achievements

The outcomes and achievements of the REA Projects are generally sustainable and continuous provided a few shortfalls are addressed as explained next.

The main threats of the achievements of the REA projects include likely theft of the transformer lubricant oil and sometimes the grid wires, and uprooting of the gridline poles. If these are not properly controlled and monitored, they are likely to recur and put the beneficiary communities into darkness and stand-still of some of the emerging business enterprises, in particular small and medium industries. This will drug back the impact of the REA initiatives.

The solar power installation projects have had profound impact on the performance of the beneficiaries. But the technology is relatively expensive to install let alone that its usage is limited to certain appliances. Sustainability of the installed solar power facilities is highly questionable because the costs of replacing the batteries are too high and difficult to be met by the beneficiaries. There is no any mechanism in place to ensure that funds are put aside or generated to service the solar power facility or even to replace some of the ageing panels and equipment. Already some of the installed solar power facilities are no longer in use because they need replacement of the batteries. The technical backstopping developed by the REA capacity building projects is not available free of charge, they must be hired and paid.

When grid electricity is connected to areas or facilities where solar power had been connected before, the solar power is abandoned –to serve as emergency source of power or abandoned completely. These abandoned solar units were provided by REA, and could be serviced and shifted to needy communities in other areas.

The results of the evaluation study have shown that if there would be a marginal increase in the prices of electricity, a significant number of consumers will reduce their consumption of electricity at both household and enterprise level. Reduced consumption will amount to increased consumption of other forms of energy – biomass in particular. This will compromise the impact emanating from the projects.

The biogas projects and the Rocket tobacco barn technology have been very effective, but they are said to be expensive to most of the people in the target areas. More research on scaling down the costs of installation is needed to make the technology financially friendly to rural people.

4 Lessons Learned and Recommendations

4.1 Lessons Learned

4.1.1. The demand for connectivity to electricity is higher than anticipated in some of the areas. This has been a challenge on the side of the contractors and TANESCO to meet the demand. The premier connectivity while the contractor is on site works well if the down payment is made on time; otherwise, connectivity when the contractor has left becomes exorbitantly expensive to poor households. Also, awareness campaigns before and during implementation of REA projects in rural areas is vital to increase people's awareness of the benefits and thus their positive participation in the projects.

4.1.2. Timely solutions to land disputes and processes of compensations in paving way to install gridlines is paramount I ensuring timely and less costly delivery on the side of both REA and contractors.

4.1.3. The current prices of electricity are generally affordable, but majority of customers are price sensitive; any price increase is likely to reduce consumption of electricity. Meanwhile, the extreme poor cannot affords connectivity to electricity even at the current rate of TZS 27,000 for installation when the contractor is on site. Special attention is needed to this group to resolve affordability and connect them to electricity.

4.1.4. Connectivity to REA funded electricity does not depend on the quality of houses; as such, and in principle, there are no denials to electricity connectivity because of the quality of the respective house. This is creating an outright opportunity to most poor households to have access to electrification.

4.1.5. Electrification of rural areas has stimulated growth of enterprises including small scale industries. This has created employment opportunities to peoples and at the same time increase rural incomes.

4.1.6 Rural electrification is reducing consumption of biomass and diesel but at a small pace. However, the decrease in the consumption of kerosene is significant.

4.1.7. With electricity, demand for women's labour in firewood collection and fetching water is on the decrease. This is likely to give girls more time for study.

4.1.8. Rural electrification is improving school performance in exams. With electricity, both teachers and pupils have more time to work, and the use of school laboratories has become more effective.

4.1.9. The consumption of charcoal and diesel has marginally increased while the consumption of kerosene and firewood sold in bundles has marginally declined.

4.1.10. The biogas and biomass technologies are good and effective but expensive to the target beneficiaries. The roll out scale has been nil or too small.

4.2 Recommendations

4.2.1. Determine to increase connectivity to electricity during and after contractor has left the site by addressing the issues related to affordability and awareness creation. This needs close cooperation with TANESCO and other stakeholders.

4.2.2. Work with other MDAs to ensure timely settlement of land disputes and timely compensation to avoid unnecessary delays in implementing the REA projects.

4.2.3. Carry out promotive campaigns to encourage more usage of electricity and connectivity including other sources of modern energy, incentives and use of energy-efficient appliances to replace old sources of energy. In particular, encourage communities to connect their schools and health facilities to modern sources of energy.

4.2.4. Carry out more research on either scaling down the costs of installation of biogas and biomass technologies, or device a mechanism of increasing access to the technologies in rural areas by targeting appropriate customers.

4.2.5. Determine to minimize if not to eliminate negative outcomes from the REA projects. These include frequent power cuts, risks from unattended loose connections, low voltage, and timely connectivity to applying customers in the project areas.

4.2.6. Determine to address all unfinished business in all the REA projects. REA's performance is outstandingly notable, but there exists a few minor gaps to sought in most of the projects to iron out peoples' complains – some are just providing them with the right information on the projects' performance relative to their expectations.

4.2.7. Encourage contractors to work closely with beneficiary communities and their leaders during implementation. There should be effective campaigns and local participation throughout.

4.2.8. Device an effective mechanism/system of ensuring that rural people have access to affordable technical backstopping services for the REA projects and the appliances/usage emanating from the energy sources.

4.2.9. Connectivity of villages to electricity should go together with increased connectivity by rural households, institutions and business enterprises, and increased usage of the energy sources at all levels. A multi objective strategy should be in place. Put special emphasis on usage by small and medium industries in rural areas to underscore the on-going government effort to industrialize Tanzania.

5 Appendices

5.1 Sampling Framework

SN	Name of the Project	Type of Project	Type of beneficiaries	Sample size		DISTRICT
				Planned	Actual	
1	Electrification of Oswald Mang'ombe Secondary School	Public service delivery point School	Head teacher	1	1	Musoma
			One another teacher	1	1	
			Two selected students	2	2	
2	Electrification of Mererani Water Pump.	Public service delivery point Water pump	Households	20	18	Mererani
			Business entities	10	9	
			School	1	1	
			Health facility	1	1	
			Water pump attendant	1	1	
3	Electrification of Mkinga District Headquarters	Headquarters	MDA/LGAs offices	2	1	Mkinga
			NGOs, FBOs, CSOs and CBOs	2	1	
			Households	20	17	
			Business entities	10	7	
			Other (Public/private)	3	-	
4	Electrification of Mother Kelvin Primary School	Public service delivery point School	Head teacher	1	1	Same
			One another teacher	1	1	
			Two selected students	2	2	
5	Electrification of Orkesumet Water Pump	Public service delivery point Water pump	Households	20	17	Simanjiro
			Business entities	10	13	
			School	1		

SN	Name of the Project	Type of Project	Type of beneficiaries	Sample size		DISTRICT
				Planned	Actual	
			Health facility	1		
			Water pump attendant	1	-	
6	Electrification of Mkingaleo Secondary School	Public service delivery point School	Head teacher	1	1	Mkinga
			One another teacher	1	1	
			Two selected students	2	2	
7	Electrification of Konga Village- Morogoro Region	Village electric supply	Households	20	19	Morogoro Rural
			Business entities	10	10	
			Public service delivery outlets	2	1	
			Water services	1	1	
			NGOs, CSOs and FBOs	3		
8	Electrification of Rorya District- Mara Region	District Headquarter	MDA/LGAs offices	2	2	Rorya
			NGOs, FBOs, CSOs and CBOs	2	-	
			Households	20	20	
			Business entities	10	10	
			Other (Public/private)	3	2	
9	Electrification of Uyui District Headquarters	District Headquarter	MDA/LGAs offices	2	2	Uyui
			NGOs, FBOs, CSOs and CBOs	2	-	
			Households	20	19	
			Business entities	10	11	
			Other (Public/private)	3	1	
10	Electrification of Ngage "B"	Village electric supply	Households	20	14	
			Business entities	10	3	

SN	Name of the Project	Type of Project	Type of beneficiaries	Sample size		DISTRICT
				Planned	Actual	
			Public service delivery outlets	2	1	Simanjiro
			Water services	1	-	
			NGOs, CSOs and FBOs	3	-	
11	Electrification of Kibinda & Mkunguni Village	Village electric supply	Households	20	24	Pangani
			Business entities	10	5	
			Public service delivery outlets	2	2	
			Water services	1	-	
			NGOs, CSOs and FBOs	3	-	
12	Electrification of Kizumbi Village	Village electric supply	Households	20	18	Shinyanga
			Business entities	10	5	
			Public service delivery outlets	2	2	
			Water services	1	-	
			NGOs, CSOs and FBOs	3	-	
13	Electrification of Kishapu Village in Shinyanga Region	Village electric supply	Households	20	35	Kishapu
			Business entities	10	16	
			Public service delivery outlets	2	2	
			Water services	1	-	
			NGOs, CSOs and FBOs	3		
14	Electrification of Songwa Station in Shinyanga Region	Station	Households	20	20	Shinyanga
			Business entities	10	5	
			Public service delivery outlets	2	-	
			Water services	1	-	

SN	Name of the Project	Type of Project	Type of beneficiaries	Sample size		DISTRICT
				Planned	Actual	
			NGOs, CSOs and FBOs	3	-	
15	Electrification of Nyamahana Village in Iringa Rural District	Village electric supply	Households	20	20	Iringa Rural
			Business entities	10	10	
			Public service delivery outlets	2	2	
			Water services	1	-	
			NGOs, CSOs and FBOs	3	-	
16	Electrification of Nine (9) Villages in Sengerema	Village electric supply	Households	20	20	Sengerema
			Business entities	10	10	
			Public service delivery outlets	2	-	
			Water services	1		
			NGOs, CSOs and FBOs	3		
17	Construction of distribution and service lines complete with equipment on turnkey basis (Lot 12), Kigoma Region	Construction and distribution	Household	20	15	Kasulu & Kibondo
			Business entities	10	7	
			Private service institution	3	-	
			Public service delivery outlets	2	-	
			Water services	1	-	
			NGOs, CSOs and FBOs	3	-	
			LGAs /MDAs	2	2	
18	Electrification of Kibaoni village, Mpanda District	Village electric supply	Households	20	20	Mpanda
			Business entities	10	10	
			Public service delivery outlets	2	1	
			Water services	1	-	
			NGOs, CSOs and FBOs	3	-	

SN	Name of the Project	Type of Project	Type of beneficiaries	Sample size		DISTRICT
				Planned	Actual	
19	Electrification of Kilindi District Headquarters	District Headquarters	MDA/LGAs offices	2	2	Kilindi
			NGOs, FBOs, CSOs and CBOs	2	-	
			Households	20	20	
			Business entities	10	6	
			Other (Public/private)	3	-	
20	Electrification of Kilolo District Headquarters and Extension of power to Kidabaga Tea Factory in Kilolo District	District Headquarters	MDA/LGAs offices	2	2	Kilolo
			NGOs, FBOs, CSOs and CBOs	2	-	
			Households	20	20	
			Business entities	10	9	
			Other (Public/private)	3	1	
21	Electrification of Matema Beach	Village electric supply	Households	20	15	Kyela
			Business entities	10	8	
			Public service delivery outlets	2	-	
			Water services	1	-	
			NGOs, CSOs and FBOs	3	-	
22	Training and Installation of Wind Turbine at Mafinga Lutheran Church	Wind electrical energy	Church (FBO)	3	-	Mufindi
			Business entity	5	-	
23	Installation of Hybrid System Solar (320WP) and Wind (1KWP) at Mtumbatu Dispensary in Kilosa District, Morogoro Region.	Health facility	Clinical officer	1	1	Kilosa
			Nurse	1	1	
			Two selected patients	2	1	
24	Development of Solar Energy-driven	Irrigation	Household	20	-	

SN	Name of the Project	Type of Project	Type of beneficiaries	Sample size		DISTRICT
				Planned	Actual	
	Irrigation System for Rural Community in Kilombero District, Morogoro Region		Business entities	10	-	Kilombero
			Service provider	1	-	
25	LRTC 2010: Intra-professionals EA LTD in Geita, Sengerema and Chato Districts		Business entities	20	20	Sengerema
26	Installation of Solar PV charging system at Wama Nakayama Girls Secondary School-Coast Region	Public service delivery point School	Head teacher	1	-	Mkuranga
			One another teacher	1	-	
			Two selected students	2	-	
27	Supply and Installation of Solar PV Systems at Mkamba Health Centre, Mbezi Msufini and Panzuo Kibuyuni Dispensaries	Health facility	Clinical officer	1	1	Mkuranga
			Nurse	1	1	
			Selected patients	2	1	
28	Installation of six solar PVs in Mtanza and Msona Villages		Household	40 (20 interviews per village)	11	Rufiji
29	LRTC 2010: Project No. M40 – Sustainable Rural Credit for Solar Lighting Systems In Singida Region	Solar energy lighting	Household	20	20	Singida
30	Installation of Solar PV System Kabangwe and Titye Secondary Schools in Kigoma Region	Public service delivery point-School	Head teachers	1	1	Kasulu
			One another teacher	1	1	
			Selected students	2	-	
31	Supply and Installation of PV System at Bukoli		Clinical officer	1	1	Geita
			Nurse	1	1	

SN	Name of the Project	Type of Project	Type of beneficiaries	Sample size		DISTRICT
				Planned	Actual	
	Health Centre in Geita Region	Public service delivery point-Health facility	Selected patient	2	2	
32	Supply and installation of distribution networks for power supply and dispensary at Mtawanya Village in Coast Region	Public service delivery point-Health facility	Clinical officer	1	1	Mkuranga
			Nurse	1	1	
			Selected patient	2	-	
33	Co-finance for installation of solar PV system in 16 secondary schools and 16 health centres in Mpanda District	Co-financing	Schools	5	5	Mpanda
			Health centers	5	5	
34	Supply of Solar Energy Lighting Systems using "Mali Kauli" Credit System in Coast Region	Solar energy lighting	Household	20	-	Pwani
35	LRTC 2010: Installation of Solar PV Systems to 40 Dispensaries in Tunduru and Mbinga Districts in Ruvuma Region.		Dispensaries in Tunduru	5	5	Tunduru & Mbinga
			Dispensaries in Mbinga	5	5	
36	Marketing, sale and install 1200 solar lighting in Musoma Rural		Households/business entities	20	20	Musoma Rural (RORYA)
37	Construction of Biogas plant in Queen of Family Girls Secondary School	Public service delivery point-school	Head teacher	1	1	Kwimba
			One another teacher	1	1	
			Selected students	2	2	
38			Head teacher	1	-	

SN	Name of the Project	Type of Project	Type of beneficiaries	Sample size		DISTRICT
				Planned	Actual	
	Construction of biogas plant at Ubungo Islamic High School in Kinondoni District	Public service delivery point-school	Teacher	1	-	Kinondoni
			Selected students	2	-	
39	Training and Construction of 7 Bio Gas plants Songea Region	Training	Selected sites	3	4	Songea Rural
40	Training of 30 Participants on production of Charcoal Briquette	Training	Household	20	-	Kilosa
41	Training, Supply and Installation of 1kW Wind Turbine and 80W Solar Hybrid System at Mtumbatu Secondary School	Public service delivery point-school	Head teacher	1	1	
			One another teacher	1	1	
			Selected students	2	1	
42	Training Of Local Artisans On Construction Of Rocket Tobacco Bans In Tabora Region		Associations	3	4	Tabora