Confidential

Evaluation of Lighting Africa Program

Final Report

Report to International Finance Corporation

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Glossary

BOP	Base of the Pyramid populations
CBA	Cost Benefit Analysis
CBO	Consumer based association
IRR	Internal Rate of Return
LA	Lighting Africa
LA Advisory Council	Group of off-grid stakeholders that met regularly to advise on direction of LA programs
LA Associate	An off-grid stakeholder that received benefits of the LA programs. For instance, a manufacturers of LA-certified lamps are LA associates
LA logframe	Tracks results achieved by the LA programs against targets. LA team refers to this as Logic Models
LA programs	Lighting Africa Kenya and Lighting Africa JV (this evaluation does not include Lighting Africa Ghana)
Last-mile suppliers	Distributors, bulk-buyers, and retailers that directly reach the end-users living in off-grid areas
Market transformation	Catalyzing development of the solar lamp market
MFI	Microfinance Institution
NGO	Non-government organization
Off-grid stakeholders	Manufacturers, distributors, retailers, donors, and financial institutions participating in the off-grid lighting market
Rest of Africa	Refers to all countries in Africa outside of Kenya and Ghana. This region is targeted by the LA JV activities
Supply Chain	Manufacturers, distributors, and retailers of solar lamps
TOR	Terms of Reference

Executive Summary

Castalia evaluated Lighting Africa—specifically the Lighting Africa Kenya and Lighting Africa Global/JV programs.[1] We found that these programs were highly successful. Targets for bringing quality solar lamps to households in Africa that were previously without electricity were exceeded. The economic rate of return on the project is quite plausibly as high as 2,000 percent. Lighting Africa transforms markets so that existing consumer spending on kerosene fuel is used to purchase solar lamps. Most benefits come from savings in fuel costs for households switching from kerosene to solar lamps. The payback period on a solar lamp for a typical family is just 5.5 months. Thus, small amounts of donor funds spent on market transformation leverage vastly larger expenditures on improved lighting products. Other benefits include improved quality of light; increased hours children spend studying at night; avoided risk of household fires, and the additional benefit of a means for charging cell phones.[2] Interviews with solar lamp manufacturers, distributors, and retailers confirmed that Lighting Africa was crucial in transforming the market.

We recommend that the program be scaled up as quickly as possible. Key improvements that should be made as the program is scaled up are: better results monitoring and reporting; adding a consumer-facing quality-seal; adding access to finance for manufacturers and distributors; and developing an effective transition to industry ownership of the Lighting Africa certification and consumer facing quality-seal.

Evaluation Against DAC[3] Criteria

The widely-used Development Assistance Committee's (DAC) evaluation framework involves assessing donor-funded programs against five criteria: **Relevance, Effectiveness, Impact, Efficiency and Sustainability**. Our findings from evaluating Lighting Africa against these criteria are discussed below.

The Lighting Africa programs are relevant. 'Relevance' is whether the aims of the programs align with the aims of its stakeholders. Lighting Kenya aligns well with the Government of Kenya's objectives including: (i) supporting electrification of rural areas through renewable energy technologies (ii) promoting development of local capacity to maintain and operate basic renewable energy technologies, such as solar systems, (iii) facilitating implementation of pilot projects to promote efficient use of energy, and (iv) facilitating imports of energy efficient, cost-effective technologies.[4]

[1] This evaluation focused on activities carried out by the IFC under the Lighting Africa Kenya and Lighting Africa JV program, from May 2007 to July 2013 (the timelines stated in the Project Completion Reports). The World Bank also played an active part in the Lighting Africa JV program. However, the scope of our evaluation does not include World Bank activities

[2] Some of the solar lamps have a feature for charging cell phones

[3] The DAC (Development Assistance Committee) Criteria for Evaluating Development Assistance were established by the Organization for Economic Cooperation and Development's (OECD) Development Assistance Committee. These criteria were first laid out in the DAC Principles for Evaluation of Development Assistance of 1991 and are widely used in evaluating donor-assisted programs. More information on the DAC criteria can be found here: http://www.oecd.org/development/evaluation/daccriteriaforevaluatingdevelopmentassistance.htm

[4] Objectives were identified in Kenya's 2006 Energy Act and confirmed during Castalia' interviews with the Kenyan Ministry of Energy

Both programs align with IFC's Private Enterprise Partnership for Africa (PEP Africa), which aims to promote private sector investment in services (including energy), and to promote energy efficiency, among other objectives.

The aim of enabling household to get high quality, safe, low-cost lighting is relevant to the needs of base of the pyramid consumers in Africa.

The programs were relevant to the firms in the supply chain, since the programs were well-targeted at removing key market barriers through their nine components: (i) market intelligence, (ii) business development, (iii) quality assurance (QA), (iv) consumer education, (v) access to finance, (vi) development marketplace, (vii) policy development, (viii) communication, and (ix) private sector development.

The programs were effective, and made an impact. The programs achieved 98 out of 114 output and outcome targets, and seven of the nine impact targets.[5] A few of the key accomplishments were:

- Through the programs' quality assurance efforts, 183 solar lamps were tested and **66 of them passed and received the Lighting Africa certification**. This is 47 percent more than the target number of certified lamps set at the start of the program
- Furthermore, Lighting Africa Kenya hosted **1,157 forums** during its consumer education campaigns, directly reaching **36,433** people in Kenya, six times more than targeted
- Over 680,000 LA-certified lamps were sold in Kenya, **135 percent above the Lighting Africa Kenya program's target sales**. Furthermore, almost two million lamps were reported to have been sold in other African countries—**185 percent above Lighting Africa JV's target.** This is a huge success for the programs as it measures the number of high-quality products getting into the market.

We tested the results reporting, and found it was generally reliable. However, results reported for two of the indicators should be revised downwards. The *Value of IFC financing facilitated* for LA Kenya was reported to be US$5 million, but should have been zero. Although a US$5 million financing facility for distributors was approved during the LA programs, the facility has since been put on hold, and no funds have been disbursed.

Secondly, the *Number of people receiving access to improved services* as a result of LA activities is most likely overstated. The program reported a result of 13,399,250 people. This is the total number of LA-certified solar lamps sold multiplied by the average size of a Kenyan household (five people). However, interviews with consumers in Kenya revealed that some of the people who purchased solar lamps were connected to the grid, and used solar lamps as a back-up during electricity outages. These people did not gain access to improved services in the sense of having modern lighting for the first time. In reality, ***more work is needed to determine the extent to which solar lamp sales can be attributed to the programs***. The program should not claim 100 percent of sales as an impact of the program. We are confident that some good quality solar lamps would have been sold in Kenya even if Lighting Africa had not existed. In this report, we assume that 50 percent of sales of LA-certified lamps can be attributed to the LA programs. Interviews with consumers, retailers, and manufacturers suggest that Lighting Africa was a very important influence on market development. The true extent the impact may

[5] Note that during result verification, one reported impact result was adjusted to zero: IFC financing facilitated for LA Kenya. This adjustment was made because no funds were disbursed from the financing facility during the time of the LA programs

well be higher than this. However, further studies are required to provide a more accurate percentage.

The Lighting Africa Programs were efficient, with a benefit-cost ratio estimated at 87:1. Efficiency refers to whether the intervention used the least costly resources possible to achieve desired results. Put differently, it involves assessing if Lighting Africa delivered the most value for funds spent. The programs cost a total of US$9.4 million to operate. The economic benefits created could be around US$807 million (assuming that just 50 percent of the Lighting Africa certified lamps sold can be attributed to the programs). These levels of efficiency are achieved because (i) the return on investment for a solar lamp could be as high as 20 times the amount invested over the life of the lamp, and (ii) donor funds are used to transform the market so that existing spending on kerosene goes instead to purchase solar lamps, rather than using donor funds to pay for the lamps themselves. The market transformation approach provides a leverage of over US$29.5 million[6] in investment in lamps for each dollar spent on market transformation. We also found that the programs' administrative costs were reasonable, and the percent of funds spent on administration was lower than similar programs. The management and operational structure was mostly efficient, although the staffing structure could be improved.

There are opportunities for improvement in the consumer education programmatic approach. TV advertisements were used to publicize solar lamps, to encourage city dwellers to purchase solar lamps as a gift for friends and family living in off-grid areas. We are unconvinced by a strategy of TV advertising for products targeted at those who do not have electricity. On the other hand, our research showed that working with local self-help groups[7] in Kenya was very effective in reaching the target market. More emphasis should be placed on this channel.

Benefits achieved are sustainable. The issue now is to transition toward continued market transformation without reliance on donor funding. Sustainability refers to measuring whether the programs' benefits are likely to continue after donor funding has been withdrawn. Interviews with market participants suggest that the gains achieved so far would continue even the programs stopped. People who have used solar lamps will continue to do, and suppliers will continue to supply.

A more ambitious target is to turn the process of market transformation into something that can continue without donor funding. IFC is promoting industry associations to do this: the Global Off-Grid Lighting Association (GOGLA) and the Kenya Renewable Energy Association (KEREA). The aim is for GOGLA to take on market research, other activities, including (i) quality assurance testing and developing standards, (ii) business linkages, (iii) improving the investment climate for solar lamps, and (iv) helping suppliers raise finance. However GOGLA is a work in progress, and current plans point to the association needing donor financing itself for some time to come.

KEREA is a local organization established in 2002 by the renewable energy committee of the Kenya Bureau of Standards (KEBS). The LA team identified the association as a sustainability partner, since some LA activities fit well within KEREA's mission. KEREA is focused on (i)

[6] Assuming an average price of US$22 per solar lamp, and that 50% of sales reported in the programs' logframes are actually attributed to LA

[7] These include women's groups, non-government associations (NGOs), employee groups in large companies, MFIs, and others

raising awareness of members in industry standards, policies, and renewable technologies, (ii) training solar technicians, (iii) lobbying Government to improve business environment, (iv) facilitating business linkages. Our evaluation revealed no concerns to KEREA's ability to manage these activities.

Lessons Learned and Recommendations

This evaluation showed that the programs were highly effective, and leveraged donor funds to yield large-scale results. We recommend that the programs be rapidly scaled-up. As this is done:

Three key success factors need to maintained. The first, obvious success factor is operating in areas where there is proven strong demand for improved off-grid lighting solutions. The second is having a carefully designed set of interventions which simultaneously target all major market barriers. Since barriers will differ from market to market, the team should start with the basic program design, but tailor the components to target the specific barriers identified in the target countries. The third is the focus on market transformation. The Lighting Africa programs do not fund solar lamps—they fund activities that create effective markets in which consumers spend their own money to buy solar lamps. To sustain this success factor, the ever-present temptation to spend money buying lamps for poor people will need to resisted, while pro-market interventions like micro-finance to assist purchase of solar lamps need to be pursued vigorously.

Three design components in the programs need to be improved:

- ***An "on-the box" quality seal is needed***. Lighting Africa needs a consumer-facing, recognizable quality-seal that lets consumers know which lamps then can trust. This would be similar to consumer electronic industry certifications, like those that indicate compliance with WiFi standards, and would achieve maximum value from the successful certification system.
- ***Consumer education activities need to focus on effective channels***. While effective channels will differ from market to market, experience in Kenya suggest that partnering with existing associations and micro-finance providers can turbo-charge consumer education and uptake. Big events and TV advertising may be less effective. Or consumer surveys showed there is still a lot of work to do on consumer awareness, even in Kenya.
- ***Access to Finance needs to be boosted for the supply chain and consumers.*** Efforts to mobilize finance to the supply chain were not very successful. Fortunately the LA team has recently facilitated a US$30 million financing facility to manufacturers from IFC, Responsibility, and the Shell Foundation. This should be complemented with micro-finance initiatives to help consumers afford the up-front cost of solar lamps (loans can be repaid from savings from reduce kerosene purchases. For instance, a local consumer facility could be established in countries where Lighting Africa is being implemented. This facility could provide micro-loans to BOP consumers who want to purchase solar lamps but cannot afford the upfront costs.

Monitoring and evaluation needs to be improved in three key ways:

- ***Attribution of sales to Lighting Africa program should be improved***. Before starting in a new country, baseline studies in the target country should be undertaken. At the same time, baselines studies in one or two other similar countries that are not targeted for

intervention should be done. Sales should then be tracked in the target and non-target countries. The difference in sales growth between target and non-target countries would provide a more robust estimate of the percentage of sales can be attributed to the LA program

- ***Estimation of sales to un-electrified households should be improved***. This can be done through 'follow the product' exercises with a sample of LA-certified solar lamps, to see how many of them are used in off-grid areas and, therefore, are providing first-time access to improved lighting.
- ***Comprehensive Cost-Benefit Analysis of Lighting Africa should be done***. The simple cost-benefit analysis done for this evaluation suggestions that the programs had impressively high benefit cost ratios. It is worth doing a comprehensive analysis—with more work on attribution—to see if these findings can be validated. If they can be, the results would create a strong case for scaling up funding of Lighting Africa, and for a search for similar market transformation programs that could be supported.

There is also scope to improve monitoring through more careful definition of the theory of change, and a smaller, more focused set of output, outcome and impact indicators.

Operations can be improved in the areas of key staff and information management. Risks from staff turnover, particularly key staff such as program managers, should be better managed. All key program documents need to be stored in a central, easy-to-access location. Data needs to be reported consistently across program documents. Information technology systems and staff processes need to ensure that key data is frequently backed-up to the central location.

Recommendations for Program Scale Up

Given the program success, we recommend that the IFC and donors expand the LA programs rapidly. As mentioned earlier, the program delivered benefits that far outweighed program costs. The programs cost a total of US$9.4 million to operate. The economic benefits created could be around US$807 million (assuming that just 50 percent of the Lighting Africa certified lamps sold can be attributed to the programs). While a more robust cost-benefit analysis is required to determine the true cost-benefit ratio of this program, our conservative approach suggests that this program is delivering benefits that far outweigh those of similar donor funded programs.

The Lighting Africa program has the opportunity to ***scale out***—that is, expand its reach to other target markets in Africa and other parts of the world. Efforts are already underway in other African countries; and the program is already been replicated in other regions (Lighting Asia/India and Lighting MENA).[8]

Furthermore, Lighting Africa also has an opportunity to ***scale up***—that is, move up the ladder of energy access. The program's impact was not just in transforming the market for solar lamps, but also in supporting the development of larger solar home systems.

Assuming that the program is scaled, characteristics that will enable a **rapid scale up** of this unique and successful program are discussed below.

[8]IFC / Lighting Global Product Testing Policy and Intellectual Property Policy. Accessed on September 2, 2014 at www.lightingglobal.org/wp.../ifc-lightingglobal-ip-policy-june2013.pdf

First, the Lighting Africa team needs to be **specialized**. The LA program approach and its activities are distinct from the IFC and the World Bank's typical business activities. For instance, for the consumer education component, the program needs experts that can educate BOP consumers about a new product, and get them to change their behaviors. The LA team must include experts in each component area (or at least people who can acquire the skills on the job and use them in other countries going forward). Not having a specialized team will lead to efficiency losses. Each new team member has to learn about the program activities and the different approaches to implementing the program.

Lighting Africa should have regional hubs, as is currently been done with Lighting Asia/India and Lighting MENA. Each regional hub should have at least one LA component specialist that will be deployed to work on engagements in countries within the region, as needed. The component specialists will design a strategy for each new country context, then work with the local country team to implement this strategy.

Each country team should have at least one **dedicated full time staff member that is solely focused on LA activities**. Since we have established that team members have to be specialized, it will be more efficient to have one or two full time staff, than several staff working part time. This dedicated team structure was one of the success factors in the LA Kenya pilot. Over the three to four years that the program managers worked in Kenya, they developed an in-depth understanding of the market transformation activities. The LA Kenya team has developed a specialized skillset that makes them well placed to support program implementation in other countries.

1 Introduction

Castalia was engaged by the International Finance Corporation (IFC) to perform an independent evaluation of Lighting Africa Kenya (LA Kenya) and Lighting Africa JV (a joint venture between the IFC and the World Bank).

These LA programs were designed to remove barriers to the solar lamp market in Kenya, and other countries in Africa[9] with the end goal of providing increased access to improved lighting sources to base of the pyramid (BOP) populations in Africa. When the program was implemented, over 587 million[10] people were living in off-grid areas of Africa, and many of them used kerosene lamps for lighting. These kerosene lamps pose many health risks to users, and emit greenhouse gases (GHG) into the environment. Solar lamps provide an affordable, healthy, and higher-quality lighting source for consumers.

LA Kenya focused on implementing market and business development activities in Kenya, creating consumer awareness, and generating demand for off-grid lighting products while supporting local distributors and stakeholders. LA JV focused on cross-cutting components of the Lighting Africa program: quality assurance, sustainability, industry association and market intelligence.

IFC engaged Castalia to evaluate the performance of LA Kenya and LA JV, and to draw lessons learned and make recommendations for the scale up of Lighting Africa. This evaluation focused on activities carried out by the IFC under the Lighting Africa Kenya and Lighting Africa JV program, from May 2007 to July 2013. The World Bank played an active part in the Lighting Africa JV program. However, the scope of this evaluation does not include the World Bank's activities. Henceforth, unless otherwise stated, "LA programs" refer to the LA Kenya program, and IFC's activities under the LA JV program.

This report explains the findings of the evaluation. The report begins with a background on the programs (Section 2) and a description of the programs' design (Section 3). Next we explain the methodology used to complete this evaluation (Section 4). Sections 5 through 6 present our analysis of the programs' relevance, effectiveness, impact, efficiency, and sustainability. The lessons learned and recommendations for scaling up the program are provided in Sections 9. Additional details from the evaluation that were not included in the body of this report are located in Appendix A through Appendix I.

[9] Burkina Faso, Democratic Republic of Congo, Ethiopia, Liberia, Mali, Nigeria, Senegal, South Sudan, Tanzania, and Uganda.

[10] Statistic from the International Energy Agency (IEA). Accessed at : http://www.worldenergyoutlook.org/resources/energydevelopment/accesstoelectricity/

2 Background

In 2007,[11] the IFC and World Bank created the "Lighting Africa" (LA) programs designed to transform the off-grid lighting market in Africa by introducing high-quality and affordable solar lamps to the market. These solar lamps offered people at the base of the pyramid (BOP) an alternative to the costly and unhealthy lighting products (such as kerosene lamps) traditionally used in off-grid areas in Africa. The programs officially closed in July 2013, but post-implementation (that is, completing activities that were still ongoing at official close), continued until mid-2014.[12]

Prior to launching the LA programs the IFC assessed five countries,[13] and found that Kenya and Ghana were best suited for the Lighting Africa intervention. Thus, Lighting Africa Kenya (LA Kenya) and Lighting Africa Ghana (LA Ghana) were selected as pilot programs. Both countries had a large off-grid population, strong private sector interest in the market, and market potential (given the high spending levels on traditional lighting products). In addition, IFC had just spent the past two years working in Kenya and Ghana working with off-grid stakeholder to promote interest in the solar lamp market.

Through LA Kenya and LA Ghana, the IFC educated consumers on the benefits of solar lamps, performed market and consumer research, supported solar lamp manufacturers, distributors, and retailers (the supply chain), and worked with governments to encourage support of the program and to advise on a supportive policy regime for solar lamps.

In addition to LA Kenya and LA Ghana, the IFC and World Bank created the Lighting Africa Global/JV (LA JV) program to support activities that were not country-specific. These activities included developing industry quality standards for the solar lamps, fostering industry associations to support the market for off-grid lighting products, market intelligence activities, and advising governments on a supportive regulatory environment for solar lamps.

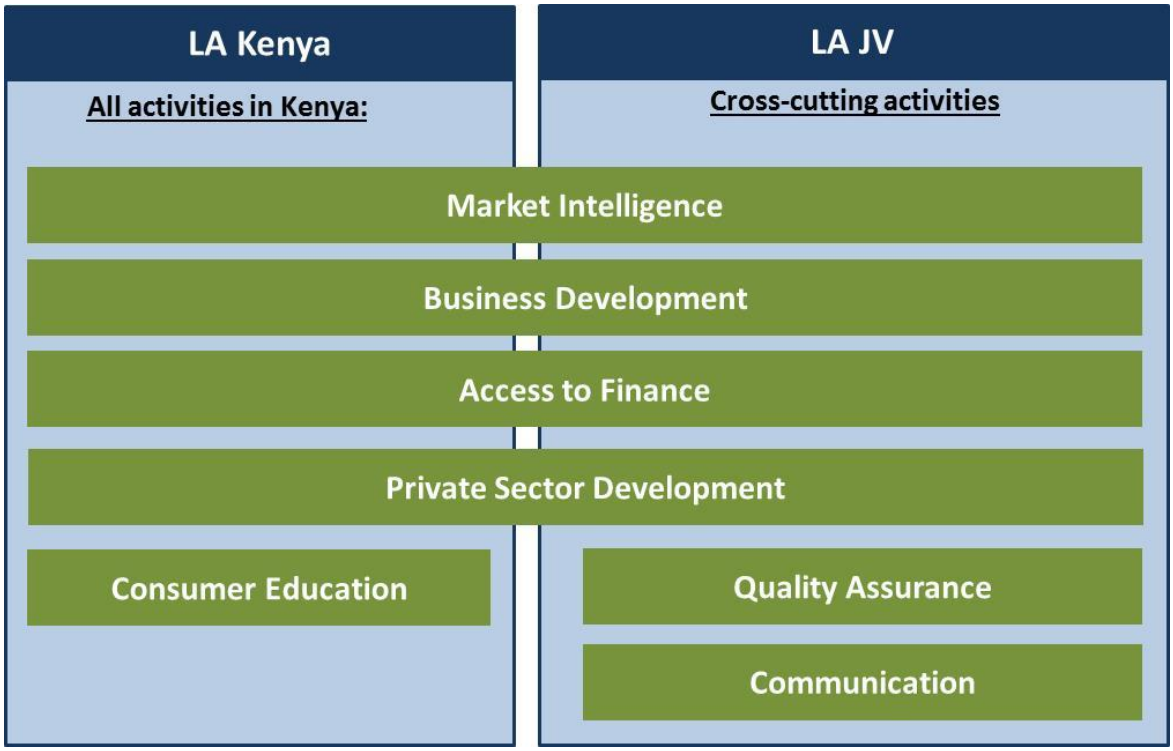
Figure 2.1 below highlights the elements of the LA programs our evaluation covered.

[11] LA Kenya and LA Global both started in 2007 according to their respective Logic Models. LA Ghana started in 2007 according to the IFC Summary of Advisory Services Project.

[12] Specifically, LA Kenya wrapped up activities for policy development and business development, and LA JV completed quality assurance, website, and business development activities. This information came from a screen shot of IFC's system showing the post-implementation budget and spending sent by IFC via email on 15 August 2014

[13] These countries included Kenya, Ghana, Uganda, Tanzania, and South Africa. See LA Kenya Program Implementation Plan

Figure 2.1: Components of the LA Programs covered in this evaluation



Note: These are the components with specific targets in IFC's logic models for LA Kenya and LA JV

The programs consisted of nine "components" designed to target and remove market barriers. We explain the nine components in Section 3. However, as illustrated in this diagram, this evaluation covered only seven[14] of the components.

The following sections expand on the background of the LA programs. We first explain the conceptual framework of the programs, describing the need and opportunity that existed in the market, and how the IFC and World Bank designed a program to address these needs (Section 2.1). We illustrate how the LA components were designed to transform the solar lamp market, in essence the program's "Theory of Change" (Section 2.2). Next, we describe the timeline of the program (Section 2.3) highlighting dates when each program component came online. Finally, we explain the structure of the LA teams (Section **Error! Reference source not found.**) and how resources were budgeted and allocated (Section 2.4).

2.1 Conceptual Framework of LA Programs

This section explains the conceptual framework of the LA programs, the reasons why the intervention was needed, and how the program was designed to meet these needs.

We start by explaining the context—IFC and World Bank recognized the need for improved off-grid lighting options, and the opportunity to mobilize affordable and quality solar lamps to address this need (Section 2.1.1). Next we explain the design of the LA programs and how they targeted the key needs of the sector (Section 2.1.2).

[14] These are the seven components with specific targets in IFC's logic models for LA Kenya and LA JV

2.1.1 The Need and Opportunity

In 2009, there was a large and growing need for access to electricity in Africa. Approximately 587 million people in Africa did not have access to electricity[15]. These people without electricity typically used kerosene lamps for light. However, kerosene lamps provide low-quality lighting, can damage one's health, and cost a lot to operate.

Given advances in technology and increased competition, portable modern lighting devices became more affordable. This created an opportunity for people living in off-grid areas to replace kerosene lamps with higher quality, safer, and more affordable modern lighting products such as solar lamps. However, despite the benefits of solar lamps, the market was not developing as quickly as expected.

To understand why the solar lamp market was not developing, the Global Environmental Facility (GEF)[16] and World Bank funded a market appraisal in 2007, and identified several needs of the key stakeholders in the market (the needs are discussed in Section 5.2). These stakeholders included base of the pyramid (BOP) off-grid lighting consumers, the supply chain (manufacturers, distributors, and retailers), and the Governments of Kenya and Ghana. Based on the needs of these key stakeholders, IFC and World Bank identified six barriers inhibiting market growth. These barriers included the following:

- **Consumers did not trust the solar products available**. Some solar lamps were already available in the market when the LA program began, but many of these products were poorly made and did not work properly. Given the large upfront cost of a solar lamp (compared to kerosene lamps), consumers were unwilling to take the risk of paying for a solar lamp that did not work
- **Consumers did not know** the benefits of solar lamps, how to use them, or where to buy them. Some consumers were unaware that solar lamps existed
- **Manufacturers/designers did not know consumer preferences** for the design and function of a solar lamp. For example, companies had to decide what, if any, additional features to add to the solar lamp (such as cell phone chargers). Understanding what consumers want and what features they are willing to pay for is crucial for a manufacturer to gain the confidence to enter the market
- **Supply chain entities did not know each other.** Solar lamp manufacturers entering the market to serve BOP consumers in developing countries did not have an established distribution network, and were unsure how to identify reliable distributors
- **All market entities needed access to finance.** Designers/manufacturers, distributors/importers, and retailers needed finance to purchase and move products to the end users. BOP consumers needed microloans to help with the initial upfront cost of purchasing a solar lamp

[15] Statistic from the International Energy Agency (IEA). Accessed at : http://www.worldenergyoutlook.org/resources/energydevelopment/accesstoelectricity/

[16] Note that GEF was originally a pilot program of the World Bank, but since 1994 has become a separate institution. World Bank is the trustee of the fund, which over the years has received funding from 39 different donor countries

- **Importers faced customs and policy barriers.** Some African countries imposed high import duties or had long and arduous customs processes. This deterred many importers from bringing in solar lamps. Importers also were often unaware what the policy environment was in these countries, and if it posed a constraint for their business.

The IFC and World Bank created the LA programs to transform the off-grid market, by removing these barriers. IFC and World Bank designed activities (grouped under nine components) to remove the six market barriers identified above, thus allowing the market to function effectively.

2.1.2 Design of the LA Programs

The goal of the LA programs was to provide consumers living off-grid with the opportunity to buy affordable and high-quality lighting products. By replacing kerosene lamps with solar lamps, consumers would have a higher-quality lighting source, save money over time, and avoid several health issues. The environment would also benefit from reduced greenhouse gas emissions (GHG).

The LA programs were unique from most donor-funded programs because it aimed to achieve its goal through a sustainable market transformation. That is, the goal was for end-users to pay the full cost of solar lamps (with loans or payment plans through microfinance institutions, if needed) without donor subsidies. LA did subsidize market entry costs for the supply chain, but it decreased subsidies over time for ongoing costs (such as quality assurance testing).

A specific set of objectives were created for each program. These objectives are the desired impacts of the LA programs, as well as some of the targeted outcomes. We present these objectives for LA JV and LA Kenya in Table 2.1 below.

Table 2.1: LA JV and LA Kenya Objectives

LA JV	LA Kenya
Increase access to better energy services for the base of the pyramid by mobilizing and providing support to the private sector to supply quality, affordable, clean and safe lighting to 3.5 million people through the sale of 700,000 off-grid lighting units to the rest of Africa (countries outside of the Kenya and Ghana country projects)	**Increase access** to better energy services for the base of the pyramid by mobilizing and providing support to the private sector to supply quality, affordable, clean and safe lighting to 1.5 million people through the sale of 300,000 off-grid lighting units
Mitigate climate change: the conversion from fuel-based lighting to clean lighting will avoid emissions of greenhouse gas (GHG) by 30,000 metric tonnes (for Africa outside of Kenya and Ghana)	**Mitigate climate change**: the conversion from fuel-based lighting to clean lighting will avoid emissions of GHG by 30,000 metric tonnes (in Kenya)
Mobilize IFC finance and non-IFC financing totaling $18 million	**Mobilize IFC finance and non-IFC financing** totaling $2.5 million
Accelerate the development of a sustainable commercial market for quality off-grid lighting products in Africa by: (i) **providing technical assistance** to 10 manufacturers to develop or enhance their products to meet Lighting Africa standards	Accelerate the development of a sustainable commercial market for quality off-grid lighting products in Kenya by: (i) **facilitating the entry of six off-grid lighting products** meeting Lighting Africa's quality standards and priced at below $25; (ii) **increase the availability of quality products** country-wide by linking international manufacturers to nine local distributors or bulk buyers with extensive distribution networks and (iii) **enhance distribution of quality products to BOP** by providing advisory services to 24 local distributors/importers to extend.
Develop and roll-out/institutionalize an **international quality standard** for low cost off-grid lighting products	

Source: These objectives come from the Implementation Plans and have been confirmed through conversations with IFC staff

To achieve these objectives, the IFC designed activities under the LA programs' components targeted to remove the market barriers (identified earlier in the section) or support the

sustainability of the market transformation. The seven program components covered in this evaluation, and their key activities included:

- **Market intelligence**—researched and disseminated information on consumer preferences and the off-grid lighting market
- **Business Development**—identified and linked supply chain companies, and provided training on how to store and repair solar lamps
- **Quality Assurance**—developed industry quality standards, and tested and certified solar lamps against these standards
- **Consumer Education—**launched advertisements and held education campaigns to inform BOP off-grid lighting consumers about the benefits of solar lamps
- **Access to Finance**—consulted with financial institutions to mobilize finance to the supply chain and end-users
- **Communication**—developed a website to spread the word of the LA program and to disseminate reports produced by the other components
- **Private Sector Development**—consulted with off-grid lighting stakeholders to maintain the relevance of the LA program to stakeholder needs. Also worked with sustainability partners GOGLA and KEREA to take over certain LA activities after the program's completion

A more detailed description of each component, including the key activities carried out under each component, is provided in Section 3.

There were two components that formed part of the LA programs but these are not covered in detail in this evaluation:

- **Development Marketplace**—mobilized seed funding to start-up solar lamp manufacturers. The team provided grants to the winners of the Development Marketplace competition, held in 2008. This was a one-time activity to provide seed financing during the early developing stages of the solar lamp market. This component was not part of this evaluation as the activities were done prior to the evaluation period
- **Policy Development**—consulted with African governments to lower import tariffs, and implement other policy changes to create an enabling environment for the solar lamp market. The LA team also produced Policy Notes to inform the supply chain of the relevant policy and regulatory environment in Kenya and other African countries. This component was not covered in detail in this evaluation as there were no specific targets set in the IFC's LA programs logic models.

2.2 LA Programs' Theory of Change

The programs' "Theory of Change" explains how the program's design (explained in Section 2.1.2) is expected to lead to the desired market transformation.

A Theory of Change model illustrates the mechanisms through which an aid activity is expected to achieve its targeted results. Specifically, a Theory of Change illustrates how an aid

program's resources (**inputs**) fund **activities** and **outputs** which then lead to planned **outcomes** and eventual **impacts.**

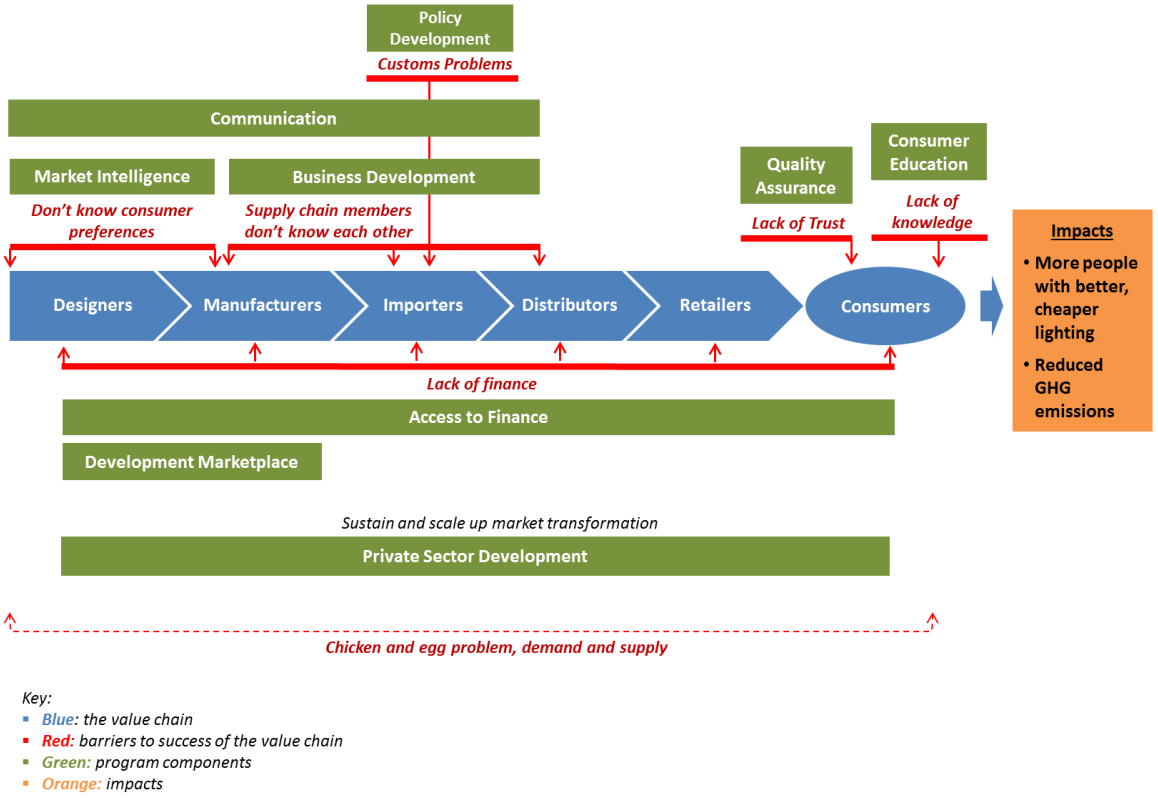
Assessing the effectiveness of any donor-funded program typically involves checking if the target outputs and outcomes were achieved. However, this linear "*output→outcome→-impact*" model is not appropriate for a market transformation program.

Unlike a traditional donor program, the outputs of the LA programs are not directly linked to the envisaged impact. For example, the LA Market Intelligence component produced Consumer Insight reports to inform manufacturers of consumer preferences for solar light design and features, and willingness to pay in specific countries. The LA Theory of Change predicts that having read this report, a manufacturer will now have the confidence to risk designing a product that consumers will buy. Thus, the report should initiate a change in behavior of the market entity. However, there are still several other factors affecting whether or not this will eventually lead to the impact of more consumers using solar lamps.

Thus, to evaluate the effectiveness and impact of this market transformation program, we designed a Theory of Change to illustrate how the program's design should remove market barriers (through its outputs and outcomes) and thus lead to the envisaged impacts. Evaluating the effectiveness of the program against this Theory of Change is a key aspect of this evaluation.

LA has a Logic Model (see 0) which groups together outputs linked to specific outcomes. The Theory of Change we developed (see Figure 2.2 below) goes a step beyond this, explaining how the program's components (outputs and outcomes) address the barriers of the market. Once these barriers are removed, the market should develop and lead to the envisaged impacts.

Figure 2.2: LA Theory of Change



The diagram above illustrates the supply chain for solar lamps, from design and production to distribution and final sale (in blue). It also depicts the key barriers (in red) that prevented the supply chain from entering and succeeding in the market. The LA Theory of Change aimed to remove these barriers through its nine program components (in green). Once these barriers are removed, the Theory predicts that the market will begin to function well, and thus achieve the envisaged impacts (in orange).

As the figure illustrates and as explained further in Section 2.1.2, there were six key barriers targeted by the program's components:

- **Consumers did not trust the solar products available**. To build consumers' confidence in LA-certified products, the LA programs developed the industry standard for high-quality solar lamps and tested and certified lamps that passed this testing standard (**Quality Assurance**)
- **Consumers did not know** the benefits of solar lamps, how to use them, or where to buy them. The IFC created the **Consumer Education** component to spread the word about solar lamps to consumers living off-grid and to explain the benefits that these solar lamps would provide over kerosene lamps
- **Manufacturers/designers did not know consumer preferences** on the design solar lamps, and how much consumers were willing to pay. For instance, consumers could prefer a simple design that is cheaper, or they could prefer a more expensive product that offers additional benefits like cell phone charging. The LA programs

researched and produced **Market Intelligence** reports to inform the supply chain of consumer preferences. A website was also created to disseminate market research for free to whoever had access to the internet (**Communications**)

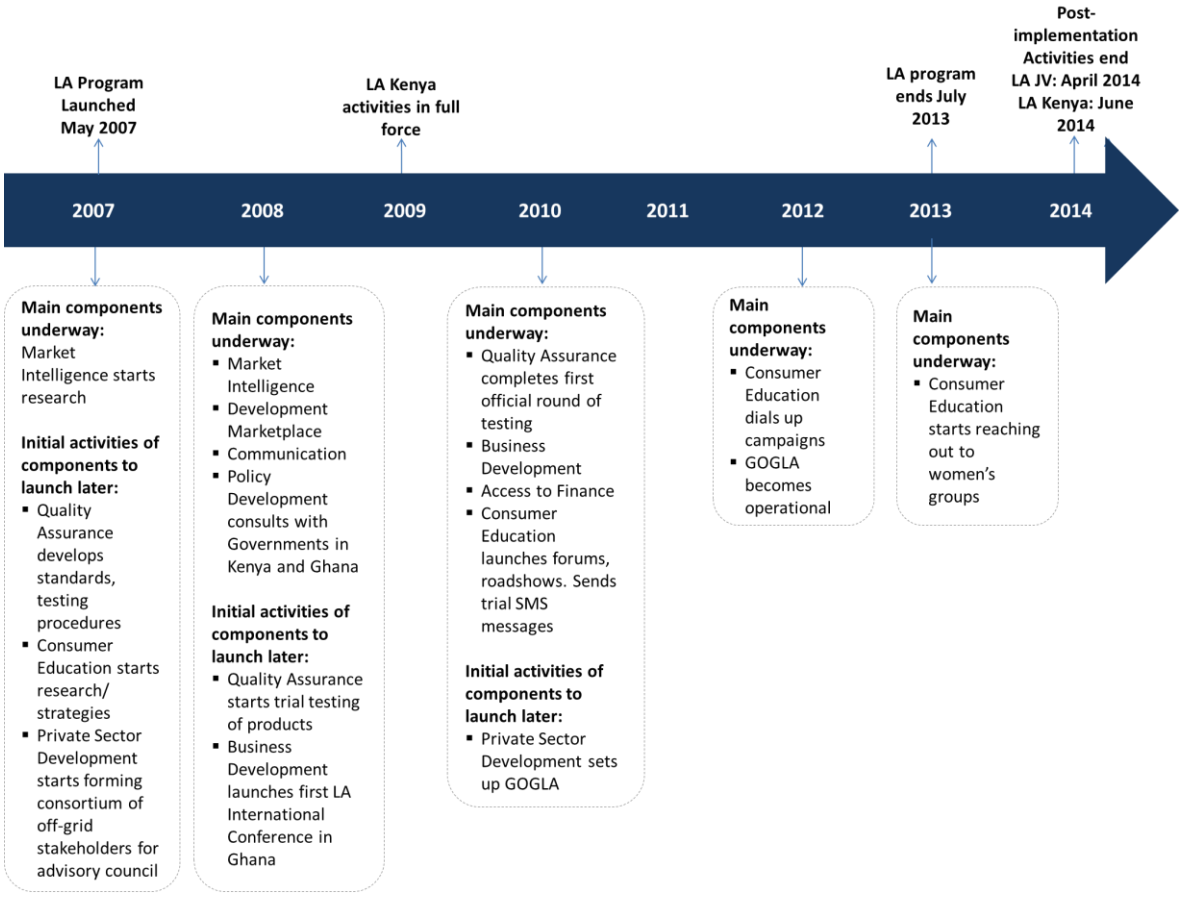
- **Supply chain entities did not know each other.** Manufacturers based outside of Africa needed connections with locally based distributors to move their products in the country. The IFC created a **Business Development** component to link manufacturers to local distributors. Through the LA website, the program disseminated information about the supply chain to link manufacturers with distributors (**Communications**). At the beginning of the programs, the website also offered a portal for virtual interaction among the supply chain members
- **The supply chain and consumers needed access to finance.** Finance was a major problem for the supply chain and consumers. The supply chain needed finance to pay for producing lamps and importing them into the target country. Distributors and retailers needed finance to make bulk purchases of solar lamps. Consumers needed finance to pay the upfront cost of a solar lamp. Although solar lamps are cheaper in the long run than kerosene lamps (due to kerosene costs), the upfront price of a solar lamps is higher than a kerosene lamp. The IFCcreated the **Access to Finance** component to mobilize IFC and non-IFC finance to the supply chain and consumers. At the beginning of the program, LA held a grant competition for solar lamp manufacturers, and awarded grants as seed finance to the winners of the competition (**Development Marketplace**). These grants were meant to kick-start the market
- **Importers faced customs and policy barriers.** The IFCestablished the **Policy Development** component to support the changes to the regulatory and policy regimes in African countries that would support the solar lamp market. The Policy Development team also produced Policy Reports to inform the supply chain of the policies and regulations in African countries targeted by the programs

The **Private Sector Development** component is unique because it is not targeted at removing a specific barrier. Instead, this component was designed to help sustain the development of the market after IFC exited. Under this component, IFC created GOGLA and worked closely with KEREA to take over certain LA activities. These activities included: producing market intelligence reports, continuing to link new businesses, hosting industry conferences, training solar lamp technicians, and consulting with governments on the regulatory environment and customs processes.

2.3 Timeline of LA Programs

Below we explain the timeline of the LA program, highlighting the dates each component came online. We illustrate this timeline in Figure 2.3 below.

Figure 2.3: Timeline of LA



Source: logframes, calls with LA staff, Dalberg Mid Term Review

As illustrated in the figure, the IFC launched in May 2007, and completed its activities on 31 July 2013. After the program closed, the IFC completed "post-implementation" work to wrap up activities. Post-implementation work was completed in mid-2014.

The figure also highlights the years that the IFC started activities for each component. As shown in the figure, often the IFC would start some activities under a component and over time introduce all the planned activities (and was thus "fully launched"). For instance, after the program launched in 2007, the LA programs began developing quality standards for testing solar lamps. But testing did not start up until 2010.

The first components were implemented in 2007, including market intelligence, quality assurance, and private sector development. Pre-activity research also started for the consumer education component (actual consumer education could not start before the quality standards had been developed). By 2008, several components had been implemented, including development marketplace, communication, and policy development. However, the LA Kenya team did not fully engage in work on the ground in Kenya until a replacement Program Manager was hired in mid-2009.

Quality assurance, business development, access to finance, and consumer education components fully came online in 2010. Consumer education forums and roadshows began in

2010, but activities scaled up in 2012, the same year GOGLA began operations. In 2013, the consumer education team began reaching out to women's groups to reach more rural consumers.

Some components were launched later intentionally. LA staff remarked that they started Access to Finance later to first see if financial institutions would react on their own given the developing market and need for finance. Consumer education was launched later so that the LA team could first focus on developing the supply-side of the market. Consumer education also had to come after LA quality standards had been developed, and some lamps had been tested and passed these tests. The consumer education roadshows and forums promoted these LA-certified lamps.

2.4 LA Programs' Budget

This section presents the IFC budget allocated to the LA Kenya and LA JV programs.[17] LA JV reportedly secured approximately US$ 5.2 million for its pre-implementation, implementation, and post-implantation operations, and spent US$4.1 million. LA Kenya secured approximately US$5.3 million for the same, and reportedly spent US$5.4 million. Clearly LA Kenya must have secured additional funding to cover its spending, though it was not reported in the LA Kenya Program Completion Report.

Table 2.2 and Table 2.3 below summarize the funding secured for the programs' pre-implementation, implementation, and post-implementation work.

Table 2.2: Sources of Funds for LA JV

Source	Secured
Pre-Implementation[18]	400,000
Implementation	
Luxembourg Government	669,245
GEF (Global Environmental Pooled Fund)	190,562
IFC (Climate Change Pooled Fund)	324,484
Italian Government (SBA Pooled Fund)	2,828,005
Government of Netherlands (Sustainable Energy Pooled Fund)	267,914
LA Client Contribution, reimbursable (suppliers)	100,000
Luxembourg Government (reimbursable fees)	78,646
Post-Implementation	
GEF	72,000
Client contributions (suppliers)	187,587
Italian Government	38,723

[17] We note that the World Bank also contributed financing to the program. However, since the evaluation focuses on IFC's activities, we have not considered the World Bank's contributions to the programs

[18] Note that we were not provided the source of LA JV pre-implementation funds and this is not available in the PCR

Totals	**5,157,166**

Source: LA JV PCR and IFC screen shot of computer system, sent by email on 15 August 2014

Table 2.3: Sources of Funds for LA Kenya

Source	Secured
Pre-Implementation	-
Implementation	
GEF (Global Environmental Pooled Fund)	8,000
IFC (Climate Change Pooled Fund)	-
GEF (Lighting BOP Pooled Fund)	2,700,000
Italian Government (SBA Pooled Fund)	2,368,025
Client/Beneficiary Parallel Support (suppliers)	-
Post-Implementation	
GEF	52,440
Italian Government	129,571
Totals	**5,258,036**

Source: LA Kenya PCR and IFC screen shot of computer system, sent by email on 15 August 2014

The largest funding source for LA JV was the Italian Government (56 percent). For LA Kenya, the Global Environment Facility (GEF)[19] (52 percent) was the largest funding source, followed by the Italian Government (48 percent).

Table 2.4 and Table 2.5 below track the programs' implementation spending broken down by component.

[19] Note that GEF was originally a pilot program of the World Bank, but since 1994 has become a separate institution. World Bank is the trustee of the fund, which over the years has received funding from 39 different donor countries

Table 2.4: LA JV Spending by Component

LA JV	FY08	FY09	FY10	FY11	FY12	FY13	FY14	ALL FYs
Component	Actuals	Actuals	Actuals	Actuals	Actuals	Actuals	Actuals	Actuals
Access to Finance					37,439	61,589		99,028
Business Development	1,360	403	82,137	78,807	171,438	389,246	14,438	737,829
Consumer Education	70,567	36,771	56,176	13,964	78,024	125,686	21,610	402,799
Market Intelligence				140,816	11,033	283,383	11,316	401,548
Program Management	163,755	74,473	48,637	82,645	50,176	245,550	55,684	720,921
Quality Assurance	28,187	8,708	9,090	95,591	353,612	892,835	361,353	1,749,375
Legal					5,219	3,655	10,619	19,493
Total	263,869	120,355	196,040	411,823	706,941	1,956,945	475,020	4,130,993

Source: IFC "Lighting Africa Budgets 2008 – 2014 with BDS A2F splits" spreadsheet

Note that not all nine components are included. IFC did not track spending for each component. These component expenses are included under one of the categories listed above

Table 2.5: LA Kenya Spending by Component

LA Kenya	FY08	FY09	FY10	FY11	FY12	FY13	FY14	ALL FYs
Component	Actuals	Actuals	Actuals	Actuals	Actuals	Actuals	Actuals	Actuals
Consumer Education		12,006	83,727	349,716	249,861	508,660	172,090	1,376,060
Market Intelligence	266,991	149,950	18,240	94,040	32,647	63,416	46,067	671,351
Business Development	2,610	5,220	100,327	118,900	89,216	130,696	137,148	584,117
Legal						7,726	25,299	33,025
Quality Assurance	8,8409	78,886	106,993	160,017	126,176	44,738	31,751	556,971
PM	25,568	78,237	275,515	298,653	369,399	622,040	297,513	1,966,923
Policy			3,750	21,250	0			25,000
Access to Finance					3,161	33,761	1,401	38,323
Total	303,578	324,300	588,552	1,042,575	870,460	1,411,036	711,269	5,251,769

Source: IFC "Lighting Africa Budgets 2008 – 2014 with BDS A2F splits" spreadsheet

Note that not all nine components are included. IFC did not track spending for each component. These component expenses are included under one of the categories listed above

As the tables above illustrate, LA JV spent a total of US$4.1 million on implementation work. LA Kenya spent US$5.3 million.

Post-implementation spending was not broken down by component. LA JV spent US$107,806 on and LA Kenya spent US$164,856.

3 Description of Program Components

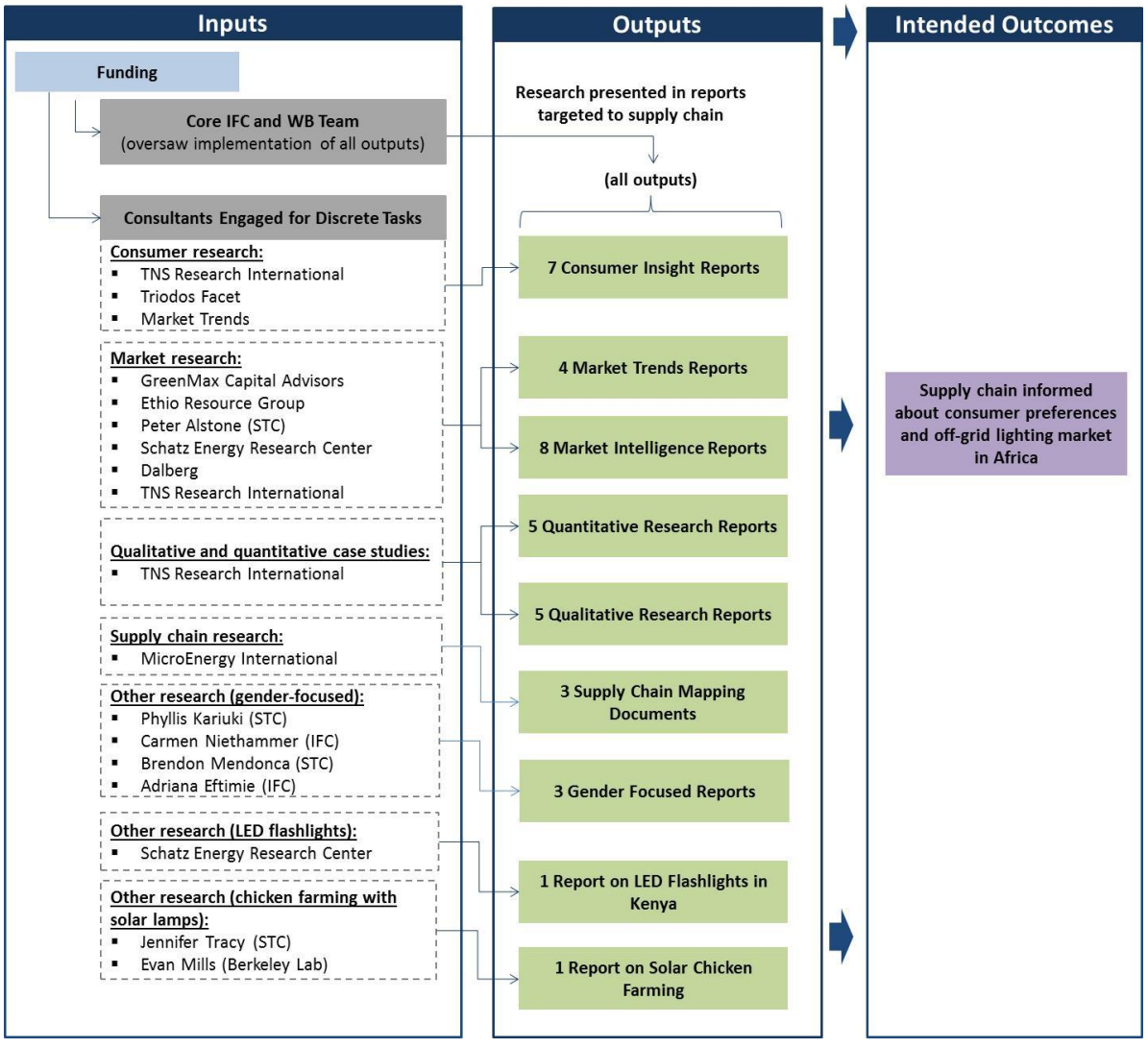
As explained in Section 2.1, each component of the LA programs was designed to address market barriers in the solar lamp market through nine components. In the sections below, we present the design and activities for each of the seven components covered in this evaluation. We note that the World Bank contributed to many of these activities, especially those within the Market Intelligence and Quality Assurance components.

3.1 Market Intelligence

In this section, we explain the Market Intelligence component, presenting the key outputs and intended outcomes, and the team members.

Figure 3.1 illustrates the inputs, outputs, and intended outcomes of this component. It also summarizes the team that performed the activities.

Figure 3.1: Illustration of Market Intelligence



As the figure illustrates, the main outputs of Market Intelligence component consisted of nine main types of reports. These include 37 published reports listed in the diagram above. The goal of this component was to help the supply chain understand consumer preferences for off-grid lighting devices, and of the distribution network in targeted African countries.

The Market Intelligence component consisted of a core team of four people leading the work, and 15 consulting firms or individuals engaged by the IFC and World Bank to do the research.

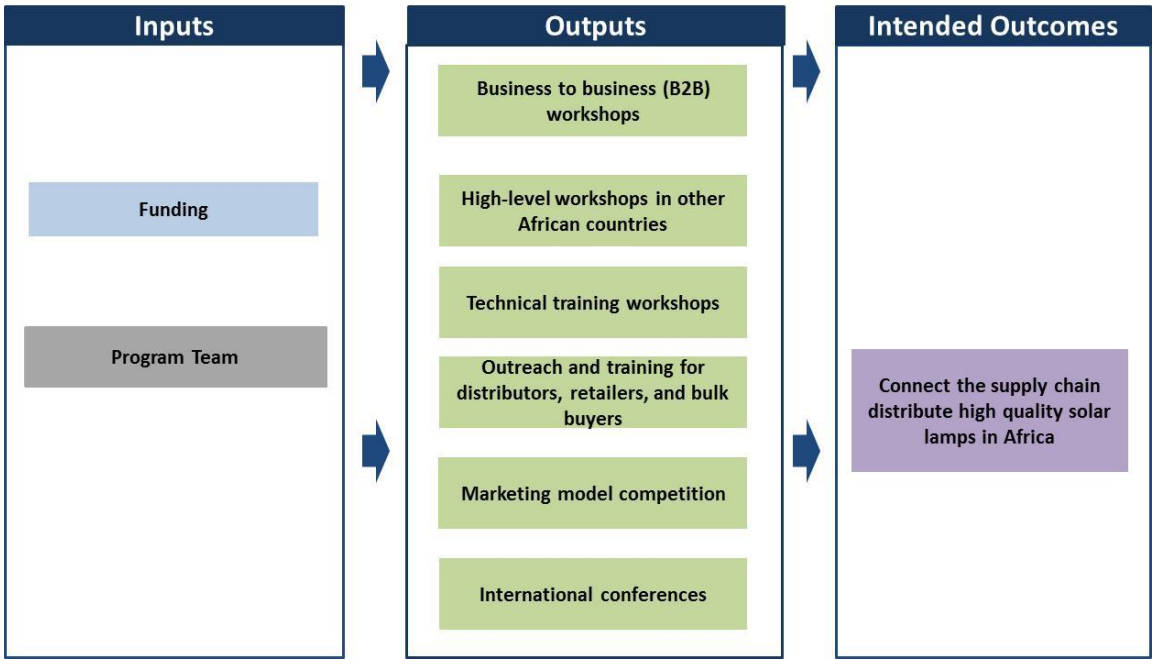
The team researched consumer preferences, and the off-grid lighting market in Africa. There were nine types of research studies (outputs) conducted, most focused on specific African countries, but others focused research on cross-cutting themes like the possible benefits of solar lamps for women and solar chicken farming. Countries covered by these research studies included Kenya, Ghana, Ethiopia, Mali, Nigeria, Tanzania, Zambia, and Burkina Faso.

3.2 Business Development

In this section, we explain the Business Development component, presenting the key outputs and intended outcomes, and the team members.

Figure 3.2 illustrates the inputs, outputs, and intended outcomes of this component. It also summarizes the team that performed the activities.

Figure 3.2: Illustration of Business Development



As the figure illustrates, the Business Development component consisted of five main outputs. The goal for the component was to connect supply chain companies to create an efficient supply chain network.

The Business Development Program team held workshops and international conferences to connect supply chain companies. The team also identified and trained new distributors, and trained retailers and bulk buyers on how to use and store solar lamps. Finally, the team trained

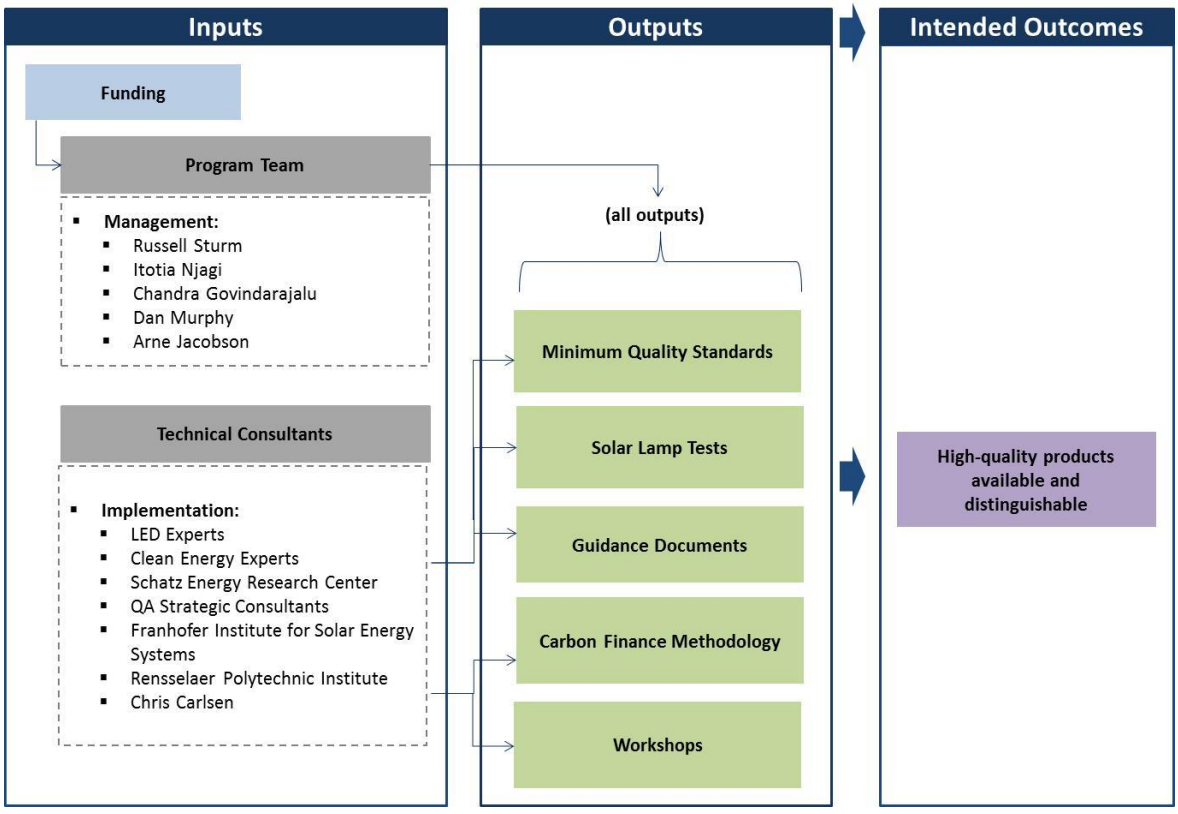
solar lamp technicians and provided funding to encourage manufacturers to develop their own marketing strategies.

3.3 Quality Assurance

In this section, we explain the Quality Assurance component, presenting the key outputs and intended outcomes, and the team members.

Figure 3.3 illustrates the inputs, outputs, and intended outcomes of this component. It also summarizes the team that performed the activities.

Figure 3.3: Illustration of Quality Assurance



As the figure illustrates, under the Quality Assurance component, the LA programs supported give main outputs with the intention of making high-quality products available in the market which were distinguishable from other cheaply-made solar lamps.

The Quality Assurance component included a core team of 24 people, including 4 IFC staff 8 STCs, and 12 laboratory staff.

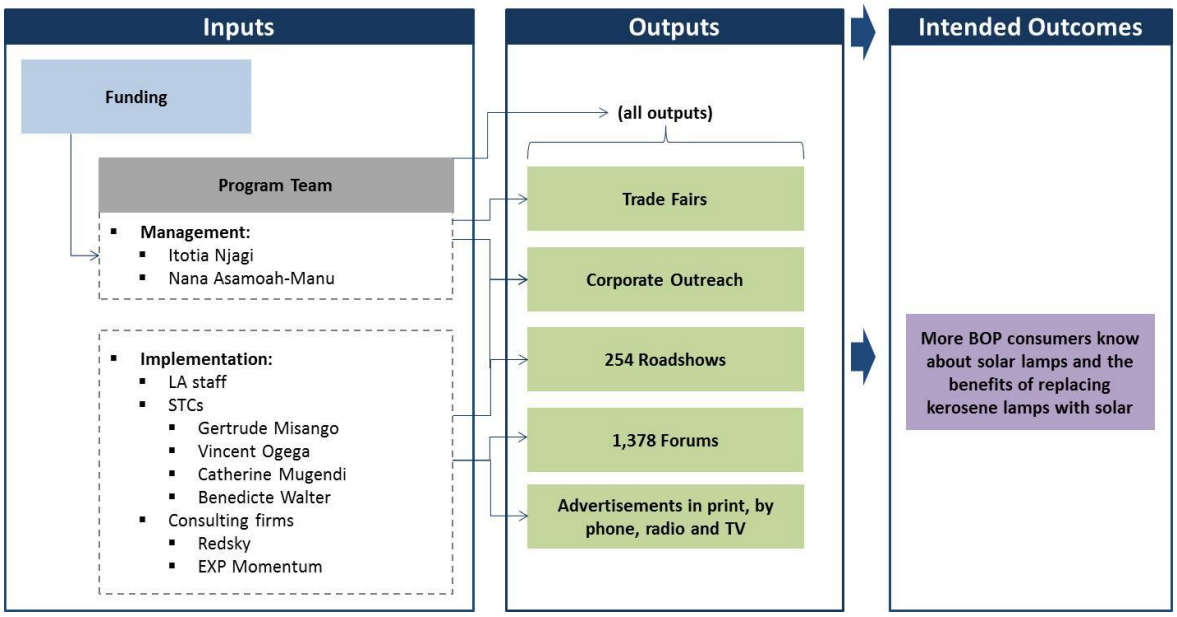
The team developed quality standards for solar lamps, and tested solar lamps against these standards. Products that passed testing received certification from the LA programs. The team also developed guidance documents advising manufacturers on how to develop high-quality products, and workshops to inform the supply chain of these LA-certified products. Finally, the team developed a carbon finance methodology to quantify the benefits of reduced greenhouse gas (GHG) emissions, which was adopted by the United Nations as the standard methodology for this calculation.

3.4 Consumer Education

In this section, we explain the Consumer Education component, presenting the key outputs and intended outcomes, and the team members.

Figure 3.4 illustrates the inputs, outputs, and intended outcomes of this component. It also summarizes the team that performed the activities.

Figure 3.4: Illustration of Consumer Education



As the figure illustrates, the Consumer Education component comprised of five main outputs. The goal of this component was to inform consumers living off-grid of the benefits of solar lamps.

The Consumer Education component included a core team of six people, including three IFC staff and three STCs.

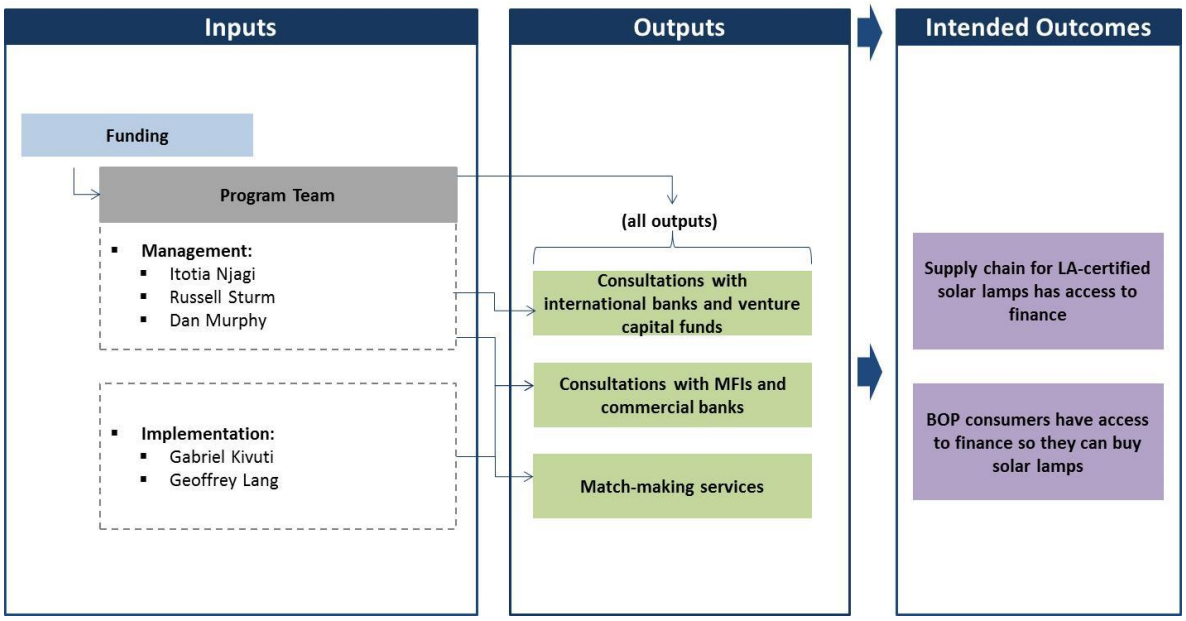
The team developed and implemented roadshows in market towns, forums in rural communities, and campaigns at firms and trade fairs to speak to consumers directly about the benefits of solar lamps. The team also disseminated fliers, SMS messages, radio advertisements, and TV advertisements to spread the word about solar lamps.

3.5 Access to Finance

In this section, we explain the Access to Finance component, presenting the key outputs and intended outcomes, and the team members.

Figure 3.5 illustrates the inputs, outputs, and intended outcomes of this component. It also summarizes the team that performed the activities.

Figure 3.5: Illustration of Access to Finance



As the figure illustrates, the Access to Finance component consisted of two main outputs. The goal of the component was to mobilize finance to consumers and the supply chain of solar lamps.

The Access to Finance component included a core team of five people, including two IFC staff, one World Bank staff, one STC, and one intern.

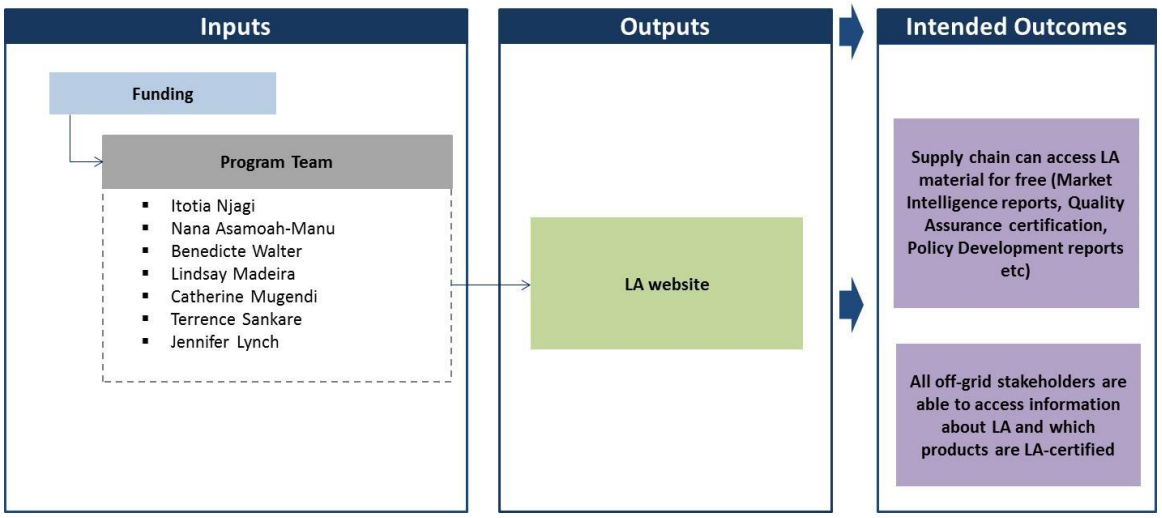
To mobilize finance to consumers, the team consulted with MFIs to explain the high-quality of solar lamps that received LA certification. The team consulted with local commercial banks (like the Bank of Africa) to try and establish a financing facility for distributors of LA-certified lamps. To mobilize working capital to manufacturers, the team consulted with international banks and venture capital funds to try and establish a financing facility. Finally, the Access to Finance team facilitated links between larger distributor companies and small manufacturers to make suppliers more attractive to banks.

3.6 Communication

In this section, we explain the Communication component, presenting the key outputs and intended outcomes, and the team members.

Figure 3.6 illustrates the inputs, outputs, and intended outcomes of this component. It also summarizes the team that performed the activities.

Figure 3.6: Illustration of Communication



As the figure illustrates, the Communication component consisted of one main output: the LA website. The goal of the website was to disseminate information and outputs of the programs, with the intended outcome of informing the supply chain of consumer preferences, and the market in Africa. Financial institutions and other stakeholders could also find out which products were quality-certified by visiting the LA website.

The Communication component included a core team of seven people, including two IFC staff, and five STCs.

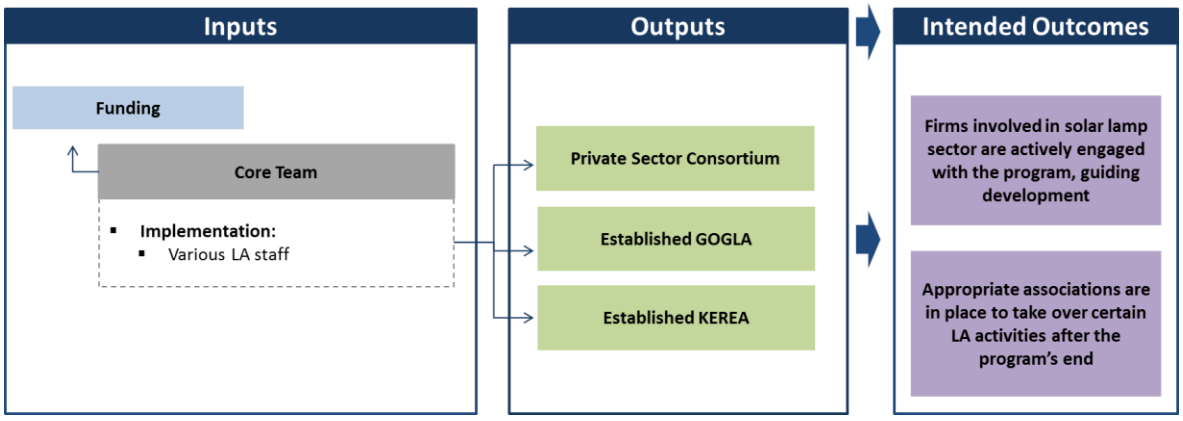
The team implemented the LA website and posted Market Intelligence reports, Quality Assurance notes and certification, and other information about the LA program. Anyone with internet could access the website, and thus access these documents. The team also disseminated information internally to the World Bank Group by presenting information or sending out reports internally about human interest stories, including Smart Lessons, Annual Reports, Donor Update Reports, Brochures, Conference Reports, and Results Fact Sheets.

3.7 Private Sector Development

In this section, we explain the Private Sector Development component, presenting the key outputs and intended outcomes, and the team members.

Figure 3.7 illustrates the inputs, outputs, and intended outcomes of this component. It also summarizes the team that performed the activities.

Figure 3.7: Illustration of Private Sector Development



As the figure illustrates, the Private Sector Development component consisted of three main outputs: an advisory council to advise on the direction of the LA program, and sustainability partners to carry on LA activities sustain benefits of the LA programs after closing.

The activities of Private Sector Development fell among most of the LA team. However, STC Rodd Eddy was in charge of establishing the Global Off-grid Lighting Association (GOGLA), an association charged with taking over certain key activities of the LA programs that were not country-specific. In particular, this included market research, hosting industry conferences, facilitating business linkages, mobilizing finance (from member firms), managing the testing standards for quality assurance, and representing industry stakeholders in engagements with governments.

LA Kenya also worked with the Kenya Renewable Energy Association (KEREA) so that KEREA could take over LA activities specific to Kenya. These included training solar lighting technicians in Kenya, providing training for new supply chain associates wanting to enter the market, and engaging on policy issues with the Kenya Government.

The LA Program also implemented a private sector consortium of stakeholders in the off-grid sector. This evolved into the LA Advisory Council, which met frequently to discuss the activities of the LA programs, and how these could best meet the needs of these stakeholders.

4 Evaluation Methodology

Our approach to evaluating the Lighting Africa (LA) programs[20], consisted of three main stages:

- **Project Inception**—during this first stage we clarified the goals of the evaluation and the Terms of Reference (TOR) questions. We also refined our approach and presented this in our Inception Report to IFC
- **Data Gathering**—next we gathered data from IFC, World Bank, research, desk interviews, and in-person interviews during our two trips to Kenya. This data review helped us understand more about the LA programs (design, achievements, spending), the needs of the lighting market of people living off the grid prior to the program, and the market as it exists today after the programs' implementations.
- **Data Analysis**—finally we analyzed the information collected to answer the TOR questions thus determining the extent to which the LA programs were relevant, efficient, sustainable, effective, and had made an impact. We also drew out lessons learned for the Lighting Global and Lighting Asia programs going forward, and made recommendations for improvements.

In the following sections, we further explain this three-stage methodology, focusing in particular on the data gathering and analysis stages.

4.1 Project Inception

First, we reviewed the objectives and scope of the LA programs. Following an Inception Call with the LA staff, the 33 TOR questions were clarified and our methodology was revised. The output was an Inception Report that explained this refined approach. The Inception Report (submitted on 9 June 2014) included a detailed explanation of our evaluation approach that set out the key questions to be answered, and the information needed to answer them.

4.2 Data Gathering

The second stage included two tasks:

- Document review
- Field visits and interviews.

Document Review

The LA staff provided program documents, financials, and other information to explain the LA program. Additional documents were collected through research and the LA website, which contains over 70 LA reports. Appendix D includes a list of the documents reviewed.

Field Visits and Interviews

In addition to document reviews, we collected relevant information directly from key stakeholders of the LA program. Our team traveled to Kenya and conducted interviews with:

- **Base of the Pyramid (BOP) Consumers**—lower-income people often living in off-grid areas.

[20] see Glossary

- **Retailers and Last Mile Entrepreneurs**—the last point of sale for portable lighting devices. This often includes small retail outlets, financial institutions that sell products directly in addition to giving loans, and distributors that sell products directly to end-users rather than a retail outlet.
- **Importers and Distributors**—individuals or organizations that import and distribute LA-certified lamps in Kenya
- **Manufacturers**—organizations that design and manufacture solar lamps for the Kenya market that have passed LA quality testing.
- **Government Stakeholders**—entities in the Government of Kenya
- **Microfinance Institutions (MFIs)**—local financial institutions that provide micro loans to consumers for LA-certified lamps
- **Consumer Based Organizations (CBOs)**—non-government organizations (NGOs), youth groups, women associations, churches, and others that engaged with the LA programs primarily through the consumer education and business development components
- **Other LA Stakeholders (Sustainability Partners)**—other stakeholders of the people lifing off the grid lighting sector that were actively involved in the LA programs. In particular, this includes the Kenya Renewable Energy Association (KEREA) and the Global Off-grid Lighting Association (GOGLA)—two associations envisaged to take over certain LA activities after the programs end. During the field visits, interviews were also held with five members of the LA National Advisory Council. The Advisory Council meets frequently with LA staff to provide input on the LA activities and plans for expansion
- **LA Team**—IFC and the World Bank staff that worked on the LA programs.

Information gathered from these interviews helped us understand the relevance of the LA programs to stakeholders, how effective the programs were at transforming the market, and the likelihood of the transformation being sustainable.

The field visits included two trips to Kenya. First, Castalia associate Dishan Mubende traveled to Kenya from 9 July 2014 to 19 July 2014. Next, Castalia Manager Ikepo Oyenuga traveled to Kenya from 28 July to 4 August for further discussions with BOP consumers.

In total, 34 BOP consumers plus four focus groups, 20 retailers, six distributors, six manufacturers, two Government entities, two MFIs, two CBOs, and seven sustainability partners[21] were interviewed across seven towns and cities in Kenya. Appendix C includes a list of the stakeholder groups interviewed.

The sample of stakeholders was not meant to provide statistically significant responses, as this was outside the scope of this assignment. However, it provides indicative information that, when combined with other information, contributes to the evaluation. It also points out where information gaps are present that should be addressed in future work.

[21] Note that two additional sustainability partners were surveyed through desk interview: KEREA and GOGLA

Sample of Towns for Field Visit

The sample of towns and cities visited included: Nairobi, Naivasha, Thika, Nakuru, Kakamega, Gatundu, Kisumu, and Kawangware. These towns were selected based on the level of LA involvement, and to reach consumers living off-grid.

One or all of the following LA activities had been implemented (to varying degrees) in six of the eight sample towns: consumer education campaigns, business linking workshops, and MFI consultations. Thus, the stakeholders in these towns should know about LA.

The remaining two towns (Kawangware, and Gatundu) were selected to target more BOP consumers living off-grid.

Survey Methodology for BOP Consumers

BOP consumers were interviewed individually and through focus groups. We spoke with 34 individuals and four focus groups. Each focus group consisted of about 30 people, most of whom were women.

Individual consumers were randomly selected on the street. Interviews were held in Nairobi, Nakuru, Naivasha, and Kisumu.

Two of the focus groups were identified by Visionary Empowerment Program (VEP)—a local microfinance institution (MFI) that supports LA-certified products. Our team picked these focus groups from a list of VEP supported consumer organizations. The specific groups were picked based on whether or not there an already scheduled meeting among the members during the time of our field visit. The other two focus groups were identified by Pulse Experiential, a marketing agency that focuses on below the line populations. None of the focus groups were part of any LA forums or other promotional campaigns. The focus groups were held in Shimanyero, Kawangware, and Gatundu.

The same surveys were administered to these randomly selected individuals, and the focus groups. However, surveys administered to focus groups mostly captured the general response of the group and were less focused on individual answers. One exception was the question on what consumers use for lighting. For this question, individual responses were recorded to reflect the breakdown of electricity, kerosene, and solar lamp users.

For both groups, surveys were designed to last 10 to 15 minutes to increase the likelihood of getting responses. The survey included questions about what products they use for lighting, their issues with solar lamps and other lighting products, why and when they started using solar lamps, if they are aware of LA or the organization's consumer education campaigns. Appendix B presents the BOP consumer survey template used.

Retailers

Retailers were surveyed in Nairobi, Naivasha, Kisumu, Kakamega, and Thika. As much as possible, we tried to speak with retailers selling solar lamps that were LA-certified, in addition to those selling other lighting products. We spoke with 14 retailers selling solar lamps, and 6 that did not sell solar lamps. Of the 14 retailers selling solar lamps, 13 sold LA-certified solar lamps.

Retailer surveys asked about their experience over time selling solar lamps, the lighting products they sell, benefits received and outputs used from the LA programs, and their opinion on how well the market is working today and why. Appendix B includes a copy of the retailer survey template used.

Distributors

Distributers of LA-certified lamps were all located in Nairobi, and so all six distributor interviews were held there. The sample was selected from the 24 distributors (identified by IFC) that sell LA-certified lamps in Kenya. In selecting the sample, we considered two main factors: (i) sales volume—selecting top distributors by sales volume, as well as two distributors with the smallest market share. (ii) length of engagement with IFC or operations in the market—we selected distributors that had operated and engaged with IFC for longer periods, as well as new entrants to the market. This diverse sample helped ensure that we collected diverse viewpoints.

The distributor survey asked questions about their experience over time selling solar lamps, benefits received and outputs used from the LA programs, and their opinion on how well the market is working today and why. Appendix B includes a copy of the distributor survey template used.

Manufacturers

Representatives were interviewed from six manufacturers of solar lamps with LA-certification. Manufacturers producing solar lamps for Kenya are located internationally, so these interviews were held by phone.

The sample of manufacturers was selected from a list of 29 manufacturers of LA-certified lamps that IFC provided. The sample was selected based on the companies' market shares in Africa's solar lamp sector (sales volumes of solar lamps also provided by IFC). Three big players (total 88 percent market share) and three smaller players (total 5 percent market share) were selected for the sample.

The manufacturer survey asked about their experience in the Kenya market including the problems faced and recent successes, how much they valued LA and its outputs, and their suggestions for improvements to the program. Appendix B includes a copy of the manufacturer survey template used.

Government Entities

Representatives from Government entities were surveyed in Nairobi: the Ministry of Energy, and the Kenya National Bureau of Standards (KEBS). These government stakeholders were selected given advice from IFC on the most relevant Government stakeholders.

Government surveys included questions about the relevance of the LA programs to the country's energy sector objectives, the effectiveness of the programs in helping the Government meet these goals, contributions of other programs to the sector, and any suggestions for improvements to LA. Appendix B includes a copy of the Government survey template used.

Microfinance Institutions

MFIs were surveyed in Thika and Nairobi. The sample was randomly selected from the 13 MFIs that worked with LA. These MFIs provided loans for (and often directly sold) LA-certified lamps after receiving consultations from the LA team.

The MFI survey asked participants about their involvement with LA, which solar lamps they provide finance to, information on the loans provided, and their opinion on to what extent LA contributed to the growth of the sector. Appendix B includes a copy of the MFI survey template used.

Consumer Based Organizations

One CBO was surveyed in Naivasha—Center For Pastoralist Development (CEPAD). CEPAD was selected given recommendations by IFC of a few different CBOs LA had worked with in the past. We also interviewed the coordinator of YUSUD, a youth empowerment CBO based in Kisumu.

The CBO survey was the same as the BOP survey since the CBO represented a group of BOP people. Our team spoke to the CBO coordinators to understand how lighting devices were used by these groups, common issues with solar lamps and other lighting products used by the group, when and why members started using solar lamps, and if they were aware of solar lamps. A copy of the survey template is located in Appendix B (BOP survey).

Other Stakeholders (Sustainability Partners)

LA sustainability partners were all located in Nairobi except for GOGLA, which is an international association of off-grid stakeholders. Our sample of stakeholders included GOGLA and KEREA as these organizations are important in supporting LA activities after the end of the programs. The sample also included four members of the LA Advisory Council (GIZ, SNV, GVEP, and KEBs). These stakeholders were selected based on suggestions by IFC.

Two different surveys were used for the sample of sustainability partners. One survey was administered in-person in Nairobi to the five Advisory Council members. The other surveys were administered via phone to KEREA and GOGLA.

The first survey included questions about their experience over time working in the off-grid sector and their role in the sector. The survey looked at their level of involvement with LA, their opinions on the outputs of the LA program, and their opinions on the sustainability of the solar lamp sector now that LA has come to an end. They were also questioned about any improvements they would make to the program.

The second survey included questions on the role of GOGLA and KEREA in the off-grid sector, which activities they plan to take over from LA and their success with these activities so far, the level of their involvement with LA, and their opinion on the sustainability of the solar lamp market now that the LA program has ended.

LA Team

LA Program Managers, and other operations and implementation staff were also interviewed during the evaluation. Specifically, three IFC staff, two World Bank staff, and four short term consultants (STCs) were also interviewed to collect data on the LA programs and their opinions on lessons learned.

We also interviewed the agency that implemented the below-the-line[22] consumer education activities (EXP Momentum)

There was no questionnaire designed for the LA team, but information was collected on the key activities, timeline, staff, and context for each of the nine program components. Staff members were also asked their opinion on how well the IFC-World Bank joint-venture has worked, and any lessons learned.

[22] communications through media focused on a smaller more specific audience. For LA, this included roadshows, forums, outreach to employee groups in larger firms, trade fairs

4.3 Data Analysis

After gathering data through document review and interviews, the information was aggregated and analyzed to draw conclusions on the relevance, effectiveness, impact, efficiency, and sustainability of the LA programs.

Survey responses were entered into an Excel database to view all responses easily, and the content was analyzed. Questions were categorized by relevance, effectiveness, impact, efficiency, sustainability, and lessons learned. The responses were used (anecdotally and sometimes quantitatively) as evidence for the programs' performance in each of the six areas.

The information collected on the programs' components was summarized into diagrams that mapped each of the components' main outputs to the intended outcomes for transforming the solar lamp market. The design and objectives of the program were analyzed along with its performance against targeted outputs, outcomes, and impacts. Results were verified by validating samples of data through independent verification when possible, and otherwise with the help of IFC.

Given this analysis, we are able to draw conclusions on the extent of the programs' relevance to key stakeholders, effectiveness and impact of its activities, efficiency in using resources, and the sustainability of the market transformation.

5 Relevance

Evaluating the relevance of the LA programs requires checking that the programs' objectives and approach were aligned with the needs of key stakeholders. We start by explaining the programs' objectives and approach in Section 5.1, then we check if they are aligned to stakeholders' needs in Section 5.2.

The main stakeholders are the ultimate beneficiaries of the LA programs—in this case, people at the Base of the Pyramid (BOP) who do not have access to electricity. Therefore, we start by assessing the relevance of the programs to their needs. We also assess the relevance of the programs to the needs of direct beneficiaries of LA activities—including manufacturers and distributors of solar lanterns, and the Government of Kenya. The Terms of Reference (TOR) also requests that we assess the relevance of the program to IFC's objectives and strategies in the off-grid sector in Africa. This analysis is also presented in Section 5.2.

Another way of assessing a program's relevance is determining to what extent beneficiaries are willing to pay for the program's services. Section 5.3 assesses if the supply chain demonstrated the importance of the programs by providing cash or in-kind contributions for LA programs' services.

Finally, our overall conclusions on the LA programs' relevance to all these stakeholders are presented in Section 5.4.

5.1 What were the LA Programs' Objectives and Program Approach?

This section presents the LA programs' objectives and approach.

As explained in Section 2.1, LA JV and LA Kenya each had its own set of **objectives** with specific targets. The first three LA JV and LA Kenya objectives are the same, just with a different target number, while the last two LA JV and last three LA Kenya targets are different from one another. Thus, overall, the LA program had eight distinct objectives:

- **Increase access** to better energy services for the BOP by mobilizing private sector to supply quality, affordable, clean, and safe lighting
- **Mitigate climate change** by avoiding greenhouse gas (GHG) emissions
- Mobilize **IFC and non-IFC finance**
- Assist manufacturers to **develop/enhance products** to meet LA standards
- **Facilitate entry** of LA-certified products under $25
- **Link manufacturers** to local distributors/bulk buyers
- **Extend distribution** of quality products
- Develop and institutionalize **quality standards**.

LA's **program approach** consisted of nine "components", under which activities were implemented to achieve the eight objectives. These nine components are listed here, and explained further in Section 3:

- Market Intelligence
- Business Development

- Quality Assurance
- Consumer Education
- Access to Finance
- Development Marketplace
- Policy Development
- Communication
- Private Sector Development.

5.2 Were the LA Programs' Objectives and Approach Relevant to Key Stakeholders?

In this section we check the extent to which the LA programs' objectives and approach are aligned with the needs of its stakeholders—first the BOP population, then the Kenyan Government, the supply chain for solar lamps, and finally the IFC's objectives (as requested in the TOR).

5.2.1 BOP Consumers

Our research showed three key lighting needs that off-grid BOP consumers had when the LA programs started (in 2008):

- More affordable and better quality lighting options
- Lighting options that are healthier and safer
- Access to financing for initial cost of solar lamp.[23]

All three of these needs were identified in a research study that explains findings from a market trial in rural Kenya. The market trial tested the uses and preferences for LED lighting for retailers in rural Kenya.

This need is not unique to Kenya, studies have shown that people living off the grid throughout Africa would also benefit from better quality lighting. In 2009, 587 million people in Africa did not have access to electricity[24]. Their primary lighting sources were kerosene lamps, candles, or flashlights with disposable batteries. Some households only used the light provided by their cooking fires[25]. These options provided poor lighting. Kerosene lamps, for instance, only emit 0.04 lumens per watt[26]. In comparison, the average 60-watt light bulb emits 13.3 lumens per watt[27]. These lighting solutions were also costly. Even with subsidized rates

[23] As identified through interviews and research. See Alstone, Peter, Radecsky, Kristen, Jacobson, Arne, and Evan Mills. "Field Study Methods and Results from Market Trial of LED Lighting for Night Market Vendors in Rural Kenya". study took place from 2008 to 2009. Accessed at: http://evanmills.lbl.gov/pubs/pdf/2014_AlstoneEtAl_Field-Study-Methods-LED.pdf

[24] Statistic from the International Energy Agency (IEA). Accessed at : http://www.worldenergyoutlook.org/resources/energydevelopment/accesstoelectricity/

[25] http://light.lbl.gov/pubs/tr/lumina-tr2.pdf

[26] "Technical Report #5: from carbon to light". 2010. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr5.pdf

[27] Accessed from the Federal Trade Commission at: http://www.consumer.ftc.gov/articles/0164-shopping-light-bulbs

for kerosene in Kenya (84 Ksh or US$ 0.96 per liter[28]), consumers on average spend 4,429 Ksh per year (US$ 51) on kerosene[29], but can spend as much as 10,369 Ksh per year (US$118)[30] on kerosene depending on how frequently the lamp is used. This expense does not include the cost of a kerosene lamp, which is approximately 498 Ksh (US$5.64) for a mid-level hurricane lamp that lasts about five years[31]. Consumers would be better off with lighting solutions with little to no operating and maintenance costs.

Furthermore, some of these lighting solutions, notably kerosene lamps and candles, pose risks to a person's health or even their life. Inhalation of kerosene smoke and fumes has been linked with Acute Lower Respiratory Infections, tuberculosis, cataracts, cancer, and other illnesses[32]. Overturned kerosene lamps can also lead to fires and resulting in injuries and possibly death. Some families have even suffered the loss of a child due to accidental ingestion of kerosene oil[33]. It has been estimated that a total of 37,172 deaths per year of people living off the grid around the world could have been avoided if kerosene lamps were replaced[34].

Solar lamps are a safer, and more affordable (in the long run) lighting option. They provide a higher-quality source of light than kerosene, at about 100 lumens per watt,[35] and do not pose health risks. Moreover, the technology used in creating these lamps has been improving, and the price of the lamps has been falling in tandem. This makes them within reach for even poor BOP consumers.

Although the solar lamps had become cheaper, some BOP consumers still needed microloans or a payment plan to cover the up-front cost (most popular solar lamps in Kenya typically cost

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[28] "Kenya raises petrol, kerosene prices". July, 2014. Accessed at http://af.reuters.com/article/kenyaNews/idAFL6N0PP3CS20140714

[29] Based on averages of kerosene usage and burn rates found. Kerosene burn rate accessed ranged from 0.018 and 0.089 liters per hour. Usage ranged from 1.6 to 3.8 hours per day.

Usage accessed at: "Technical Report #3: solid-state lighting on a shoestring budget". 2008. The Lumina Project. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr3.pdf. table 4 and UNEP e.lighten Kenya off-grid lighting assessment. accessed at: http://api.ning.com/files/yrG0YlPnk7HdT2RLgBvpBjXwWJQEuZwO7XGEBTRM3qd5LPG5gLQgODDl2nuBNi2rHt8ORTMLkzVXrO4nX-fWZYUcQFAaz7mh/OGL_KEN_v1.pdf

Burn rates accessed at: "Technical Report #5: from carbon to light". 2010. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr5.pdf

[30] Taking the higher-bound estimates. Kerosene used 3.8 hours per day at a burn rate of .089 liters of kerosene per hour. See previous footnote

[31] "Technical and Economic Performance Analysis of Kerosene Lamps and Alternative Approaches to Illumination in Developing Countries". 2003. Evan Mills.Lawrence Berkeley National Laboratory. accessed at: http://evanmills.lbl.gov/pubs/pdf/offgrid-lighting.pdf

[32] Lam, Nicholas, Smith, Kirk, Gauthier, Alison, and Michael Bates. "Kerosene: a Review of Household Uses and their Hazards in Low- and Middle- Income Countries". http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3664014/?report=classic

[33] Lam, Nicholas, Smith, Kirk, Gauthier, Alison, and Michael Bates. "Kerosene: a Review of Household Uses and their Hazards in Low- and Middle- Income Countries". http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3664014/?report=classic

[34] "From Gap to Opportunity: Business Models for Scaling Up Energy Access". IFC. 2011

[35] "Technical Report #5: from carbon to light". 2010. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr5.pdf

approximately 1,985 Ksh or US$22.63[36]). The cost advantage solar lamps have is that users no longer have to buy kerosene, or replace their candles. Lack of access to financing to cover this initial cost was also a deterrent to BOP consumers needing these lamps. Although countries like Kenya had a well-established microfinance market, many were not offering loans for solar lamps at the time the LA programs started[37] and those who had tried had bad experiences due to poor quality products in the market

Our field interviews in Kenya corroborated these research findings. We interviewed 143 BOP consumers in Kenya (34 through individual surveys and 109 through four focus groups), and confirmed that many of them relied (and some still rely) on poor lighting from kerosene lamps, candles, and battery-powered torches. These users understood the dangers of these solutions, particularly of kerosene lamps. Some of them now appreciate the long term cost savings of switching to solar lamps. None of these consumers used solar lamps before 2008. The reasons they gave are aligned with the needs identified in IFC's research studies. When asked why they did not use solar lamps, consumers said they either did not know solar lamps existed, did not know how they worked, or found they were too expensive.

[36] Prices of solar lamps collected during field visits in Kenya. Took weighted average of price of a high-end solar lamp with price of a low-end solar lamp. Weights based on volumes sold

[37] from calls with IFC

Table 5.1: BOP Needs Targeted by Program Objectives and Approach

BOP Needs	LA Objectives Targeting Needs	LA Approach Targeting Needs
More **affordable** and **better quality** lighting options	▪ **Increase access** to better energy services for the BOP by mobilizing the private sector to supply quality, affordable, clean, and safe lighting ▪ Assist manufacturers to **develop/enhance products** to meet LA standards ▪ **Facilitate entry** of LA-certified products under $25 ▪ **Extend distribution** of quality products ▪ Develop and institutionalize **quality standards**.	**Quality Assurance** ▪ Designed high quality standards and tested solar lamps against these standards LA Overall ▪ LED technology improvements were already driving prices down for higher quality products
Access to finance for initial cost of solar lamp	▪ Mobilize **IFC and non-IFC finance**	**Access to Finance** ▪ Consulted with MFIs to explain the quality of LA-certified products and rigor of testing process, thus lowering risk of providing microloans for these products
Healthier and safer lighting options	▪ **Increase access** to better energy services for the BOP by mobilizing private sector to supply quality, affordable, clean, and safe lighting	LA Overall ▪ Promoted high-quality solar lamps, which are healthier and safer options than kerosene lamps

5.2.2 Government of Kenya

We identified at least six key objectives that the Government of Kenya had for developing the off-grid energy sector at the time from the Kenyan 2006 Energy Act[38]

- Support the electrification of rural areas and other areas considered economically unviable, and promote the use of renewable energy technologies including solar
- Attract outside funds for the expansion of rural electrification
- Promote development of appropriate local capacity for the maintenance and operation of basic renewable technologies such solar systems
- Promote international co-operation on programs focusing on renewable energy sources
- Facilitate implementation of pilot projects and demonstration projects for promotion of efficient use of energy and its conservation

[38] As identified in Kenya's 2006 Energy Act

- Facilitate importation of energy efficient but cost effective technologies.

Some of these objectives were corroborated during our meetings with the Kenya Ministry of Energy. For instance, we spoke with a director at the Ministry, who indicated that LA rightly targeted the country's objective of improving access to people living off the grid (particularly through use of solar), and developing the renewable energy sector. Specifically, our contact with the Ministry remarked that LA helped achieve these objectives by implementing the quality standards, increasing consumer awareness, and defining the solar lamp supply chain.

The Government is an agent of the people. Through these objectives, it sought to meet consumers' needs for better quality, healthier, safer, and more affordable lighting options. Therefore these objectives are aligned with consumers' needs.

The LA programs targeted all six Government objectives through the Policy Development and Business Development components. Furthermore, program objectives are directly aligned with four of the Government objectives. Therefore, we conclude that **the LA program is highly relevant to the energy sector plans of the Government of Kenya, and by extension, the needs of its citizens.**

Table 5.2 shows the link between the Government's objectives and the LA objectives and approach.

Table 5.2: Kenya Government Objectives Targeted by LA Objectives and Approach

Kenya Government Objectives	LA Objectives targeting Government Objectives	LA Approach targeting Government Objectives
Support electrification of rural areas, promote use of renewable energy technologies including solar	▪ Increase access to better energy services for BOP consumers by mobilizing private sector to supply quality, affordable, clean, and safe lighting	**Policy Development** ▪ Consulted with Government to explain the potential of the solar lamp market to support the country's goal of increased access to improved lighting for rural populations LA Overall ▪ LA was designed to develop the solar lamp market to serve off-grid areas, which are generally in remote and rural parts of the country
Attract outside funds for the expansion of rural electrification	▪ Mobilize IFC and non-IFC finance	LA Overall ▪ Designed to mobilize private funds of the supply chain, and to finance to the supply chain from financial institutions and IFC

Promote development of local capacity for maintenance and operation of basic renewable technologies, such solar systems	▪ N/A	**Business Development** ▪ Train solar lamp technicians
Promote international co-operation on programs focusing on renewable energy sources	▪ Link manufacturers to local distributors/bulk buyers	LA Overall ▪ Facilitate entry of international manufacturers into Kenya solar lamp market
Facilitate implementation of pilot projects and demonstration projects to promote efficient use of energy	▪ N/A	**Policy Development** ▪ Support Government to develop pilot projects that demonstrate benefits of solar lamps to consumers
Facilitate importation of energy efficient but cost effective technologies.	▪ Facilitate entry of LA-certified products under $25	**Policy Development** ▪ Advise Government on tariffs and customs practices for solar lamps

5.2.3 Supply chain (Manufacturers, Distributors, Retailers)

Another major need in the market was getting the lamps to the consumers. Manufacturers (mostly international), Distributors, and Retailers (referred to as the "supply chain") faced several barriers, including:

- Lack of information explaining consumer lighting needs, lighting behavior, and preferences on product design
- Lack of understanding of the supply chain and how it could be adapted for this market
- Inadequate finance
- Lack of information on improved customs procedures, policies, and regulatory environment
- Lack of industry quality standards for solar products
- Lack of consumer awareness of solar lamps and their benefits.

These supply chain needs were identified through IFC's publication "From Gap to Opportunity: Business Models for Scaling Up Energy Access" and through the programs' 2007 Appraisal Document. Our interviews with the supply chain during this evaluation confirmed that lack of information on consumer preferences, industry quality standards,

finance, and consumer awareness were major needs the supply chain faced prior to the LA intervention.

The needs identified in the table agree with our findings from interviews with supply side stakeholders, including 6 manufacturers, 6 distributors, and 20 retailers. These entities confirmed that the LA program was targeting the right barriers that prevented them from entering markets in Africa, and thereby limiting their sales potential. For instance, they cite the initial challenges they faced from not knowing enough about the markets or what these BOP consumers were looking for in their lighting products.

LA's approach and objectives are aligned with all these supply chain needs, making the **programs highly relevant to the supply chain for solar lamps**. Table 5.3 shows the links between the supply chain needs and the relevant LA objectives and components.

Table 5.3: Supply chain Needs Targeted by Program Objectives and Approach

Supply chain Needs	LA Objectives Targeted to Needs	LA Approach Targeted to Needs
Information explaining consumer **lighting needs**, **lighting behavior**, and **preferences** on product design	▪ Assist manufacturers to **develop/enhance products** to meet LA standards	**Market Intelligence** ▪ Produced and disseminated reports to get this information to the supply chain **Communication** ▪ Developed a website to disseminate market intelligence reports
A good **understanding of the supply chain** and how it could be **adapted** for this market	▪ **Link manufacturers** to local distributors/bulk buyers	**Business Development** ▪ Held workshops and conferences to introduce supply chain members ▪ Trained solar lamp technicians, and recruited and trained additional distribution companies to adapt the supply chain to address needs of solar lamp market **Communication** ▪ Developed a website to disseminate information on the supply chain
A set of minimum **quality standards** for solar products, to avoid market spoilage	▪ Develop and institutionalize **quality standards**	**Quality Assurance** ▪ Designed quality standards against which to test products **Communication** ▪ Developed a website to disseminate certification explaining which products passed LA-quality testing
Increased **consumer awareness** of the solar lamps	▪ **Extend distribution** of quality products	**Consumer Education** ▪ Communicated benefits of solar products to end-users, explained how they worked and where they could be purchased
Increased **availability of finance** for the supply chain	▪ Mobilize **IFC and non-IFC finance**	**Access to Finance** ▪ Consulted with financial institutions on market potential and quality of LA-certified products **Development Marketplace** ▪ Provided competitively awarded grants as seed finance for start-up solar lamp companies
Information on improved **customs procedures and policy/regulatory environment**	▪ **Facilitate entry** of LA-certified products under $25	**Policy Development** ▪ Informed supply chain of customs and policy procedures in African countries ▪ Consulted with governments to try and improve customs and policy environment

Access to **start-up information** (market intelligence, supply chain mapping) **at affordable** prices	▪ Assist manufacturers to **develop/enhance products** to meet LA standards	LA Overall ▪ LA absorbed all or parts of costs for developing and disseminating the needed information, testing products, and establishing links among supply chain entities **Market Intelligence** ▪ Produced and disseminated reports for free to get this information to the supply chain **Business Development** ▪ Held workshops and conferences to introduce supply chain members and produced documents that listed contact information of distributors

5.2.4 International Finance Corporation

To identify IFC's objectives for the lighting sector of people living off the grid in Africa, we checked the objectives of IFC's Private Enterprise Partnership for Africa (PEP Africa) program. PEP Africa is an IFC program created to stimulate private sector growth in Africa with the long term goals of creating jobs, reducing poverty, and improving livelihoods. Through this program, IFC provides advisory services to build partnerships among donors, governments, and the private sector to promote a stronger business environment.

PEP Africa's objectives include: (i) helping small and medium enterprises (SMEs) develop; (ii) promoting private sector investments that will help improve access to basic services (including energy); (iii) improving investment climate; (iv) promoting energy efficiency, and (v) helping financial institutions expand services to low-income households and SMEs. These objectives were identified in a PEP Africa Development Impact Report[39].

We checked the relevance of LA to these IFC objectives as was required in the TOR. It is important to confirm that IFC's activities within the LA programs are aligned with IFC's overall goals for the Africa region.

Table 5.4 below shows clear links between PEP Africa's objectives, and the LA programs' objectives and components.

[39] "IFC Advisory Services the Private Enterprise Partnership for Africa, a Development Impact Report". IFC. Accessed at: http://www.ifc.org/wps/wcm/connect/24f3e50048915c2fb254f681dd77ebd3/PEP_Africa_Dvlpt_Report.pdf?MOD=AJPERES

Table 5.4: IFC Objectives Aligned with LA Objectives and Approach

PEP Africa Objectives	LA Objectives Targeted to Priorities	LA Approach Targeted to Priorities
Support creation and growth of **small and medium enterprises (SME)**	▪ Assist manufacturers to **develop/enhance products** to meet LA standards ▪ **Link manufacturers** to local distributors/bulk buyers	LA General: ▪ The program was designed to assist manufacturer, distributor, and retail companies, which were mostly small and medium companies
Promote **private sector involvement** that will help improve **access to basic services (including energy)**	▪ **Increase access** to better energy services for the BOP by mobilizing private sector to supply quality, affordable, clean, and safe lighting	LA General: ▪ LA promoted private sector investment by facilitating the entry of private manufacturers into the sector ▪ LA promoted expansion of energy by facilitating the solar lamp market in off-grid areas of African countries.
Improve **investment climate**	▪ **Facilitate entry** of LA-certified products under $25	**Policy Development** ▪ Consulted with governments to try and improve customs and policy environment
Promote **energy efficiency**	▪ **Increase access** to better energy services for the BOP by mobilizing private sector to supply quality, affordable, clean, and safe lighting	LA General: ▪ LA promoted development of the solar lamp market. These products are more energy efficient than the kerosene lamps commonly used in the region
Help financial institutions **expand services to low-income households and SMEs**	▪ **Mobilize IFC and non-IFC finance**	**Access to Finance** ▪ LA consulted with MFIs and local financial institutions on lending to consumers and suppliers of LA-certified lamps

As seen in the table, LA objectives and components were aligned with all key objectives of the PEP Africa program. Therefore, we conclude that the LA programs' were clearly **aligned to IFC's strategic objectives in improving access to lighting for populations living off the grid in Kenya and other parts of Africa**.

5.3 Did Stakeholders Demonstrate Relevance of the Programs through Cost-Sharing or In-Kind Contributions?

We checked if program stakeholders were willing to pay for benefits received by the LA programs. This is important because if stakeholders truly value something, they should be willing to pay something for it. If beneficiaries did not pay for services, statements about relevance may not be credible unless there are other strong reasons for lack of payment. Thus, in-kind or cash contributions from stakeholders provide strong evidence that the programs were relevant and of value to them.

LA charged for two services provided by the programs: quality assurance testing, and attendance of LA conferences. On occasion beneficiaries were also charged for some training events. Furthermore, LA associates that benefited from LA's cost-sharing grant programs contributed cash, which was then matched by the program. Even when attending free events (like LA workshops), associates paid for all or part of their travel costs.

LA did not charge for Market Intelligence reports or workshops for linking businesses. However, we checked the willingness of the supply chain to pay for these services. There were no in-kind contributions made to the programs.

Table 5.5 below presents the evidence we gathered through interviews on how much program beneficiaries' paid for LA services, and their willingness to pay for services that were provided for free.

Table 5.5: Cost Sharing of Program Activities

Component	Activity	Cost-Sharing or In-Kind Contributions?
Paid something or made in-kind contribution to receive benefit of program activity		
Quality Assurance	Product testing	**Yes, 6 out of 6 stakeholders paid something (100%)** ▪ 6 out of 6 manufacturers interviewed paid for testing
Business Development	International conferences	**Yes, 11 out of 12 stakeholders paid something (92%)** ▪ 5 out of 6 manufacturers interviewed paid to attend at least one conference – 1 did not attend ▪ 6 out of 6 distributors interviewed paid to attend at least one conference
Willing to pay something to receive benefit of program activity if it were not provided for free		
Business Development	Workshops and/or trainings	**Mixed, 5 out of 10 stakeholders interviewed were willing to pay something to register (50%)** ▪ 2 out of 6 manufacturers interviewed said they would pay some registration fee (in addition to travel costs) to attend a workshop – 3 were unsure if they would pay – 1 would not pay ▪ 3 out of 4 distributors[40] interviewed who attended the workshops said they would pay to attend – 1 would not pay
Market Intelligence	Reports	**Mixed, 8 out of 12 stakeholders interviewed were willing to pay something (67%)** ▪ 3 out of 6 manufacturers interviewed said they would pay something for these reports – 2 would not pay – 1 had not used them and was unsure if would pay ▪ 5 out of 6 distributors interviewed said they would pay something for these reports – 1 would not pay

Source: Desk and Field Visit Interviews

As indicated in the table:

- **100 percent** of manufacturers interviewed paid something to receive quality assurance testing
- **92 percent** of manufacturers and distributors interviewed paid something to attend at least one LA conference

[40] Note that we only included results for distributors who understood the distinction between the LA workshops and the LA conferences

- **50 percent** of manufacturers and distributors interviewed were willing to pay something to register for a LA workshop
- **67 percent** of manufacturers and distributors interviewed were willing to pay something for a Market Intelligence report

Manufacturers and distributors were more likely to pay for quality assurance testing and LA conferences than they were willing to pay for market intelligence reports or workshops.

Responses on willingness to pay for market intelligence reports indicate that some companies believe they could get this information elsewhere for free, and so would not pay for it. Specifically, one manufacturer said that these types of reports could be produced by local MBA students for free. With half of our sample of manufacturers and distributors not willing to pay for market intelligence reports, this could present difficulties for the Global Off-Grid Lighting Association (GOGLA), which plans to charge for market intelligence reports in the future.

Another finding from our interviews is that market intelligence reports may only have been valuable to the supply chain when the market was nascent. However, once the market is developed, there is no substantial need for these reports. Two of the manufacturers we interviewed said that the market intelligence reports are no longer very valuable now that the companies have been operating in the sector for a couple years.

The LA programs did not charge for some outputs because they had public good characteristics. These included information on the market (market intelligence reports and consultations with financial institutions and governments), information on the policies and regulatory environment in different African countries (policy reports), using the quality assurance standard, and accessing the website. These outputs were designed to provide information to the market in one way or another. Not charging for these outputs is reasonable—charging for information is generally difficult because it is often a public good (that is the information is non-excludable and non-rival). Another factor that makes it difficult to charge for information is that people cannot judge the quality of the information until they have it; and when they possess it, they will not pay for it.

Other outputs, such as quality assurance testing, workshops, and conferences, are private goods—people could be excluded from benefiting from these for instance. The LA programs charged for the international conferences and testing, but not for most of the workshops. These are all private goods, and so LA could have charged for all three of these outputs, instead of just the two.

To illustrate, we examine the quality assurance component. It will be very difficult to charge for the **minimum quality standards** developed. The information needs to be published and made freely available for people to adopt them in designing their lamps. This makes it almost a pure public good. On the other hand, **quality assurance testing**, certifications, and advice to a particular company are excludable. Advice to one company can be kept confidential, and people who claim to be certified but are not can be prosecuted. Therefore these are private goods for which companies can charge.

Similarly, **workshops** and **conferences** are private goods—given limited space and seating, people can easily be excluded. Thus beneficiaries can be charged for these programs. However, **information campaigns to consumers** cannot be charged for. The idea is to reach as many people as possible, and so they are by definition non-excludable.

Based on this analysis, it is clear that activities the LA programs charged for were private goods, including the quality assurance testing, the workshops, and the conferences.

LA could have charged for the market intelligence reports, but this may have limited the market transformation. **Market intelligence reports** can be rival and excludable if not made publically available. However, since the point of the market intelligence report is to spread information on the market, making these reports excludable early on might have been detrimental to market growth. Furthermore, those who received the reports may not have been willing to pay since they could not judge the quality of the information until they actually read the reports. The remaining outputs of the programs were more difficult to charge for because they had elements of non-rivalry or non-excludability:

The LA team consulted with financial institutions to **mobilize finance** to the supply chain and BOP consumers. IFC provided information on the quality assurance testing and the market potential to financial institutions illustrating the opportunity for providing finance to the market. Again this is an issue of providing information where people do not know the quality of information until it is provided, and are unwilling to pay after already receiving the information. In addition, it would be illogical to charge for these consultations since the purpose was to raise funds, not make money.

Through its Communications component, the LA team **disseminated information** (consumer research, policy research, and quality assurance criteria) through the LA website. Similar to consumer education campaigns, the purpose of this activity was to spread information to as many relevant stakeholders as possible, therefore it would not make sense to charge.

Finally, the LA program established one institution (GOGLA) and trained others (including KEREA) to take over LA activities after the programs' close. The goal was to **sustain certain benefits** of the programs through local institutions. This leads to pricing decisions for the future, what these sustainability organizations should and should not charge for.

5.4 Conclusions on Relevance

We conclude that LA was highly relevant to key stakeholders (BOP consumers and the Kenya Government). The programs targeted all three of the major lighting needs of BOP consumers; and all six of the relevant objectives the Kenya Government set for expanding access to electricity for rural consumers.

The LA programs' design also targeted all seven of the supply chain needs. Furthermore, the supply chain demonstrated that the programs' activities were relevant to them by paying to receive quality assurance testing of their solar lamps, and by paying to attend the LA international conferences and some training workshops. The supply chain was less willing to pay for services LA had provided for free, including the workshops to link businesses, and the market intelligence reports. This is reasonable since these outputs and activities are non-excludable and non-rival.

By targeting barriers for the supply chain, LA sought to increase the production and distribution of high-quality, safer lighting devices. Thus by targeting the supply chain needs, LA was in effect targeting the needs of BOP consumers. The LA programs objectives and design were also aligned with all five of IFC PEP Africa's objectives.

6 Effectiveness and Impact

Evaluating the effectiveness and impact of the LA programs involves assessing the extent to which LA achieved its targeted outputs, outcomes and impacts. Section 6.1 presents tables with the programs' targeted outputs, outcomes, and impacts, and the results reported against these targets. We spot-checked some of the results as a way to validate reporting by the program.

This is not enough however. We need to know if the impacts reported were really *caused* by LA. Lighting Africa as aimed to transform the market, and if it did as planned, then the impacts can fairly be attributed to LA. Section 6.2 assesses the solar lamp market today, using evidence from our interviews with the supply chain, BOP consumers, and the Government of Kenya

Once the market is functioning, this should lead to the envisaged impacts. Section 6.3 evaluates the extent that these impacts can be attributed to the LA programs.

To be effective, the LA programs should also have identified potential risks to the program and developed mitigation strategies. Section 6.4 provides an assessment of the risks identified and strategies implemented.

Based on this analysis we conclude the extent to which the LA programs were effective in Section 6.5.

6.1 Did LA Meet its Targeted Outputs, Outcomes, and Impacts?

When the LA program was created, the IFC selected a set of indicators and set targets to measure the programs' effectiveness. These were recorded in a logframe that presents, for each indicator, the target, and the result observed (IFC refers to this as the "Logic Models"). LA JV and LA Kenya logframes have a total of 71 output indicators, and 30 outcome indicators spread across seven program components.

In this section, we assess the LA programs' effectiveness by comparing the results reported to the targets. To confirm the accuracy of the reported results, we validate the numbers for a sample of the reported results, and check the consistency of reported results across program documents.

6.1.1 Targets and Reported Results of Outputs, Outcomes, and Impacts

This section presents program targets and results by indicator for the LA JV and LA Kenya programs. These are organized by component in Table 6.1 through Table 6.6 below. The tables include outputs and outcomes for the programs' seven components: Market Intelligence, Quality Assurance, Business Development, Consumer Education, Access to Finance, Communication, and Private Sector Development.

In addition to the targets and results, we explain (in the "Interpretation" column) how each indicator should be interpreted and measured.

Table 6.1: LA JV Market Intelligence Outputs and Outcomes

LA JV							
Output Performance				**Outcome Performance**			
Indicator	**Target**	**Result**	**Interpretation**	**Indicator**	**Target**	**Result**	**Interpretation**
Market Intelligence (outside Kenya and Ghana)							
Number of entities receiving advisory services	17	144	Tracks number of companies using LA research reports	Number of entities that implemented recommended changes	15	101	Number of entities receiving the research reports that implemented any of the recommendations indicated
Number of procedures recommended for improvement or elimination	5	0	Number of recommendations in the LA research reports. Recommendations from reports. This reports tend to be market specific and informative in nature rather that instructive and company specific	Number of recommended procedures improved/eliminated	5	0	Recommendations from reports implemented
Number of reports completed	12	33	Produced reports detailing consumer preferences, willingness to pay, distribution networks, etc				
Market Intelligence (knowledge management)							
Number of entities receiving advisory services	3	0	Beneficiaries from the development of a replication/best practice toolkit for market transformation programs	Number of entities that implemented recommended changes	15	0	Number of entities receiving the toolkit that implemented any of the recommendations therein

Number of procedures recommended for improvement or elimination	4	0	Number of recommendations from the kit	Number recommended procedures improved/eliminated	4	0	Number of specific recommendations adopted
Number of reports completed	1	0	Development of a replication/best practice toolkit for market transformation programs				

LA Kenya

Output Performance				**Outcome Performance**			
Indicator	**Target**	**Result**	**Interpretation**	**Indicator**	**Target**	**Result**	**Interpretation**
Market Intelligence							
Number of entities receiving advisory services	20	24	Number of organizations directly receiving marketing intelligence reports to support their operations in the market	Number of entities that implemented recommended changes	8	12	Number of entities receiving the reports that implemented any of the recommendations indicated
Number of procedures recommended for improvement or elimination	2	2	Type of reports which are market specific not company specific, this indicator targets two key recommendations from the Market Intelligence reports.	Number of recommended procedures improved/ eliminated	1	2	Of the recommendations indicated which ones were implemented. For instance, did associates engage with women's groups as highlighted in the reports
Number of reports completed	13	20	Reports detailing consumer preferences, willingness to pay, distribution networks, etc				
Number of copies of project materials distributed or downloaded	30	115	Number of times reports were distributed physically or electronically to beneficiaries (in Kenya)				

Based on the results reported in its logframe, LA JV did not meet most of its market intelligence targets. There were also some inconsistencies in how the results were reported.

On market intelligence efforts outside Kenya and Ghana, LA JV reportedly recommended **zero procedures** (instead of the five planned recommendations); yet, 101 entities were reported to have implemented recommendations. If zero recommendations were reported, the program should not then claim that 101 entities implemented recommendations. We probed this inconsistency and gathered that while there may not have been *specific* recommendations, the market intelligence provided in the 33 reports were useful to the firms that received these reports. These 101 entities were companies that reported (via surveys) that they used the market intelligence reports to improve their operations. Moreover, during this evaluation, we interviewed a sample of manufacturers and distributors that benefited from the LA program. These beneficiaries explained that the market intelligence reports were useful in improving their business operations. Three of the six manufacturers (50 percent) interviewed said that reports were important to their businesses, but two of them remarked that the reports are now less important after having been in the market a while. All six of the distributors interviewed (100 percent) said these reports were helpful to their businesses. Section 6.2 (page 78) provides more detail from our interviews about how the market intelligence outputs helped to remove the barriers suppliers faced in the solar lamp markets.

LA JV also did not deliver the three outputs and two outcomes targets that were related to developing a best practice toolkit for market transformation programs. The Completion Note reports that this replication toolkit will be a priority for the next phase of the program.

LA Kenya, on the other hand, did well at meeting its targets for Market Intelligence. Twenty four entities benefited from advisory services (120 percent of its target). Similarly, LA Kenya delivered 20 reports (154 percent of target), recommended two main procedures in these reports (100 percent), and these recommendations were implemented by 12 of the other entities (150 percent of target).

Again, the programs are likely underestimating the actual outcomes delivered through the programs' market intelligence efforts. Evidence from surveys administered by the LA team to beneficiaries, and from our interviews during this evaluation suggests that the market intelligence reports were useful to many of the beneficiaries in understanding their target markets. The benefits may be difficult to quantify within these specific indicators. Therefore, we suggest that the LA program team evaluate its approach to measuring the effects of its market intelligence efforts. This could be by redefining what is counted as a "recommendation" or a "procedure", and being more deliberate about tracking which of these recommendations were implemented by target entities.

Table 6.2: LA JV Quality Assurance Outputs and Outcomes

LA JV	
Output Performance	**Outcome Performance**

Indicator	Target	Result	Interpretation	Indicator	Target	Result	Interpretation
Quality Assurance (Technical Notes)							
Number of entities receiving advisory services	65	68	Number of manufacturers receiving advising from LA or submitted products for testing. Advising provided through interpretation of testing results	Number of unique product models improved	32	44	Number of manufacturers that used LA reports for their business plans or improved products from technical briefing notes
Number of reports completed	12	15	Technical Briefing Notes and Eco-Design Notes to guide manufacturers on how to develop high-quality and environmentally friendly products				
Quality Assurance (Testing)							
Number of off-grid lighting products tested	70	183	Number of unique solar lamps submitted for the QTM, ISM, or MCM tests	Number of Lighting Africa approved products	45	66	Number of unique solar lamps that passed the QTM tests
Number of entities receiving advisory services	50	72	Number of manufacturers that submitted products for testing	Number of entities that implemented recommended changes	36	46	Number of entities that adopted the ISM & QTM recommendations that were proposed to them by the program
Number of procedures recommended for improvement or elimination	2	16	(i)LA off-grid Lighting standards, (ii) Number of ISM & QTM recommendations made to specific companies	Number recommended procedures improved/eliminated	2	16	Number of ISM & QTM recommendations made to specific companies that were adopted
Number of reports completed	180	184	(i) Develop off-grid Lighting standards (ii) Number of test reports from LAQTM and ISM testing labs	Number of LA approved products sold	700,000	1,993,165	Number of LA approved products sold in Africa (excluding Kenya and Ghana)

Quality Assurance (lab capacity building)							
Number of entities receiving in-depth advisory services	8	8	Number testing labs received training, guidance from LA	Number of entities that implemented recommended changes	5	6	Number of testing labs receiving recommendations that actually implemented them.
Number of procedures recommended for improvement or elimination	1	21	number of recommendations made to labs or other institutions	Number recommended procedures improved/eliminated	1	21	Of the recommendations indicated which ones adopted by labs or other institutions
Number reports completed	1	1	Number of testing methodologies completed and made available to labs				
Quality Assurance (carbon finance methodology)							
Number of procedures recommended for improvement or elimination	1	1	Number of testing methodologies adopted by other institutions for carbon credits assessment for off-grid products	Number of recommended procedures improved/ eliminated	1	1	Number of testing methodologies proposed were actually adopted by the target entity
Number of entities receiving advisory services	1	1	Number of institutions advised on carbon finance methodology in relation to off-grid lighting products	Number of entities that implemented recommended changes	1	1	Number of entities that actually adopted the methodologies
Number of reports completed	1	1	Number of testing methodology documents prepared for adoption for carbon credits assessment for off-grid products				

As illustrated in the table above, only LA JV had targets for the Quality Assurance component. Although both LA Kenya and LA JV played a role in this component, LA JV implemented most of the activities.

LA JV reports that all 12 of its output indicators were met (100 percent), and all nine of its outcome indicators were met (100 percent). This indicates LA JV met its targets to a large extent for Quality Assurance.

It appears that LA JV did well to leverage its advisory services to get manufacturers to implement recommended changes. For instance, the *Number of entities receiving advisory services* either through advisory on product testing results or through Technical Notes was slightly above target (5 percent). However, the number of manufacturers that improved their product design or business plans was 38 percent above target. This implies high-quality advisory services and Technical Notes were provided.

On product testing, LA JV exceeded all four output and four outcome targets. The reported number of LA-certified lamps sold was 185 percent above target. This appears to be a huge success for the programs—this measures the high-quality products getting into the market. Because this is an important indicator, we attempt to validate this result. This is discussed in more detail in 6.1.2.

LA JV also reports that all 16 of its recommendations and standards were adopted by companies advised. The same applied to the number of recommendations made to testing laboratories, all 21 recommendations made were adopted. Six testing labs were reported to have implemented recommended changes. These were the six labs that went on to test solar lamps using the LA methodology. These labs had to implement the Lighting Africa recommendations before they could be approved as testing facilities.

LA JV set targets to develop one carbon finance methodology and one minimum quality standards methodology—the logframe reports that both of these targets were met. There was no intention of creating multiple methodologies, thus there was no room for exceeding the target.

Table 6.3: LA Kenya Business Development Outputs and Outcomes

LA Kenya							
Output Performance				**Outcome Performance**			
Indicator	**Target**	**Result**	**Interpretation**	**Indicator**	**Target**	**Result**	**Interpretation**
Business Development (workshops, training)							
Number of workshops, training events, seminars, conferences, etc	12	16	Number of business linking workshops, outreach, trainings, held in Kenya	Number of people reporting on knowledge, attitude, practices	200	107	Number of survey respondents in the Knowledge/Attitude/Practices survey taken to gauge effectiveness of the training, three to six months post-training

Number of participants providing feedback on satisfaction	160	167	Number of participants who provided feedback on satisfaction surveys after business linking workshops, outreach, trainings, held in Kenya	Number of people reporting improved knowledge, attitude, practices	100	106	Based on the above survey, number of respondents who confirmed that the training had resulted in improved knowledge, attitudes or practices
Number of participants reporting satisfied or very satisfied with workshops, trainings, seminars, conferences, etc.	130	144	Number of participants who reported that they were satisfied with business linking workshops, outreach, trainings, held in Kenya				
Number of participants in workshops, training events, seminars, conferences, etc.	200	340	Number of participants at the business linking workshops, outreach, trainings, held in Kenya				
Number of women participants in workshops, training events, seminars, conferences, etc.	60	97	Number of women participants at the business linking workshops, outreach, trainings, held in Kenya				
Business Development (advisory services for distributors)							
Number of distributors of quality products	24	24	Total key distributors/ importers of LA-certified products operating in the country (confirmed by	Number of LA approved lighting products sold	300,000	686,685	Number of LA approved lighting products sold in Kenya

			manufacturers with LA-certified products)				
Number of procedures recommended for improvement or elimination	1	25	Number of procedures/recommendations to distributors/importers that would improve business.	Number recommended procedures improved/eliminated	4	24	Number of distinct elements of the team's recommendations actually adopted by the target entity.
Number of reports completed	8	8	Business related reports, generally LA updated product reports for distributors	Number entities implemented recommended changes	9	14	How many entities implemented the recommendations made
Number distributors with products passing QA test	15	17	Number of distributors who were actively involved in disseminating LA-certified solar lamps				
Business Development (conferences, trade fairs)							
Number of participants in workshops, training events, seminars, conferences, etc.	800	828	Number of people who attended Kenya conferences and trade fairs	Number of SME contracts signed	9	11	Number of business agreements facilitated among supply chain
Number of participants reporting satisfied or very satisfied with workshops, trainings, seminars, conferences, etc.	540	639	Number of participants who reported that they were satisfied with the conferences and trade fairs	Number of entities that implemented recommended changes	24	37	Number of entities that acted on information from conferences/ workshops.

Number of LA approved products available in the market	18	24	Number of unique products that passed QTM and are available for sale in Kenya	Number of LA approved products available in the market under $25	6	7	Number of LA approved products available in Kenya under $25
Number of workshops, training events, seminars. Conferences, etc.	3	5	Number of conferences in Kenya	Number of people reporting on improved knowledge/attitude/practices	100	105	Number of survey respondents who confirmed that the event had resulted in improvements in their knowledge or attitude or practices relevant to their work/circumstances
Number of participants providing feedback on satisfaction	640	695	Number of participants who provided feedback on satisfaction surveys after conferences in Kenya	Number of people reporting on knowledge/attitude/practices	200	120	Post activity survey participants
Number of procedures recommended for improvement or elimination	2	3	Recommendations from Kenya conferences	Number of recommended procedures improved/eliminated	2	3	Number of recommendations that actually helped improve operations among target entities
Number of women participants in workshops, training events, seminars, conferences, etc.	200	165	Number of female participants at Kenya conferences				
Business Development (workshops, training in Kenya)							
Number of participants providing	60	62	Number of participants who provided feedback on their level of	Number of people reporting on knowledge practices	48	73	Number of respondents to the post-training survey on Knowledge/Attitude/Practice

feedback on satisfaction			satisfaction with workshops				
Number of participants reporting satisfied or very satisfied with workshops, trainings, seminars, conferences, etc.	48	57	Number of participants who reported that they were satisfied with workshops	Number of people reporting improved knowledge	38	73	Number of survey respondents who confirmed that the event had resulted in improvements in their knowledge or attitude or practices relevant to their work/circumstances
Number of workshops, training events, seminars. Conferences, etc.	4	8	Number of workshops specifically related to technical/ technician training in Kenya				
Number of participants in workshops, training events, seminars, conferences, etc.	80	94	Number of participants at the technical training workshops				
Number of women participants in workshops, training events, seminars, conferences, etc.	16	9	Number of female participants at the technical training workshops				
Business Development (linkages for value chain)							

Number of entities receiving advisory services	20	26	Number of potential non-traditional organizations (NGOs, plantations, corporates, self-help groups) reached out to enter the off-grid market	Number of entities that implemented recommended changes	6	8	Number of non-traditional organizations that adopted the procedures recommended
Number of procedures recommended for improvement or elimination	1	9	Number of recommendations provided to the target organizations to improve performance (in this case, improve linkages)	Number recommended procedures improved/eliminated	1	8	Number of recommendations provided that actually improved performance for these target organizations
Number of reports completed	3	3	Number of Reports/ manuals/ presentations made to these non-traditional outlets . This includes market surveys/ presentations, passed products reports				
Number corporates and other organizations (not Associates) receiving advisory service to develop market	9	14	Tracks corporates and non-traditional channels for LA quality products facilitated				

As illustrated in the table above, only LA Kenya had targets for the Business Development component. Although both programs played a role in this component, more business development efforts were focused in Kenya. LA Kenya reports that 23 of its 25 output indicators were met (92 percent) and 13 of its 15 outcome targets were met (87 percent).

The program delivered more workshops and training events (16 versus 12) and reached more people (340 versus 200) than targeted. About 86 percent of the participants that provided feedback said they were satisfied with the workshops. LA Kenya also outperformed on most of its target outcomes. In particular, 99 percent of the people who reported on the effectiveness of the workshops and trainings confirmed improved knowledge and practices as a result of their participation.

On its advisory services to distributors, the key success recorded is that distributors of LA-certified products were able to sell 686,685 lamps, **129 percent more than targeted**. This success can be partly attributed to the program's services to distributors. LA Kenya reportedly recommended 20 more procedures to its target clients than planned and 14 entities implemented these procedures. However, it is unlikely that the total number of lamps sold can be fully attributed to Lighting Africa. This point is discussed in more detail in Section 6.3.

One of the targets not met was the total female participants in the conferences and training events held in Kenya, although the total participants target was met. This poses the question of why there was less involvement by women in these conferences. Perhaps the IFC could consider the design or advertisement of these conferences and how they could attract more women in the future, if this is important to the organization.

In addition to the programs' success with conferences, workshops, LA Kenya outperformed on its efforts to expand and link the value chain for solar lamps. Eight organizations reported changes to their business lines as a result of recommendations made by the LA team. Specifically, they agreed to become off-grid lighting channels. The IFC should look into the success factors here and replicate elements of this activity. For instance, was part of the success due to involvement by MFIs and CBOs to disseminate awareness of solar lamps and sometimes to sell directly end-users? Evidence from our interviews in Kenya indicates CBOs are educating their consumer groups on solar lamps and MFIs are selling products directly to consumers.

Table 6.4: LA Kenya Consumer Education Outputs and Outcomes

LA Kenya							
Output Performance				**Outcome Performance**			
Indicator	**Target**	**Result**	**Interpretation**	**Indicator**	**Target**	**Result**	**Interpretation**
Consumer Education (launch campaign)							
Number of media appearances	3,000	2,014	Number of times a LA TV or radio advertisement ran in Kenya	Number of people reached by IFC partners/clients	15,000,000	29,518,000	Number of people reached through above the line media (TV, radio, fliers)
Number of workshops, training events, seminars. Conferences, etc.	250	1,157	Number of forums run during consumer education campaigns	Number people reporting on knowledge/attitude/ practices	320	511	Number of people who attended education campaigns who responded to the post-even survey
Number of participants in workshops, training events, seminars, conferences, etc.	5,000	36,433	Number of people reached through education campaigns in Kenya	Number of people reporting improved knowledge/attitude/ practices	160	379	Number of survey respondents who indicated positive improvement in knowledge/attitude/practice as a result of the education campaigns. This could mean purchase, recommending to others, beginning to save towards buying solar lamp
Number of participants providing feedback on satisfaction	800	813	Number of people who attended education campaigns and gave feedback on survey				

Number of participants reporting satisfied or very satisfied with workshops, trainings, seminars, conferences, etc.	600	613	Number of people who reported they were satisfied with the education campaign				
Number of women participants in workshops, training events, seminars, conferences, etc.	1,600	6,464	Number of females who attended education campaigns				

As illustrated in the table above, only LA Kenya had targets for Consumer Education. LA JV did develop consumer education material to be adapted for different countries, but the program did not set targets.

LA Kenya reports five of its six output targets were met (83 percent), and all three of its outcomes were met (100 percent). Thus the logframe indicates LA Kenya did well on this component.

LA Kenya did well to leverage its media advertisements to reach more people than targeted (launched 33 percent less advertisements than targeted and reached 97 percent more people than targeted). However this begs the question of how this reach result was calculated, and why this same calculation was not taken into account when setting the target. Although the target for media advertisements was not met, the outcome of people reached was far exceeded. This could imply that the LA Kenya team did not think it was necessary to launch the additional advertisements.

LA Kenya reached over six times more people than targeted through its education campaigns. This was driven in part because LA Kenya held more than four times the amount of targeted forums. While the LA Kenya did very well to meet its Consumer Education targets, evidence from our surveys indicate that consumer awareness could still be improved in Kenya. Assuming LA Kenya also noticed lower levels of consumer awareness than expected, it makes sense that the program would implement more campaigns than planned.

Table 6.5: LA JV and LA Kenya Access to Finance Outputs and Outcomes

LA JV							
Output Performance				**Outcome Performance**			
Indicator	**Target**	**Result**	**Interpretation**	**Indicator**	**Target**	**Result**	**Interpretation**
Access to Finance							
Number of entities receiving advisory services	5	24	Number of financial institutions receiving advise from LA to develop financial products	Number of entities that implemented recommended changes	10	24	Number of manufacturers that used the financial guide, or other LA insight reports to mobilize financing
Number of new financial products designed	2	1	Number of products designed by the entities that received advisory service	Number of new financial products launched	1	0	Number of new financial products launched by financial institutions as a result of LA advisory services
Number of procedures recommended for improvement or elimination	2	4	Number of unique recommendations made to the financial institutions	Number of recommended procedures improved or eliminated	1	2	Number of recommendations provided that actually changed the beneficiary financial institutions' procedures
Number of reports completed	1	4	Number of reports completed to assist with access to finance	Number of loans disbursed	5	0	Number of loans disbursed to manufacturers
LA Kenya							
Output Performance				**Outcome Performance**			
Indicator	**Target**	**Result**	**Interpretation**	**Indicator**	**Target**	**Result**	**Interpretation**
Access to Finance (link distributors with financial institutions)							

Number of reports (assessments, surveys, manuals, Phase I/strategic option reports) completed	2	2	Reports presented to financial institutions	Number of entities that implemented recommended changes	5	17	Number of financial institutions that received advisory services that actually implemented the recommendations.
Number of entities receiving advisory services	8	9	Number of distributors that LA worked closely with to try and increase their access to finance	Number recommended procedures improved/eliminated	3	25	Number of recommendations that led to a change in the entities' operations
Number of entities receiving advisory services (financial institutions)	8	19	Number of local commercial banks/MFIs/ Financiers LA consulted with to strengthen their confidence in the solar lamp market and encouraged them to lend to distributor/BOP consumers				
Number of procedures/firm-level policies/practices/standards recommended for improvement or elimination	3	47	2-3 recommendations made to 19 financial institutions				

The logframe results versus targets illustrated in the table above, suggests that LA JV performed well, exceeding most of its targets on the number of entities advised, and recommendations made to these entities. However, the advisory services did not yield as much of the intended outcomes as expected. Specifically, the logframe reports that only one (instead of two) new financial products were designed. Technically, this is true. A new financial product was **designed**—this was an intended facility by Bank of Africa to support local distributors. This financial product would be instrumental in solving the access to finance challenge local distributors face. However, the facility had not been launched as at when the program ended. Hence, LA JV reported a zero for number of new financial products launched.

LA Kenya met or exceeded its access to finance targets. In particular, it provided advisory services to more than double the number of financial institutions targeted. Moreover, 17 of the 19 institutions advised went on to implement recommended changes. These were organizations that began distributing, and lending for, LA-certified products based on the LA team's recommendations. The number of institutions was over three times higher than the target. This illustrates the market potential for solar lamps in Kenya—clearly local financial institutions saw this potential and were got involved in the sector. Evidence from our surveys with MFIs also indicated that the LA-certification was a big determinant in whether or not these institutions were willing to provide loans. Both MFIs we spoke to said they do not lend for other off-grid products except LA-certified lamps.

Table 6.6: Impacts of LA Programs

Impacts	LA JV			LA Kenya		
	Target	Result	Variance from Target	Target	Result	Variance from Target
GHG emissions reduced (metric tons)	30,000	199,316	564%	30,000	68,669	129%
Number of people receiving access to improved services	1,500,000	9,965,825	564%	1,500,000	3,433,425	129%
Value of financing facilitated (US$)	3,000,000	5,750,000	92%	1,500,000	1,766,519	18%
Value of IFC financing facilitated (US$)	15,000,000	-	-100%	1,000,000	5,000,000	400%
Number of LA approved products available in the market under $25	N/A	N/A	N/A	6	7	17%

As the tables above illustrate, the programs met all targets except one: value of IFC financing facilitated in the rest of Africa[41]. IFC had planned to mobilize US$15 million for the supply chain outside of Kenya and Ghana, but no finance was provided for outputs and outcomes, the reported results indicate that together, the LA programs met or exceeded 98 of their 114 output and outcome targets (86 percent). By program, LA Kenya met more of its output and outcome targets than LA JV (92 percent versus 79 percent). By component, the LA programs met 100 percent of their targeted outcomes for Quality Assurance, Private Sector Development, Communication, and Consumer Education.

According to the reported impact results, the LA programs met or exceeded 89 percent of their impact targets.

6.1.2 Validation of Outcome, Output, and Impact Results

An important next step in assessing how the programs performed against their targets is validating the results reported. Ideally, we would check if each result reported in the logframes was actually met. However, given the large number of indicators, a sample was validated.

Outputs and Outcomes

Together, the LA programs have a total of 71 output and 43 outcome indicators. Of these indicators, LA has a subset of "key indicators"[42] which include 41 outputs and 22 outcomes.

A sample was selected from the programs' logframes. For LA JV, we verified approximately 50 percent of the total output and outcomes reported (44 percent of outputs and 52 percent of outcomes).

For LA Kenya, we verified about 25 percent of the output and outcome indicators. There were a lot of similarities across the 29 indicators, and a larger number of indicators tracked per component than for LA JV. Therefore, we limited the sample to a smaller size.

We verified these sample results by reviewing supporting evidence from LA staff in the form of documents from stakeholders, and spreadsheets of the inputs and assumptions used for calculations.

For example, we verified the output for total Technical Briefing Notes and Eco-Design Notes produced by counting these reports posted on the LA website that were written prior to July 2013 (when the LA programs closed). For some results we requested additional documents and calculations from IFC. For instance, we requested copies of the google analytics reports to confirm the total website hits. Some results we requested IFC list the inputs that were included in the calculation. For instance, we requested IFC to provide a list of the workshops held to link the supply chain businesses in Kenya.

The full list of output and outcome indicators verified is located in Appendix H.1.

For LA JV, 22 of the 25 indictor results were verified. The following five indicators still require further information to verify:

- Outcome: Number of unique solar lamps that passed the QTM tests—verified 58 lamps passed the test, need additional documentation to verify remaining 8

[41] refers to all other countries in Africa outside of Kenya and Ghana

[42] Given the large number of output and outcome indicators, the LA team has selected a smaller set of "key indicators" which are tracked quarterly on the Supervision Reports.

- Outcome: Number of manufacturers that used LA reports for their business plans or improved products from technical briefing notes—we received the list of manufacturers recorded in the result, but need additional documentation to verify (for a sample) that these manufacturers made changes given the briefing notes
- Output: Number of Website Hits—verified 659,699 website hits from 2011 to 2012. Need additional numbers from 2013 to verify entire figure

For LA Kenya, 10 of the 15 indicators were verified. The following five indicators still require further information to verify:

- Number of organizations directly receiving marketing intelligence reports to support their operations in the market—received sample of emails sending reports to manufacturers but need remaining emails to confirm entire figure, or other documents listing manufacturers who received reports
- Number of entities receiving the reports that implemented any of the recommendations indicated—received surveys but need additional clarification on number of firms taking reporting that they implemented recommendations
- Months after workshops, participants were surveyed to indicate how they used information received—received copies of many attendance sheets but need further clarification which attendance sheets were included in these particular workshops
- Number of business agreements facilitated among supply chain—verified 10 agreements facilitated but need additional evidence for the remaining one business agreement
- Number of people reached through above the line media (TV, radio, fliers)—received information verifying a portion of this number, need additional documents to verify full figure

Impacts

We verified all five impact results and found the following:

Number of people receiving access to improved services

The LA program calculates this figure by multiplying the total LA-certified lamps sold by five, the average household size in Kenya. IFC receives these sales figures from manufacturers and distributors.

This indicator was verified by checking these two assumptions, and checking the logic of the calculation. The assumption of average household size was verified by referencing a 2008 survey report by the Kenya National Bureau of Statistics[43].

The total LA-certified lamps sold was verified by checking IFC's calculations and reported sales figures against a sample of data points retrieved directly from manufacturers, or through emails manufacturers sent to IFC reporting the data. Out of 31 data points checked, all of IFC's reported figures were consistent with the numbers provided by manufacturers except

[43] According to a Kenya demographic and health survey for 2008 to 2009, the average size of a rural household is 4.6 people. Accessed at http://statistics.knbs.or.ke/nada/index.php/catalog/23. See table 2. According to a survey by Ghana Statistical Service in 2008, the average size of a rural household in Ghana in was 4.6. Accessed at: http://www.statsghana.gov.gh/docfiles/glss5_report.pdf. See table 1.1

for one. In addition, a few inconsistencies were found: (i) correct figures were reported but for the wrong dates, (ii) inconsistencies in the dates reported for data may imply a slightly higher impact result for LA, (iii) one of the calculations was summed incorrectly, though the difference is minute in comparison with the total.

From this exercise we conclude that the sales data reported by IFC accurately represented the sales reported by manufacturers and distributors. However, we did not verify the accuracy of sales figures reported by manufacturers or distributors. Also, from our surveys with consumers living off-grid in Kenya, we found that sometimes consumers who already have access to the grid also use solar lamps because electricity provided is inconsistent. Thus, these consumers are not receiving access to improved services, they already have access. This indicates that using the total LA-certified lamps sold is over-estimating the impact of increased access. Recommendations for scaling down this figure are provided in Section 9.2.2.

We recommend scaling this impact result down. One way to estimate this scaling factor is to implement a lamp-tracking program. IFC could select a sample of LA-certified lamps and track their sale through a bar code. The LA team could then follow up with the end-users to see of the sample, how many consumers already have access to electricity. The proportion of people in the sample who received access to improved lighting services due to purchasing the solar lamp could be used as the scalable factor for this impact result.

GHG emissions reduced

IFC calculates this impact result by multiplying four assumptions: (i) the GHG emission factor per kerosene lamp, (ii) the amount of kerosene consumed per lamp, (iii) the carbon dioxide (CO2) displacement factor, and (iv) the total LA-certified lamps sold.

The first three assumptions were checked by referencing various research papers, including one explaining a framework for estimating GHG reductions from replacing fuel lighting with LED lighting, and a research study on a market trial testing LED lighting for retailers in rural Kenya. The last assumption was checked for the previous impact result.

We conclude that the assumptions and logic used for this impact result are sound.

Value of financing facilitated

This indicator refers to all **non-IFC** loans, equity, and grants mobilized to solar lamp end-users or the supply chain. Funds were counted in the result if LA helped facilitate these funds. The result was calculated differently for the two programs.

For LA Kenya, IFC added up the financing provided by MFIs, and the grants provided by donor programs going to solar lamp consumers. For LA JV, IFC disseminated a survey at the end of the program to 261 manufacturers, distributors, retailers, end-users, and other stakeholders. One of the questions asked how much these respondents received in grants or awards from using LA resources. This reported total was the financing facilitated result for LA JV.

The LA JV result was verified by checking the survey results. The LA Kenya result was verified by checking a sample of the loans and grants provided. For this sample, IFC provided the data from the MFIs and donor, and provided an email or document mentioning LA's involvement in mobilizing these funds. For instance, documents mentioned that loans were provided for LA-certified products.

We conclude that the result is accurate.

Value of IFC financing facilitated

This IFC financing facilitated indicator refers to all loans, grants, and equity mobilized through **direct participation** of IFC.

For LA JV, the reported result was zero. For LA Kenya, LA reported the value of a planned financing facility for distributors. The planned facility in Kenya was confirmed through a PDS Concept Note. IFC planned to partner with Bank of Africa (BoA) to provide this US$5.0 million financing facility for distributors. The facility was approved during the time of the LA program but it has since been put on hold, and no funds were disbursed during the LA programs. IFC decided that a more diverse and large portfolio of distributors was needed to hedge the risks of the facility.

We conclude that although the facility was planned during the LA Kenya program, because it has not been finalized, and no funds were disbursed during the programs, this value should not be included in the impact result.

Number of LA approved products available in the market under $25

This result is calculated by counting the number of solar lamp models available in Kenya for less than US$25. IFC calculates this number by checking with distributors working with the program.

To verify this number, IFC provided a list of these seven products available for under $25. A sample of these products was also verified by checking prices in retail outlets during our trip to Kenya.

We conclude this impact result is accurate.

After verifying the results of these five impact indicators, we conclude that three of the nine reported results should be adjusted. As explained above, the number of people with improved services should be adjusted downward for both LA Kenya and LA JV. The IFC financing facilitated in Kenya should be adjusted to zero since the facility was not implemented. More details on the impact verification analysis are provided in Appendix H.1.

Table 6.7 summarizes these conclusions.

Table 6.7: Impacts Attributed to LA

Impacts	LA JV			LA Kenya		
	Target	Result	Verified?	Target	Result	Verified?
GHG emissions reduced (metric tons)	30,000	199,316	✓	30,000	68,669	✓
Number of people receiving access to improved services	1,500,000	9,965,825	Adjust downwards to account for those who already have access	1,500,000	3,433,425	Adjust downwards to account for those who already have access
Value of financing facilitated (US$)	3,000,000	5,750,000	✓	1,500,000	1,766,519	✓
Value of IFC financing facilitated (US$)	15,000,000	-	N/A	1,000,000	5,000,000	Adjust to zero since facility did not disburse funds
Number of LA approved products available in the market under $25	N/A	N/A	N/A	6	7	✓

6.1.3 Consistency of the reported output and outcome results of LA

The final step of assessing the LA programs' results against targets was to confirm that the results are reported consistently across program documents. If documents reflected different numbers, this would call into question which result was actually achieved.

Results and targets were compared across the Implementation Plans, Logic Models, and Completion Reports. We found that the results and targets were the same across these documents.

However, we also noted that the Logic Model included eight more output indicators and three more outcome indicators than in the Completion Reports and Implementation Plans. This is not an error in accuracy, just a finding in the comparison. These additional indicators in Appendix H.3.

6.2 Did LA Successfully Transform the Market?

As established in the previous section, the LA programs, to a large extent, met their output and outcome targets. These outputs and outcomes were intended to achieve the envisaged impacts by transforming the market. Thus in this section we check the extent that the market was successfully transformed.

As explained in Section 2.1.2, six barriers were keeping the solar lamp market from operating effectively:

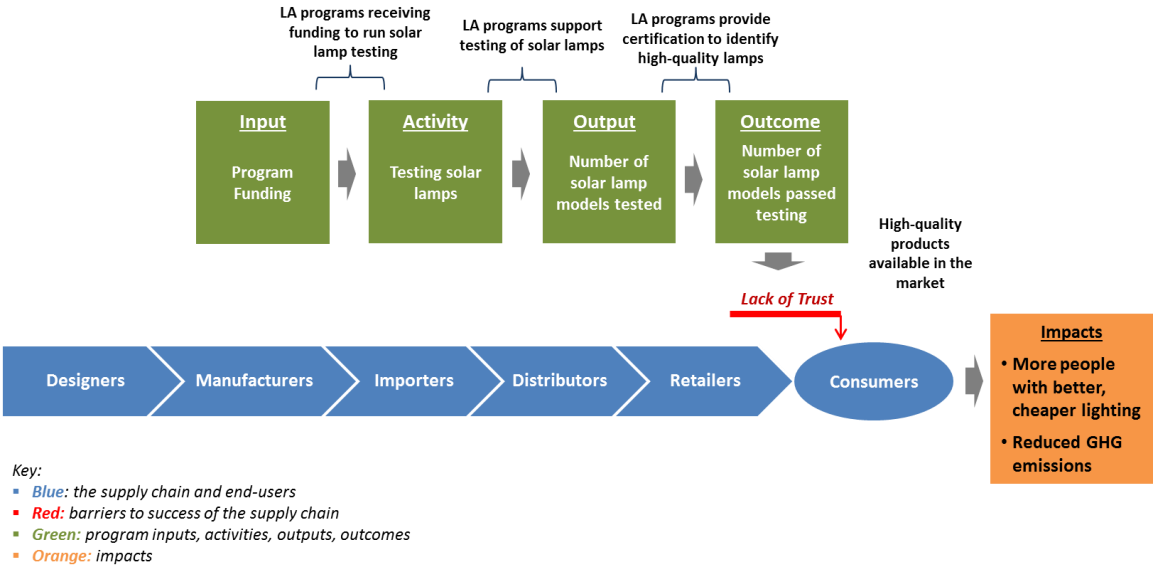
- **Suppliers did not know consumer preferences** in Africa on the design of solar lamps and their willingness to pay (WTP) for these products
- **Members of the supply chain did not know each other**
- **Long customs processes and import tariffs on solar lamps** were common concerns among manufacturers who were considering importing solar lamps to African markets
- **Lack of finance** was a big problem for the supply chain and consumers
- **Consumers lacked trust in solar lamps**, given the existence of cheap, low-quality solar lamps in the market and the fact that most lighting consumers had never used a solar lamp before
- Many consumers **did not know about solar lamps** before the LA program.

To remove these barriers, the IFC designed 114 targeted outputs and outcomes. Depending on the barrier, the intended causal chain will be one of the following:

- Output→Market barrier removed→Outcome→Market transforms→Impacts
- Output→Outcome→Market barrier removed→Market transforms→Impacts

One market barrier and some of the actions intended to remove this barrier are illustrated in Table 6.8 below

Table 6.8: Mapping Outputs to Outcomes



Source: Castalia figure, indicators from logframes plus IFC clarification on definitions of indicators

As illustrated in the diagram, the Quality Assurance component was intended to remove the barrier of "lack of trust" in solar lamps. This diagram illustrates a sample of the Quality Assurance indicators—in total the component had 12 output and 9 outcome indicators.

For this set of indicators, the outcome was designed to remove the barrier. The Quality Assurance team tested solar lamps against the LA quality standards (activity), which led to a

set of solar lamps that were tested (output) and a sub-set that passed the testing criteria (outcomes). Achieving the outcome meant that high-quality products would be available in the market, thus building consumer confidence.

To achieve the intended impacts, all barriers must be removed from the supply chain and consumers. Thus making high-quality products available in the market would not achieve the impacts by itself. All LA's program components worked together to target different barriers and achieve these impacts.

Similar analysis was done for the rest of the programs' outputs and outcomes.

To determine the extent to which the solar lamps market has been transformed, we checked to what extent these six barriers have been removed. Evidence for this analysis was taken from LA's logframe results, conversations with the LA team, and most importantly, from our conversations with program stakeholders (BOP consumers, retailers, distributors, manufacturers, and the Kenya Government).

Barrier 1: suppliers did not know consumer preferences on solar lamps

LA helped address this barrier by producing and disseminating market intelligence reports on consumer preferences in Africa on the design for solar lamps and their willingness to pay (WTP) for these lamps. LA produced 20 reports for Kenya and 33 reports for the rest of Africa.

According to results reported in LA's logframe, market intelligence reports were used and stakeholders found them useful. LA reports that 24 firms in Kenya used these reports to support their operations, and 12 firms implemented recommendations from the reports. In the rest of Africa, LA reports that 144 firms used these reports, and 101 firms said these reports were useful.

Furthermore, our evidence supports LA's results that suppliers used these reports. From our interviews with 12 manufacturers and distributors, 5 out of 6 (83 percent) manufacturers and 6 out of 6 (100 percent) of distributors said they used market intelligence reports. When asked how they used the reports, one manufacturer said it used the reports to pick up statistics on different markets. Another said it used the reports to learn more about consumer behavior and their willingness to pay for lighting devices. A third firm said it used the market studies to help evaluate new markets to invest in.

When asked which reports manufacturers have used, two firms mentioned the "state of the market" reports, one saying this was not particularly helpful while the other said these were helpful for developing business. One firm mentioned the report on using solar for chicken farming[44], saying that the best reports are those that cover specific topics.

Three of the six manufacturers interviewed said that these reports were important to their businesses, but two of them remarked that the reports are now less important after having been in the market a while. All six of the distributors interviewed (100 percent) said these reports were helpful to their businesses.

[44] "Illuminating the Pecking Order in Off-Grid Lighting: a demonstration of LED lighting for saving energy in the poultry sector". Tracy, Jennifer, Mills, Evan. IFC, Berkeley National Laboratory. Accessed http://lightingafrica.org/resources/market-research/other-market-reports/at:

Of the six distributors, three used the reports to learn more about trends in the market in Kenya or identify opportunities in new markets. One used the reports to get statistics on household expenditure on kerosene and mobile phone chargers.

Based on this evidence we conclude that the outputs of the Market Intelligence component helped remove this barrier. Suppliers that interacted with the LA programs could access information on consumer preferences in Africa and on the state of the market. Furthermore, most of these reports are publically available on the LA website, therefore other non-LA associates can also benefit from this market intelligence.

Barrier 2: members of the supply chain did not know each other

LA held workshops and international conferences to introduce members of the supply chain in Africa. According to the logframe, LA held 16 workshops and trainings, 5 conferences, and 8 technical trainings on quality assurance testing in Kenya. These events included manufacturers, distributors, and often financial institutions and other relevant stakeholders.

According to the LA logframe, linkages were made among the supply chain. The logframe reports that after LA workshops, 11 business agreements were signed among the supply chain.

Our evidence finds that the supply chain found the LA workshops and conferences were helpful to some extent. Of the six manufacturers interviewed, three (50 percent) found the workshops helpful at least when they first entered the market. Two manufacturers were unsure how helpful these events were (33 percent), and one had never attended (17 percent). Two manufacturers commented on how the workshops were used. One said it was helpful for getting governments on board with solar lamps, and the other said workshops were helpful for meeting local partners.

For LA conferences, four manufacturers found them helpful (67 percent), one was unsure how helpful, and the other had not attended. Three of the six manufacturers (50 percent) found the conferences helpful because they gained product visibility. One said they found conference helpful for learning new information, and the other two had either not attended or were not sure how the conferences were helpful.

Of the six distributors interviewed, all agreed these workshops were useful to their businesses, and four of them (67 percent) met business partners, MFIs, or other interest groups at these workshops.

We conclude the outputs of the Business Development component were helpful to some extent for removing this barrier, though not as effective as the Market Intelligence component.

Barrier 3: long customs processes and import tariffs on solar lamps

LA consulted with governments in Cameroon, Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Rwanda, Senegal, and Tanzania on creating an enabling regulatory, policy, and customs environment for importing solar lamps. LA produced nine Policy Reports to disseminate information to the supply chain on the policies and procedures relevant to the solar lamp market in these eight African countries.

According to LA reports, and through conversations with LA staff, some African governments have made changes to the regulatory environment to support the solar lamp industry. According to LA's 2011 Annual Report, the Government of Ethiopia waived taxes

on all off-grid lighting products that meet or exceed LA's performance standards[45]. In Kenya, the regulatory environment is now more supportive of solar lamps than it was at the beginning of the LA program. When LA was first starting up, the Government of Kenya raised import taxes on solar lamps[46]. In 2011, these taxes were removed for all solar lamps[47]. The LA team also engaged with the Kenya National Bureau of Standards (KEBS) to advise the country on adopting LA minimum quality standards as the International Electro-technical Commission (IEC) did. This consultation process is still underway.

Evidence from our interviews also indicates that LA has been influential in the regulatory changes in Kenya, though this is based on the opinion of suppliers. From interviews with manufacturers, three (50 percent) identified favorable import duties as a reason for the increased sales of solar lamps in Kenya. Two of them specified they thought these favorable duties could be attributed to the work of LA. For instance, one manufacturer said: "LA has lobbied to customs officials and tax authorities, making it easier to bring lights in and make consumers afford lights". Another said "LA has helped in getting VAT exemption for lamps".

We conclude that the outputs of the Policy Development component have to some extent helped remove this barrier. The case is stronger in Ethiopia, since the import tariff applies to products with LA-certification. In Kenya, the barrier has been removed but it is unclear if this was due to the outputs of the LA programs.

Barrier 4: lack of finance to consumers and supply chain

LA consulted with MFIs, local commercial banks, and international banks to mobilize finance to the supply chain.

According to information provided by LA staff and the logframe, the programs have helped mobilize finance to some consumers and suppliers. MFIs and NGOs supporting LA-certified products have provided US$1.76 million in loans and grants to help consumers purchase LA-certified solar lamps. These include four MFIs (VEP, Rafiki, Faulu, and K-Rep) and one NGO (Global Village Energy Partnership "GVEP"). As explained in Section 6.1.2, this figure was confirmed by verifying the total loans disbursed by a sample of the MFIs. Attribution to LA was also confirmed by verifying the MFIs disbursed loans for LA-quality certified lamps. From our trip to Kenya, we know of at least one additional MFI providing loans to consumers for LA-certified solar lamps: Once Acre Fund.

For the supply chain, LA helped mobilize US$5.75 million in non-IFC grants to firms manufacturing and distributing LA-certified solar lamps in the rest of Africa. As explained in Section 6.1.2, this figure was verified by survey responses. The survey asked firms to quantify how much funding they received in all cases where they used LA resources to seek awards or grants. Resources included market intelligence reports, briefing notes, and others[48].

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[45]See LA's 2011 Annual Report, accessed at: http://lightingafrica.org/wp-content/uploads/bsk-pdf-manager/7_Annual_Report_2011_Eng.pdf

[46] Information provided on calls with IFC staff

[47] United Nations Foundation, Tariff Database for Kenya, accessed at: http://www.energyaccess.org/resources/tariffs-database/search-tariff-database. Also see LA Policy Report for Kenya, accessed at: http://lightingafrica.org/wp-content/uploads/bsk-pdf-manager/24_Kenya-policy-report-note.pdf

[48] These reports were specified on the survey. The question asked if the organizations used LA resources such as information from the market trends reports or briefing notes when approaching potential investors, accessing financing, or applying for grants and awards. Of the 184 respondents, 67.39 percent answered yes they used this material.

During the time of the LA programs (2007 to 2013), IFC did not help set up any financing facilities for the supply chain in Kenya. However, recently (after the LA programs ended), the IFC has just reached an agreement with Responsibility and Shell Foundation to set up a US$30 million financing facility for manufacturers importing products to Kenya.

Evidence from our interviews with the supply chain indicates that not enough financial support was received. From our interviews with six manufacturers, four (67 percent) reported that they have had difficulties raising finance, and five (83 percent) said LA has **not** supported them to raise finance. The one manufacturer that did receive support from LA said it received funds after benefiting from LA's G20 "innovative business" awards, and that LA helped the firm to get loans for operations in Ethiopia.

Of the six distributors interviewed, 100 percent said they have had difficulties raising finance, although one distributor clarified this used to be a bigger problem when they first entered the market in 2010. Three distributors (50 percent) said they received support from LA in raising finance. This included linking them to financial institutions, helping them identify grants, and directly providing matching funds for marketing materials.

We conclude that LA helped mobilize finance to a small extent. However, more could still be done to mobilize finance to the supply chain. The recent approval of the US$30 million financing facility is a step forward here.

Barrier 5: lack of trust in the quality of solar lamps

LA implemented quality standards and tested solar lamps against these standards to increase transparency in the market of good and poor quality products.

Evidence from the LA logframe illustrates that high-quality products are now available in the market. LA reports that manufacturers have submitted 183 solar lamps for testing against the LA quality standards, and of these, 66 have passed the minimum standards[49]. These standards have been adopted as the industry standards by the International Electro technical Commission (IEC). The logframe also reports that 44 manufacturers have used LA Technical Briefing Notes and Eco-Design Notes to improve product design.

Interviews with six LA associate manufacturers[50], four said they have submitted additional products for testing after receiving certification on their first products, This indicates that manufacturers are using the certification process, and experienced enough benefits from the process that they want to receive certification for additional products.

When we asked the six distributors why they thought sales had increased, three cited higher quality products as one of the reasons, and four agreed that LA has helped to increase sales, For example, one distributor remarked that being able to differentiate between good and bad quality products has built client confidence.

However, five of the six distributors (83 percent) said they have had complaints about LA-certified products. Of these five distributors, one reported that occasionally products did not work for reasons unknown to them, one reported problems with the light not running the full advertised duration, and three reported batteries failing (for two lamp models). However, for two of the distributors that reported batteries failing, one of these lamp models has since been

[49] Included in the logframe and confirmed by IFC in an email on 18 August 2014

[50] meaning all six manufacturers have LA-certified products

discontinued. From our conversations with IFC, it may be that some of these technical difficulties can be explained by improper storage or usage of the solar lamps. To address this, LA launched an outreach program to train more last-mile distributors on proper storage and usage.

We spoke with 14 retailers selling solar lamps and asked if they chose to sell LA-certified lamps in preference to other lamps and if so why. Nine said at least one of the reasons they chose to sell LA certified lamps was because they are higher quality. Two others chose to sell LA-certified lamps due to popularity, and two preferred LA-certified lamps but did not give reasons why. The last retailer sold solar lamps but did not carry LA-certified lamps, and said this was because they are too expensive.

Consumers are buying LA-certified solar lamps, thus implying that they trust the quality of these lamps. In Kenya, 686,685 LA-certified lamps were sold during the LA programs and an additional 1,993,165 LA-certified lamps were sold in the rest of Africa. Sales of LA-certified lamps have been steadily increasing over the life of the LA programs. By the end of the programs in 2013, sales had increased in Kenya by 1,366 percent, and in the rest of Africa by 10,873 percent.

In focus groups, people said one of the reasons they started using solar lamps because they heard they were reliable. Focus group members indicated they know high quality solar lamps by brand name, not by the LA certification.

We conclude that there are now high-quality products available in the market. LA has helped companies to improve product quality, and thus the Quality Assurance component has helped remove this barrier. Thus LA addressed this barrier to a large extent. However, there may still be work to do to inform last-mile distributors and consumers of how to properly store and use solar products.

Barrier 6: consumers did not know about solar lamps

LA consumer awareness campaigns informed consumers about the benefits of LA-certified solar lamps, how to use them, and where they could purchase them. LA held roadshows, forums, trade fair campaigns, and also disseminated printed fliers, SMS messages, radio advertisements, and TV advertisements to reach consumers.

According to the LA logframe, LA Kenya did teach people in Kenya about solar lamps. LA directly reached 43,616 people through forums, and 287,757 people through roadshows in Kenya[51]. LA estimates it reached 29.5 million people through media advertisements (fliers, TV, and radio).

However, our interviews with four focus groups indicate that consumer awareness may still be a barrier to the solar lamp market. When we asked why people did not use solar lamps before or why they are not using them now, some of the people from three of the four consumer focus groups interviewed said that they did not know solar lamps existed prior to joining their consumer based organization. Although one of the focus groups contained people with grid connections, the other two focus groups included people living off-grid. Within these two focus groups, some people were already using solar lamps. Of the people who did not use solar lamps, some of them said this was because they had other more pressing

[51] Both numbers retrieved from original roadshow tracking spreadsheets

needs to spend their money on (such as school fees, and livestock purchases). Clearly, the concept of savings from buying a solar lamp had not been clearly communicated.

In surveys of 34 individuals, and 12 people said they did not know solar lamps existed. However, 30 of these 34 individuals (lived off-grid. Even looking just at the off-grid individuals interviewed, 3 did not know about solar lamps.[52] See table below:

Table 6.9: Breakdown of Individual Consumers Surveyed

	Consumers Living in Off-Grid Areas	Consumers Living in On-Grid Areas
Knew about solar lamps	1	21
Did not know about solar lamps	3	9
Total	**4**	**30**

Source: Surveys with BOP consumers

Other reasons given by these consumers for not purchasing a solar lamp included: 26 did not know how the lamps worked, 25 said the lamps were not available in their area, 19 did not know where to buy the lamps, 9 did not trust the lamps, 5 were not sure how to tell which were good quality, and 1 said they were too expensive.

While the sample is too small to be able to draw a statistically significant conclusion, these results help identify some areas where the LA program could do better. We see that LA education campaigns did inform some consumers about solar lamps because according the logframes, the education campaigns reached 36,433 people. Also the logframe reports that 379 people (out of 511 surveyed) reported that they made positive improvements (purchased lamp, recommended lamp to others, or started saving to buy a lamp) after attending the LA education campaigns. However, the extent of the reach of the LA programs could still be improved. We understand that IFC is now scaling up consumer education efforts in Africa (including Kenya) and we think this is a step in the right direction.

6.3 Can Impacts be Attributed to LA?

Lighting Africa's objective was to accelerate the transformation and growth of the market for solar lamps. To do this, it intended to remove specific barriers that hindered this market transformation.

The growth in sales of solar lamps in Kenya, and the rest of Africa, over the past four years show that this market transformation has indeed been rapid. To illustrate, in 2009, only 23,035 lamps were reportedly sold in Kenya. By 2011, sales had more than tripled to reach 84,812. This growth rate of 268 percent is a stark increase over a short period of time.[53]

LA clearly helped accelerate this market transformation, as the evidence in Section 6.2 shows. The LA team researched and disseminated information on consumer preferences and their willingness to pay for solar lamps. This information helped manufacturers design products

[52] We acknowledge that the sample of individuals interviewed is too small to make conclusive inference

[53] Sales figures provided by IFC

that suit BOP populations who had limited or no access to electricity. Furthermore, LA helped manufacturers develop high-quality solar lamps by providing guidelines on quality standards. It also helped differentiate these high quality lamps, by establishing a certification process that solar lamp distributors, retailers and users can rely on in selecting what lamps to purchase. LA successfully linked at least 11 manufacturers to local distributors[54] through workshops, conferences and similar activities. This helped manufacturers get their products to the intended beneficiaries. LA's consumer awareness activities helped increase awareness of solar lamps and their benefits, whether through direct advertising and campaigns, or indirectly through interactions with existing consumer groups and microfinance institutions.

However, the market would have developed to some extent without LA. Solar lamps were already available in Africa before the LA programs. LA supported a baseline study prior to implementing the programs. This study presents a survey of 37 retailers in a rural Kenya town selling off-grid electricity lighting products. Of the 240 electricity products sold across these retailers, 90 percent of the products available were torches, and only two solar-charged products (0.83 percent) were available.[55] Although this is a small number, some products were available.

Solar lamp manufacturers and distributors that were already operating in African countries would have likely experienced some increases in sales even without LA support. Furthermore, even manufacturers and distributors associated with LA did not rely solely on LA to grow their sales. Companies like dlight have designed highly effective marketing strategies that have helped them develop very strong brands in Kenya. These strategies have certainly contributed to their achieving such high sales numbers.

Moreover, other development agencies were also working in the market to accelerate growth. For instance, GIZ has supported consumer awareness activities that complemented LA activities with end users. GIZ also helped link the LA program to grassroots businesses and consumers, and created distribution channels for solar lamps. Another organization, SNV, also reaches out to BOP consumers to explain the benefits of solar lamps.

Thus, we conclude that not all the market acceleration can be attributed to LA. This is not a surprise—if the idea is to accelerate a market that is already being driven by a clear need and rapidly developing technology, it follows that some increase in sales would be expected even without LA. Indeed, manufacturers we spoke to tended to say that LA was helpful for increasing sales. One manufacturer said that LA has done a "phenomenal job" at catalyzing the industry. However, these manufacturers did not suggest that their businesses would simply not have developed without LA. For instance, one manufacturer said that sales have increased because "the product is now established and has a good reputation…brand awareness has spread by word of mouth." Another firm said that they have done "lot of business development, as well as getting new partners." Finally another firm said that its high-quality product was the "driver" to success.

Given this, it is reasonable to attribute some, but not all, of the impact LA reports to the LA programs' own actions.

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[54] As reported in the logframe

[55] "Pilot Baseline Study- Report: Market presence of off-grid lighting products in Kenyan towns of Kericho, Brooke, and Talek". Accessed at http://lightingafrica.org/wp-content/uploads/bsk-pdf-manager/47_OffGridLighting_MarketPresence_PilotBaselineReport_Kenya_20091130.pdf

Of the people receiving service, some would have bought a solar lamp even without LA. Therefore the number of people receiving service *because* of LA must be less than the number of people who are actually using an LA lamp. Without LA they could not have bought an LA certified lamp (by definition) but some of them could, and would, have bought a reasonable quality solar lamp. Unfortunately, we cannot say what percentage of market growth was attributable to LA, and hence what percentage of sales of quality lamps can be attributed to LA

GHG emission reductions depend on the sale of lamps. If LA caused some, but not all, of the increase in sales of lamps, it also caused some, but not all, of the reduction in GHGs resulting from use of these lamps.

On the finance facilitated component, we would attribute the full impact reported to the LA programs. The programs did not claim to have *raised* the finance; rather, program activities *facilitated* financing. We established that LA did carry out these activities, and MFIs, manufacturers and distributors provided evidence that corroborated the claim that LA activities played a role in these funds being made available to consumers and the supply chain.

In conclusion, while we cannot be sure of the amount of market acceleration achieved by the LA programs, and hence of the total number of sales due to them, we expect that it is lower than the numbers reported, but still above the targets. This is because while the LA programs clearly helped accelerate the market transformation, it was not the sole factor responsible for the sales in solar lamps reported by the program.

6.4 Did LA Mitigate Risks to the Program?

Another measure of effectiveness requested in the TOR is how well LA managed the risks to the programs.

At the start of the LA programs, the LA team identified 17 potential risks to the programs. For each risk, the team developed a mitigation strategy, or a reason why a strategy was not needed. For example, if these risks were not likely to impact the program, or if they did not pose a significant risk, or if the risk was out of the team's control (such as natural disasters), then no mitigation strategy was proposed.

These risks, mitigation strategies, and whether or not these strategies were implemented are presented in Table 6.10 below.

Table 6.10: Identified Risks and Mitigation Steps of the LA Program

Risk Category	Risk Description	Mitigation Strategy	Source	Risk Mitigated?
Internal to IFC	**Inadequate project funding:** not enough to support manufacturers and distributors	▪ Develop risk guarantee facility with Chinese banks under IFC Global Trade Finance Facility. Provide working capital for manufacturers ▪ Facilitate introduction of manufacturers to early stage development funds to provide capital for scale-up ▪ Recruit a dedicated resource to pursue Access to Finance funding options ▪ Received approval to finance the market through a third party financial institution. This allows for aggregation of the market demand and enables IFC to work with bigger player	IP[56]	**Not Implemented** Remains a major obstacle to the market, although IFC is now making progress in this area
Internal to IFC	**Project design:** M&E indicators are not appropriate to track developmental impact of project	▪ Design custom indicators as recommended in Mid Term Review	IP	**Not implemented** Make it difficult to track program performance
Internal to IFC	**Project design:** unable to maintain viability after IFC exits	▪ This does not apply to the program	IP	✓ Created GOGLA and worked with KEREA
Internal to IFC	**Project design:** IFC selection of projects in challenging environments result in inability to secure quality baseline data	▪ N/A, program obtained baseline data required	IP	N/A

[56] Implementation Plans. Note these were not the original implementation plans so there may be some differences. IFC was unable to locate original files

External to IFC	**Operating environment**: prolonged project disruption due to natural disasters, political turmoil, riots, lack of security	▪ Does not feature as a risk, no mitigation strategy proposed	IP	N/A
External to IFC	**Operating environment**: uncertainty about demand, change in demand given high tariffs, kerosene subsidies that distort prices	▪ Engage government in discussions to keep favorable investment climate	IP	✓
External to IFC	**Price of solar lamps:** rural consumers may be deterred by higher upfront cost of lamps	▪ Market intelligence: survey consumers to inform manufacturers of realistic prices for consumers ▪ Policy development: engage with Kenya government to try and reduce taxes and duties ▪ Work with MFIs to provide consumer finance	IP	✓
External to IFC	**Reintroduction of tax:** Kenya Government is considering re-introducing VAT on off-grid lighting, making lights more expensive	▪ Work with stakeholders (KEREA, and Kerosene Free Kenya Program) to engage Government in discussion on VAT free status	IP	✓
External to IFC	**Market spoilage**: erosion of consumer confidence because influx of low-quality products in market	▪ Consumer education campaigns: advise on which products to purchase ▪ Quality assurance: support manufacturers and distributors of good-quality products ▪ Request manufacturers provide warranties	IP	✓
Environmental/ Social	**Battery disposal**: consumer battery disposal methods may not meet country standards	▪ Quality Assurance program, by increasing useful life of products and reducing use of hazardous components, has a direct impact on reducing amount of waste compared to baseline of kerosene lanterns and disposable flashlights	IP	✓
		▪ Program will explore economics of working with manufacturers to offer nominal value of expired off-grid	IP	**Not Implemented**

		lighting products and discount nominal value against price of a new lantern. "Trade in" concept will encourage consumers to bring expired products in for proper disposal by distributors and manufacturers with local recycling agents		
Conflict of interest	**IFC investment/ advisory conflict:** conflict involving actual or potential investee client	▪ No mitigation required.	IP	N/A
Conflict of interest	**IFC investment/advisory conflict:** privatization/PPP where IFC has actual or potential investment in potential bidder	▪ Nothing required.	IP	N/A
Conflict of interest	**IFC investment/advisory conflict:** policy/regulatory advice where IFC has actual or potential investment in affected entity	▪ Nothing required.	IP	N/A
Client/ stakeholder	**Capacity of client to implement IFC recommendations:** lack of client sustainability, company dissolves, bankrupt, etc.	▪ Not a significant risk, but exists as new entrants tend to be social entrepreneurs with limited business exposure ▪ No mitigation strategy proposed	IP	N/A
Client/ stakeholder	**Stakeholder relations and perceptions:** developing quality seal takes time to bring to market and gradually becomes expensive. Involves getting consensus from industry on standards	▪ Facilitate creation of industry association to lead quality seal efforts and build consensus ▪ Create partnerships with organizations (GTZ, enlighten) to share costs of developing seal	IP	✓
Client/ stakeholder	**Capacity of client to implement IFC**	▪ Develop trade finance facility so manufacturers can scale up	IP	**Not Implemented**

	recommendations: lack of client absorptive capacity (resources, staff, knowledge, skills). Especially given new industry with small manufacturers			
Client/ stakeholder	**Inadequate financing:** both for end-users and distributors	▪ Set up a trade finance facility for local distributors with Bank of Africa	IP	**Not Implemented**
		▪ Set up working capital facility for manufacturers. Then manufacturers can provide credit facilities to distributors	IP	**Not Implemented**
		▪ Identify financially stable distributors to pair with new manufacturers	IP	✓

Sources: LA JV and LA Kenya Project Completion Reports (PCRs)

Dalberg Mid Term Review (MTR)

Castalia

As illustrated in the table, the LA team identified and implemented mitigation strategies for most risks identified. In the cases where there were no strategies suggested, this was appropriate most of the time. We highlight a few exceptions below.

No mitigation strategy was proposed to help **sustain the benefits** of the program (see risk "unable to maintain viability after IFC exits"). However, a mitigation plan was clearly implemented because the LA team created the Global Off-Grid Lighting Association (GOGLA) and worked closely with the Kenya Renewable Energy Association (KEREA) to sustain certain LA activities. The plan to establish these entities was also included in other sections of the Implementation Plan, though not in the risk section.

However, GOGLA did not start operations until 2012, only one year before the LA programs ended. GOGLA has not yet taken over LA activities. Instead, these activities are still being carried out by the IFC and World Bank through another program (Lighting Global). Lighting Africa may have benefited from setting up GOGLA earlier on, so that the association could have taken over LA activities promptly at the end of the programs.

The LA team planned to create an on-the-box **quality seal**,[57] but determined the risks were too high. As explained in the table above, developing this seal would take time and money, but it would also pose legal risks to IFC if issues came up with the branded products. These risks could be higher after the program ends and IFC is no longer in charge of setting the quality standards. To mitigate these risks, LA decided that GOGLA should develop this seal with support from other local organizations in the sector (like GIZ and Enlighten). However, since GOGLA just recently began operating it has not yet developed this quality seal. Thus, the LA programs did not create the quality seal as planned, and the seal has still not been developed.

Although the risk of developing a quality seal was mitigated for the IFC, this created another risk—that consumers would not be able to **identify high-quality products.** To mitigate this risk LA used its education campaigns as a chance to display a sample of LA-certified products. During these campaigns, consumers learned about these select brands of lamps, and sometimes learned which retail outlets they could purchase the lamps. In theory consumers with access to internet could also find out which products were LA-certified by checking the LA website, but this has not really been the case. From our interviews with consumers in Kenya, most know about brands for a few high-quality solar lamps, and they do not know about LA-certification.

Another risk identified was that the **indicators selected would not be appropriate** to track the development impact of the programs. IFC applies a standard set of indicators across all programs, thus these indicators are quite general. However, the LA team has done a good job of applying these indicators to the LA programs.

Creating some customized indicators for the programs, in addition to the standard indicators, may have helped the programs to more accurately capture the benefits the program created. These indicators could have captured the extent of market transformation, which was key to the program's success.

For example, the LA programs may have benefitted from having a better system of tracking data on access. As discussed in Section 6.1.2, the impact of increased access could have been

[57] LA JV Implementation Plan

more precisely calculated if the program tracked how many solar lamps were being purchased by consumers living off-grid, versus those that had access to electricity. Indicators could also measure if the market transformation was happening faster in Kenya than in one or two other "control" countries. Similarly, the programs could have tracked the quality of solar lamps that were not LA-certified, and also the sales over time of these lamps in comparison to LA-certified lamps. These indicators would help attribute impacts to LA.

Also, there were far more indicators measuring the outputs produced by the program (71), and less are focused on outcomes (43) and impacts (5), the changes LA was trying to achieve. Finally, the indicators do not cover all components of the program and therefore do not capture some important activities. Specifically, no indicators were included for Policy Development or the Development Marketplace components.

Although the risk of inappropriate indicators was identified, and a mitigation strategy put in place, the indicators were not updated.

LA faced other risks that were not included in the Implementation Plans. We have identified the following additional risks:

Table 6.11: Ex-Post Risks and Proposed Mitigation Strategies

Risk Identified	Suggested Mitigation Strategy
Expensive repairs for solar lamps Although LA successfully encouraged manufacturers to offer a warranty on products, after this expires (generally one year) consumers need to pay for repairs themselves. From our interviews with CBOs, we found this can be expensive and thus may deter consumers from buying solar lamps	▪ Train more solar lamp technicians to increase competition in the market – The LA team did train solar technicians but this activity could be scaled up
Lack of control of product quality at the end of the supply chain Even with rigorous LA certification testing, distributors we spoke with are still finding some problems with product quality. Specifically, there have been problems with the batteries. From talking to LA staff we confirmed that sometimes distributors and MFIs will store lamps improperly, thus reducing the quality of the lamp	▪ Increase supply chain education campaigns: the problem could be that the supply chain not storing products properly between purchasing products from manufacturers and selling them to end-users. If this is the case, this risk could be mitigated by ramping up efforts to train supply chain on proper product storage ▪ LA programs also facilitated product quality improvements by producing Technical Notes, which suggested best practices for high-quality product design. For instance, Technical Notes recommend conversion from lead acid batteries to improved technologies, including lithium-ion batteries, that are less susceptible to failures related to bad storage ▪ If this is not a storage issue, testing labs could look into increasing the required hours for batteries to be tested as part of quality assurance testing

Source: Castalia and Dalberg MTR

6.5 Conclusions on Effectiveness and Impact

Evaluating LA's performance against its targets, it is clear that LA met most of its targets. Together, the programs met 86 percent of their output and outcome targets. LA Kenya achieved slightly more of its targets than LA JV (92 versus 79 percent). By component, the program met all of its outcome targets for Quality Assurance, Private Sector Development, Communication, and Consumer Education.

In validating a sample of reported results, 33 out of 40 (83 percent) output and outcome results were verified. However, we believe the seven un-verified results could be verified with additional documentation and clarity provided by IFC. We believe this additional clarity and information can be provided to verify the remaining indicators. We conclude that the output and outcome indicators are likely all accurate, but that the LA team's information tracking procedures could be improved.

Reported results for impact should be adjusted slightly. In particular the IFC financing facilitated in Kenya should be adjusted to zero. Furthermore, IFC's approach of calculating the number of people with increased access to electricity from sales of solar lamps is likely overestimating this impact number.

The programs' outputs and outcomes targeted market barriers. Four of the six market barriers were removed to a large extent due to LA outputs, while two barriers still require more work. These two barriers include a lack of finance available to the supply chain, and a lack of consumer awareness of solar lamps. Thus, we conclude the market is working much better because of the LA program, but more work needs to be done to fully transform the market.

Given that the market is now functioning well, even if not completely transformed, impacts have been achieved. We conclude LA was necessary though not sufficient for improving the market, and therefore we attribute the impact results of LA-certified product to the LA programs.

7 Efficiency

Evaluating the efficiency of the LA programs involves assessing if the programs' costs were justified by its results. A simplified cost benefit analysis (CBA) is presented in Section 7.1, and shows that programs' benefits clearly outweighed its costs.

Efficiency also requires assessing if the programs' operational model and program design were ideal for achieving its objectives. In Section 0, we review how each component was delivered, to see if there were opportunities for efficiency gains. Furthermore, we assess the efficiency of key aspects of the LA programs' operations: governance, staffing structure, and budgeting.

To be efficient, the LA programs need strong systems in place to manage costs and monitor results. In Section 7.3, we assess the programs' procurement system for engaging consultants. In Section 7.4, we assess the programs' internal systems for consistently tracking and storing key information.

In Section 7.5, we check if the programs leveraged as much external funding as planned, by comparing IFC's leverage calculation at the beginning and at the end of the programs.

Finally, evaluating efficiency also means checking that LA charged beneficiaries when appropriate, and followed the IFC's pricing policy. This analysis is presented in Section 7.6.

The last section concludes on the extent that the LA programs were efficient overall, considering the findings of each element of efficiency described above (Section 7.7).

7.1 How Reasonable were Costs Compared to the Realized and Potential Benefits

This section compares the costs of the LA Kenya and LA JV programs to their benefits, through a simplified cost benefit analysis (CBA). The purpose of this exercise is to determine, with some level of confidence, if the LA programs achieved more benefits than the costs incurred—that is, if the present value of net benefits is greater than zero. This CBA is not meant to definitively quantify the benefits of the programs.

Our approach to this CBA is to quantify the costs and benefits of replacing one hurricane kerosene lamp with one typical solar lamp. These net benefits are then scaled up by the total LA-certified lamps sold, and compared to the costs of the LA programs' to quantify the net program benefits.

The following sections explain the key assumptions and costs used, the resulting net benefits of a typical solar lamp, and the implied net benefits of the LA JV and LA Kenya programs based on these assumptions. Screen shots of the CBA are presented throughout the sections to illustrate the calculations.

Benefits identified and quantified in the model include savings from displacing costs of kerosene, reduced GHG emissions, and avoided health issues. Additional benefits were also identified but not quantified in the model including improved quality of light, increased hours studying, avoided risk of household fires, and ability to charge cell phones.

Conservative estimates on the benefits were taken throughout to attempt to provide a "lower-bound" estimate for the true net benefits of the programs; although, again the results here

should not be taken as the definite quantified benefits of the programs. Further research and data collection is needed to accurately quantify program benefits.

For instance, additional information is needed to quantify the percentage of sales that should be attributed to the LA programs. As explained in the effectiveness analysis (see Section 6), the LA programs did have an important causative role in improving the solar lamp market. However, it is likely that some sales of high-quality lamps would have still happened without the programs. Thus, only a percentage of the total LA-certified lamp sales should be attributed to the programs.

Also discussed in the effectiveness analysis is the question of improving access. From interviews with consumers in Kenya, we found that not every solar lamp purchased displaced a kerosene lamp. For instance, some people with access to electricity still buy solar lamps to supplement the inconsistent electricity received from the grid. These people are not receiving first time access to improved services, and thus these sales should not be counted as part of the program impacts (and thus the program benefits in the CBA).

7.1.1 Key assumptions and costs

Below are the key assumptions used in this CBA. A bibliography on all sources used is provided in Appendix E.

Kerosene costs:

- Price of kerosene fuel: $0.96/L[58]
- Price of replacement wicks: $0.14/wick[59]
- Price of large hurricane lamp: $5.64[60]
- Number of wicks replaced per year: 4[61]
- Useful life of hurricane lamp: 5 years[62]
- Kerosene usage: 2.7 hours/day[63]

Solar costs:

[58] We found this value through research, and confirmed it during our field visit to Kenya

[59] "Technical Report #3: solid-state lighting on a shoestring budget". 2008. The Lumina Project. See table 5. Accessed at: http://light.lbl.gov/pubs/tr/lumina-tr3.pdf.

[60] Average value given range of values reported. Lower bound taken from: "Technical and Economic Performance Analysis of Kerosene Lamps and Alternative Approaches to Illumination in Developing Countries". Evan Mills. 2003. Upper bound taken from: "Cost Comparisons spreadsheet", calculations for "From Gap to Opportunity: Business Models for Scaling Up Energy Access". IFC, 2011

[61] "Technical Report #3: solid-state lighting on a shoestring budget". 2008. The Lumina Project. See table 5. Accessed at: http://light.lbl.gov/pubs/tr/lumina-tr3.pdf.

[62] "Technical and Economic Performance Analysis of Kerosene Lamps and Alternative Approaches to Illumination in Developing Countries". 2003. Evan Mills.Lawrence Berkeley National Laboratory. accessed at: http://evanmills.lbl.gov/pubs/pdf/offgrid-lighting.pdf

[63] Note we found a range of usage figures, and this is an average of the upper and lower bounds

- Price of a typical solar lamp: $22.63 [64]
- Useful life of typical LA-certified solar lamp: 3 years[65]

Other assumptions:

- Reduced carbon emissions by replacing one kerosene lamp: 0.085 T/year[66]
- Price of each CO2 emitted: $20/T[67]
- Sick days avoided by replacing one kerosene lamp: 0.107 days/year[68]
- Value of deaths avoided by replacing one kerosene lamp with one solar lamp: $192/year[69]

7.1.2 Benefits of a LA-certified solar lamp

Using the assumptions from the previous section, the calculated present value of net benefits for replacing one kerosene lamp with one solar lamp was $910. This considers the benefits of a solar lamp in displacing kerosene operating costs, reducing carbon emissions, and reducing the risk of death and sickness caused by kerosene lamps.

This amount could be taken as a "lower bound" estimate of the net benefits since other benefits were identified but not quantified in the model, including improved quality of light, increased hours children spend studying at night, avoided risk of household fires, and the additional benefit of a means for charging cell phones.

The health benefits of replacing a kerosene lamp with a solar lamp are summarized in Figure 7.1 below. Here, we consider each of these quantified benefits separately, calculating the net benefits of replacing one kerosene lamp with one solar lamp.

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[64] A "typical" solar lamp was taken to be the most popular solar lamp in Africa given sales data reported by IFC. The most popular solar lamp was d.light, thus we took an average of the price of the two most popular d.light models: s2 and s300. Prices of these models were retrieved from interviews with retailers in Kenya. The average price was weighted given the relative total sales volumes of each model.

[65] From their websites, LA-certified solar lamp manufacturers indicate an approximate five-year lifespan. Warranties are generally provided for one year. The midpoint was taken as a conservative estimate for the life of a solar lamp.

[66] "From Gap to Opportunity: Business Models for Scaling Up Energy Access". IFC, 2011. See table in Annex B

[67] Report of the Secretary General's High-level Advisory Group on Climate Change Financing, United Nations. 2010.

[68] "From Gap to Opportunity: Business Models for Scaling Up Energy Access". IFC, 2011. See table in Annex B

[69] Note, this was calculated by multiplying the "deaths avoided by replacing one kerosene lamp with one solar lamp" (0.00033 deaths/year) by the value of a statistical life (VSL) for a typical African ($577,000). The deaths avoided figure was taken from a paper Castalia previously produced for IFC: "From Gap to Opportunity: Business Models for Scaling Up Energy Access". For the VSL estimate, we understand that there is no agreed method or value for valuing a life. We have taken one of the lower estimates so we can quantify a lower bound estimate of benefits for the LA programs. The method used to estimate VSL was based on selection of transportation. See following paper: "Transportation Choices and the Value of Statistical Life". Gianmarco Leon and Edward Miguel. First version October 2011, this version September 2013. Accessed at: https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxnaWFubWFyY29sZW9ufGd4OjUyYzI1MWViYmU3YjQ4ZTM

Figure 7.1: Savings by Replacing one Kerosene Lamp with one Solar Lamp

Year		[units]		2014	2015	2016
Cost of a Solar Lamp						
Price of solar lamp	[2014]	[US$ / lamp]	22.63	22.6	0.0	0.0
Total costs	**[2014]**	**[US$]**		**22.6**	**0.0**	**0.0**
Benefits of Displacing Kerosene						
Costs of a Kerosene Lamp						
Price of a hurricane lamp	[2014]	[US$ / lamp]	5.64	5.6	0.0	0.0
Useful life of kerosene lamp		[years]	5			
Wicks replaced for hurricane lamp		[wicks / year]	4	3.60	3.60	3.60
Cost of replacing a wick	[2014]	[US$]	0.14	0.14	0.14	0.14
Total cost of replacing wicks for hurricane lamp	**[2014]**	**[US$]**		**0.51**	**0.51**	**0.51**
Cost of kerosene fuel	[2014]	[US$ / L]	0.96	0.96	0.96	0.96
Fuel consumption		[L/ year]	52.7	52.72	52.72	52.72
Total cost of fuel consumption	**[2014]**	**[US$]**		**50.49**	**50.49**	**50.49**
Total costs for keroene and lamp		**[US$]**		**57**	**51**	**51**
Net Benefits of Displacing Kerosene Costs	**[2014]**	**[US$]**		**34**	**51**	**51**
Total Savings over four years	**[2014]**	**[US$]**	**136**			
Social Discount Rate		[%]	10%			
Private Discount Rate		[%]	25%			
NPV of Savings in fuel costs (social discount)		**[US$]**	**123**			
NPV of Savings in fuel costs (private discount)		**[US$]**	**107**			
IRR		**[%]**	**237%**			
Payback period		**[months]**	**5.48**			

Source: Screenshot of Castalia cost benefit analysis

As illustrated in the figure, the savings from not buying and operating a hurricane kerosene lamp are sufficient justification for buying a solar lamp. Given the assumptions taken, replacing one kerosene lamp with one solar lamp would save a total of US$136[70] over the lifespan of a solar lamp, just from displacing kerosene costs. Discounting these savings over the life of a solar lamp, total savings from the consumer point of view would be US$107 (using a 25 percent discount rate). From the perspective of a government stakeholder or other "social" point of view, savings would be US$123 (using a 10 percent discount rate).

The internal rate of return (IRR) for the investment is huge (237 percent), even just considering the savings in kerosene costs. Also, the payback period for recouping initial investment costs in a solar lamp is only five and a half months. These two figures indicate that buying a solar lamp is a great investment, even just considering the financial benefits.

The environmental benefits of replacing a kerosene lamp with a solar lamp are summarized in Figure 7.2 below.

[70] Total cost of a kerosene lamp over four years less total cost of a solar lamp over four years

Figure 7.2: Environmental Benefits from Replacing one Kerosene Lamp with one Solar Lamp

Year		[units]		2014	2015	2016
Health benefits						
Sick days avoided		[days sick / year]	0.107	0.11	0.11	0.11
Average income in rural areas Kenya	[2014]	[US$/ year]	866	866	866	866
Value of sick days avoided	**[2014]**	**[US$]**		**93**	**93**	**93**
Deaths avoided		[deaths avoided/ year]	0.0003	0.0003	0.0003	0.0003
Value of a life (lower bound)	[2014]	[$/person]	577,000	577,000	577,000	577,000
Value of life extended	**[2014]**	**[US$]**		**192**	**192**	**192**
Total health benefits	[2014]	[US$]		284	284	284
Total health benefits per LA-certified lamp	**[2014]**	**[US$]**	**1.00**	**284**	**284**	**284**
Cost of a solar lamp	[2014]	[US$]	22.63	22.63	0.00	0.00
Net Benefits of avoiding health costs of kerose	**[2014]**	**[US$]**		**262**	**284**	**284**
Social Discount Rate		[%]	10%			
NPV of benefits from avoiding health costs of kerosene		**[US$]**	**755**			
IRR			**1256%**			

Source: Screenshot of Castalia cost benefit analysis

As illustrated in the figure, the emission reductions alone are not enough benefits to outweigh the costs of a solar lamp. The present value of net benefits in this case is negative US$17.98. The IRR is also negative, indicating low rates of return predicted for this investment.

The health benefits of replacing a kerosene lamp with a solar lamp are summarized in Figure 7.3 below.

Figure 7.3: Health Benefits from Replacing one Kerosene Lamp with one Solar Lamp

Year		[units]		2014	2015	2016
Health benefits						
Sick days avoided		[days sick / year]	0.107	0.11	0.11	0.11
Average income in rural areas Kenya	[2014]	[US$/ year]	866	866	866	866
Value of sick days avoided	**[2014]**	**[US$]**		**93**	**93**	**93**
Deaths avoided		[deaths avoided/ year]	0.0003	0.0003	0.0003	0.0003
Value of a life (lower bound)	[2014]	[$/person]	577,000	577,000	577,000	577,000
Value of life extended	**[2014]**	**[US$]**		**192**	**192**	**192**
Total health benefits	[2014]	[US$]		284	284	284
Total health benefits per LA-certified lamp	**[2014]**	**[US$]**	**1.00**	**284**	**284**	**284**
Cost of a solar lamp	[2014]	[US$]	22.63	22.63	0.00	0.00
Net Benefits of avoiding health costs of kerose	**[2014]**	**[US$]**		**262**	**284**	**284**
Social Discount Rate		[%]	10%			
NPV of benefits from avoiding health costs of kerosene		**[US$]**	**755**			
IRR			**1256%**			

Source: Source: Screenshot of Castalia cost benefit analysis

The economic health benefits of solar lamps are driving the large overall benefit results. Just considering the health benefits of replacing a kerosene lamp with a solar lamp is enough

justification to purchase a solar lamp. The present value of net benefits is US$755 over the life of a solar lamp.

The IRR is very large at 1,256 percent, indicating that a solar lamp is a great investment in terms of economic returns for improved health.

7.1.3 Examples of benefits of an LA-certified solar lamp not quantified in cost-benefit analysis

Replacing a kerosene lamp with a LA-certified solar lamp would yield additional benefits than those captured in this CBA. For instance, solar lamps provide a **higher quality of light** than kerosene lamps. Kerosene lamps only emit approximately 0.04 lumens per watt[71], versus a solar lamp which emits about 100 lumens per watt[72]. Put into perspective, the average 60-watt incandescent light bulb emits 13.3 lumens per watt[73].

Because solar lamps offer a better quality, and healthier (as discussed in previous section) lighting source than kerosene lamps, students are able to **study longer** after the sun goes down. GIZ carried out a field study in Uganda to test effects of giving solar lamps to people living off-grid[74]. When asked how solar lamps had changed the activities of these off-grid populations, over half said that their primary use of the light was for studying or reading. Comparing children's activities before and after receiving the solar lamp, total hours at night spent studying increased by 25 percent.

Another reason to use a solar lamp is because it **reduces the risk of household fires**. Overturned kerosene lamps have been known to cause fires and burn injuries. According to research sponsored by the United States Department of Energy's Global Lighting and Energy Access Partnership (Global LEAP), 200,000 people in South Africa are injured or lose property each year due to kerosene-related fires[75]. This research also refers to a study that estimates approximately 70 percent of house fires in Uganda are caused by kerosene lanterns.

In addition to avoiding the risks associated with kerosene lamps, solar lamps can also provide the additional benefit of **cell phone charging**. For a slightly higher price than the typical solar lamps, many manufacturers offer solar lamps with outlets for charging cell phones. People living off-grid will normally go to the nearest retail outlet with access to electricity and pay a fee to charge their phones. Thus paying the one-time fee of a solar lamp can also save people money from avoiding this charging fee.

7.1.4 Benefits versus costs of the LA programs

The benefits of the LA programs were calculated by scaling up the net benefits of replacing one kerosene lamp with one solar lamp, and subtracting the programs' spending. Figure 7.4 below presents these results.

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[71] "Technical Report #5: from carbon to light". 2010. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr5.pdf

[72] "Technical Report #5: from carbon to light". 2010. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr5.pdf

[73] Accessed from the Federal Trade Commission at: http://www.consumer.ftc.gov/articles/0164-shopping-light-bulbs

[74] Anna Brüderle. "Solar Lamps Field Test Uganda: Final Report". GIZ. July 2011

[75] Mills, Evan. "Health & Safety Benefits of Modern Off-grid Lighting". Lumina Project. Lawrence Berkeley National Laboratory. US Department of Energy.

Figure 7.4: Cost Benefit Analysis Results

Year		[unit]		FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014
Costs of the LA Program										
LA JV										
Total Spent		[US$]	4,130,993	263,869	120,355	196,040	411,823	706,941	1,956,945	475,020
LA Kenya										
Total Spent	[2014]	[US$]	5,251,769	303,578	324,300	588,552	1,042,575	870,460	1,411,036	711,269
Total spent on both programs	**[2014]**	**[US$]**	**9,382,762**	**567,447**	**444,655**	**784,592**	**1,454,398**	**1,577,401**	**3,367,981**	**1,186,288**
Benefits of the LA Program										
Sales of LA-certified lamps		[lamps]	2,679,850	0	32,092	121,505	325,263	869,567	1,331,423	0
Percent of Sales attributed to LA		[%]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Total Sales attributed to LA		**[%]**	**1,339,925**	**0**	**16,046**	**60,753**	**162,631**	**434,784**	**665,712**	**0**
Net benefits of one solar lamp	[2014]	[US$]	910	910	910	910	910	910	910	910
Discount Rate		[%]	0.10							
Benefits of programs	[2008]	**[US$]**	**816,923,643**	**0**	**14,608,656**	**55,310,513**	**148,063,317**	**395,837,129**	**606,079,415**	**0**
Net Benefits of the LA Program										
NPV of net benefits of programs	**[2008]**	**[US$]**	**807,540,881**							
Net benefits of programs		[US$]		(567,447)	14,164,001	54,525,921	146,608,919	394,259,728	602,711,434	(1,186,288)
IRR			**2766%**							
Benefit to cost ratio			**87**							

Source: Screenshot of Castalia cost benefit analysis

As illustrated in the figure, the present value of net benefits of one solar lamp (US$910) was multiplied by 50 percent of the total LA-certified lamps sold in Kenya and the rest of Africa[76] during the programs.

We have taken a conservative estimate of 50 percent of total lamp sales reported by the LA program for this benefits calculation. This is for two reasons. First, our effectiveness analysis indicates that some of these sales would have occurred without the LA programs. Second, our interviews with BOP consumers indicate that some of the people buying solar lamps already have access to electricity. Thus, not all lamp sales are contributing to the programs' targeted benefit of increased access to improved lighting services.

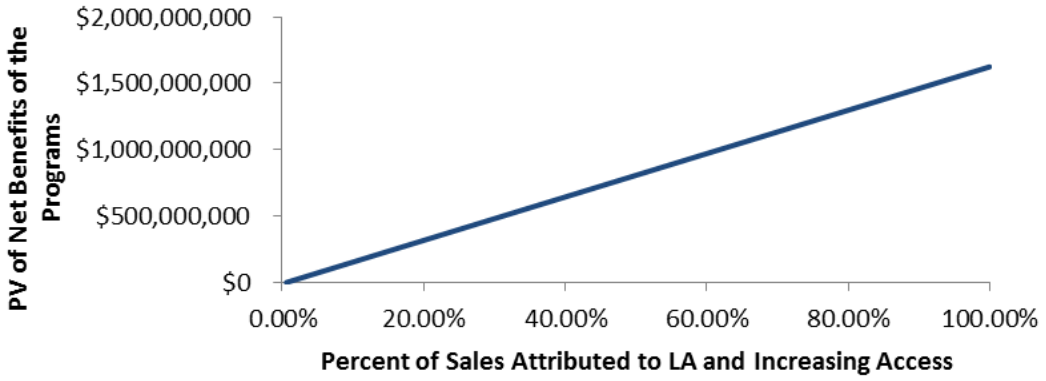
Further data is needed to estimate what proportion of lamp sales should be attributed to the LA programs for achieving this improved access. This CBA runs a conservative scenario where half of the sales are attributed to LA and providing increased access. Thus this scenario predicts that of the total 2.7 million lamps LA-certified lamps sold, 50 percent (1.3 million) were sold because of the LA programs and were sold to people previously using lower quality lights (like kerosene).

The annual sales figures were multiplied by the net benefits of one solar lamp to get the total benefits in each year. The programs' spending per year was subtracted to get the net benefits per year, and then discounted back over the life of the programs to get a final number of US$807.5 million of net benefits in 2008. Again, the purpose of this CBA is to check that net benefits are positive, not to quantify the extent that benefits were achieved. Thus this figure should be taken as an indication of positive net benefits, not an exact number.

[76] Refers to all countries in Africa outside of Kenya and Ghana

Furthermore, we conducted a sensitivity analysis to achieve more confidence that the program benefits were indeed much larger than the program costs. The sensitivity analysis first assessed how the programs net benefits changes, as we vary the percentage of sales attributed to the LA programs (the 50 percent assumption). As the graph below shows, the programs would have had positive net benefits even if only 0.57 percent of sales were attributable to LA and increased access. Thus we can say with a high level of confidence that the programs had much higher benefits than costs.

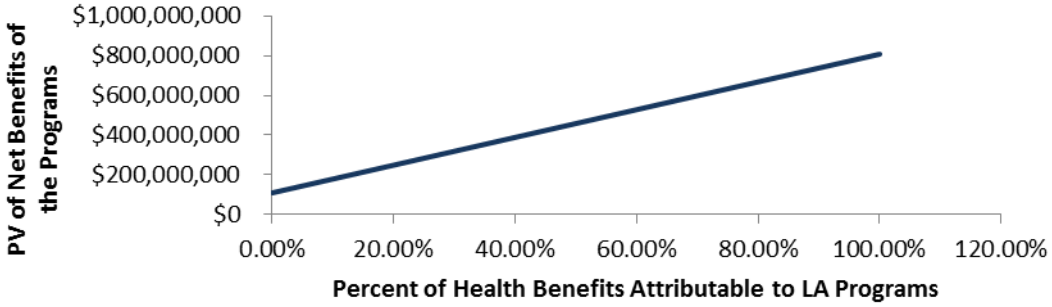
Figure 7.5: Sensitivity Analysis on Number of Lamps Sold Attributed to LA



Source: Screenshot of Castalia cost benefit analysis

Figure 7.6 below shows another sensitivity analysis for health benefits of a solar lamp—the main driver of total economic benefits of a solar lamp. As the graph shows, even assuming zero health benefits, the net benefits of the programs would still be positive because of the savings in kerosene costs.

Figure 7.6: Sensitivity Analysis on Number of Lamps Sold Attributed to LA



Source: Screenshot of Castalia cost benefit analysis

Given these results, we can say with a high level of confidence that the LA program provided very high net economic benefits and is certainly cost benefit justified. With these potentially enormous benefits, the program would benefit from a full-scale cost benefit analysis to more accurately calculate the programs' net benefits. If indeed they are close to the level calculated in our simplified model, then donors should prioritize a rapid scale up of this program to other target countries.

7.2 Was the Programs' Programmatic Design and Operational Model Ideal for Attaining the Stated Objectives?

This section starts by analyzing the LA programs components to determine if their design and delivery models were ideal for attaining program objectives. We then evaluate key aspects of the operational model: governance, staffing structure and the program budget. Throughout this section, we assess how efficient the programs were in expending resources, and highlight areas where there were opportunities for efficiency gains.

7.2.1 Programmatic design – components and delivery models

A good programmatic design would have components designed to address each barrier in the market. Furthermore, the activities carried out under each component should have been designed and delivered to remove the barrier in the most efficient way.

In this section we assess the overall program design to test its suitability for attaining the stated program objectives. We then assess the five main program components (Market Intelligence, Business Development, Quality Assurance, Consumer Education, Access to Finance), to check if the activities were designed and delivered appropriately for achieving the component's objectives. We also highlight what worked well and areas for improvement.

First, to assess the overall program design, Table 7.1 summarizes and categorizes the six barriers in the market (as explained in Section 2.1.1) into key supply-side and demand-side barriers.

Table 7.1: Barriers to Supply and Demand in the Market

Supply-side Barriers	Demand-side Barriers
1a) Lack of finance for the supply chain	**1b) Lack of finance** for consumers
2) Suppliers did not know consumer preferences in Africa on the design of solar lamps and their willingness to pay (WTP) for these products	**5) Consumers lacked trust in solar lamps**, given the existence of cheap, low-quality solar lamps in the market and the fact that most lighting consumers had never used a solar lamp before
3) Members of the supply chain did not know each other	**6)** Many **consumers did not know about solar lamps** before the LA programs
4) Long customs processes and import tariffs on solar lamps were common concerns among manufacturers who were considering importing solar lamps to African markets	

The LA programs' design had components that addressed each barrier. The six key components[77] are listed below:

- **Market Intelligence**: helped to gather and distribute information on consumer needs and preferences to manufacturers

[77] As indicated on the LA website

- **Quality Assurance**: designed high quality specifications to guide manufacturers in developing their products. This component also included product testing and certification, which differentiated
- **Consumer Education**: held Consumer Education campaigns and created TV and radio advertisements to inform consumers of the benefits of using LA-certified solar lamps
- **Business Development Services**: linked manufacturers (who were mostly international) to local distributors and retailers, thereby ensuring that the solar lamps were available to the beneficiaries
- **Access to Finance**: aimed at creating financing options for manufacturers, distributors, and consumers of solar lamps
- **Policy Development**: to influence the government to remove policy and regulatory barriers

Based on this, we can conclude that the LA programmatic design was appropriate for achieving the programs' objective of removing the market barriers that hindered the growth of the off-grid lighting market.

Next, we assess if the activities and delivery methods used under each key component were efficient.

Market Intelligence

As explained in Section 3.1, the objective of the Market Intelligence component was to help manufacturers understand consumer preferences for off-grid lighting solutions. To achieve this objective, the LA programs supported the production of 53 consumer and market research studies[78]. Of these reports, 37 were made publically available on the website, and 15 were sent directly to LA-associates. Table 7.2 below summarizes the reports that have been made publically available:

Table 7.2: Market Intelligence Reports Available on LA Website

Type of Report	Country/Region Covered	Number of Reports
Consumer Insight Reports	Ethiopia, Ghana, Kenya, Mali, Nigeria, Tanzania, Zambia	7
Market Intelligence Reports	Tanzania, Ethiopia, Kenya	9
Market Trends Reports	Africa Region	3
Quantitative Research Reports	Ethiopia, Ghana, Kenya, Tanzania, Zambia	5
Qualitative Research Reports	Ethiopia, Ghana, Kenya, Tanzania, Zambia	5
Supply Chain Mapping	Burkina Faso, Ghana, Kenya	3
Other Reports	Kenya and Africa Region	5

[78] According to logframes, LA JV produced 33 reports and LA Kenya produced 20

(gender-focused, LED flashlights, chicken farming with solar)		
Total		**37**

Source: LA website

In assessing the efficiency of this activity, one factor to consider is whether these 53 research studies were necessary to achieve the desired outcome: manufacturers designing products for African markets. Could the same results have been achieved with fewer reports and thus less spending? Should the LA programs have supported a different mix of research studies?

Our interviews with the supply chain indicate that beneficiaries' are using the reports to gather information about new markets and investment opportunities. The country-specific market and consumer research, and supply chain mapping information provided a lot of value as it directly informed supply chain members' strategies for investing in new markets. High-level market and consumer research such as the market trends reports are useful for getting an overview of the market, but the LA programs' target audience (manufacturers, distributors) really want to know what it takes to enter a country, and grow their sales.

Market research was done by firms contracted by the LA programs'. Findings were presented in form of reports—research reports, country case studies and presentations. The LA programs engaged 15 consultants and firms to research markets in Kenya, Ghana, Ethiopia, Mali, Nigeria, Tanzania, Zambia, and Burkina Faso, and prepare reports.

Firms and consultants were procured through the IFC's standard competitive procurement process—evaluating the technical methodology, qualifications, and financial proposals. This process helped to increase the likelihood that the firms and consultants selected were the best value for money.

We note that one firm—Research International—wrote fifteen of the market intelligence reports. Research International wrote five quantitative reports and five qualitative reports in 2008, then was engaged again in 2009 to write five more consumer insight reports across the same five countries. Thus there were likely gains in efficiency by hiring the same firm to conduct studies on the same set of countries.

An alternative delivery model could have been for the IFC staff to do the research themselves. Engaging specialists for this research was more efficient since the LA team selected organizations that had the qualifications to do the work, and could be hired on a short term basis to conduct discrete research tasks.

Furthermore, disseminating the research gathered through reports is far more efficient than other alternatives—such as hosting seminars or workshops to educate the manufacturers on the research findings.

Overall, we conclude that the activities delivery model for this component was appropriate for its stated objectives. Going forward, we recommend LA focus more on specific and country-level market intelligence studies.

Quality Assurance

As explained in Section 3.3, the objective of the Quality Assurance component was to help manufacturers develop high quality lamps. Furthermore, this component aimed to restore

confidence in solar lamps, among consumers, by developing rigorous test methods for solar lamps, and a way to differentiate these high quality solar lamps.

To achieve these objectives, the LA team carried out six main activities (see Section A.3 for further explanation):

- Developed quality standards for solar lamps
- Tested lamps against these standards
- Certified products that passed the testing process
- Produced guidance documents to advise manufacturers how to develop high-quality products
- Held workshops to inform the supply chain of these LA-certified products.

Several aspects of the delivery model helped to ensure that the activities were efficiently delivered. We highlight three key aspects here.

First, the activities were done by an appropriate team of people. Among others, the Quality Assurance team included two LED experts, one clean energy expert, and several engineers from the laboratory teams at Schatz Energy Research Center (California) and Fraunhofer Institute for Solar Energy Systems (Germany). This team of technical experts led efforts to develop the quality standard for solar lamps.

Thus the Quality Assurance team included experts on the subject matter. The team also put one laboratory (Schatz Energy Research Center) in charge of coordinating with the others to ensure consistency across laboratories. Thus, this team was well placed to achieve their objectives of designing quality standards and managing the testing of solar lamps.

Secondly, testing laboratories were set up in geographic locations that were close to solar lamp manufacturers. Specifically, several of the first-mover manufacturers had offices in Germany,[79] and thus could coordinate with the Fraunhofer Institute. Manufacturers entering the market later on had offices in China, India, the United States, the United Kingdom, and Kenya. These locations also aligned well with the locations of the remaining testing laboratories trained by the LA programs: Kenya, India, China, and Senegal.

Although the lead laboratory was located in the United States (Schatz Energy Research Center), most of the product testing was done by the other partner labs[80]. The Schatz team was mostly made up of technical staff and thus they focused on developing the quality standards.

Finally, the testing process was structured efficiently. Manufacturers had the option to first undergo a preliminary assessment and get feedback (Initial Screening Method "ISM"), before going through the rigorous test that led to the certification (Quality Test Method "QTM"). The preliminary test was cheaper, so this process helped save costs as manufacturers could improve their lamps after the preliminary test and then bring it back for certification. For products that already passed the QTM, products are randomly tested with a quick and inexpensive Market Check Method (MCM) test to confirm that products are still complying with quality standards. This is used as a monitoring mechanism by the LA programs to ensure

[79] Of the three "first-mover" firms according to sales figures provided by IFC, two of these firms had offices in Germany.

[80] From calls with IFC

that LA-certified products remain of high quality. When a product fails the MCM test, manufacturers are alerted to make changes or they lose their LA-certified status.

Consumer Education

IFC's Consumer Education activities included roadshows (held 254), forums with community based organizations (held 1,378), corporate outreach trainings (with 14 organizations), and advertisements through SMS messages, fliers, radio advertisements, and TV commercials.

Findings from this evaluation suggest that the smaller, intimate forums were the most effective. Because these forums were smaller, the LA team was able to engage directly with end users. Participants were also able to engage directly with the product to better understand it. These direct consultations made it more likely for consumers to understand and retain the information. In comparison, roadshows were much larger campaigns, held in bigger market towns. Roadshows mimicked the format of a concert, with the campaign hosts singing songs about solar lamps and dancing on stage. These roadshows were much less personal than the forums.

Roadshows were held strategically on market days when people from surrounding villages (including those off-grid) would come into these bigger market towns to shop. Roadshows also had the potential to reach a larger audience than the smaller-scale forums—on average roadshows reached 1,000 people versus forums which reached approximately 30. Even so, there was no guarantee that consumers living in off-grid areas would stop by the roadshow and participate. Thus while the intention of the roadshows was to target BOP consumers living off-grid, this was not necessarily the audience attending the roadshow. Our interviews with consumers in Kenya suggest that the roadshows were not as effective as the forums. Almost none of the members in the consumer associations interviewed had heard of the roadshows. Consumers in one association mentioned they had heard of an event that took place in a nearby town, but was not sure what was the purpose or the message.

The LA team held many more forums than roadshows, but still spent money on 254 roadshows. Thus the LA programs may have been more efficient if they diverted spending from roadshows to the smaller forums focused on off-grid areas.

In addition to the direct reach of the forums and roadshows, the LA team assumed this reach would extend even further through "word-of-mouth"—that is, people who attended the roadshows and forums would tell their friends about these LA-certified solar lamps. This seems to be a logical assumption, but again more likely to happen with forums than roadshows. People are more likely to talk about solar lamps when they have had a deeper engagement with the product, like they had at the forums.

The LA team also launched TV and radio advertisements to inform consumers of LA-certified solar lamps. It is clear that TV advertisements are more likely to reach a higher-income population who already has access to electricity. However, the LA team used TV advertisements sparingly, and also strategically; most advertisements were run during holidays and advertised solar lamps as the perfect gift for family or friends living in areas off-grid. The specific channels used were also selected strategically, based on total viewership of the surveyed rural and urban populations. Media firms were engaged to determine the effectiveness of various media forms. For instance, billboards were determined to be less effective than TV advertisements.

Even so, TV advertisements are clearly targeted at populations connected to the grid, and thus without strong evidence that solar lamps are often purchased as gifts for consumers living off-grid, it seems more efficient for LA to have spent these funds on mechanisms targeted directly to consumers living in off-grid areas. If the LA programs already have such evidence and used this to make the decision to use TV advertisements, then certainly the use of TV advertisements would be appropriate. If this evidence has not yet been researched, we recommend performing a literature review of these studies before pursuing further indirect advertisement routes.

Another way consumers seem to be learning about LA-certified solar lamps is through consumer associations. During our field visits, we interviewed members of four consumer associations that had not interacted directly with the LA programs. We found that some consumers in all of these associations had learned about solar lamps through their association. For example, some members of Asante Mama (a women's group in Kawangware) found out about solar lamps through the association. Asante Mama offers payment plans to consumers for purchasing solar lamps. Some consumers in three other associations and groups (Shimanyero family planning group, Kamuryu Glory Ladies, and NDIKO women's group) found out about solar lamps through the MFIs that support activities of the associations. These MFIs included One Acre Fund and VEP.

In contrast, results from our one-on-one interviews with consumers indicate that there are still many consumers that do not know about solar lamps, even those living in off-grid areas (see Section 6.2). Of the 34 individuals interviewed, 12 people (35 percent) said they did not know solar lamps existed. Looking only at the four individuals interviewed who did not have access to electricity, three of them (75 percent) did not know about solar lamps. In comparison, at least some of the consumers in all four consumer associations interviewed had heard of solar lamps. Interviews with consumer associations revealed that almost all of the members had not heard of the LA programs. None of the four individual interviewees that lived off-grid understood what the LA programs were.

We conclude that the Consumer Education component could have been designed more efficiently by directly targeting BOP consumers living in off-grid areas (and less efforts on TV advertisements and roadshows in larger towns). The LA team also may have increased its efficiency in reaching more consumers by working with more consumer associations and MFIs to have them spread the word about LA-certified solar lamps.

Business Development

The purpose of the Business Development component was to introduce members of the supply chain entering the market, particularly in Kenya. To facilitate linkages among the supply chain, the LA team held regular workshops in Kenya, Nigeria, Democratic Republic of Congo, Ethiopia, Mali, Senegal, and Tanzania, and hosted three international conferences held in Kenya, Ghana, and Senegal. The LA team also strengthened the distribution network by identifying and training new distributors, training solar technicians to repair lamps, and training last-mile retailers and bulk buyers about how to use and properly store solar lamps.

Results from our interviews indicate that the workshops and conferences were successful and valued by manufacturers and distributors (see Section 6.2). For instance, three of the six manufacturers (50 percent) found the workshops helpful, and four of the five manufacturers that attended the conferences (80 percent) found them helpful. Of the six distributors interviewed, all agreed these workshops were useful to their businesses (100 percent).

Having both the workshops and the conferences was helpful for reaching multiple segments of the market, and provided opportunities for meeting different market players. For instance, most workshops were provided for free thus appealing to the smaller companies. Conferences cost money to register (US$270 to US$800[81]) and included not just supply chain members but also government stakeholders, NGOs, and donors. Conferences also provided the opportunity for manufacturers to display their products for an extra charge[82]. Thus suppliers that could afford the registration fee would have access to other types of stakeholders and more product visibility than at workshops.

Although conferences took more time to plan and were likely more expensive to host than the workshops, they were still quite useful. As mentioned above, results from our interviews indicate the supply chain valued these conferences. Also, the IFC was able to recoup some of their costs by charging registration fees for the conferences.

We conclude both the workshops and conferences were efficient mechanisms for linking the supply chain, at least early on in the market development. As the market develops, it may be more efficient to link the supply chain through non-client-facing mechanisms. For instance, another activity the LA programs did to link the supply chain was to post contact information of distributors in Kenya and Ghana on the LA website. Once contact information is retrieved from hosting a certain number of workshops in other countries, this information could be disseminated through the website. This is also aligned with feedback from one of the manufacturers interviewed who suggested that while workshops were useful in the early days of market development, this facilitation is no longer needed.

The IFC also did well to design mechanisms that supported a strong and knowledgeable supply chain. For instance, the Business Development team trained solar technicians to repair solar lamps, thus supporting the supply chain and giving confidence to consumers who purchased the lamps. The LA programs also did well to respond to stakeholder needs that arose during the programs. For instance, it was brought to the attention of the LA team that some last-mile retailers and bulk buyers were not properly storing solar lamps, and sometimes did not know how to use these lamps. The result was that some consumers purchased the lamps without knowing how to use them, and sometimes received products that would not last long or operate properly because they were not stored properly. In response, the LA programs started training these last-mile retailers and bulk buyers how to use solar lamps and how to properly store them to retain the quality.

The LA programs also had the right people in place to host these workshops. The core Business Development team included seven people, five of which were located in Kenya thus allowing easier facilitation of local workshops. Another STC was engaged to help lead the technical trainings of solar technicians. This STC was a technical expert who had previously worked with the LA programs to supervise quality testing trials for solar lamp products in 2009.

Access to Finance

[81] Prices of Senegal conference accessed here:
http://lightingafrica.org/2012conference/index.php?option=com_content&view=article&id=67&Itemid=322

[82] Prices of Senegal exhibition booths here:
http://lightingafrica.org/2012conference/index.php?option=com_content&view=article&id=67&Itemid=322

The Access to Finance component aimed to mobilize financing to consumers, and the supply chain for LA-certified solar lamps. To increase access to finance, the LA programs consulted with MFIs to explain the quality of LA-certified solar lamps, and highlight the potential for growth in the solar lamp market. The LA team also reached out to commercial banks in Kenya and international banks and venture capital funds to try to form financing facilities to provide working capital to distributors and manufacturers of LA-certified solar lamps.

The LA activities were designed to mobilize finance to all three of the stakeholders that needed access to finance: consumers, distributors, and manufacturers. The approach also targeted financial institutions to provide the financing instead of the IFC giving money directly, thus the approach was designed sustainably.

Consultations with these financial institutions were led by one or two IFC staff members plus one STC. This same small team participated in all the consultations, thus building specialization for giving the presentations. Also, having an IFC staff member involved was likely important for gaining the trust of these financial institutions. IFC has a strong reputation for making sound financial investments and being a "first mover" in promising markets. Had the LA programs only sent consultants to speak with the financial institutions, this might not have instilled as much confidence in the financial institutions. In addition, already having a relationship with these international banks and investors, IFC was able to find good contacts to reach out to.

Although the Access to Finance team did not achieve all the results they set out to accomplish with this component, the activities were designed well. The program tried different approaches to mobilizing finance for the supply chain and it appears it just took more time than planned for financial institutions to gain confidence in the market. IFC has just now started working with Responsibility and Shell Foundation to establish a financing facility for manufacturers.

Even though the activities did not yield all the desired results, the Access to Finance component was the least costly component[83]. Thus the LA programs did well not to overspend on activities that were not yet yielding the desired results.

Policy Development

The purpose of the Policy Development component was to reduce import duties on solar lamps to improve the business environment for the market. The LA team consulted with governments in Kenya, Ghana, Ethiopia, Senegal, Cameroon, Mali, Tanzania, Democratic Republic of Congo, Rwanda, and Uganda[84] to explain the benefits of solar lamps and their potential for meeting the lighting needs of populations living in areas not connected to the grid.

Government consultations were focused on the pilot countries (Kenya and Ghana) at the beginning of the LA programs, and later expanded to other African countries. Countries were selected based on the level of interest expressed by the governments. Thus the LA programs did well to target activities to the key stakeholders (government of the pilot countries), and to expand activities opportunistically.

[83] According to the "Lighting Africa Budgets 2008 – 2014" spreadsheet provided by IFC

[84] List includes countries with policy reports, country's mentioned in 2011 Annual Report under Policy Component, and countries included on "where we work" section of LA website that mention policy work with Governments

Given that the Policy Development team mainly consisted of World Bank staff, the programs did well to put the right people in the right roles. The World Bank is well-positioned to consult with African governments because it already has relationships with these governments. The World Bank was already consulting with African governments as part of its African Renewable Energy and Access Program (AFREA), thus it used these consultations as an opportunity to check government interest in the LA programs.

Given that Kenya was the area of focus for the LA programs, it made sense that one of the team members was based in Kenya. Other team members were based in the United States and traveled as needed.

7.2.2 Operational Model

To evaluate the LA programs' operational model, we evaluated the following key elements:

- **Staffing structure**—the appropriateness of the programs' human resources and whether there were opportunities for efficiency gains
- **Administration of funds**—the allocation of funds to different components.

Staffing Structure

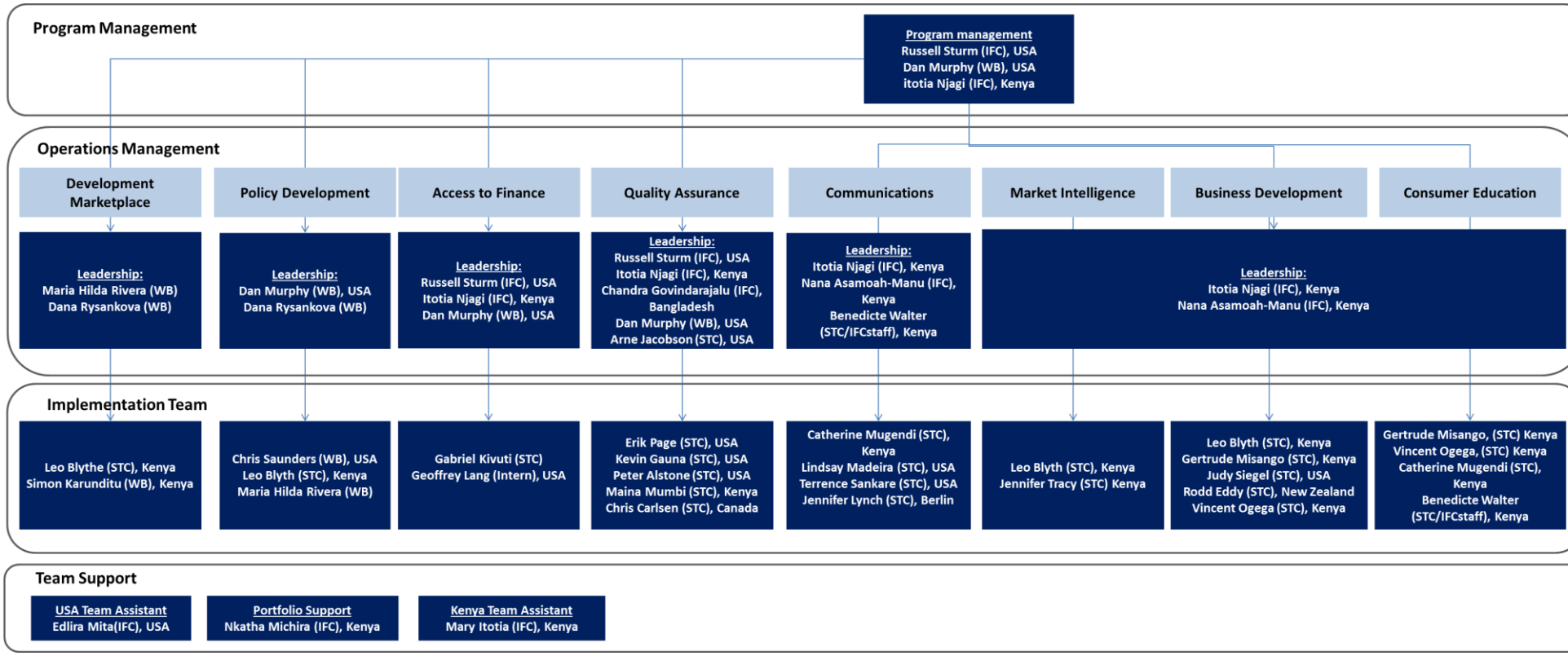
Figure 7.7 below illustrates the staffing structure of the LA programs, including team members from both the IFC and the World Bank, as both organizations worked closely together on LA JV activities. Not everyone who worked on the programs is included in the figure because several staff and consultants have changed over time, and the programs engaged several additional STCs and consulting firms to produce one-time outputs. The organization chart below reflects the core team structure as it was for most of the program.

We only present the "core team" of the LA programs who were either IFC or World Bank staff, or contractors that were engaged continuously throughout the program. Other people worked on LA activities that are not included in this core team. For instance, LA engaged several consulting firms or individual consultants to complete discrete tasks. The LA programs also engaged various laboratories to test and certify solar lamps.

As illustrated in the figure, LA had three Program Managers: Russell Sturm and Itotia Njagi from IFC, and Dan Murphy[85] from the World Bank. The program managers oversaw the leadership team for each component. The leadership team included 9 people, several of whom held multiple positions, including program management. The implementation team consisted of 21 people, including 3 IFC and World Bank staff and 17 STCs, and 1 intern. Finally the team included 3 support staff members, all IFC staff.

[85] Dan Murphy took over from Dana Rysankova and Kate Steele in 2012.

Figure 7.7: Organization Chart, Team for Most of the Program[86]



Source: Castalia figure, information from IFC

[86] Note this Organization Chart illustrates the team for 8 components. The ninth component (Private Sector Development) did not have a separate team

As the figure illustrates, the team could be grouped into four categories: program management (those making decisions for the programs, approving spending), operations management (those managing the program spending, hiring, and activities), implementation (those executing the program activities, or working with consultants to complete activities), and support (those assisting the team with administrative or other support tasks).

Teams were also grouped by component, though often several team members worked on more than one component. For instance, one STC worked on the Development Marketplace, Policy Development, Market Intelligence, and Business Development components.

Geographically, the LA Kenya team was efficiently situated and managed, with most of the programs' operations implemented and managed in Kenya. Having the operations management team on the ground in Kenya was critical for designing and executing an approach that was-well suited for the local market. For instance, having a local presence allowed the team to more easily identify local partners, such as the market firm for consumer education campaigns. This also helped the team identify corporations and NGOs to reach out to for employee trainings on solar lamps.

The IFC LA team was part of IFC's SBA department focused on Sub-Saharan Africa (SSA). This SBA department was headed by the Regional Business Line Leader, who was based in Nigeria. This Leader reported both to the General Manager (GM) of Advisory Services (based in South Africa) and the SBA Head (based in Washington DC). Thus, oversight of the IFC LA team was mainly based out of the SSA region, and allowed for quicker approvals and thus quicker decision making.

The core LA team was very lean; at any point in time, there were no more than seven full-time IFC staff working on the programs, including support staff. There were 31 team members (including IFC and World Bank staff and consultants), including Program Managers, Operations Managers, the Implementation Team, and the Support Team. As mentioned earlier, many of these team members served multiple roles.

The structure of this team included a core group of staff and consultants working long-term on the programs, and other temporary consultants hired to complete a specific deliverable. Many consultants played a large and long-term role in leading the LA programs. Thus the programs made good use of hiring specialists to complete a short-term task while engaging a smaller core-team for the long-term. Because these were pilot programs without the certainty of scaling up in the future, it also made sense to have a lot of temporary staff rather than hire full-time IFC staff to work on the programs.

Some of the LA activities were delayed at the beginning of the programs due to a gap in hiring a new Program Manager. When the Program Manager for LA Kenya and LA Ghana left at the end of 2008, it took approximately six months to hire a replacement. During this gap, activities in Kenya were delayed. Although operations began in 2008, activities on the ground in Kenya did not fully get underway until mid-2009 when the manager was replaced[87]. Appendix E provides a timeline of the program managers.

Not being able to hire a new Program Manager quickly enough to keep activities operating on time is a risk that needs to be managed in the future. For instance, this should be kept in mind as the IFC rolls out the next LA program in Nigeria. We understand that the rollout of this

[87] Dalberg MTR

program may also be experiencing delays given the time it has taken to hire a Program Manager.

We conclude that the staffing structure of the LA programs was mostly appropriate given the size of the team, their geographic location, and the use of both short-term and long-term staff. However, the weakness of this structure was the delay in operations due to the gap between Program Managers. This is a risk that should be mitigated in the future.

Administration of Funds

Finally to evaluate the efficiency of the LA programs' operational model, we assess how the funds were spent, laying particular emphasis on human resources and operations.

Table 7.3: Budget Uses

Uses	LA JV (IFC)		LA Kenya	
	Budget (US$)	Spent (US$)	Budget (US$)	Spent (US$)
Pre-implementation				
	74,227	74,227	-	-
Implementation				
Staff costs	595,987	550,393	1,137,856	1,044,599
Consultants	2,173,995	2,545,581	1,880,847	2,413,958
ET Consultants and Temps	18,976	18,976	26,924	24,754
Travel Costs	693,486	577,491	419,459	402,095
Staff Representation and Hospitality	3,409	1,458	1,425	14,618
Contractual Services	822,866	321,043	1,221,969	660,886
Communications and IT	104,479	81,678	55,438	93,651
Office Rent	8,162	8,162	45,035	61,496
Office Equipment	2,628	5,125	9,467	23,555
Other Expenses	34,870	37,149	47,007	82,026
Development Grants			160,000	122,914
Contingency			65,338	
Total	**4,533,085**	**4,221,283**	**5,070,765**	**4,944,552**

Source: Project Completion Reports

Note that the spending reported in the table above is different from the program spending reported in Table 2.4 and Table 2.5. These figures came from different sources to allow us review the breakdown of spending in different categories. The LA team sent us the breakdown of spending by component in an excel spreadsheet. The Program Completion Report, however, only tracks the aggregate program spending by specific line items, as shown in Table 7.3). The reason behind this inconsistency in total spending across the two sources is explained further in Section 7.4.

Thus, the total reported spending in the table above is used in this section to analyze the breakdown of spending by type of cost. Table 2.4 and Table 2.5 show the breakdown of spending by component.

In total, LA JV spent 112 percent of its budget for **human resources**, and LA Kenya spent 114 percent[88]. Thus both programs went over the planned recruitment budget.

In total, LA JV spent 84 percent of its budget for **operations**, and LA Kenya spent 115 percent[89].

Overall for both programs, 72 percent of total spending was used for human resources and 15 percent was used for operations. Because the delivery of LA outputs involved engaging consulting firms and STCs, it makes sense that the bulk of spending would have gone towards procuring these outputs. Thus this allocation of spending is reasonable.

The LA programs' total administrative costs[90] were 29 percent of total program spending[91]. To assess the efficiency of LA's management spending, we compared this spending with that of the Public Private Infrastructure Advisory Facility (PPIAF). According to its 2013 Annual Report, PPIAF spent 20 percent of total funds on program management[92].

Within the reported spending and budget broken down by component, not all components are included. Spending for the Communication, and Private Sector Development components were grouped with another component.

7.3 Has the Programs Built an Enabling infrastructure to Manage Costs and Monitor Business Processes?

To manage program costs, the LA team followed a standard process for recruiting consultants. This helped the team ensure that they were getting the best value for money.

This recruitment process was different depending on if consultants were being hired for the first time, or if they were recurring consultants on the team.

For new consultants, the LA team followed IFC's standard procurement process. This involved first developing a shortlist of consultants that could be a good fit for the position. Shortlists of firms were identified through three main sources:

- Developing a Terms of Reference and requesting "Expression of Interest" through the online EConsult portal
- Developing a Terms of Reference and posting advertisements in the newspaper, online, or internally through IFC's job board
- Actively searching for specific consultants directly. The team could search through consultants previously engaged by IFC and stored in IFC's databank. The LA team

[88] Includes staff costs, consultant costs, and ET consultants and temps

[89] Includes travel costs, communications and IT, office rent, office equipment, and other expenses

[90] staff costs, office rent, office equipment, and travel costs. LA "administrative costs" defined based on the categories of spending included by PPIAF for administrative costs

[91] Completion Reports

[92] PPIAF calls this spending "administrative costs", which includes: staff salaries, benefits, overhead, travel, office space, administration, evaluation of proposals, and governance and coordination of donor relations

could also ask for recommendations from the SBA department or other relevant departments at IFC.

This shortlist would then be evaluated against the required capabilities for the role. Once a consultant was selected by the LA team, final approval was needed from the regional SBA Business Manager. All STCs hired by IFC could only be engaged for a period of 150 days per year.

However, sometimes the LA team needed a specific STC for a longer period, given the expertise they had developed from working on the program over time. For instance, many STCs were re-engaged multiple times throughout the LA programs and therefore developed relationships with the targeted stakeholders. They also may have developed expertise in how best to organize a consumer education forum, or how to deliver a high-quality presentation to financial institutions as part of efforts to mobilize finance. These specialists could not easily be replaced by another consultant, even if they did offer a high-quality proposal.

In these cases, the LA team made a "single source justification". This justification explained why the team chose this particular STC over other options, including justifications for the costs of the STC, in what ways they have a unique knowledge or specialization for the position, and why it would take more time to train a different consultant.

These single source justifications were highly scrutinized by IFC to make sure the justifications were reasonable. The LA team was required to have procurement specialists monitor the entire process. In the end the SBA manager gave the final approval.

Given the strict rules of oversight and competition, and given that the LA team followed the IFC's procurement procedures for recruiting first-time consultants we conclude there were efficient structures in place for managing costs of the programs.

7.4 Did the Programs Track and Store Internal Data Efficiently?

Another measure of efficiency is the extent that the LA programs were able to consistently track data and catalogue program information in an easily accessible system. Consistency in data reporting avoids confusion and provides credibility in reported results. Archiving key program information helps maintain institutional memory, and facilitates the transition to new staff. In particular, since the LA programs frequently engaged new STCs, maintaining information on the LA programs should be particularly important for facilitating a smooth transition for the STC.

In evaluating the LA programs we had some difficulties in accessing older program documents. For instance, we were unable to receive the original version of the programs' **Implementation Plans**. Unfortunately, these files were apparently overwritten by the updated results of the Completion Reports, and thus the original plans are no longer available. We did receive a later version of the Implementation Plans, but certain information was still unavailable given the later version of these documents. For instance, we did not have access to IFC's original estimates for the leverage calculation of the LA Kenya program (see Section 7.5).

Another inefficiency was the **time required to retrieve backed-up files** for the LA team based in Kenya. Unfortunately, the LA Kenya Program Manager's laptop was stolen during this evaluation. This meant that some of the older documents and emails needed for the evaluation had to be retrieved from the archive facility, which took some time.

There were also inconsistencies in the reported **budget and spending** across different sources. As explained in Section 7.2.2, the programs' spending and budgets were tracked in the Completion Reports and also in an Excel spreadsheet "Lighting Africa Budgets 2008 - 2014", but the totals are different. Because the spending and budget are broken down differently in the two sources (by program component versus type of spending), the differences cannot be easily reconciled.

We conclude that there were several inefficiencies in how the LA programs stored and tracked data. We recommend making improvements to the data archiving system going forward, and being more conscious of storing key program documents.

7.5 Did the Programs Leverage as much Value as Planned?

One of the ways IFC measures the efficiency of its programs is to by calculating the program's "leverage"—a ratio of the value created by the programs compared to the costs. IFC calculates the expected leverage at the beginning of the programs (total expected value divided by the budget) and the actual leverage at the end of the programs (total achieved value divided by total spending). The purpose of this calculation is to see if the programs were more or less efficient than expected.

The estimated leverage was calculated and reported in the Implementation Plans, and the final leverage calculation was reported in the Completion Reports. Because we did not receive the original Implementation Plans we do not have the estimated leverage at the beginning of the LA Kenya program. Thus results are reported only for the LA JV program.

The value created as reported in the IFC's leverage calculation is not the same as the economic benefits reported in the CBA in Section 7.1. The value created by the LA JV program as recorded in the leverage ratio consists of four key elements[93]:

- Sales revenues form solar lamps
- Savings from displacing kerosene costs
- Carbon credits from displacing emissions from burning kerosene
- Financing facilitated (as reported in the impact result).

Below we present the LA JV total value created as estimated at the beginning and end of the program. We divide this figure by the program budget and program actual spending to get the estimated and actual leverage calculations.

Table 7.4: Leverage Calculation for LA JV

	LA JV	
	Expected	**Actual**
Total Value (US$)	$ 41,340,000	$ 35,284,000
Total Spending (US$)	$ 4,533,085	$ 4,130,993
Leverage	9.12	8.54

[93] As reported in the LA JV Completion Report (version "PCR doc in ASOP")

Source: Expected values taken from LA JV Implementation Plan
Actual values taken from LA JV Completion Report (version "PCR doc in ASOP")
Expected spending taken from LA JV Completion Report
Actual spending taken from "Lighting Africa Budgets 2008 – 2014" spreadsheet

As illustrated in the table, the LA JV program was expected to leverage benefits that were 9.12 times greater than the costs. However, the final leverage calculation reports that the value created was actually 8.54 times the costs.

Although this benefit to cost ratio was slightly lower than expected it is still very large and indicates that the program created much more value than it incurred costs.

7.6 Was LA's Activity Pricing Aligned with IFC's Pricing Policy?

Another element of efficiency is how much the LA programs charged program stakeholders for receiving benefits of the programs. Particularly because this was a market transformation program, the supply chain should eventually be able to bear the full costs of operating in the sector.

As explained in Section 5.3, there were some program benefits for which it did not make sense to charge; either because the benefits were public goods (like the quality assurance standard, and the website), or information (market intelligence reports, information on the quality of LA-certified products and the market potential). As explained, charging for information is difficult because its quality is difficult to discern until having already received the information, and once the information is received, people are no longer willing to pay for it.

However there were other benefits provided by the programs (either excludable, rival, or both) that were reasonable to charge for. The extent that these benefits were priced efficiently is analyzed below. IFC's 2007 pricing policies are used as the guideline for efficient pricing[94]

Quality Assurance—Product Testing

The LA team tested solar lamps against the LA quality standards to certify high-quality products. Providing the more rigorous QTM tests cost the LA programs approximately US$8,250 per test, and the quicker ISM tests cost US$750 per test[95]. These costs do not include investment costs required to train the staff at testing laboratories, buy testing equipment, and test samples of products at the beginning.

The LA team charged manufacturers a subsidized price for product testing, and gradually lowered this subsidy over time. QTM tests are still provided at a subsidized rate (US$4,550), while ISM tests are no longer subsidized and now include a margin to cover replacement costs of equipment (US$960)[96].

[94] AS Pricing Procedures 2007 and AS Pricing Directive 2007. Note these early versions of the pricing policy are used because this was the time when the LA programs were set up and establishing their pricing policies

[95] From an IFC email sent 17 July 2014

[96] Prices are calculated average of testing fees charged to manufacturers as reported in spreadsheet "LA Cash Contributions" provided by IFC in an email on 7 August 2014

According to IFC's pricing policy, subsidies for private companies should not exceed 50 percent of the total cost. For the ISM tests, the subsidized fee was always at least 60 percent of the cost of the test[97], and thus has always been in line with IFC's pricing policy. For the QTM test, the LA started off charging a subsidized fee that was around 36 percent[98] of the cost of the test, but now the subsidized fee is in line with IFC's pricing policy (55 percent).

We also note that the same subsidized price was not offered for all companies[99]. Although the reason for this difference in pricing is not clear, it is not aligned with IFC's pricing policy.

We conclude that the pricing of QTM product testing was not aligned with IFC's pricing policies for most of the life of the programs. However, the ISM pricing was in line with IFC's pricing policies for the entire program.

Business Development—Workshops and Conferences

The LA team hosted workshops and conferences to introduce stakeholders of the solar lamp market, and to train these stakeholders about solar lamps, how to store them, and how to repair them.

The cost to the LA programs for hosting workshops and conferences depended on the specific event.

The LA team charged a registration fee for the international conferences held in Ghana, Kenya, and Senegal. For the most recent conference in Senegal, registration fees ranged from US$270 to US$2,000. The required fee depended on three factors: timing of registration, location of the registrant, and whether or not the registrant wanted to display its products. Thus organizations could pay the smaller fee if they registered early, were based in Africa or India (regions targeted by the LA and Lighting Global programs), and did not wish to display their solar lamps at the conference.

Business Development—Grant Matching and Contributions

The LA team provided various matching grants and contributions for manufacturers that won LA competitions for high-quality and affordable products, or innovative marketing models.

For instance, the LA team provided grants matching 50 percent of total contributions made by winners of a competition for innovative marketing models. IFC provided $10,000 to each manufacturer that spent $20,000 on their winning innovative marketing models[100].

These grants were provided in line with IFC's pricing policy because these innovative marketing models had the potential for demonstration effects to other firms, and because subsidies were 50 percent of the total money spent on the marketing models.

The LA team also held various Global Product Awards competitions to reward products that were high-quality and affordable.

Policy Development—Contributions to Government Solar Lamp Pilot Programs

[97] According to IFC, LA originally charged $500 for ISM tests up until 2012 (see email on 7 August 2014)

[98] According to IFC, LA originally charged $3,000 for QTM tests (see email on 7 August 2014)

[99] according to the "LA Cash Contributions" provided by IFC in an email on 7 August 2014

[100] Based on calls with LA staff

As part of the Policy Development work, the LA team often made financial contributions to Government programs aimed to increase awareness of solar lamps.

7.7 Conclusions on Efficiency

The results of the simplified CBA show that both programs were efficient in spending money to create benefits. This conclusion holds even when very conservative assumptions are taken on the attribution of sales to the LA programs, and on the number of sales leading to access to improved lighting services. The results also indicate that the programs achieved extremely large benefits compared to its costs, thus we recommend that a full CBA is undertaken of the programs to quantify the program benefits.

The LA operation model and program design were also efficient, although the design of the Consumer Education component could be improved upon. Here, activities could have been designed more efficiently by directly targeting the key beneficiaries of the programs, and by leveraging more of the consumer associations in Kenya as key partners in spreading the word about LA-certified solar lamps.

Program costs were managed efficiently by following a strict procurement process for recruiting new and repeat consultants. However, tracking program spending and budgets could have been improved by keeping more consistent records. These records and other program documents should also be stored in an archival system that is easy to access, particularly for the LA team based internationally.

IFC's internal leverage calculation for LA JV shows that the program was able to create much more value than it incurred costs. While this value was measured differently than the economic benefits estimated in the CBA model, both calculations agree that the LA programs provided significantly more benefits than costs.

Subsidies and financial contributions made by the LA programs were aligned with IFC's pricing policy by the end of the programs. However, the pricing of QTM tests was not always aligned with this policy throughout the life of the programs—subsidies started off low then were gradually scaled up. Because manufacturers may not have been willing to bear a high cost for testing when the LA programs were still new, the evaluation finds this gradual increase in subsidies to be reasonable. Interviews with manufacturers indicate that they are now willing to pay the full costs of the QTM tests, and Lighting Africa is now charging these higher prices.

Overall, because the LA programs were able to leverage such large benefits in comparison to its costs (as reflected in the CBA), this indicates that the LA programs were efficient to a large extent. The details of exactly how the program benefits were priced and carried out are smaller details in comparison to the large benefits generated by the programs.

8 Sustainability

The LA programs were designed to transform the market for solar lamps in Kenya and Africa by removing the barriers that hindered market growth. Despite the fact that solar lamps had become more affordable due to improvements to technology, the market was not developing as rapidly as expected because of these barriers. Thus, the programs' benefits are the successes achieved in transforming the market—essentially, the effects of removing these market barriers and unlocking market growth potential.

This evaluation revealed that the LA JV and LA Kenya programs helped to create the following benefits, albeit to varying levels of success:

- Suppliers understand consumer preferences for solar lamps
- Supply chain entities know one another
- Tariffs and policy regimes are supportive of importing solar lamps
- The supply chain and consumers of LA-certified solar lamps have access to finance
- Consumers trust the quality of solar lamps
- Consumers know about solar lamps.

The LA programs were designed to catalyze market growth. Thus the LA programs were unique in that the programs were never meant to be a permanent fixture in the market. Once the market barriers were removed, the benefits should be sustainable without the LA programs. In some cases, LA activities may need to be continued to sustain these benefits, however these activities can be taken over by another stakeholder in the sector.

Therefore, evaluating the sustainability of the LA programs means assessing how likely these benefits are to continue once the IFC exits the market. Currently, the IFC is still operating in Africa through the Lighting Global program, though most activities have ended in Kenya. Thus to evaluate the exit strategy, we assess what mechanisms have been put in place to sustain benefits in Kenya, and what mechanisms have been planned to sustain benefits in the rest of Africa after the IFC exits (Section 8.1).

Having established what the planned exit strategy is, we assess the likelihood that each of the benefits achieved by the programs will be sustained. We also assess the extent that future benefits will be achieved (Section 8.2).

Finally, Section 8.3 presents conclusions on sustainability of the program benefits.

8.1 Was the LA Exit Strategy Appropriate for Sustaining Program Benefits?

The crux of the LA exit strategy was establishing GOGLA and identifying KEREA to take over certain activities after the IFC exits the sector. Thus evaluating the exit strategy involves assessing how appropriate these associations are for taking of LA activities, and how likely these associations themselves will be sustainable (Sections 8.1.1 and 8.1.2).

8.1.1 GOGLA

GOGLA is a membership association made up of 38 manufacturers, distributors, donors, and other off-grid stakeholders from around the world. The association is run by a small team. There is one full-time Executive Director, and the Senior Director works as a volunteer.

Supporting the directors is one full-time employee, and one intern. The board consists of seven volunteers from the member associations.

GOGLA was established by IFC in 2010, and began operations in 2012. Currently, the IFC is still carrying out LA activities through its Lighting Global programs. The plan is for GOGLA to take over many of the cross-cutting activities of the LA JV program before the IFC and World Bank exit the market.

Specifically, GOGLA will be taking over the following activities:

- Researching commonly used off-grid lighting products, and the potential market for solar lamps around the world (including Africa)
- Disseminating market reports and other best practice materials
- Linking businesses and informing off-grid stakeholders about solar lamps through international conferences held every couple years
- Managing the quality assurance standard and overseeing the lead testing laboratory at Schatz Energy Research Center
- Advising governments around the world on reducing import taxes on solar lamps
- Helping supply chain companies raise finance through GOGLA members[101].

GOGLA will not take on capacity building or other activities that are country-specific. GOGLA plans to work with local associations (like KEREA) to take over these activities, though these relationships and agreements have not yet been made.

Appropriateness of GOGLA to perform the Activities

The activities assigned to GOGLA seem appropriate for the association, although it will depend on how the activities are carried out.

For instance, government advisory on policy and tax decisions would likely be best done on a country-by-country basis, deferring to leadership from a locally-based association like KEREA. Thus the best role for GOGLA in this activity may be to oversee and support locally-based associations like KEREA who would perform the actual government consultations.

Another potential risk is the amount of activities GOGLA is planning to take on. As explained at the beginning of the section, the association is run by a small team of four people, several of whom do not work for GOGLA full-time. In addition, so far, GOGLA has only secured funding for this fiscal year, and is unsure about funding sources going forward. It is clear that membership dues will not be sufficient to cover the costs of all the planned activities. This poses the question of whether or not GOGLA will be able to take on all of these activities.

Particularly because the association recently began operations, it is not yet clear how many activities and outputs GOGLA will be able to take on. So far, GOGLA has made some progress in disseminating market intelligence, GOGLA recently published an investor report on the market for solar off-grid lighting products[102]. GOGLA is also now planning the next

[101] From interviews with GOGLA Executive

[102] "Study for Off-Grid Lighting". A.T. Kearney in collaboration with GOGLA. GIZ, Quadia, Stiftung Solar Energie, Solar Aid. June 2014. Accessed at: http://global-off-grid-lighting-association.org/wp-content/uploads/2013/09/A-T-Kearney-GOGLA.pdf

LA international conference scheduled for 2015. Clearly more time is needed before GOGLA's performance can be assessed.

For managing the quality standard, GOGLA should also consider the potential risks that come with charging a membership fee. This could be a club good (non-rival, and excludable) if a membership fee is charged. This would allow for cost recovery from establishing and operating the association. However, the risk in charging for membership is that the original members will limit access too much, excluding participation from important stakeholders. This could lead to an industry standard that is biased to one group. For instance, some manufacturers might want to lower the standard so that products could pass more easily, but of course the risk is that the quality standard will no longer identify high-quality products.

One way to address this risk is by creating a "constitution" for GOGLA to follow that allows for the standard to be developed in a commercially viable way, while also protecting open access to the association and competition among the manufacturers to create high-quality products. The constitution could also include a non-distribution rule to protect the right of new market entrants to join the association.

Sustainability of GOGLA

Particularly because GOGLA is a newly-established entity, there may be risks that it will not last long into the future. If GOGLA is expected to take on activities needed to sustain certain benefits, then it is very important for GOGLA to remain a permanent entity in the sector.

One of the potential risks to GOGLA's sustainability is its limited resources. As mentioned above, GOGLA so far has had difficulties securing enough funding for future operations. IFC plans for GOGLA to charge for market intelligence reports in the future, thus adding to its revenue sources. However, our interviews with manufacturers and distributions indicate that these companies may not be willing to pay for these reports (see Section 5.3).

Another risk to GOGLA's sustainability is a lack of large-scale stakeholder interest. Because GOGLA focuses specifically on solar lighting options for people living off-grid, this topic may be too narrow to attract the interest of enough member organizations, thus again limiting GOGLA's financial resources. From conversations with GOGLA we understand that many of the members are interested in selling larger scale electricity solutions, not just solar lamps. Off-grid lighting is now a given—customers are demanding systems that can power fans, televisions and other household appliances. The organization may benefit from expanding their focus to cover solar home systems, for instance.

Thus, there are clearly risks to the sustainability of GOGLA, and since GOGLA is a crucial part of the plan to sustain LA benefits, this poses risks to the sustainability of these benefits.

8.1.2 KEREA

KEREA is an energy-focused membership association in Kenya. KEREA has 50 member organizations mostly consisting of local private companies. The association is run by one full-time staff member, and seven committee volunteers elected by the association members.

KEREA was established in 2002 by the renewable energy committee of the Kenya Bureau of Standards (KEBS)—a government agency in charge of governing and maintaining quality standards.

KEREA's main activities include the following:

- Promoting awareness of renewable energy markets, actors, and technologies
- Supporting training and certification activities for solar PV technicians
- Researching the industry for informing stakeholders and lobbying to improve the business environment
- Facilitating networking and business linkages[103].

Given the alignment of some of KEREA's activities with those of the LA programs, the LA team identified KEREA as a promising association to help sustain program benefits. KEREA also showed interest early on in the LA programs by joining the LA Advisory Council.

The LA team envisaged KEREA sustaining two program benefits including: (i) improving tariffs and policies to support the solar lamp market, and (ii) increasing consumer awareness of solar lamps[104].

Appropriateness of KEREA to perform the Activities

Given the tasks KEREA has already been performing in the sector, and given its local presence in Kenya, KEREA seems well-placed to sustain the two benefits identified by the LA team.

In particular KEREA is well-placed to sustain the benefits of a supportive policy and regulatory environment for solar lamps. Because KEREA was established by a government agency, this may facilitate connections for KEREA with the right government agencies. KEREA also has experience working directly with the LA team to produce a policy paper for the Kenya government[105], and thus the association understands how to prepare the type of outputs required for this activity.

To aid consumer awareness, KEREA is working on an "accreditation program" for Kenya. Through this program, KEREA aims to create awareness of high-quality solar lamps and to explain where people can purchase them. According to IFC, KEREA will operate a phone number where consumers can call in to learn which products have been quality assured[106].

Sustainability of KEREA

Because KEREA was already operating in the sector long before the LA programs began, this implies that the association is more likely to be sustainable in the future.

Also, instead of focusing specifically on solar lamps, KEREA has a broader focus on renewable energy in general, including wind, geothermal, hydropower, and biomass energy. Thus KEREA is able to attract a wider base of associates.

8.2 How Likely are LA Benefits to be Sustainable?

Here, we assess whether the benefits achieved by the LA programs have been sustained, and the likelihood that these benefits will last till well into the future.

[103] From website and interview with KEREA representative. http://kerea.org/about-us/

[104] Based on calls with IFC

[105] From calls with IFC

[106] from calls with IFC

Some benefits may be sustainable without additional support. Other benefits may require some "sustainability mechanism" to be maintained. The LA team identified two mechanisms to help sustain benefits: GOGLA and KEREA.

As explained in Section 8.1, the LA programs plan for these associations to help sustain program benefits by continuing to provide certain LA services, namely, (i) market intelligence, (ii) business linkages, (iii) quality testing and standards, (iii) policy advisory, (iv) raising finance, and (v) consumer awareness.

In the sections below we examine the six benefits achieved, to varying degrees, by the LA programs. For each benefit, we assess the likelihood of the benefits to be sustained after the programs end, given the sustainability mechanisms put in place by the LA programs.

Below we examine the six barriers targeted by the programs. Under each barrier, the section explains whether benefits achieved by the programs are likely to be sustained, and whether further benefits will likely be achieved.

8.2.1 Suppliers understand consumer preferences for solar lamps

To inform suppliers of consumer preferences, the LA team researched consumer preferences and spending for off-grid lighting in Kenya, Ghana, Ethiopia, Mali, Nigeria, Tanzania, Zambia, and Burkina Faso, and summarized results into market research studies.

The benefits of informing suppliers of consumer preferences in Kenya has been sustained so far, and are likely to continue for new suppliers entering the sector because the LA team made most of this information available for free on the LA website. Thus, the supply chain could access these reports at any time.

The next question is whether additional actions are needed to keep the supply chain informed of consumer preferences and market changes in the future.

To an extent, yes, additional actions are needed. Manufacturers need to understand changes in consumer preference and market trends to continue operations in the future. Thus, the LA team plans for GOGLA to take over producing market studies.

Going forward, it appears that the same amount and level of in-depth market reports will not be needed to sustain benefits. According to the IFC, companies now understand the markets in Africa better and how they will likely evolve in the future[107], and so GOGLA will focus on producing more general market reports. From our interviews with manufacturers, it seems that manufacturers value market intelligence reports more for new or less developed solar lamp markets. Two of the six manufacturers interviewed said that the market intelligence reports are no longer very valuable now that the companies have been operating in the sector for a couple years.

Particularly in Kenya where LA has already produced in-depth reports and the market has been developing, the supply chain will likely have access to the information it needs to remain informed of consumer preferences. These companies can simply observe the existing products developed, read the previous research published, and remain updated on the general market trends by reading GOGLA's market reports.

[107]From calls with IFC

In addition, there are other ways of retrieving market information. The Monitor Group—a strategy consulting firm owned by Deloitte—recently released a market study, though it is charging for this report[108]. The supply chain can also procure market research themselves. One of the manufacturers we interviewed said that these types of reports could even be produced by local MBA students for free.

Even if the supply chain ends up paying for the market research, either to produce the research directly or purchase a report, it may be worth the investment given the enormous additional growth potential of the market. In addition to the further growth potential of the solar lamp market, our interviews with consumers in Kenya indicate that people are now starting to demand larger solar home systems to power other appliances. Thus the supply chain should be incentivized to find out consumer preferences as an investment in growing and sustaining their businesses.

Given the detailed reports already available, and the updated reports to be produced by GOGLA and other entities in the sector producing market reports, it is likely that these benefits will be sustained to a large extent. In addition, it may be time for the supply chain companies to step in and start performing their own market research, thus reducing the need for outside assistance producing this research.

8.2.2 Members of the supply chain know one another

The LA team hosted workshops and conferences to introduce members of the supply chain and facilitate business linkages. The programs focused on Kenya, but LA JV also worked in Nigeria, Democratic Republic of Congo, Ethiopia, Mali, Senegal, and Tanzania.

For the supply chain entities already introduced during the LA programs, no further action is required to sustain these benefits. These firms will keep in contact if they found the partnership helpful to their business.

To sustain linkages for new supply chain entities entering the market in Kenya, the LA team has already included on the LA website the contact details for local distribution networks in Kenya and Ghana.

For the remaining African countries where the LA team has held business linking workshops, some supply chain companies have already been introduced, and thus no further action is needed to sustain those linkages.

To sustain linkages for new entities entering these other African countries, further action is needed. The LA team is still working in these countries, thus it may be that by the end of the Lighting Global program, enough contacts will have been established to keep the market running, and such that the programs have enough contact details to disseminate (as in the case of Kenya).

Additional benefits could be achieved by linking new supply chain entities in Kenya and these other African countries. Local associations could be well-placed to facilitate these linkages.

In Kenya, KEREA is already working with supply chain businesses to facilitate business networking and linkages[109]. For instance, in 2011 KEREA led a study tour for nine Kenyan

[108] From calls with IFC

[109] http://kerea.org/about-us/

businesses to Bavaria, Germany. The group met with the Bavarian Employers Association to facilitate business linkages in the solar, geothermal, and mirco-hydro sectors[110].

The LA team also reported that they have identified associations in other African countries that could help sustain benefits in these countries. These associations could perform a similar role as KEREA in linking local businesses in each country.

To help sustain linkages at a global level, GOGLA is taking over hosting the LA international conferences. These conferences help to link manufacturers to distributors, but can also link these companies to international donors, financial institutions, and government stakeholders. GOGLA is a sensible choice to sustain these international benefits given its global focus. GOGLA also plans to work with the local associations identified by the LA programs (like KEREA), and thus GOGLA will have connections to government and supply chain contacts in several countries.

We conclude that linkages already established in Kenya and other African countries are likely to be sustained without additional actions. To link additional companies in these countries and internationally, sustainability mechanisms are needed. GOGLA is already planning to host international conferences to facilitate linkages at a global scale. KEREA is already working to facilitate linkages in Kenya. The LA team identified local associations in other African countries, and should consider if these associations are well-placed to facilitate business linkages.

8.2.3 Tariffs and policy regimes are supportive of importing solar lamps

The LA team consulted with governments on tariffs and customs procedures to facilitate a more supportive regulatory environment for importing solar lamps in Kenya, Ghana, Democratic Republic of Congo, Ethiopia, and Uganda[111].

To maintain the tax benefits achieved during the LA programs (such as those in Kenya and Ethiopia), future government officials must be aware of the benefits of solar lamps and their potential for meeting the country targets for expanding access to lighting for populations living off-grid. Given election cycles and thus regular changes in government officials, additional advocacy and consultations may be needed to inform new government officials of the benefits of solar lamps. The same applies for governments not yet targeted by the LA programs.

Although, if enough governments start providing tax subsidies for solar lamps and if other countries observe the success of these solar lamp markets, this may help sustain future benefits.

Because this critical mass of governments providing tax benefits has not yet been achieved, sustainability mechanisms are needed to maintain tax benefits in countries like Kenya and Ethiopia, and to achieve tax benefits in additional countries.

Both GOGLA and KEREA are (or plan to) take on the role of advising governments to reduce import taxes on solar lamps. KEREA already advises the Government of Kenya to facilitate a supportive environment for renewable energy products, including solar lamps. In

[110] From interviews with KEREA Chairman and details accessed at: http://kerea.org/wp-content/uploads/2012/11/KEREA-Brochure-and-Membership-Details.pdf

[111] Countries mentioned in calls with IFC staff, and through LA website "where we work"

2011 during the LA programs, KEREA worked with the LA team to review the draft VAT bill in Kenya[112]. KEREA led the work to produce a policy paper for the Government, and the World Bank assisted with connections at the Government[113]. The association is also well-placed to advise the Government given its connections to Government agency KEBS. As explained in Section 8.1.2, KEREA was established by KEBS, and currently KEREA is working with KEBS to have Kenya adopt the LA quality standards for solar lamps.

GOGLA also plans to work with governments to facilitate a supportive business environment for solar lamps[114]. Because local associations with government connections like KEREA may be better placed to perform this advisory work, GOGLA should consider providing a support role for this activity. GOGLA could help identify local associations who could carry out this activity, help draft policy papers, and potentially provide financial support to these associations.

We conclude that these benefits will likely be sustained in Kenya given KEREA's role in the sector. To sustain benefits in other countries targeted by the LA programs, we recommend GOGLA reach out to local associations identified by the LA programs to identify which associations are well-placed to work with governments.

8.2.4 Finance mobilized to the supply chain and consumers of solar lamps

The LA team consulted with financial institutions to mobilize finance to consumers and the supply chain for LA-certified solar lamps. The LA programs succeeded in indirectly mobilizing US$1.77 million in grants and loans to consumers in Kenya, and US$5.75 million in grants to the supply chain in other African countries.

The financing and grants already received by the supply chain and consumers are sustainable with no further action needed.

To mobilize finance to additional consumers in Kenya, it seems that the market is functioning well enough on its own to provide this finance with no further assistance. According to the LA team, there are approximately 11 MFIs in Kenya now providing consumer finance for LA-certified solar lamps[115]. From our interviews with consumer associations in Kenya, MFIs seem to be taking an active role in also promoting and selling solar lamps directly.

For distributors in Kenya, the financial markets have not been transformed to the same extent as for consumer finance. The Commercial Bank of Africa provided loans to two or three distributors, and the Equity Bank of Kenya began developing a financial product for retailers and distributors[116]. However, IFC's planned financing facility with Bank of Africa never got to the point of disbursing funds. After approving the fund, it was decided that a more varied portfolio (of approximately 40 different companies) was needed to hedge risk for IFC. Thus funds have yet to be disbursed from the facility.

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[112] http://kerea.org/wp-content/uploads/2012/11/KEREA-Brochure-and-Membership-Details.pdf

[113] From calls with IFC

[114] From interview with GOGLA Executive Director

[115] From calls with IFC

[116] From conversations with IFC

Thus, it may be that more time and support is needed for commercial banks to be comfortable lending to the supply chain. GOGLA plans to help the supply chain raise finance through its associate members (which includes investment organizations like IFC and Shell Foundation)[117]. Encouraging local banks to lend to distributors may be more challenging. Considering that IFC found difficulties mobilizing finance from these banks, even with IFC guarantee, this begs the question of whether an association or the distributors themselves would be successful in this activity.

For international manufacturers, it is too early to tell if additional support is needed to mobilize finance. Although the LA programs' did not deliver the planned financing facility for manufacturers during the LA programs, a financing facility was just approved this year. The World Bank Group is partnering with Shell Foundation and Responsibility to implement a US$30 million financing facility for manufacturers. After this model has proved successful, Responsibility plans to scale up the facility to $100 million.

Because the IFC is still working in countries outside of Kenya, it is too early to tell if additional mechanisms will be needed to sustain finance to the supply chain and consumers in these markets.

We conclude that the financing already mobilized, while limited, is sustainable. MFIs are likely to continue providing finance to consumers since they are making money off these loans and are confident in the quality of LA-certified lamps. It is too early to tell if additional finance will be sustainable to international manufacturers and distributors in Kenya and other African countries the LA programs worked in. It is also unclear how much finance GOGLA will be able to raise from its associate members additional to the finance Shell Foundation and IFC are already planning to provide for the manufacturer facility. So far no other associate members have planned to invest or lend to the supply chain that we are aware of.

8.2.5 Consumers trust the quality of LA-certified solar lamps

The LA team developed quality standards and tested solar lamps against these standards to identify high-quality products in the market. LA helped consumers understand which products were high-quality by displaying these certified brands at Consumer Education campaigns.

Thus the direct benefits of the program for addressing this barrier were the 66 unique product models that were certified as high-quality during the LA programs. To sustain these benefits in the long-run, the LA programs developed the Market Check Method (MCM) to check that products which previously passed the in-depth Quality Test Method (QTM) tests were still high-quality. QTM testing is used as a monitoring mechanism by the LA programs to ensure that LA-certified products remain high-quality.

However, to continue re-certifying these products and certifying new products, the testing activities need to be maintained. The quality standards against which products are tested also needs to be managed and updated when necessary.

To sustain benefits achieved by the LA programs and to certify additional high-quality products in the future, the LA programs planned for GOGLA to take on LA quality assurance activities. Specifically, GOGLA will manage the quality standards (updating them as needed), and manage the lead testing laboratory: the Schatz Energy Research Center at Humboldt State (California), headed by Arne. The LA team also trained the staff of seven testing laboratories

[117] From calls with GOGLA Executive Director

to facilitate scaling up testing activities after the LA programs ended. These laboratories will continue testing solar lamps after the LA team exits the sector.

This plan for sustaining the benefits of high-quality products was designed in a very effective way. First of all, GOGLA is well-placed to manage the quality standard given that it is an association of off-grid stakeholder firms. This is not a very costly activity, thus GOGLA does not need to raise a lot of funds to carry out the work.

Also, this model of putting an association in charge of managing an industry standard has seen success in many cases, particularly in the electronics industry. For example, the Wi-Fi Alliance is an association that certifies Wi-Fi products that conform to certain industry standards. We agree that handing off the management of the industry standard to an association is a good step for sustainability.

Although the LA programs put in place appropriate mechanisms to sustain the benefits of high-quality products, the step missing to achieve consumer trust is for consumers to be aware of these high-quality lamps. Once solar lamps pass quality assurance testing, firms receive LA-certification which is available on the LA website. However, there is no on-the-box seal to easily identify which products are LA-certified. As a result, it is very difficult for consumers to know which products are LA-certified. This was confirmed from our interviews with consumers in Kenya—it was clear consumers did not know which products were LA-certified, or even what LA-certification was.

From conversations with GOGLA's Executive Director, we understand the association plans to create this certification seal. However, there does not appear to be a plan or timeline for implementing this seal.

However, some consumers are aware of high-quality solar lamps because they know about certain high-quality brands. Thus consumers who know about these brands trust the product. These benefits are likely to be sustained so long as these particular brands continue producing high-quality products.

We conclude that for those people who know about a few high-quality brands of solar lamps, these consumers trust the product, and these benefits will likely be sustained so long as these particular brands continue to produce high-quality products. The LA programs have also done well to sustain the existence of high-quality products in African markets. However, because there is no clear mechanism to inform consumers which products are high-quality, the benefits of bringing high-quality products into the market cannot fully be realized. We recommend that GOGLA and the LA program team focus on implementing the quality seal to achieve these benefits.

8.2.6 Consumers know about LA-certified solar lamps

LA team used roadshows, forums, SMS messages, fliers, radio advertisements, and television advertisements to inform consumers living in off-grid areas of the benefits of using solar lamps.

Thus the benefits achieved by the LA programs include those consumers who learned about LA-certified solar lamps either directly through these campaigns and advertisements, through word-of-mouth, or through organizations that interacted with the LA programs.

For consumers who heard about solar lamps and purchased one, these benefits will be sustained with no further actions.

However, for consumers who heard about solar lamps and have not yet purchased one, additional information or continued reinforcement is needed to sustain benefits for these consumers. For instance, someone may learn about the benefits of solar lamps and then start saving towards buying a lamp. But as time passes, they may decide to spend this money on other things or they may decide it is too difficult to save up enough money. Providing continuous reinforcement of the benefits of LA-certified solar lamps is needed to keep the message present in the minds of consumers. Particularly for behavior change campaigns, it takes time and repeated exposure to information for someone to change their actions.

To sustain benefits for consumers in Kenya, KEREA is working on an accreditation program to create consumer awareness of solar lamps. KEREA will operate a phone number where consumers call to learn which products have been certified[118].

However, based on our interviews with consumers in Kenya, it appears that consumer awareness has not been "catalyzed" sufficiently for information to be sustained by word-of-mouth and KEREAs smaller-scale activities. Also, now that the LA programs have ended, the risk is that the momentum built in Kenya through LA Consumer Education activities has been lost.

Thus to sustain benefits for consumers in Kenya that have not yet purchased a lamp, additional Consumer Education activities are likely needed. However, this support does not have to be in the form of the education campaigns implemented by the LA programs. For instance, the LA team could help sustain benefits by encouraging local consumer based organizations (CBOs) and microfinance institutions (MFIs) already established in the sector to spread the word of solar lamps to consumers. Our interviews with consumer associations indicate that some of these organizations are already helping spread the word to more consumers.

Consumer knowledge of solar lamps could also be sustained through increased supply chain marketing. D.light for instance has done a phenomenal job at marketing its products. The company has built a strong brand that is widely-recognized throughout Kenya. The company has also built many d.light retail outlets dedicated to selling d.light products. Most consumers who are using solar lamps now are using d.light lamps, and learned of its high quality through word-of-mouth.

The LA programs already supported innovative marketing methods through its grant cost-sharing program, and through some training workshops. However, these efforts could be expanded as a more cost-effective way to educating consumers, given that these costs would be shared with suppliers instead of being borne entirely by Lighting Africa.

As Lighting Africa is scaled up to other countries, the team should keep in mind lessons learned from the Consumer Education campaigns in Kenya. For instance, take advantage of local consumer associations already established, promote supplier marketing, and keep the momentum of Consumer Education activities until the "critical point" where enough consumers are aware of LA-certified solar lamps that the message can spread through word-of-mouth.

We conclude that for consumers that already purchased solar lamps, these benefits will be sustained. However, for the remaining consumers in Kenya and those in other African

[118] From calls with IFC

countries, additional support is likely needed to keep consumers informed of the benefits of these solar lamps.

8.3 Conclusions on Whether Program Benefits are Likely to be Sustained?

The LA programs' strategy to sustain benefits after program close was for GOGLA and KEREA to take over certain key LA activities. Both KEREA and GOGLA are appropriate organizations to take over these activities, however GOGLA should consider not taking the lead for government consultations when there are local associations (like KEREA) that may be better-placed to take this on.

One risk to this exit strategy is that GOGLA may not be sustainable in the future. We understand that GOGLA has had difficulty securing funding for future operations, and given the amount of activities GOGLA plans to take on this may not be feasible given the budget.

Another issue with the exit strategy was timing. It seems that the LA Kenya program may have ended too early to achieve the envisaged benefits of informing consumers about solar lamps.

Considering each of the six benefits targeted by the LA programs, it appears that current and future benefits are likely to be sustained for the (i) supply chain to understand consumer preferences, (ii) supply chain businesses to meet one another, (iii) tax benefits to continue in Kenya, and (iv) finance available to consumers in Kenya.

Other benefits may need additional actions or institutions to be sustained. These benefits include: (i) tax benefits for other African countries, (ii) finance available to the supply chain in Kenya and other African countries, (iii) consumer trust in solar lamps in Kenya and other African countries, and (iv) consumer awareness of solar lamps.

9 Lessons Learned and Recommendations

This section summarizes key lessons from the LA Kenya and LA JV programs that can be applied in expanding or replicating future LA programs. Identifying key lessons and translating them into useful knowledge for future interventions is particularly important in this evaluation since the program is already being replicated in other African countries as well as in Asia.

We start by presenting some of the key lessons from the Dalberg Mid Term Review (MTR) conducted in 2011 in Section 9.1. Here we highlight the recommendations that the LA program team have already adopted, as well as recommendations that were not yet adopted and are supported by our evaluation.

Next, Section 9.2 presents recommendations from our evaluation, both at the program-level and component-level, and highlighting the key factors that led to the success of the LA programs.

A key aspect of the LA Kenya and LA JV programs is the collaboration between the IFC and World Bank. In Section 9.3, we review how well the IFC/WB collaboration worked, highlighting what worked particularly well and what could be improved.

Drawing from the review of the IFC/World Bank collaboration, and the overall findings from the evaluation, we conclude this section by recommending a structure for scaling up the LA programs going forward (Section 0).

9.1 Lessons Already Documented

A review of the previous evaluation of the LA programs led by Dalberg showed that some of the lessons drawn from our evaluation were already suggested in the Dalberg evaluation, but were not implemented. These lessons are presented in the second column of Table 9.1. Going forward with the Lighting Global programs we recommend implementing these recommendations.

The table also presents recommendations suggested in the Dalberg review that have already been adopted by the LA programs (see first column).

Table 9.1: Previous Recommendations Supported by our Evaluation

Dalberg Recommendations Already Implemented	Dalberg Recommendations not yet Implemented, and Supported by our Evaluation
Continue program funding and support ▪ The LA team continued the program until July 2013, when the program closed	N/A
Quality Assurance ***consider creating feedback opportunities for manufacturers to comment on quality standards*** ▪ Once GOGLA takes over managing the quality standard, member firms will have the opportunity to provide feedback and input on the quality standards	**Quality Assurance: r*efocus on rolling out consumer seal*** ▪ Lessons drawn from our evaluation agree with the Dalberg MTR that the quality seal is of key importance for increasing consumer trust in solar lamps. Currently many consumers only know of a few high-quality brands, and are not aware if they are LA-certified or what LA-certification is. This can undermine the lesser-known companies with LA-certified products
Access to Finance: ▪ ***Major components like Access to Finance should be defined distinctly from other interventions to improve transparency and facilitate monitoring*** ▪ *Access to Finance* was established as a distinct component with its own team and targets in the logframes ▪ ***Develop clear intervention plans for each element of the value chain: manufacturers, distributors, retailers, and consumers*** ▪ The LA team targeted each of these value chain entities for its Access to Finance activities: (i) targeted international banks and venture capital funds to create a financing facility for manufacturers; (ii) targeted local commercial banks to create a financing facility for distributors, (iii) consulted with Bank of Africa to encourage the development of new	N/A

financial products for retailers, (iv) consulted with local MFIs to mobilize finance to consumers	
<u>Consumer Education</u>: *engage governments on awareness raising efforts, particularly through educational channels* ▪ The World Bank staff on the LA team worked with governments to support consumer awareness programs. For instance, the World Bank helped support the Government of Senegal on a pilot program to provide solar lamps in public schools and libraries with the purpose of educating consumers on how to use these lamps	**<u>Consumer Education</u>: *re-think the below-the line consumer education initiative*** ▪ Lessons drawn from our evaluation indicate that the smaller and more interactive forums held in rural communities are more likely to reach targeted consumers and increase consumer knowledge of solar lamps than the larger roadshows held in market towns
<u>Policy Development</u>: *communicate policy reform objectives and accomplishments to LA private and social sector counterparts and, where possible, involve them in advocacy initiatives* ▪ The LA team produced Policy Reports that summarized for each country the policy barriers identified, and recommendations for removing these barriers. Supply chain stakeholders were consulted during the drafting of these reports to provide an objective assessment	N/A
<u>Communication:</u> *collect feedback and measure results, such as satisfaction surveys and website user metrics* ▪ The LA team collected user metrics for the LA website using google analytics. Also, feedback on the usefulness of the website was collected at the end of the LA programs	N/A
<u>Business Development:</u> ▪ ***Consider doing follow-up conferences of more modest scope to lay ground for transfer of the conference to the off-grid lighting association*** ▪ The LA programs continued to hold the large-scale international conferences every couple years, but the team also held smaller conferences and workshops in Kenya ▪ ***Provide grants to help drive innovation and scale*** ▪ The LA programs provided matching grants to the winning firms of an innovative business models competition.	N/A

▪ **Cut back on direct business strategy advisory by LA staff for individual companies and refocus on more scalable and standardized advisory and "matchmaking" products and services. Move to more standard solutions in-house, outsource where possible, and increase cost-sharing with beneficiaries** ▪ The LA team hosted workshops to advise firms on marketing strategies. Some workshops were hosted by LA staff and STCs, but business training workshops were led by "business edge certified" consultants	
Prioritize Consumer Education and Access to Finance to drive sales volumes, while continuing lower-level support for market infrastructure interventions like Quality Assurance and Market Intelligence ▪ A larger proportion of program spending was focused on Consumer Education activities the last few years of the programs, but spending on Access to Finance remained low. Spending on Market Intelligence decreased, but spending on Quality Assurance remained high and increased towards the end of the programs	N/A
Roll out competitive grants to facilitate market entry, business model replication, or business capacity building ▪ The LA team held competitions to encourage innovative marketing strategies. Winners received grant matching for their investments	N/A
N/A	**Embed social sector engagement more explicitly throughout program components, particularly for Consumer Education** ▪ The LA team started targeting women's groups in 2013, but should scale up efforts to work with consumer associations. Our evaluation shows that many consumers learn about solar lamps through consumer associations, and this is a good way to target people living in off-grid areas. Particularly in countries like Kenya with a large network of established consumer associations there are opportunities to reach target consumers through these associations

	Going forward we recommend targeting consumer associations as a key part of consumer education efforts
N/A	**Move to a leaner, regional, cross-geography execution model with regional LA hubs, more standardized products and toolkits, and tiered delivery of services at country levels** ▪ We agree that Lighting Africa should, where possible, adopt a standardized model to apply in other countries. While clearly not every service can be standardized and applied to new countries, there are several aspects of the LA programs that could be standardized. For instance, when rolling out a new program, the team could start with a standardized checklist of market barriers, and identify which barriers apply for this market and thus adopt the LA components as appropriate. While a few staff members will be needed on the ground for each country that rolls out the LA program, the programs could benefit from having a regional hub of "component specialists" who could easily travel to the targeted countries. These recommendation is expanded further in Section 9.4
Focus on countries with the highest potential in terms of units sold and demonstrated government and private sector interest ▪ The World Bank is targeting countries opportunistically for policy consultations, depending on the level of Government interest The IFC targets countries based on market potential. This was also done for pilot countries Kenya and Ghana, but since the Dalberg Mid Term Review, the LA team has adopted a new system of evaluation to select targeted countries	N/A
	Invest in baselines and periodic feedback collection, particularly for Consumer Education ▪ Our evaluation finds that the LA impact results may be over-estimating the true results of people with access to improved services. Follow-up data collection could help provide a more accurate estimate by

	tracking a sample of lamps sold, and identifying the proportion of consumers that received access to improved lighting services through buying the solar lamp, rather than those who already had access to electricity Also, consumer education activities could benefit from tracking baseline and follow up data to identify which techniques are most effective. This could be done by including a unique discount code for each type of education activity, and tracking how many people heard about solar lamps through each type of education activity (e.g. radio advertisements versus roadshows)
	Add new indicators to improve learning and measurement of impact ▪ Additional indicators could be added to better track the market transformation achieved by adding indicators that track the barrier that was removed by the programs. For instance, indicators could track the improvement in consumer awareness of solar lamps, distributing surveys over time after implementing consumer education activities to see if awareness increases This would also better explain the underlying component logic, linking the outputs and outcomes to the targeted barrier, and finally the intended impact
Improve financial tracking and monitoring by program component ▪ The LA team tracked spending by component, though the budget was not tracked by component for most years	**Improve financial tracking and monitoring** ▪ Our evaluation found that financial tracking was not done consistently across different program documents, thus creating confusion as to exactly how much was spent
Continue to move to pro-active dissemination of research ▪ LA team sent out newsletters, brochures, and market research reports not posted on the website to LA-associates	N/A
Invest aggressively in building and strengthening off-grid lighting industry associations ▪ The LA team established GOGLA to take on key LA JV cross-cutting activities. The LA programs also worked with KEREA to take on key program activities in Kenya. More	N/A

needs to be done in terms of **strengthening** these institutions to take over LA activities	
Experiment with increasing beneficiary cost contribution expectations for services including market intelligence, workshops, and quality assurance testing ▪ The LA programs gradually increased the fee charged for quality assurance testing. However, the programs did not charge for workshops or market intelligence reports	N/A

Source: Dalberg MTR

9.2 Lessons from our Evaluation

This evaluation has revealed some key success factors that should be considered in replicating or expanding the programs. Similarly, some aspects of the program could have been better designed or implemented. In this section we discuss, what worked well, and should continue as is—that is, what activities, aspects of the program design and operational process were particularly effective. We also present the aspects of the program that should be improved or structured differently in future programs. The lessons at the overall program level are first discussed (in Section 1.2.1) and then by component (in Section 1.2.2).

9.2.1 Key success factors at the program level

Results from this evaluation point to three main reasons why the LA programs have achieved such tremendous success.

First, the programs identified an important need (improved access to lighting); and a solution that had the potential of providing tremendous benefits to a large population of people (BOP consumers living in off-grid areas of Africa), and could be delivered at affordable prices. Therefore, **the LA programs will continue to remain relevant as long as there is a market for off-grid lighting solutions.** To take advantage of this success in future program replications, the LA team must ensure that there is a strong demand for off-grid lighting solutions in countries where it chooses to operate going forward.

Secondly, the programs' approach to addressing the need for improved off-grid lighting solutions was tailored to addressing the specific barriers that hindered the market. Thus because the programs were well-suited to addressing these barriers, this ensured that the programs would be efficient. We also concluded from the evaluation that the programmatic approach was well-designed and effective in achieving the desired market transformation. Therefore, **going forward, the LA team must ensure that the programmatic approach adopted for each new country is specific and suitable for that market.**

At the start of the program, the LA team identified a set of barriers that limited growth in the market for solar lamps. This evaluation revealed that these were indeed the "*right barriers",* and were generally relevant to Kenya. In designing the Kenya pilot, it was clear from our evaluation that the team thought through whether these barriers were relevant in Kenya; and how they

manifested in the country. From our field visit surveys, we asked why BOP customers were not using solar lamps, and the reasons given were those identified by LA.[119]

Identifying the right barriers is the first step; the next is designing an approach that effectively addresses them for the least cost. Again, the evaluation revealed that the LA team designed an appropriate program approach for the broader LA programs as well as the LA Kenya pilot. The components were directly relevant to the specific barriers, and the activities under each component did, for the most part, help to address these barriers.

We also note that the LA team tried to tailor component activities to the specific country where they were operating. For instance, the LA Kenya pilot developed consumer education material tailored to the population in Kenya, while the LA JV program developed more general consumer education material that could be disseminated in various countries. The Policy Development team tailored their approach consulting with governments depending on the specific barriers present. For instance, Kenya raised taxes on solar lamps not long after the LA Kenya program started. Thus, the key focus of the Policy Development team in Kenya was to help reduce these taxes.

Therefore, for future success as the IFC replicates the programs, the key is to find the **specific barriers** in each new country that Lighting Africa targets, and then design a programmatic approach (components and activities) that is specifically suited for the market. While there are similarities across countries in a particular region, each context is still different enough that a "one-size fits all" program approach is unlikely to work. As was done for Kenya and Ghana, pre-implementation research should be done in each country to understand what the barriers are.

The specific barriers in any new target LA country are likely to be part of the ones already identified at the start of the program. The key task in assessing a new market is to determine if **all** the barriers are relevant in the country; and how do the relevant barriers manifest in the particular country. Then the LA team can work to create a response (that is, components and activities) that is tailored to the particular country.

Furthermore, in designing a country-specific approach, we do note that there are certain components of the LA programs that will still remain cross-cutting, such as the Quality Assurance component. These have been rightly identified by the LA team and housed under the "LA Global" program. We expect that these cross-cutting solutions will still apply in all the markets where LA operates.

Thirdly, the program was designed sustainably. LA programs were never meant to be a permanent fixture, rather the aim was to catalyze market growth and then exit to allow the market for solar lamps operate on its own. Going forward, it is crucial that **Lighting Africa maintains this focus on catalyzing the market**, rather than providing continuous support. For instance, if the programs were to subsidize lamps for consumers or give away lamps for free, this would only be a temporary fix to a permanent problem, and would spoil the market. The LA programs are unique in that they offer a sustainable solution to market development, and this is the key to its success.

[119] Our interviews with the supply chain during this evaluation confirmed that lack of information on consumer preferences, industry quality standards, finance, and consumer awareness were major needs the supply chain faced prior to the LA intervention.

9.2.2 Areas for improvement at the program level

More than just designing an effective and efficient approach to achieving the program's objectives, the approach must be implemented in a way that provides the most value for money. From evaluating the LA programs' efficiency we found that there are opportunities for improvement in the program's operations, including monitoring and evaluation (M&E), data management and staffing.

Recommendations for improving monitoring and evaluation

The LA programs' current monitoring and evaluation (M&E) framework and process have its strengths and weaknesses.

At the **impact** level, one strength is that the LA programs' impact indicators are measuring the "right things" because they reflect the objectives of the programs, and because they are a logical result of the program outputs and outcomes. Specifically, impacts targeted by the programs include increased access to improved lighting services, reduced GHG emissions, finance to the supply chain and consumers, and affordable high-quality products available in the market.

However, the approach to reporting results for these indicators is likely leading to an overstatement of the programs' achievements. This problem is discussed in detail in Section 6.1.2, and summarized here. First, not every lamp sold is providing first time access to improved lighting. This is one of the assumptions in calculating the benefits of the LA programs. We found that in Kenya, some of the users of solar lamps are connected to the electricity grid, which means that the results reported for the indicator *Number of people receiving access to improved services* is likely to be overstated.

Secondly, although the LA programs have contributed to the sales of additional lamps by catalyzing the market in Africa, it is inaccurate to attribute all the sales reported by LA associates as benefits of the LA programs. Some of these sales would have still occurred without the LA intervention—some manufacturers would have still entered these markets.

The LA team should develop a more accurate approach to measuring the true impact of the programs. This includes the number of sales of solar lamps that should be attributed to the LA programs; and a more realistic estimate of what proportion of these sales are providing first time access to lighting.

One suggestion could be to "follow" a sample of solar lamps. The LA team could track the sales of a sample of solar lamps by having manufacturers include a bar code identification number on the lamps before they are imported into the targeted country. Once these lamps are sold, the LA team could "follow the lamps" to see who are the end-users that purchased the lamp. In particular, the LA team would count what proportion of consumers who purchased the lamp lived in off-grid areas, and thus received access to improved lighting services by purchasing this lamp. Other consumers may have already had access to electricity and purchased the lamp to supplement their use of electricity. These consumers should not be included in the impact result of *Number of people receiving access to improved services*. The proportion of people in the sample who received access to improved lighting services due to purchasing the solar lamp could be used as the scalable factor for this impact result.

We also recommend that the LA team conduct a full-scale cost benefit analysis (CBA) to get a better sense of how much net economic benefits the programs have generated. Our simple CBA shows that for a conservative scenario (where we attribute 50 percent of lamp sales to

LA), the programs provided very large net economic benefits (approximately 807 million). Given these very large numbers, the IFC should invest in a full-scale CBA to have more support for why this program needs to be scaled up and replicated. If the full-scale CBA finds similar large numbers, this means that the LA programs have net economic benefits that far exceed similar development programs, thus providing enormous value for money to donors.

At the **output** level, we were able to draw a logical causal link between the output, outcome and impacts for one of the components (see Section 6.2). This suggests that the outputs measured are relevant and could be kept as is. However, two steps could be taken to make the process of tracking performance at the output level more efficient.

First, we recommend reducing the number of output indicators the program tracks and limiting the total indicators to those that are most relevant. Currently, the programs track 71 outputs and 43 outcome indicators, which is excessive for a program of this nature. For instance, PPIAF has six output and six outcome indicators. ESMAP has a total of 19 indicators, including both outputs and outcomes. The LA team has already identified a set of "key indicators", for which the team reports results in the supervision reports. Limiting the programs' results monitoring to these key indicators would significantly reduce the programs' administrative burden, whilst still capturing the results of the program.

Second, the IFC should consider redefining indicators for the future LA programs, or at least be more diligent about keeping an internal record of what these generic indicators mean given the context of the LA programs (for instance, see the "interpretation" column of Table 6.1). We understand that the programs report against IFC's standard set of indicators to be consistent with IFC's other programs. However, LA programs are unique by design because they are market transformation programs. A market transformation is the strategic process of intervening in the market for a new technology (typically one that promotes energy efficiency) to create lasting change in market behavior. The change is created by removing identified barriers or exploiting opportunities to accelerate the adoption of the technology. This is what Lighting Africa was designed to do and attempting to measure results of the programs by a generic set of indicators is unlikely to capture the market transformation that the programs are targeting.

Should IFC decide to maintain its standard output and outcome indicators for the LA programs going forward, then the LA team could still improve its reporting against these indicators by providing a clear interpretation of the meaning of these indicators for donors and relevant stakeholders. Specifically, we recommend that the Completion Reports, Implementation Plans, and Supervision Reports include both the IFC definition and the LA team definition of these output and outcome indicators.

Currently these indicators are generic and thus the meaning is unclear. Upon request, the LA team provided interpretations for these indicators, and after reviewing those, we found that they are mostly relevant. However, there were some discrepancies in what the indicators were intended to measure, and what LA team actually measured, as explained in Section 6.1.1. A more straightforward and clearer way of tracking performance will be to name indicators based on what the indicators are actually measuring. If the IFC's institutional constraints prevent renaming these indicators for the LA programs, a second option is to have a second set of indicator definitions that are also included in the programs' reports.

On the **outcome** indicators, we also recommend limiting them to a set of indicators that specifically measure the program's expected outcomes—the removal of barriers that limited

the market for off-grid lighting products. The LA programs already include some outcome indicators that measure the removal of these barriers. For instance, the Quality Assurance component tracks the number of LA-certified lamps available in the market, and the Business Development component tracks the number of business agreements facilitated among the supply chain. However, some others could be added to adequately cover all targeted barriers. For instance, additional outcome indicators could include:

- New distribution outlets identified for LA products (Business Development Services)—
- More target beneficiaries that know about the benefits of using solar lamps (Consumer Awareness)
- More targeted beneficiaries that trust the quality of certain solar lamps (Quality Assurance).

To illustrate, the consumer awareness component was intended to educate target end users about solar lamps, how to use them, and what their benefits are. Therefore, the outcome indicator(s) here should directly measure people's awareness and knowledge of solar lamps, for instance: *number of* ***additional*** *people who know about solar lamps*. To track performance against this indicator, the program team would have to do a baseline survey at the start to establish the level of awareness. Then, at different intervals during the program, follow up surveys should be administered to track changes in awareness levels among the same set of people surveyed, over time. This deliberate approach to setting relevant outcome indicators, and tracking performance over time would help the program team be better able to estimate and report the effects generated over the life of the program.

Recommendations for improving operational inefficiencies

After assessing the efficiency of the LA programs, we identified three key areas of improvement: staffing and data management.

There was an issue with engaging a replacement Program Manager at the beginning of the program. As explained in Section 7.2.2, there was a six month gap in engaging a new Program Manager for the LA Kenya and LA Ghana programs. This resulted in delays for implementing activities. We also understand that there have been delays in engaging a Program Manager in Nigeria, which may have delayed the full rollout of the Nigeria program. Thus, one of the challenges moving forward with these LA programs will be to mitigate the risks of staff turnover affecting the progress of activities.

Another recommendation for improving operations is to focus more attention on storing key program documents and report data consistently across these documents. As explained in Section 7.2, one of the findings from this evaluation was that the early versions of the Implementation Plans have been over-written, and are thus no longer available. Keeping copies of program documents, particularly the early plans, is important for understanding how the programs performed against the initial plan and forecasts. These documents can also be helpful for planning the rollout of the next programs.

Some data was not recorded consistently across documents. Specifically, the program spending and budgets were recorded in two different locations[120], broken down by different categories.

[120] Lighting Africa Budgets 2008 – 2014 Spreadsheet and Completion Reports

The total spending and budgets reported in these two sources were different, thus the actual program spending and budgets were not clear. Consistency in data tracking is important for credibility in reporting, and to avoid confusion on what the true figures are.

9.2.3 Component level lessons learned

Drilling down to the component level, our overall findings for the programs' six main components[121] are the following:

- **Market Intelligence, Business Development and Policy Development** were very successful. Thus going forward, the LA programs could, in general, adopt the activities (design and implementation) when replicating the LA programs in other countries. Again, we highlight the importance of tailoring specific activities and implementation strategies to the country context
- **Quality Assurance, Consumer Awareness and Access to Finance** could be improved.

We elaborate on lessons learned from these components below.

Market Intelligence

The market intelligence component was well-designed and executed. Manufacturers and distributors explained that the information gathered from the research studies was useful in determining their customers' preferences, how to design products to suit those preferences, and how to get these products to them.

A key lesson learned from the LA Kenya pilot experience is that the LA programs should continue **to make the market intelligence component a focus at the start of an engagement in a new country**. There are two reasons for this. First, manufacturers need the market intelligence early on to ensure they are designing the right products. Secondly, the value of the market intelligence decreases as these manufacturers and distributors understand the market.

Business Development Services

This was another component that was well designed and executed. The mix of global conferences, and local workshops and training activities, helped to connect supply chain counterparts in a meaningful way.

In the future, we recommend continuing the LA International Conferences (now to be organized by GOGLA) to bring together stakeholders at the global level. The manufacturers and distributors interviewed highlighted these conferences as being very useful for their business development services.

At the local level, the LA team would need to tailor its approach to linking manufacturers, distributors and retailers; and supporting them in developing a footprint in new markets to the specific country's context. In some countries, this may involve working with government agencies, which may be better able to identify and engage appropriate distribution channels on a large scale. In other countries, distribution channels may be easier to identify and manufacturers may need little to no LA support. A solid understanding of the market for

[121] These are the main components according to the LA website

similar products in each country will be extremely important in designing business development activities that will be effective.

Policy Development

The scope of the Policy Development component was quite limited, compared to other program components. However, the activities were ideal and sufficient for addressing the policy barriers in the Kenyan market. The LA programs played a role in influencing the Government's decision to remove import taxes on solar lamps. Furthermore, the LA team has been working with the Kenyan Bureau of Standards (KEBS) to adopt the LA minimum quality standards as the national standard for solar lamps in Kenya.

We did not identify any policy barriers that were not addressed by the LA programs. Going forward, we recommend that the LA programs continue to focus its policy activities solely on barriers that have been identified in each new market.

Quality Assurance

The design of minimum quality standards and testing of solar lamps was successful. However, as of the end of the LA programs, there was still no on-the-box seal or label to signal to consumers which lamps were LA-certified. Without having this recognizable brand, the LA programs cannot claim to have eliminated the barrier of *consumers not trusting the quality of solar lamps*. Rather, the programs have really only assisted manufacturers in developing high quality lamps, thereby increasing the availability of these lamps in the market.

Discussions with the LA team revealed that they were deterred by possible legal risks of implementing this seal which the IFC was unwilling to assume. Failure to achieve this goal may have affected the success of the LA programs' consumer education activities. The importance of having a recognizable brand that differentiates a high quality, LA-certified solar lamp, warrants the LA team revisiting this goal and finding ways to achieve it. For instance, the LA programs could adopt a brand or logo that simply represents **products that have met the Lighting Global Minimum Quality Standards**, without guaranteeing their durability or quality. Over time, consumers will realize that these products are of high quality and are more likely to look out for the brand when purchasing.

Consumer Education

While the results reported against logframe targets suggest that the Consumer Education component was highly effective, the reality on-the-ground suggests otherwise. The limited scope of this evaluation makes it difficult to conclude with certainty the level of consumer awareness achieved by the LA education campaigns. Particularly for the target beneficiaries (consumers not connected to electricity grids) it appears that there are still several consumers who do not know about solar lamps (this result is explained in more detail in Section 6.2). Again, this is simply an indication of consumer awareness for Kenya given our small sample size.

The LA team tried out several approaches to increase awareness about LA-certified solar lamps—some more effective than others. Several lessons can be drawn from this experience of the LA team in Kenya to better structure this component going forward. Furthermore, we highlight the activities that were particularly successful. The team should focus on these activities going forward.

First, having a recognizable LA brand that clearly indicates to customers which lamps are of good quality would increase the effectiveness of the programs' consumer education activities. An effective consumer awareness campaign needs to first, be clear about the product it is promoting. In the case of LA Kenya, was the program promoting all solar lamps? A subset of solar lamps? Or lamps created by specific manufacturers? Clearly, the programs intended to promote a subset of solar lamps—LA-certified lamps. An effective way to do this would be to set up a campaign centered on the LA brand. This brand should be something that is easy to remember, will stick in the audience's mind, and will be used throughout all LA's consumer education campaigns. This achieves two things: first, it helps pass on the message that solar lamps have benefits for consumers, and that a certain group of solar lamps are high-quality.

From our interviews with BOP consumers in Kenya, only one person reported that they were familiar with the term "Lighting Africa" and understood that this title had a connection to high-quality lamps. However, most people were familiar with specific brands, not Lighting Africa. This suggests that if the programs' campaign was centered on promoting "LA-certified lamps" then it did not succeed. Alternatively, it could be that the LA team was promoting a subset of LA-certified solar lamps, specifically the brands that are now popular in Kenya. If this were the case, this message would have been confusing to consumers. Imagine having five or more competing products at a roadshow campaign or a forum. This competition would be counter-productive to the overall goal of promoting high-quality solar lamps. This also reduces the likelihood that the consumers will remember what lamps to buy. If there was a clear LA brand, consumers would know to simply look for the LA logo or label.

Furthermore, the approach of featuring a select group of LA-certified lamps during the consumer education campaigns poses the risk that some manufacturers would feel that their products received less "promotion" from the LA program than others.

Thus a consumer education campaign centered on a recognizable LA logo would send a clearer message to consumers, increase the likelihood of "brand recognition", and reduce the risk that some products are promoted over others.

Another key lesson from the LA Kenya pilot experience is that consumer associations, non-governmental organizations, employee groups within large companies, microfinance institutions and other social sector partners are very useful in promoting awareness of solar lamps. Our evaluation showed that these were the most effective channels of consumer awareness, and certainly more effective than the roadshows. As the LA programs are replicated in other countries, we recommend that the LA team takes advantage of these consumer groups where they exist.

Evidence from our surveys suggests that roadshows may not have been as effective as forums. The BOP consumers we interviewed did not remember these roadshows, and did not know what message they were promoting. The LA team's strategy was to organize roadshows in city centers on busy market days, with the hope that people traveling from the more remote (off-grid, rural areas) would stop in the city during those periods, and spend some time participating. A more effective strategy would be to move these campaigns closer to the target audience. Any form of consumer education campaign should be targeted at the off-grid population, which means bringing the consumer awareness activities closer to them.

A third important lesson is that before deciding to use indirect channels, and which ones to use, the LA team should have strong evidence showing that these channels are

likely to be effective. The programs used TV adverts as an indirect channel to reach BOP consumers. Specifically, the hope was that higher-income consumers with access to TVs would purchase solar lamps as gifts for family members or friends living in off-grid areas. However, for this to be an effective channel for reaching consumers living off-grid, there should be substantial evidence to support this linkage. For instance, have TV adverts been effective in marketing other consumer goods (indirectly) to BOP populations in Kenya, or other countries in Africa?

Without substantial evidence linking these TV advertisements to consumers living off-grid receiving solar lamps, these funds would likely have been more effective used for more direct consumer education campaigns (such as forums).

Finally, the LA team needs to develop ways to better measure the effectiveness of each consumer awareness channel used. This way, the LA team will have a better read out on what channels are most effective and can adapt its strategy accordingly. There are several ways of tracking the effectiveness of consumer awareness channels. For instance, the team could suggest that manufacturers adopt discount codes tied to each consumer channel. Thus a TV advert would provide a discount code to use when purchasing any LA-certified solar lamp. Then when a consumer uses this code for purchasing the lamp, the retailer can keep track of how many people used a specific discount code. The LA team can then ask LA associate manufacturers/distributors to report this information, in addition to the regular sales reporting.

In addition to implementing these recommendations, more resources could certainly be invested to improve consumer education. Also, these activities could start earlier in the program. Our focus here has been to identify ways to achieve more within the resource constraints that many donor-funded program like Lighting Africa face. As with the other components, in replicating consumer education activities in other countries, the LA team would do well to find out what approaches to consumer education have worked well, or are likely to work in each new market.

Access to Finance

The LA team's access to finance activities targeted to consumers were quite effective. The team engaged with several MFIs and helped them identify what lamps were of good quality, which in turn boosted the MFIs' confidence in lending to consumers to purchase these lamps.

More MFIs could be engaged to scale up consumer finance, but none of the people we spoke with mentioned that a lack of access to financing was a deterrent. Rather some people were concerned about the overall cost of the product—that is, they knew that financing could be made available but were still hesitant about the overall costs of the lamp (perhaps because they did not want to take on debt). The LA team should seek to engage with microfinance and other financing institutions targeted at BOP consumers as the program is replicated in other countries.

For increasing access to finance for manufacturers and distributors, prior attempts were unsuccessful but the LA team has now identified a way forward that seems promising. As the LA programs are scaled up, the IFC should take into account the lessons learned from prior attempts in designing financing facilities for the supply chain.

In particular, prior attempts to set up financing facilities in the sector have been difficult given the small size of these manufacturers and distributor companies, and the different geographic

locations of the manufacturers. Also, banks were hesitant to invest in a new product for the region.

In the end, the Lighting Africa's recent success in designing a financing facility seems to be attributable to increased comfort with the market's development, which just took time to happen. Thus one lesson drawn could be to start bank consultations earlier on to continuously reinforce the market prospects. Also, the IFC can now point to the success in growth of the Kenyan market to bring comfort to investors in other countries.

9.3 Review of IFC and World Bank's Collaboration

A critical part of the LA program's operational model is the collaboration between the World Bank and IFC to deliver the program's objectives. We explained how this collaboration worked, highlighting who was responsible for what, as part of our review of the LA program's operational model in Section 7.2.2. Here, we briefly discuss the salient points from the review of this collaboration, and draw lessons that feed into our recommendations for scaling up the LA program in the next section (Section 9.4)

The IFC and World Bank effectively leveraged their comparative advantages to achieve program objectives. During the LA Kenya pilot, IFC was primarily responsible for the components that played to its strengths—including business development, consumer education, market intelligence, and access to finance. The IFC's private sector approach to implementing programs, and its focus on developing markets and transactions helped it develop a unique, market-based approach to delivering the LA program's objectives. The World Bank's strong relationship with governments has helped the program achieve scale already. Furthermore the World Bank's involvement in the overall energy policy and sector strategies in countries where the LA program has expanded to has also been a critical success factor. During the LA Kenya pilot, the World Bank led the policy component and development marketplace activities which fit well with its strengths as an institution.

In addition to each institution taking ownership of components that were most aligned with their institutional strengths, **the LA program itself is now being managed as a truly collaborative effort between the IFC and the World Bank.** The IFC and World Bank LA teams hold a conference call every two weeks to discuss ongoing and proposed activities, to ensure smooth coordination between both entities. This is an area where the program learned from past experience during the pilot stage. This collaboration has improved, particularly over the past eight to ten months. Each institution better appreciates the importance of getting buy in from the other, before proceeding on any activity.

The approach to engaging new countries has changed post the Kenya and Ghana pilots. The World Bank has taken a more active role in replicating the program in other African countries. So far, the World Bank has engaged governments in Senegal, Mali, Burkina Faso, Nigeria, Liberia, the Democratic Republic of Congo, Uganda, Ethiopia and Tanzania. These engagements are at different stages; but the World Bank's overall goal is to mainstream Lighting Africa activities into its energy access programs. The Lighting Africa team essentially proposes the program to relevant country governments as part of their overall energy sector program in the country. Governments then decide if they want to integrate off-grid lighting products into their energy access plans, and what their implementation strategy would be. The World Bank Lighting Africa team advises them on effective implementation strategies, including an appropriate programmatic approach, based on the country's context.

The IFC, on the other hand, is focused on expanding its activities in three countries: Nigeria, Ethiopia and Tanzania. IFC's strategy seems to still be a purely market-based approach—that is, going into countries with strong market potential (for instance, countries with low grid penetration and large BOP populations).

9.4 Recommendations for Program Scale Up

Our evaluation has shown that the LA JV and LA Kenya programs were highly effective. They delivered results that, even when valued conservatively, amount to net economic benefits worth hundreds of millions of dollars. Our analysis also showed that the return on investing in a solar lamp could be as high as 20 times the amount invested, over the life of the lamp.

Given the success of this program so far, we recommend that the WBG and Lighting Africa donors take steps to expand this program rapidly to benefit off-grid populations. It is likely that the economic internal rate of return (EIRR) will be an order of magnitude higher than conventional donor programs. This is because Lighting Africa is a market transformation project—public funds are not paying for solar lamps, rather these funds are used for making a market work so that people can buy lanterns themselves. Secondly, these solar lamps are very valuable to the target beneficiaries. We estimated that people who have no access to electricity earn a return of over 200 percent of their initial investments when they buy these solar lamps. Thirdly, the program is enormously scalable—it depends on switching existing consumers' spending (from poorer, more expensive lighting sources to solar lamps) and not scarce public funds, to scale up.

Our focus in this section is to identify key elements that are required to scale up this program rapidly. In other words, what are the characteristics of an organization that will enable a rapid scale up of this unique and successful program?

First it has to be **specialized**. The LA program approach and its activities are distinct from the World Bank and IFC's typical business activities. For instance, for the consumer education component, the program needs experts that know how to educate BOP consumers about a new product, and get them to change their behaviors. The team engaged to scale up LA activities must include experts in the different component areas the program covers (or at least people who can acquire the skills on the job and use them in other countries going forward). Not having a specialized team will lead to efficiency losses—each new team member will have to come up to speed on program activities and the different approaches to implementing the program.

Secondly, the organization must have **dedicated** team members. By dedicated, we mean people who are solely focused on LA activities. This follows from the expectation that the program will be scaled up. If the WBG and LA donors want to expand this program quickly in other countries, then a fairly large number of people will have to be mobilized. For instance in each region, the program will need several full time equivalents (FTE) to oversee activities in the different countries within the region. Also, at least when creating and starting a program in country, the program would need a couple of FTE in country. Since we have established that these team members have to be specialized, it will be more efficient to have two full time staff, for instance, focused on LA activities in one country, than four staff members working part time. This dedicated team structure was one of the success factors in the LA Kenya pilot. Over the three to four years that the program managers worked in Kenya, they developed an in-depth understanding of the market transformation activities. This team has developed a

specialized skillset that makes them well placed to support program implementation in other countries.

Third, the organization structure has to be **cohesive.** The different aspects of the program should combine well, in a planned and organized manner. This is because there are several common elements across geographies. First, there is a single LA certification used globally. Secondly, there is a set of relationships with global manufacturers who are looking to enter different countries. Third, the same market transformation strategy is being used across the world. The conceptual framework is the same, although details of how barriers will be removed may vary from country to country. Finally, there is a common intellectual framework that needs to be preserved to ensure that individuals or specific country themes do not stray from the program's focus. Given these factors, each country program needs to be working cohesively under the same program strategy. Again, this is nothing new. This global strategy describes the LA model so far. We simply emphasize that these characteristics must be preserved as the organization scales up.

Appendix A Description of Program Components

This section provides a brief description of the nine LA components. In particular, this section provides an explanation of the context of each component, and the key activities performed under each component and the main outputs produced.

A.1 Market Intelligence

The purpose of the Market Intelligence component was to research consumer preferences for solar lamps, and spending on other lighting products to inform the supply chain of these consumer preferences for markets in Africa.

This work was carried out by a core team of four people including IFC staff and STCs. This team worked closely with 15 other STCs and consulting firms to carry out specific research tasks.

The context and key activities of this component are explained further in the sections below.

A.1.1 Context

Before the LA programs, many solar lamp manufacturers did not understand lighting preferences of consumers living in African countries. Most of these manufacturers were based in Europe and Asia[122], and many were not selling products yet in African countries[123].

Specifically, manufacturers did not know how much consumers in African countries were willing to pay for solar lamps, or what features consumers wanted. For instance, if consumers were only willing to pay very little, then manufacturers would need to design a simple product with limited features. If instead consumers were willing to pay more, manufactures could add additional features to the lamps like ports for charging cell phones. Without experience working in these African markets, manufacturers were left wondering what type of product to design and whether or not they should take the risk of designing the a product that did not meet the needs of consumers.

To help manufacturers understand consumer preferences in these markets, the LA teams researched consumer preferences, and wrote and disseminated market reports. These activities were called the "Market Intelligence" component.

By taking on the costs of completing this research, the LA team hoped to speed up the development of these markets. Also, while some of the "first mover" manufacturers were big companies (like Philips and Barefoot), many first-movers were small companies[124] (like Solux). Thus it was difficult for these small firms to bear the costs of the market research.

The Market Intelligence activities began in 2007 at the beginning of the LA programs. Market reports originally targeted manufacturers, but by 2010 report topics were broadened to serve a wider audience including distributors, financial organizations, governments, community-based associations (CBOs), small and medium enterprises (SMEs), and other players interested in energy access.

[122] According to calls with IFC

[123] According to sales volumes reported for Africa provided by IFC

[124] Based on calls with IFC , several of the first-mover manufacturers were small companies

A.1.2 Activities

Under the Market Intelligence component, the LA team performed five main types of research, explained below. Research was focused on the pilot countries (Kenya and Ghana), but research was also done in Ethiopia, Mali, Nigeria, Tanzania, Zambia, and Burkina Faso.

The LA programs engaged consulting firms and individual short-term consultants (STCs) to help the WBG staff carry out the market research and help produce reports. The Market Intelligence team was managed by Itotia Njagi and Nana Asamoah-Manu from IFC. The key personnel and firms to carry out these activities are highlighted below. Note that since the same management team was involved in all Market Intelligence activities, they are not included in the descriptions below to avoid repetition. See Section 3 for a more detailed illustration of the team.

Key activities of this component included:

- **Consumer research**: the LA team researched consumer willingness to pay for solar lamps and their preferences on solar lamp design in Ethiopia, Ghana, Kenya, Mali, Nigeria, Tanzania, and Zambia. Findings were summarized into seven "Consumer Insight Presentations" (one for each country).

  Three market research organizations were engaged to assist on this activity: TNS Research International, Triodos Facet, and Market Trends.

- **Market intelligence and market trends research**: to help the supply chain understand the size of the market, the LA team researched how much consumers were already spending on off-grid lighting. The LA team also researched off-grid lighting technology used, sales volumes, and the supply and distribution chains established in the country. Other market research explored more specific knowledge gaps, such as effective product warranty practices, and the availability of rechargeable batteries in the region. The team produced nine "Market Intelligence Reports" for Kenya, Tanzania, Ethiopia, and the Africa region, and three "Market Trends" reports for the Africa region.

  Several firms and individuals were engaged for this research including: GreenMax Capital Advisors, Ethio Resource Group, Peter Alstone (Clean Energy Consulting), Schatz Energy Research Center (Meg Harper, Arne Jacobson, Peter Johnstone, Jenny Tracy), Dalberg, and TNS Research International.

- **Quantitative and qualitative market research**: the LA team researched the characteristics of a typical off-grid consumer and retailer, their lighting habits and expenditures, their reactions to a sample of solar light devices, and information on the competing light technologies for Kenya, Ghana, Ethiopia, Tanzania, and Zambia. Findings were written up into two reports per country: one focused on qualitative findings, and the other on quantitative findings. Qualitative reports provided anecdotes, pictures, and descriptions of the consumers and retailers, their habits, and their reactions to a sample of solar devices. Quantitative studies included consumer and retailer profile statistics (occupation, income, grid connection, and others); and charts summarizing responses to survey questions on their current lighting habits and preferences for improved lighting. The team produced five "Quantitative Research" reports and five "Qualitative Research" reports.

TNS Research International was engaged to carry out these studies and prepare the research reports.

- **Supply chain mapping**: the LA team identified the supply chain networks for solar lamps in Kenya, Ghana, and Burkina Faso. For Burkina Faso, the team wrote a report that summarized findings on the common supply and distribution models for solar lamps in the country, identified main bottlenecks to moving solar lamps in the country, and provided recommendations for improving the supply chain. For Kenya and Ghana, the LA team disseminated the contact details of distribution networks identified in these countries.

  MicroEnergy International was engaged to research the supply chain in Burkina Faso and write the report. The whole LA team helped produce the list of distributor contacts for Kenya and Ghana.

- **Other market reports**: the LA team also researched other topics relevant to the market for solar lamps. For instance, the team researched the possible benefits of solar lamps for women, and if there are any women-specific opportunities from these lamps. Three gender-focused reports were produced and disseminated on the website. The team also researched the use of LED flashlights in Kenya, and the use of solar lamps for chicken production. These reports are also available on the LA website.

  Several organizations and individuals were engaged to research these "other" topics including: Schatz Energy Research Center (Tirian Mink, Peter Alstone, Jennifer Tracy, Arne Jacobson), Evan Mills (Berkeley National Laboratory), Phyllis Kariuki (STC), Carmen Niethammer (IFC), Brendon Mendonca (STC), Adriana Eftimie (IFC).

All of the research reports mentioned above were made available for free on the LA website. Other Market Intelligence reports were produced but were not made available on the website. These reports were sent directly to LA-associations, that is, supply chain companies with products that have passed LA-certification. This may also include other off-grid stakeholders that participated in the LA Advisory Council.

A.2 Business Development

The purpose of the Business Development component was to introduce companies in the supply chain for solar lamps in Africa. This helped connect international manufacturers wanting to enter markets in Africa with local distribution networks on the ground. This work was carried out by a core team of seven people including IFC staff and STCs.

The context and key activities of this component are explained further in the sections below.

A.2.1 Context

When the LA programs started, solar lamp manufacturers often did not have connections to distribution networks in Africa. As mentioned in Section A.1, many solar lamp manufacturers were based in Europe or Asia[125], and did not have distribution networks in African countries[126].

[125] Manufacturers now selling in African markets are reported in the sales breakdown spreadsheet provided by IFC.

[126] According to sales volumes reported for Africa provided by IFC

To help link the supply chain, the LA team identified local distributors, and held workshops and conferences to introduce supply chain companies. The LA team also helped strengthen the distribution network by identifying new distributors, and training the last-mile retailers on how to use and properly store solar lamps. This was called the "Business Development" component.

A.2.2 Activities

Under the Business Development component the LA team performed five main activities, explained below. The LA Kenya and LA JV programs focused Business Development activities on Kenya, but also held some workshops in Nigeria, Democratic Republic of Congo, Ethiopia, Mali, Senegal, and Tanzania[127]

The Business Development team included both IFC staff and STCs. The key personnel who carried out this work are highlighted below. Note that the same management team oversaw all activities below, but their names are only listed below if they also helped implement the activities. See Section 3 for a more detailed illustration of the team.

Key activities of this component included:

- **Hosting business to business (B2B) workshops**: the team held B2B workshops to introduce members of the solar lamp supply chain, and facilitate business agreements. Workshops were held in Kenya, Nigeria, Democratic Republic of Congo, Ethiopia, Mali, Senegal, and Tanzania.

  The Business Development management team (Nana Asamoah-Manu and Itotia Njagi) implemented these workshops.

- **Identifying and training distribution network**: the team identified and trained new members for the distribution network. They also trained last-mile entities how to use and properly store solar lamps:

  - *Distributor outreach*: recruited new distributors by putting out job advertisements, vetting candidates, training a short list of candidates, and connecting high-quality distributors to the rest of LA's supply chain associates

    Nana Asamoah-Manu worked closely with Vincent Ogega (STC), and Gertrude Masago (STC) to recruit and train distributors

  - *Retail outreach*: provided training to retailers on how to use and properly store solar lamps, thus controlling the quality of the product for end users

    Nana Asamoah-Manu worked closely with Vincent Ogega (STC), and Gertrude Masago (STC) to identify and train retailers

  - *Bulk buyer outreach*: in 2012, the team launched a bulk buyer outreach project to identify potential bulk buyers of solar lamps (such as plantations, MFIs, and NGOs), and provide training and education campaigns. In particular, this campaign was intended to address the issue of improper storage of solar lamps.

[127] Based on calls with LA staff

Bulk buyers reached included Unilever, Delmonte, EPZ, and Portland Cements[128].

The entire Business Development team implemented the bulk buyer outreach campaign.

- **Hosting international conferences**: the team held international conferences to provide a global platform for industry development. These conferences helped to link key stakeholders, inform stakeholders about solar lamps and potential markets, and to inform stakeholders of the potential policy and regulatory bottlenecks. Policymakers and financial sector representatives also attended and spoke about the future of the industry and challenges in the market. The first conference was held in Ghana in 2008, the second in Kenya in 2010, and the third in Senegal in 2012[129]. A fourth international conference is currently planned for 2015 in Dubai. This conference will be hosted by GOGLA[130]. Turnout for these conferences is large, the conference in Senegal attracted over 300 off-grid lighting stakeholders and 40 exhibitors.

  Marketing firms Professional Marketing Services and Energy Net[131] were engaged to organize these conferences.

- **Training solar lamp technicians**: the team trained technicians to repair solar lamps. These training sessions provided comfort to consumers that there were institutions in place to maintain the consumers' investment. IFC identified about 10 technicians in Kenya[132] and worked with the Quality Assurance team to create technical training modules.

  Nana Asamoah-Manu worked closely with Schatz Energy Research Center (Jenny Tracy, Peter Alstone), and Maina Mumbi (STC) (STC), and Chris Carlsen (STC) to lead the technical training workshops.

- **Encouraging innovative business models to reach new market segment**: towards the end of the program, LA reached out to manufacturers to encourage them to develop their own marketing and consumer outreach models. LA held a competition among ten manufacturers for innovative marketing models. IFC provided cost sharing loans to the winners, committing $10,000 for $20,000 spent by the manufacturer associate[133]. This activity helped LA discover if manufacturers were trying to market and push products on their own without assistance.

  The Business Development management team (Nana Asamoah-Manu and Itotia Njagi) worked closely with Leo Blyth (STC), to implement this program.

[128]Organizations identified through calls with LA staff

[129]LA JV Completion Report

[130]Based on calls with LA staff

[131]Note that information was not provided on the consulting firm who carried out the 2008 conference in Ghana

[132]Based on calls with LA staff

[133]Based on calls with LA staff

A.3 Quality Assurance

The purpose of the Quality Assurance component was to identify high-quality solar lamps in the market, and make this quality transparent to the market. This work was carried out by a core team of 13 IFC staff, World Bank staff, STCs, and testing laboratories.

The context and key activities of this component are explained further in the sections below.

A.3.1 Context

When the LA programs started, it was difficult to identify which solar lamps were high-quality and which were poor quality. Thus some consumers did not trust the quality of solar lamps.

To help consumers identify which products were trustworthy, the WBG created the "Quality Assurance" component. Activities under this component consisted of developing a quality standard for the industry, testing solar lamps against these standards, and certifying products that met the standards to identify high-quality products in the market.

To inform consumers which products were high-quality, the WBG also created the Consumer Education component (see Section A.4) to inform consumers living off-grid about these high-quality products. The programs held education campaigns, during which LA-certified lamps were put on display for consumers to interact with.

Quality certification also helped companies receive access to finance. Companies producing or distributing LA-certified products could use this certification to demonstrate to financial institutions that these are high-quality products.

A.3.2 Activities

The Quality Assurance component consisted of six key activities, explained further below. Most activities were not country-specific, and were thus carried out by the LA JV program.

The key personnel and testing laboratories to carry out these activities are highlighted below. Note that since the same management team oversaw all activities, their names are only listed below if they also helped implement the activities. See Section 3 for a more detailed illustration of the team.

Key activities of this component included:

- **Developing minimum quality standards**: the Quality Assurance team developed the industry standard to define high-quality solar lamps. The team worked closely with industry stakeholders to strike a balance between ensuring that certified solar lamps are of high quality, while still being affordable for the target market. This resulted in a two-part testing criteria that included a set of required standards, and a set of recommended performance targets. Products that pass the required standards receive LA certification, while products that pass both required standards and recommended targets receive additional LA benefits. Benefits include additional product exposure through the LA education campaigns.

  The Schatz Energy Research Center, and Fraunhofer Institute for Solar Energy Systems implemented led the work to develop these standards.

- **Testing solar lamps against the quality standards**: once the quality standards were developed, the Quality Assurance team tested solar lamps to identify which products were high-quality. The team developed three types of tests for solar lamps:

the Quality Test Method (QTM) is the most thorough and costly test. QTM is the standard testing process. The Initial Screening Method (ISM) is a faster, less costly version of the QTM and can help indicate to companies whether or not their products will pass the QTM test, or if further modifications are needed. Finally the Market Check Method (MCM) is another quick test but meant to serve as a refreshment test to check if products that once passed the QTM testing continue to provide high-quality performance. So far, 183 products have been submitted for testing and 66 [134] products have been certified.

Testing laboratories included: Schatz Energy Research Center (California), Fraunhofer Institute for Solar Energy Systems (Germany), Lighting Research Center at Rensselaer Polytechnic Institute (New York), and Lighting Laboratory at the University of Nairobi (Kenya). STC Erik Page led the work to build capacity of these testing laboratories.

- **Certifying products that pass quality standards**: to inform the market which products were high-quality, LA developed certificates for those products that passed the quality testing. Certificates included Standard Verification Letters, which confirm that the product has passed the LA tests, and Standard Specification Sheets (SSS) which provide information on the product details, features, and durability. Both documents are available on the LA website for all products that have passed the LA-quality assurance testing.
- **Advising companies on improvements to solar lamps:** the programs developed Technical Briefing Notes and Eco Design Notes to guide manufacturers on how to develop high-quality and environmentally friendly products. Technical Briefing Notes explain relevant technical topics that a solar manufacturer should know. For instance, some notes have covered LED lumen depreciation rates, thermal management techniques for LEDs, and an overview of lithium-ion batteries, and other topics. Eco Design Notes explain health and environmental safety issues for manufacturing solar lamps. Specifically, notes discussed battery toxicity, LED lights and eye safety, and chemical safety issues. LA produced 14 Technical Briefing Notes and three Eco Design Notes.

  LA STC Peter Alstone took the lead in writing the Technical Briefing Notes along with other Quality Assurance consultants. STC Kevin Gauna led the writing of the Eco Design Notes, working with other Quality Assurance consultants.
- **Developing a carbon finance methodology**: to help quantify the benefits of the LA programs, the Quality Assurance team developed a standard methodology to account for the displacement of kerosene by solar lamps.

  The entire Quality Assurance team helped develop this methodology.
- **Informing distributors and retailers how to source high-quality solar lamps**: the Quality Assurance component worked closely with retailers and importers in Kenya to ensure they knew how to source high-quality products. The program also hosted workshops with importers in Ethiopia, Tanzania, Democratic Republic of Congo, and Mali.

[134] as reported in the logframes

Maina Mumbi (STC) developed curricula and delivered workshops along with other Quality Assurance staff.

A.4 Consumer Education

The purpose of the Consumer Education component was to inform BOP consumers living in off-grid areas of the benefits of using solar lamps compared to kerosene lamps. This work was carried out by a core team of six IFC staff, and STCs. This team also worked closely with contracted firms to carry out the education campaigns.

The context and key activities of this component are explained further in the sections below.

A.4.1 Context

When the LA programs started, many consumers living in off-grid areas did not know about solar lamps or the benefits these products provide over kerosene lamps.

The Consumer Education team held consumer education campaigns, disseminated posters and SMS messages, and launched radio and television advertisements to inform the public about the benefits of these solar lamps. Campaigns and advertisements also emphasized that these LA-certified lamps were high-quality, and backed with a warranty. These activities were called the Consumer Education component.

The Consumer Education activities started later than most of the other components—education campaigns and advertisements were not launched until 2010. This timing was planned so that the LA programs could first focus on developing the supply-side of the market. However, this meant that the Consumer Education activities only ran for the last four years of the program, thus limiting the potential reach of these campaigns.

A.4.2 Activities

The Consumer Education component consisted of six key activities, explained further below. The education campaigns and advertisements targeted Kenya, but some general consumer education material was also developed that could be adapted to other countries.

The key personnel and testing laboratories to carry out these activities are highlighted below. Note that since the same management team oversaw all activities, their names are only listed below if they also helped implement the activities. See Section 3 for a more detailed illustration of the team.

Key activities of this component included:

- **Hosting roadshows in market towns:** the team launched 254 roadshows in central marketplaces all over Kenya[135] to educate BOP consumers about the benefits of solar lamps, how to use them, and where people could buy them. Roadshows generally consisted of four-hour performances held in larger market centers. Shows included dance performances and singing, and solar lamp models (of extended associates) were on display for people to touch and ask questions. Each show reached approximately 500 to 2,000 people.

[135] tracking material provided by IFC ("IFC Summary to Date" plus "IFC Roadshow Summary Sheet")

EXP Kenya, one of the leading local agencies in experiential campaigns, was engaged to carry out the roadshows.

- **Hosting forums in rural communities**: LA hosted 1,378 forums[136] throughout rural Kenya to educate consumers living in off-grid areas about the benefits of solar lamps, how to use them, where people could buy them, and which MFIs would provide finance for the lamps. Forum facilitators led discussions with a small consumer association group (including women's groups, churches, and others). Forums generally lasted an hour and reached a group of 30 or so people. However, the hope was that word of mouth would carry the information provided at these sessions to extend the program's reach. These forums were very useful to reaching the "last mile" consumers who would not attend the roadshows in larger market centers.

  EXP Kenya was engaged to carry out the education forums.

- **Outreach to employees of corporations, MFIs, and NGOs**: the Consumer Education team reached out to corporations, MFIs, and NGOs to explain the benefits of solar lamps to employees. The team also advised corporations on business models for offering solar lamps directly to employees. For instance, corporations could purchase the solar lamp for an employee, and deduct payment gradually from their paychecks. In total the team reached out to 14 organizations (corporates, MFIs and NGOs) in Kenya[137].

  Nana Asamoah-Manu worked closely with STCs Gertrude Masago and Vincent Ogega to carry out the corporate outreach campaigns.

- **Hosting a stand at trade fairs**: the team also reached BOP consumers through trade fairs (like the Agricultural Society of Kenya "ASK"). Trade fairs also offered the opportunity to sell solar lamps, not just provide them on display. LA-associates were invited to sell their products at these trade fairs if they shared some of the registration costs with the LA programs.

  The Consumer Education management team (Nana Asamoah-Manu and Itotia Njagi) delivered the trade fair presentations.

- **Disseminating fliers and SMS messages**: the team also distributed printed fliers and sent SMS messages to reach target consumers. These fliers and SMS messages provided brief information on LA-certified solar lamps. Both of these communication tools were used more heavily at the beginning of the Consumer Education component. SMS messaging was a particularly popular tool because it was an inexpensive way to reach people far from the center of town.

  STCs Benedict Walter, Antoine Guy Patrick, and Gregor Pfifer developed the content for and disseminated fliers and SMS messages.

- **Launching radio and TV advertisements**: the team developed radio and TV advertisements for solar lamps to inform consumers of their benefits and where they could be purchased. Although TV advertisements were likely to only reach the

[136] tracking material provided by IFC ("IFC Summary to Date" plus "IFC Forums Summary Sheet")

[137] "April 2013 Corporate Outreach Status Report" provided by IFC

wealthier segments of the community, the hope was that wealthier family members could purchase the solar lamps for their friends and family who needed them. These advertisements also served to confirm, in a more formal fashion, what people may have already learned from attending road shows, forums, or trade fairs.

Entire LA team led the development of content for TV and radio advertisements, in collaboration with consultants Redsky and EXP, and STCs Benedict Walter, Antoine Guy Patrick, and Gregor Pfifer

The team targeted towns for education campaigns based on the need for off-grid lighting, and the commercial interests of LA associates (distributors and local representatives of manufacturers). The location of these consumer education campaigns in effect determined which town's associates would sell their products, so they were quite interested to be involved in the town selection process.

A.5 Access to Finance

The purpose of the Access to Finance component was to mobilize finance to consumers and the supply chain of solar lamps. This work was carried out by a core team of five IFC staff, World Bank staff, and STCs.

The context and key activities of this component are explained further in the sections below.

A.5.1 Context

When the LA programs started, many BOP consumers did not have enough money to buy a solar lamp. Even though consumers would save money over time by buying a solar lamp, they often could not pay the up-front costs of a lamp.

Similarly, manufacturers and distributors also lacked the liquidity to design, create, and import products before receiving sales revenues. Again, because many of the "first mover" manufacturers were small companies[138], this implied less liquidity.

Consumers, manufacturers, and distributors could not borrow from MFIs and commercial banks because these lenders were not familiar with the products. Previously, some MFIs had negative experience lending for low-quality solar lamps, and were hesitant to make the same mistake.

To help mobilize finance to consumers and the supply chain, the Access to Finance team consulted with financial institutions to build confidence in the quality of LA-certified products, and to explain the potential for growth of the solar lamp market. These activities were called the Access to Finance component.

A.5.2 Activities

The Access to Finance component consisted of three key activities, explained further below.

The key personnel who carried out these activities are highlighted below. Note that since the same management team oversaw all activities, their names are only listed below if they also helped implement the activities. See Section 3 for a more detailed illustration of the team.

Key activities of this component included the following:

[138] According to calls with IFC

- **Consulting with MFIs and commercial banks to mobilize finance to consumers in Kenya**: many BOP consumers were used to making small and frequent payments for kerosene lighting, but were unable to pay the up-front cost of a solar lamp. Thus consumers needed access to microloans to pay for a solar lamp. To mobilize finance to consumers, the Access to Finance team consulted with MFIs to strengthen their confidence in the quality of LA-certified lamps. In Kenya, 11 MFIs are now providing finance to consumers for LA-certified solar lamps[139]. Some MFIs are now also selling these lamps directly to consumers.

  Itotia Njagi worked with STC Gabriel Kivuti to consult with MFIs

- **Consulting with local commercial banks to mobilize finance to distributors in Kenya**: Distributors needed financing to make bulk purchases of solar lamps and store solar lamps over a period of time before selling enough lamps to make back their investment. Distributor financing needs ranged from $800,000 to $1 million per year depending on the size of the company[140].

  The Access to Finance team consulted with local banks to try and create a financing facility for distributors of LA-certified lamps. For instance, the WBG designed a financing facility with the Bank of Africa, but unfortunately this did not go through.

  The LA programs were less successful in mobilizing finance to distributors than with consumers. The problem was that these commercial banks were not set up to provide such a large amount of finance to small companies. Even if the banks were to provide this finance, they would require IFC to perform due diligence of all 20 distributor companies, which would be quite costly and difficult for IFC to undertake[141].

  However, two successes came from these bank consultations. First, the Commercial Bank of Africa provided loans to two or three distributors[142]. These cases were unique because the companies were larger than the average distributor, thus making them a more attractive investment. Second, Equity Bank of Kenya is now developing a new financial product for smaller entities in the market (retailers and distributors). The bank is planning to leverage on its 11,000 banking agent outlets to reach these smaller entities. IFC is working with the bank to roll-out this new financial product.

  Itotia Njagi worked with STC Gabriel Kivuti to consult with local commercial banks.

- **Consulting with international banks and venture capital funds to mobilize finance to manufacturers**: manufacturers needed financing to design, and produce products before receiving revenues. Financing needs ranged from $0.5 million to $3.0 million per company.

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[139] From calls with IFC

[140] from calls with IFC

[141] From calls with IFC

[142] From calls with IFC

> The Access to Finance team consulted with international banks and venture capital funds to try and develop a financing facility for manufacturers. Unfortunately, interest was low among banks and investors because these manufacturers were often small, lacking experience, and located in different countries. When consultations proved unsuccessful, IFC considered investing in the companies directly. However, IFC also could also not justify making such small-scale loans for scattered, small companies.
>
> Although the Access to Finance team was not able to establish a financing facility for manufacturers during the life of the LA programs, their efforts are now starting to pay off. Last month, IFC helped establish a $30 million financing facility with Shell Foundation and Responsibility. Shell Foundation is putting up money for first loss and transaction costs, and Responsibility is managing the funds. This facility will provide working capital debt for manufacturers. Fifteen firms have already undergone due diligence and will start receiving loans in the next two to three years. After this model has proved successful, Responsibility plans to scale up the facility to $100 million.
>
> Itotia Njagi and Russell Sturm worked with STC Gabriel Kivuti to consult with international banks and venture capital funds to mobilize finance to manufacturers

It is important to note that the WBG also mobilized funds directly the Development Marketplace component (see Section A.6), and various competitive grant awards. In Tanzania, the WBG mobilized government funds by helping select 10 firms to receive $1 million grants from the Tanzania Rural Electrification Agency[143].

A.6 Development Marketplace

The purpose of the Development Marketplace component was to provide seed finance to manufacturers to jumpstart the market at the beginning of the LA programs. This work was carried out by a core team of four World Bank staff and STCs.

The context and key activities of this component are explained further in the sections below.

A.6.1 Context

When the LA programs started, many of the solar lamp manufacturers entering the African markets were new companies[144] and thus needed financial support to cover start-up costs.

To support companies with the greatest potential for development impact, the WBG held a competition for innovative business models for the solar lamp industry, and provided grants to winners of this competition. This competitive grants activity was called the "Development Marketplace" component.

The Development Marketplace awards were granted in 2008, and distributed in 2009. Finalists of the grant competition presented their projects at a workshop where they met with potential investors. The LA programs selected 16 finalist projects, and provided each project $200,000[145]. The LA programs kept contact with the winners of the competition over the life

[143]IFC 2011 Annual Report

[144] From calls with IFC staff

[145]Numbers from calls with LA staff

of the projects to advise on operations, provide business development support, and oversee the integrity of the grant funds used.

The Development Marketplace award was a one-time activity for the LA programs, but it was also part of a larger ongoing World Bank "Development Marketplace Program".

A.6.2 Activities

The Development Marketplace component consisted of a one-time activity: mobilizing grants to start-up solar designers/manufacturers for the purpose of jumpstarting the market.

A.7 Policy Development

The purpose of the Policy Development component was to reduce taxes on solar lamps to support the development of the market. The World Bank led the work for this component, given its relationships with African governments. The core team included four people—three World Bank staff and one STC.

The context and key activities of this component are explained further in the sections below.

A.7.1 Context

When the LA programs started, the LA team identified various policy and regulatory barriers in Africa that were not supportive of the solar lamp market. These barriers included import tariffs on solar lamps, and subsidies on kerosene.

To facilitate a better business environment for solar lamps, the LA team consulted with African governments about reducing tariffs. They explained the potential for solar lamps to help meet the countries' targets for increasing access to lighting for communities living in off-grid areas. These activities were called the "Policy Development" component.

This component was first implemented in the pilot countries Kenya and Ghana, but later expanded to Ethiopia, Senegal, Cameroon, Mali, Tanzania, Democratic Republic of Congo, Rwanda, and Uganda[146]. Activities varied from country to country depending on the government's level of interest. Activities were also opportunistic, meaning that the Policy Development team only met with governments when they expressed interest and were receptive to these consultations.

A.7.2 Activities

The Policy Development component consisted of four key activities to create an enabling environment for the solar lamp market, and to inform manufacturers and importers on the status of these environments in different African countries.

The key personnel who carried out these activities are highlighted below. Note that since the same management team oversaw all activities, their names are only listed below if they also helped implement the activities. See Section 3 for a more detailed illustration of the team.

Key activities of this component included the following:

- **Consulting with African governments**: to help create an enabling environment for the solar lamp market, the Policy Development team liaised with five African

[146]List includes countries with policy reports, country's mentioned in 2011 Annual Report under Policy Component, and countries included on "where we work" section of LA website that mention policy work with Governments

governments to consult on policies and regulation. Countries include Kenya, Ghana, Democratic Republic of Congo, Ethiopia, and Uganda[147].

These consultations primarily focused on pilot countries Kenya and Ghana at the start of the program. During the early years of the LA programs, the Government of Kenya raised import taxes on solar lamps[148]. The LA team worked with local association KEREA to advise the Government on the benefits of reducing taxes on solar lamps. In particular they explained the importance of solar lamps for serving the off-grid population, and how this could help the country reach its off-grid energy targets. In 2011, the Government removed these taxes on solar lamps[149]. Given the success of these consultations, the Policy Development team has pointed to Kenya as a success story when consulting with other African governments.

STC Leo Blyth and World Bank staff Chris Saunders led these government consultations.

- **Drafting Policy Notes**: to inform manufacturers and importers of the policy and regulatory environment, the LA team produced policy notes for Cameroon, Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Rwanda, Senegal, and Tanzania. The LA team also produced one Policy Summary Note which summarizes the findings of the eight previous country-specific policy notes.

  The LA team engaged energy consulting firm Econoler to produce these Policy Notes.

- **Supporting government pilot projects for solar lamps**: the Policy Development team mobilized World Bank finance to help countries implement pilot solar projects. In 2013, the World Bank, through the LA programs, provided funding to the Government of Senegal to distribute solar lamps to public schools and libraries. The purpose of the project was to disseminate information about solar lamps, how to use them, and where families could purchase them.

  The LA team engaged energy consulting firm Econoler to help implement these pilot projects.

- **Hosting workshops with the supply chain**: to disseminate knowledge of solar lamps to other countries in Africa, the Policy Development team held workshops in Ethiopia, Mali, and Senegal. These workshops also served to introduce members of the supply chain.

  STC Leo Blyth led these workshops.

A.8 Communication

The purpose of the Communication component was to support the other LA components by disseminating outputs produced by the LA team (such as market intelligence reports and

[147] Countries mentioned in calls with IFC staff, and through LA website "where we work"

[148] Information provided on calls with IFC staff

[149] United Nations Foundation, Tariff Database for Kenya, accessed at: http://www.energyaccess.org/resources/tariffs-database/search-tariff-database. Also see LA Policy Report for Kenya, accessed at: http://lightingafrica.org/wp-content/uploads/bsk-pdf-manager/24_Kenya-policy-report-note.pdf

quality certification), as well as information about the LA programs. This work was carried out by a core team of seven IFC staff and and STCs.

The context and key activities of this component are explained further in the sections below.

A.8.1 Context

At the beginning of the LA programs, the WBG created a website to disseminate information about the LA programs, disseminate outputs produced by the LA team, and to connect members of the supply chain. This was called the "Communications" component.

When the website was first created, one of the features was a virtual portal that allowed supply chain companies to interact virtually. However, this portal was later removed. The website still serves as a tool to connect the supply chain by disseminating Supply Chain Mapping documents that include contact information of distributors in Kenya and Ghana.

The website also helps disseminate outputs produced by the programs including LA-certification of solar lamps, market intelligence reports, and policy reports. The website also includes information about the LA programs such as annual reports to donors, results summary sheets on the achievements of the program, news blogs about the program and industry, and other information about LA activities.

Information disseminated through the website mainly benefits manufacturers and distributors, but the LA team has also tried to target governments, consumers, retailers, the donor community, MFIs, and other relevant stakeholders.

A.8.2 Activities

The Communication component consisted of two key activities to extend the reach of the program and disseminate important program materials. The component was not targeted to any one country, its reach extended to everyone with internet access.

The key personnel who carried out these activities are highlighted below. Note that since the same management team oversaw all activities, their names are only listed below if they also helped implement the activities. See Section 3 for a more detailed illustration of the team

Key activities of this component included the following:

- **Disseminating information externally:** to extend the reach of the program and disseminate materials, the LA team posted information on the programs; quality-assured products and their certification; market intelligence reports; supply chain mapping and distributor contact information; and reports on the policy and regulatory environment of various countries in Africa. By posting information on LA quality-assured projects, the website also served as a marketing tool for high-quality solar products.

  STCs Linday Madeira and Catherine Mugendi posted material produced by other components.

- **Disseminating information internally:** the Communication team was also tasked with keeping IFC and World Bank staff informed about the program and its development impact. The team produced and disseminated/presented human interest stories, Smart Lessons, Annual Reports, Donor Update Reports, Brochures, Conference Reports, and Results Fact Sheets.

STCs Antoine Guy Patrick, Gregor Pfifer[150], Benedict Walter, Catherine Mugendi developed these reports and presented or disseminated information to IFC and World Banks staff.

A.9 Private Sector Development

The purpose of the Private Sector Development component was to keep the LA programs aligned with key stakeholder needs, and to establish mechanisms that would help sustain benefits achieved by the LA programs.

The context and key activities of this component are explained further in the sections below

A.9.1 Context

At the beginning of the LA programs, the WBG organized a group of off-grid lighting stakeholders to help advise on the direction and activities of the LA programs. This was important for keeping the LA programs in line with the needs of key stakeholders.

The WBG also identified and established stakeholder associations to help sustain the benefits achieved by the LA programs. Because the LA programs were designed to catalyze the market and then exit, other institutions needed to take over certain key activities to help sustain the market. These activities were called the "Private Sector Development" component.

A.9.2 Activities

The Private Sector Development component consisted of two key activities. The entire LA team worked on these activities. Key team members are highlighted under the activities below.

Key activities of this component included the following:

- **Forming a private sector consortium**: the LA team formed a private sector consortium to help the LA programs remain aligned with the needs of the key stakeholders. Forming this consortium also helped LA facilitate private sector interest in the programs right from the beginning. This activity in large part was built off of the work IFC had previously done in Kenya and Ghana before the LA programs—engaging with off-grid stakeholders to identify their needs. By the time the LA programs started in 2007, IFC had already engaged 198 manufacturers, distributors, retailers, NGOs, universities, and other industry associations to become a part of this private sector consortium. Consortium members were some of the first entities to use the LA website, and at the time these companies used the website to connect virtually. Consortium members also participated in the LA conferences, and regular workshops and meetings to discuss the direction of the program.

  The entire LA team participated in this activity.

- **Establishing and identifying associations to sustain benefits of the LA programs**: To sustain benefits of the LA programs, certain activities needed to be maintained after the WBG exited the sector.

  To facilitate a smooth transition, the WBG identified a local association in Kenya to take over key LA Kenya activities; this association was called the Kenya

[150]Note that Antoine, Gregor and Benedict did not work in these roles for the program at the same time, each replaced the former

Renewable Energy Association (KEREA). KEREA had been operating in the sector since 2002 working with stakeholders in the renewable energy sector. The LA team envisaged KEREA taking over consultations with the Kenya Government on tax reductions for solar lamps, and increasing consumer awareness of solar lamps[151].

To take over key cross-cutting activities of the LA JV program, the WBG established the Global Off-Grid Lighting Association (GOGLA). The association recently started operations in 2012, and has not yet taken over LA activities. GOGLA plans to perform the following activities to help sustain benefits of the LA programs: (i) market research for off-grid lighting products and solar lamps for the Africa region, (ii) dissemination of market reports and other best practice materials, (iii) linking businesses and informing off-grid stakeholders about solar lamps through international conferences held every couple years, (iv) managing the quality assurance standard and overseeing the lead testing laboratory at Schatz Energy Research Center, (v) advising governments around the world on reducing import taxes on solar lamps, and (vi) helping supply chain companies raise finance through GOGLA members[152]

STC Rodd Eddy led the establishment of GOGLA. The PSD management team (Itotia Njagi and Nana Asamoah-Manu) worked with external consultants to restructure KEREA.

Appendix B Field Visit Surveys

B.1 Survey Questionnaire for Retailers

General Questions

1. When did you start selling solar lamps?

   a. *If pre-2008*, go to Question 2

   b. *If after 2008 (skip questions 2)*: what made you to start selling these lamps?

2. Before 2008, did you have any problems selling solar lamps? Do you still have any of these problems?

[151] Based on calls with IFC

[152] From interviews with GOGLA Executive

3. Has your sales of solar lamp gone up recently, especially since 2008? Do you know what led to this increase?

4. Have you heard of Lighting Africa?

5. Do you know what Lighting Africa is?

(For those who don't know what Lighting Africa is, provide brief explanation of Lighting Africa program)

6. Do you sell any LA certified products? Which ones?

7. Do you choose to sell LA certified lamps in preference to other lamps? Why or Why not?

8. How much is each LA certified lamp?

9. How much profit do you typically make from each one

10. Have you had any complaints about these certified products?

11. What percentage of your customers would you say ask for LA certified products?

12. How do these other products compare in pricing to non-certified products?

Market Intelligence/ Business Development Services

13. Have you had any dealings with the people from LA, read any of their reports or attended any LA events?

14. If so, which service(s) have you benefited from?

15. How important would you say they were for your business?

16. How much would you pay for the service(s)?

Access to Finance

17. How do you finance your stock of solar lamps

18. Have you had any problems with that financing option?

19. Have you gotten any loans from MFIs for your operations? If so, which MFIs?

20. Are people in this town buying more solar lamps? If so, why do you think this has happened?

B.2 Survey Questionnaire for Manufacturers

General Questions

1. When did you start manufacturing solar lamps?

2. When did you start exporting to Kenya?

   a. *If pre-2008*, (*skip question 3)*

   b. *If after 2008 (skip questions 7 - 9)*:

3. What motivated you to start manufacturing these lamps?

4. In what other countries are your products sold?

5. When did you start selling in these countries?

6. How do you get your products to the end user (distribution channel)?

7. What were the problems you faced in exporting solar lanterns to Kenya/Africa prior to 2008?

8. D

9. Have you noticed any significant increase in your exports to Kenya/Africa since 2008?

10. Do you know what factors led to the increase in sales of solar lamps in Kenya and the rest of Africa?

11. [*if only Lighting Africa intervention(s) mentioned*]: Apart from the LA interventions, do you think there were other reasons for the increased sales?

12. [*if no LA intervention mentioned*]: Do you think the LA program has helped to increase sales of solar lamps? How?

13. How much have you paid in total for LA services? Any in-kind contributions?

Quality Assurance (for those who have LA certified products)

14. When did you get the LA certification?

15. How much did you pay for quality assurance testing?

16. Have you had any testing done since then? If so, when?

17. How much did you pay for the subsequent QA testing?

18. If the price were increased to US$8,000 to US$8,500, would you still pay for it? Why or why not?

    a. What is the maximum that you would pay for the service

Market Intelligence/Business Development Services

19. Have you used any of the LA published reports? Which ones?

20. What did you use them for?

21. How important would you say these are to your business?

22. How much would you pay for them?

23. Have you attended any LA workshops? If so, which ones?

24. How useful were they to your business?

25. How much would you pay to attend such workshop?

Access to Finance

26. Have you had any difficulties raising finance to support your operations?

27. Has Lighting Africa provided any support for you in raising finance for your business? If so, what support

Conferences

28. Have you attended any LA conferences or workshops? Which ones?

29. If so, how beneficial were they to your business?

30. If not, why not? Would you attend in the future?

31. How much did you/would you pay to register for the conference?

Other General Questions

32. What changes have you made to your product (design, pricing, etc) in response to information gained through Lighting Africa?

33. What effect has this had on your sales?

34. Do you think the Quality Assurance/Market Intelligence/Business Development efforts by Lighting Africa are sufficient? If not, what else should be done?

35. What other services do you think are needed to further develop the market for solar lamps in Kenya and other African countries? What barriers aren't being addressed by the Lighting Africa program?

36. What should the Lighting Africa program have done differently to generate better, longer lasting results?

B.3 Survey Questionnaire for Distributors

General Questions

1. When did you start importing/selling solar lamps in Kenya? *(month, year)*

   a. *If pre-2008*, (*skip question 2 and go to 3)*

   b. *If after 2008 (skip questions 3 and 4)*:

2. What made you start importing/selling solar lamps?

3. What were the problems you faced in importing/selling solar lamps prior to 2008? Do you still face any of these problems?

4. Have you noticed any significant increase in imports/sales since 2008? Do you know what factors led to this increase?

5. [*if only Lighting Africa intervention(s) mentioned*]: Apart from the LA interventions, do you think there were other reasons for the increased sales?

6. [*if no LA intervention mentioned*]: Do you think the LA program has helped to increase sales of solar lamps? How?

7. How much have you paid in total for LA services? Any in-kind contributions?

Quality Assurance

8. Which LA certified products do you have in stock?

9. Have you heard any complaints about these products?

10. Do you sell other solar lamps that are not certified by LA?

11. What percentage of your solar lamp sales consist of LA certified products?

12. How do these other products compare in pricing to non-certified products?

Market Intelligence/Business Development Services

13. Have you used any of the LA published reports? Which ones?

14. What did you use them for?

15. How important would you say these are to your business?

16. How much would you pay for them?

17. Have you attended any LA workshops? If so, which ones?

18. How useful were they to your business?

19. How much would you pay to attend such workshop?

Access to F

20. H

21. Have you had any difficulties raising finance to support your operations?

22. Has Lighting Africa provided any support for you in raising finance for your business? If so, what support

Conferences

23. Have you attended any LA conferences or workshops? Which ones?

24. If so, how beneficial were they to your business?

25. If not, why not? Would you attend in the future?

26. How much did you/would you pay to register for the conference?

Other General Questions

27. Do you think the Quality Assurance/Market Intelligence/Business Development efforts by Lighting Africa are sufficient? If not, what else should be done?

28. What other services do you think are needed to further develop the market for solar lamps in Kenya and other African countries? What barriers aren't being addressed by the Lighting Africa program?

29. What should the Lighting Africa program have done differently to generate better, longer lasting results?

B.4 Survey Questions for BOP Consumers and Consumer Based Association – Part 1

1. What do you use for lighting now?

(If you use multiple products, continue to Question 2. If you only use solar lamps, move to Question 5. If you do not use solar lamps, only answer Question 8)

2. How many hours do you use the solar lamp for in a day?

3. What about the other products?

4. Why do you need to use the other products and not just the solar lamps?

5. Which solar lamp do you use (type, brand)?

6. When did you start using solar lamps? *(month, year)*

7. What were you using before then?

8. Why didn't you use solar lamps before then/don't you use solar lamps now *(check all that apply)*

   a. I did not know solar lamps existed

   b. I did not know how solar lamps worked

   c. Solar lamps were not available

   d. I didn't know where to buy a solar lamp

   e. I did not trust solar lamps

   f. I could not tell which solar lamps were good

g. I/someone I know bought one that did not last long

h. Solar lamps were too expensive

i. If too expensive: why didn't you get a loan for it

j. Other (*explain below*)

9. What made you start using a solar lamp?

(*select all relevant options in column 1 and ask respective follow up question*)

I found out about solar lamps	Where did you first hear about them?
I learned how solar lamps worked	Who taught you how to use them?
Solar lamps became more readily available in my [town/district]	Where do you buy these lamps?
I found out where to buy a solar lamp	How did you find out where to buy a lamp?
I discovered that solar lamps are actually good and can be reliable	How/where did you learn about the benefits of solar lamps? What else made you gain confidence in them?
I was able to identify which lamps were of good quality	How do you identify good quality lamps? Where did you learn this?
Solar lamps became cheaper	
I was able to get a loan to buy a solar lamp	Who gave you the loan?
Other, please explain:	

Survey Questionnaire for BOP Consumers and Consumer Based Association – Part 2

10. Have you heard of Lighting Africa?

11. Do you know what Lighting Africa is?

(provide brief explanation of Lighting Africa program)

12. If you have a solar lamp, is it a Lighting Africa certified lamp?

13. Did/Do you have any problems with the other lighting products you've used, outside of solar lamps? (if so, explain)

14. Have you attended any of the Lighting Africa roadshows/campaigns? If so, what did you learn from the campaign?

B.5 Survey Question for Other LA Stakeholders

General Questions

1. Where you involved in off-grid solar lighting before 2008? If yes in what capacity?

2. Did your level of involvement change after 2008? How did this change?

3. Engagement on LAP:

   a. For how long have you been engaged on the LAP?

   b. In what capacity?

   c. What is the nature of your relationship?

4. Are your interventions for off grid solar lighting LAP complementary, supplementary, or parallel? Please explain?

5. How would you rate the LA Program's on the following thematic areas: Business Development, Market Intelligence, Communication, Financing, Product Quality Assurance?

6. Which of the above thematic areas is your organization involved in on LAP? What is your role?

7. What is your assessment of sustainability of LAP achievement after the programs has closed?

8. What do you think would be your role after the LAP has closed?

9. Is your off grid lighting intervention different from that of LAP? In which ways?

10. Are there shortcomings you have noticed in the LAP implementation?

11. What changes would you propose to address these shortcomings?

B.6 Survey Questions for MFIs

1. Does your MFI interact with LAP?

2. Do you provide finance support to LAP?

3. What type of financial support do you provide?

4. How many LAP products do you know of?

5. Which of the above products does your MFI provide with financing?

6. Are there some LAP products that you do not support?

7. Why don't you support the above stated products?

8. Other than LAP do you finance off-grid products acquisition from other programs?

9. In comparison would gauge LAP products as of superior quality?

10. Do you have a limit on the loan finance for the products?

11. What is the rate of interest?

12. Are there any other financing costs to the applicant?

13. Has the interest and financing cost changed over time?

14. W

15. How developed was the off-grid lighting products market before LAP?

16. How do rate LAP contribution to the off-grid lighting market?

17. What other program/organization has contributed in comparable terms to LAP?

18. Has the number of loan applications for LAP products been on the upward?

19. Is there an increase in total annual amounts for LAP product loans?

B.7 Survey Questions for Government of Kenya Stakeholders

1. In 2008, what were the GoK goals and strategies for:
   a. Improving lighting access to off-grid populations?

   b. Renewable energy sector in Kenya?

   c. The energy sector as a whole?

2. To what extent has the LA program helped to achieve these goals?

3. Is the program still relevant to the Government's plans for the energy sector?

4. How would you rate the LA program's contribution to its target market – lighting solutions for the off-grid population?

5. What other programs and organizations are addressing the need in this market segment? How would you rate their contributions compared with the LA program's?

6. Would you consider LA program a high priority program?

7. Has the Government changed regulation to facilitate development of the off-grid market?

8. If so, what motivated this change?

9. Have you noticed any negative outcomes of the LA program?

10. What shortcomings have you noticed in the way LAP is being implemented?

11. What changes would you propose to address these shortcomings?

Appendix C List of Stakeholder Groups Interviewed

Table C.1: List of Distributors Interviewed

Company Name	Name of Representative	Location	Date of Meeting
BAREFOOT POWER	Jackson Machuhi	Ngong Road, Nairobi	11/7/2014
PULSE EXPERIENTIAL	Mary Rugambwa	Karen, Nairobi	11/7/2014
SUNNY MONEY	Steve Andrews	Karen, Nairobi	11/7/2014
D.LIGHT	Tim Rump	Off James Gichuru Road, Nairobi	11/7/2014
ECOSMART	Simon Kiruri	Avenue Ngong, Nairobi	14/7/2014

Table C.2: List of Retailers Interviewed

Company Name	Name of Representative	Location	Date of Meeting
ELSAM Electronics	Samuel Ndungu	River Road Nairobi	14/7/2014
John Mwathimi	John Mwathimi	Tom Mboya Avenue, Nairobi	17/7/2014
Withheld	Withheld	River Road, Nairobi	17/7/2014
ACE	Elija Chege	Naivasha	16/7/2014
SCIENTEC	Rachael Waithera	Naivasha (Mai Mahiu)	16/7/2014
Wairimu	Anne Wairimu	Naivasha (Mai Mahiu)	16/7/2014
Mpesa Stores	Name withheld	Naivasha (Mai Mahiu)	16/7/2014
LW Mpesa	Lilian Wairimu	Naivasha (Mai Mahiu)	16/7/2014
Gatukuyu General Stores	Name withheld	Gatukuyu Trading Centre, Gatundu Road, Nairobi	18/7/2014
Susan Electronics	Susan Gathinji	Thika Town	18/7/2014
Elmasi	Janet Mwangi	Thika Town	18/7/2014
Nakumatt Super Market	Name withheld	City Hall Branch Nairobi	19/7/2014
Tuskys Super Market	Name withheld	Kenyatta Avenue Branch, Nairobi	19/7/2014
Naivas Super Market	Name withheld	Ronald Ngala Street, Nairobi	19/7/2014
Improved Energy and Stove Center	Bernard Mbati	Kakamega	31/7/2014
D.light sales outlet	Evelyn	Kakamega	31/7/2014
Action for child development trust Business Center	Name withheld	Kakamega	31/7/2014

Nakunmatt Kondele Main Supermarket	John xx	Kisumu	31/7/2014
Unknown	Agnes xx	Kisumu	31/7/2014
MACDEES store	Anne	Kisumu	31/7/2014

Table C.3: List of Manufacturers Interviewed

Company Name	Name of Representative	Date of Meeting
Barefoot Power	Eliza Hogan and Anthony Lenthen	7/17/2014
D.Light	Ned Tozun	7/17/2014
Greenlight Planet	Radhika Thakkar	7/17/2014
Fosera	Annika Tillmans	7/18/2014
Nokero	Blake Sanders	7/18/2014
Omni Voltaic	Huashan Wang	7/18/2014

Table C.4: List of BOP Consumers Interviewed Individually

Name of Representative	Location	Date of Meeting
Mwaura	Nairobi	10/7/2014
Ogola	Nairobi	10/7/2014
Wekesa	Nairobi	10/7/2014
Ndubi	Nairobi	10/7/2014
Barasa	Nairobi	12/7/2014
Lukhoni	Nairobi	12/7/2014
Karani	Nairobi	12/7/2014
John Nderi	Nairobi	12/7/2014
Salga Police Post 1	Nakuru	15/7/2014
Salga Police post 2	Nakuru	15/7/2014
Salga Police Post 3	Nakuru	15/7/2014
Salga Police Post 4	Nakuru	15/7/2014
Salga Police Post 5	Nakuru	15/7/2014
Tuskys Nakuru 1	Nakuru	15/7/2014
Tuskys Nakuru 2	Nakuru	15/7/2014

Tuskys Nakuru 3	Nakuru	15/7/2014
Tuskys Nakuru 4	Nakuru	15/7/2014
Tuskys Nakuru 5	Nakuru	15/7/2014
Maai Mahiu 1	Naivasha	16/7/2014
Maai Mahiu 2	Naivasha	16/7/2014
Maai Mahiu 3	Naivasha	16/7/2014
Maai Mahiu 4	Naivasha	16/7/2014
Maai Mahiu	Naivasha	16/7/2014
Chege	Naivasha	16/7/2014
Mwangi	Nairobi	17/7/2014
Garenyo	Nairobi	17/7/2014
Mumbi	Nairobi	17/7/2014
Agwero	Nairobi	17/7/2014
Mauren	Nairobi	17/7/2014
Wangari	Nairobi	17/7/2014
Habenga	Nairobi	17/7/2014
Karuri	Nairobi	17/7/2014
Monde	Nairobi	17/7/2014
Anne	Kisumu	31/7/2014

Table C.5: List of BOP Focus Groups Interviewed

Company Name	Name of Representative	Location	Date of Meeting
Ndiko Womens Group	30 members present	Gatundu North	18/7/2014
Kamunyu Glory Ladies	25 members present	Gatundu South	18/7/2014
Shimanyero Focus Group	32 members present	Outskirts of Kakamega	31/7/2014
Asante Mama – Pima Gas stoves	22 members present	Kawangware	1/8/2014

Table C.6: List of MFIs Interviewed

Company Name	Name of Representative	Location	Date of Meeting
FAULU Kenya	William Nderitu	Ngong Road, Mimosa Area, Nairobi	14/7/2014
Visionary Empowerment Program (VEP)[153]	Bernard Karanja Ndungu	Thika	18/7/2014

Table C.7: List of Government Stakeholders Interviewed

Company Name	Name of Representative	Location	Date of Meeting
Ministry of Energy	Eng. Isaac Kiva	Nairobi	17/7/2014
Kenya National Bureau of Standards (KEBS)	Eng. Alex Mboa	Nairobi	14/7/2014

Table C.8: List of Other Sustainability Partners Interviewed

Company Name	Name of Representative	Location	Date of Meeting
Momentum Experiential/Experientia l Marketing Services "EXP"	Gordon Achola	Nairobi	14/7/2014
GIZ	Walter Kipruto	Nairobi	17/7/2014
Center For Pastoralist Development (CEPAD)	Andrew Olekoisnou	Naivasha	16/7/2014
SNV	Jechoniah Kitala	Nairobi	18/7/2014
GVEP	Jack Muthomi and Jack Muthomi	Nairobi	19/7/2014

[153] Note that VEP has both a distribution and lending arm

Table C.9: List of LA Staff Interviewed

Company Name	Name of Representative
IFC	Itotia Njagi
IFC	Nana Asamoah-Manu
IFC	Russell Sturm
World Bank	Dan Murphy
STC	Arne Jacobson
STC	Leo Blyth
World Bank	Chris Saunders
STC	Catherine Mgendi
STC	Jennifer Lynch

Appendix D Document Review

The list below includes reports, excel sheets, and notes on the LA programs. Many of the documents were provided directly from IFC.

Information on the LA programs

1. 2007 project appraisal doc
2. Dalberg MTR
3. LA Kenya Completion reports
4. LA JV Completion reports
5. LA Kenya Implementation plans
6. LA JV Implementation plans
7. AS project life cycle
8. LA Kenya Logic model
9. LA JV Logic model
10. Supervision documents (15)
11. LA overview note
12. Survey to evaluate program ("Summary all respondents")
13. Full list of stakeholders that have engaged with LA in Kenya (distributors, MFIs, NGOs, public officials) and their locations ("Stakeholders of Lighting Africa Kenya 2013 July")
14. IFC Corporate Presentation 2009
15. AS Pricing Procedure 2007
16. AS Pricing Directive 2007
17. Contact information for distributors in Kenya
18. "Sales breakdown" excel spreadsheet
19. "Lighting Africa budget 2008 – 2014" excel
20. "LA team member + staff" powerpoint

Information on quality assurance

21. Schematic of the supply chain key for QA component ("LA for manufacturers")
22. Number of products that passed QA testing and how this number has changed over time ("QA MonEval Indicators 2013")
23. Testing completed between Q42012 and Q2 2013 ("QA MonEval Company Information 2013")
24. Lighting Global QA Roadmap
25. Snapshot of the team organization from July 2013 ("Lighting Global QA Team")

26. LA cash contributions spreadsheet

Information on communications

27. Lighting Africa Final PCR EvNote
28. Communication strategy
29. Snapshot of communication strategy
30. Work plan for communication
31. AS Completion Report (for website)

Information on consumer education

32. IFC forums summary excel workbook
33. IFC roadshow summary excel workbook
34. IFC Summary to date Nov 2012 excel workbook

Information on market intelligence

35. Consumer Insight Reports
36. Market Trends Reports
37. Market Intelligence Reports
38. Quantitative Research Reports
39. Qualitative Research Reports
40. Supply Chain Mapping Documents
41. Gender Focused Reports
42. LED Flashlights in Kenya Report
43. Chicken Farming with Solar Lamps

Appendix E Timeline of LA Program Managers

Table E.1: Timeline of LA Program Managers

Name	Title	Dates	Location
IFC			
Lindsay Sergent Madeira	IFC Program Manager for LA JV	2007 to 2008	Based in DC
Patrick Avato	IFC Program Manager for LA JV	2008 to Dec 2011	Based in DC/Turkey
Cyril Kattah	IFC Program Manager for LA Kenya/Ghana	2008 to December 2008	Based in Ghana
Itotia Njagi	IFC Program Manager LA Kenya/Ghana	Mid 2009-2013	Based in Kenya
Russell Sturm	IFC Program Manager	2008-2011, Nov 2012-2013	Based in Washington DC
World Bank			
Anil Cabraal	World Bank Program Manager	2007 to 2009	Based in DC
Dana Rysankova	World Bank Program Manager	2009 to 2011	Based in Washington DC
Kate Steel	World Bank Program Manager	2011 to 2012	Based in Washington DC
Dan Murphy	World Bank Program Manager	November 2012 to 2013	Based in Washington DC

Source: Castalia table, information from IFC

Appendix F Sources for Cost Benefit Analysis

Figure F.1: Sources of Cost Benefit Analysis

	Methodology	Source
A1	BLS inflation calculator	http://www.bls.gov/data/inflation_calculator.htm
A2	regulated maximum price in Nairobi	"Kenya raises petrol, kerosene prices". July, 2014. Accessed at http://af.reuters.com/article/kenyaNews/idAFL6N0PP3CS20140714 Rate confirmed with retailers during trip to Kenya
A3	Average value given range of values reported ($3 in 2003 to $7 in 2011). Inflated up to 2014 $3.88 and $7.40 then took average.	Value of $7/lamp: "Cost Comparisons spreadsheet", part of "From Gap to Opportunity: Business Models for Scaling Up Energy Access". Castalia report to IFC, 2011 Value of $3/lamp: "Technical and Economic Performance Analysis of Kerosene Lamps and Alternative Approaches to Illumination in Developing Countries". Evan Mills. 2003.
A4	Average of wicks replaced from two different sources	"Technical and Economic Performance Analysis of Kerosene Lamps and Alternative Approaches to Illumination in Developing Countries". Evan Mills. 2003. See table 2 "Technical Report #3: solid-state lighting on a shoestring budget". 2008. The Lumina Project. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr3.pdf. http://light.lbl.gov/pubs/tr/lumina-tr3.pdf. See Table 5
A5	See table 5	"Technical Report #3: solid-state lighting on a shoestring budget". 2008. The Lumina Project. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr3.pdf.
A6	Figure 7: 5-year service life based on usage assumption of 3.5 hour per day	"Technical and Economic Performance Analysis of Kerosene Lamps and Alternative Approaches to Illumination in Developing Countries". 2003. Evan Mills.Lawrence Berkeley National Laboratory. accessed at: http://evanmills.lbl.gov/pubs/pdf/offgrid-lighting.pdf
A7	Reports show a range of daily usage of kerosene from 1.6 to 3.8 hours per day. Our estimate takes an average of this rage.	1.6 hrs/day estimate from: "Technical Report #3: solid-state lighting on a shoestring budget". 2008. The Lumina Project. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr3.pdf. table 4 3.8 hrs/day estimate from: UNEP e.lighten Kenya off-grid lighting assessment. accessed at: http://api.ning.com/files/yrG0YlPnk7HdT2RLgBvpBjXwWJQEuZwO7XGEBTRM3qd5LPG5gLQgODDl2nuBNi2rHt8ORTMLkzVXrO4nX-fWZYUcQFAaz7mh/OGL_KEN_v1.pdf
A8	average of fuel usage range 0.018 to 0.089 litres of kerosene per hour (p12)	"Technical Report #5: from carbon to light". 2010. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr5.pdf
A9	Replacing 112 million kerosene lamps one for one with solar lamps means 37,172 deaths avoided	"From Gap to Opportunity: Business Models for Scaling Up Energy Access". IFC, 2011. See table in Annex B

A10	For a "typical" solar lamp, took popular mid-level brand in Kenya (d.light s300). For price, took average of prices found at retailers in different towns (Nairobi, Thika, Naivasha, Kisumu)	Castalia team interviews with retailers in Kenya
A12	Two most popular LA-certified brands (d.light and sunking) claim >5 year life of products. Warranties are offered for 1 year. The mid-point between these estimates was used as a conservative estimate for the useful life of a solar lamp (3 years).	LA technical note issue 2 march 2010 accessed at: http://www.lightingglobal.org/resources/technical-notes/ d.light advertises >5 year life: http://www.dlightdesign.com/productline/S2/ sunking advertises >5 year life: http://greenlightplanet.com/our-products/pro
A13	The UN High-Level Advisory Group on on Climate Change Financing's recommendation of a carbon price between US$20 to US$25 per ton of CO2	UN (2010). Report of the Secretary General's High-level Advsiory Group on Climate Change Financing, United Nations. 2010.
A14	Replacing 112 million kerosene lamps one for one with solar lamps means 9,520 million emissions avoided	"From Gap to Opportunity: Business Models for Scaling Up Energy Access". IFC, 2011. See table in Annex B
A15	Replacing 112 million kerosene lamps one for one with solar lamps means 12 million sick days avoided	"From Gap to Opportunity: Business Models for Scaling Up Energy Access". IFC, 2011. See table in Annex B
A16	An average family in Maai Mahiu (Kenya) makes around 5,000 Kenya shillings (Ksh) per month, roughly $65	"Technical Report #6: market trial: selling off-grid lighting products in rural kenya". 2010. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr6.pdf
A17	In both ex ante project economic analysis and ex post project performance evaluation, most MDBs estimate and evaluate benefits and costs of development projects using a uniform cut-off discount rate, also called economic internal rate of return (EIRR), of 10%–12%	"cost benefit analysis for development, a practical guide". ADB. 2013. accessed at: http://www.adb.org/sites/default/files/cost-benefit-analysis-development.pdf
A18	Uses selection of method of transportation to determine value of a statistical life (VSL) for Africans. Specifically, estimates the trade-offs individuals are willing to make between mortality risk and cost as they travel.	"Transportation Choices and the Value of Statistical Life". Gianmarco Leon and Edward Miguel. First version October 2011, this version September 2013. Accessed at: https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxnaWFubWFyY29sZW9ufGd4OjUyYzI1MWViYmU3YjQ4ZTM
A19	Average of prices found during Kenya trip for high-end d.light product (s300)	Retailer surveys
A20	Price found during Kenya trip of a low-end d.light product (s2)	
A21	Most popular products were d.light. To get a typical solar lamp, an average price was taken of the high-end (s300) and low-end (s2) d.light models. A weighted average was taken of these prices. Weights were calculated based on the percent of s300 sales compared to the percent of s2 sales as reported in the "Sales" spreadsheet provided by IFC	see "sales" spreadsheet
A22	Castalia assumption	

A23	One scenario	Represents a possible scenario where 50 percent of LA-certified lamps purchased: 1. are attributable to LA (these sales would not have happened without the program) and 2. are going to people living in off-grid areas that are currently using kerosene products (not going to people already recieving access to electricity)

Appendix G Remaining Output and Outcome Targets

Table G.1: LA JV and LA Kenya Private Sector Development Outputs and Outcomes

LA Kenya							
Output Performance				**Outcome Performance**			
Indicator	**Target**	**Result**	**Interpretation**	**Indicator**	**Target**	**Result**	**Interpretation**
Private Sector Development							
Number of entities receiving advisory services	1	1	Established GOGLA	Number of entities that implemented recommended changes	15	21	Number of International Off-Grid Lighting Association members (e.g. manufacturers, NGOs, financial institutions etc.)
Number of procedures recommended for improvement or elimination	1	2	Number of policies the GOGLA board has approved	Number recommended procedures improved/eliminated	2	2	Number of procedures adopted by GOGLA
Number of reports completed	1	2	Number of reports issue in line with overall private sector development				
Number entities receiving in-depth advising	15	24	Number of private sector companies consulted with to establish private sector consortium [indicator discontinued]				

Table G.2: LA JV and LA Kenya Communication Outputs and Outcomes

LA Kenya							
Output Performance				**Outcome Performance**			
Indicator	**target**	**result**	**Interpretation**	**Indicator**	**target**	**result**	**Interpretation**
Communication							
Number of reports completed	1	1	Number of reports on how to develop a website for such programs	Number of entities that implemented recommended changes	100	102	Number of organizations impacted positively by the materials that they have downloaded from the website (tracked by survey)
Number of copies of project materials distributed or downloaded	270,000	197,365	Number of copies of project materials distributed or downloaded [Discontinued due to duplication]	Number of recommended procedures improved/eliminated	30	101	Tracks number of improvements based on information from the website
Number of Website Hits	630,000	700,290	Number of Website Hits				
Percentage of site visits that are new (first time users)	50	51	Percentage of site visits that are new (first time users)				
Number of page views	1,440,000	2,009,160	Number of page views				
Creation of online platform for business networking	1	1	Number of virtual interactive portals created to facilitate interaction among supply chain members				

Appendix H Verifying Reported Results

H.1 Verifying Output and Outcome Results

Verification results are presented below for the output and outcome indicators.

Table H.1: Results Verified for Sample of Outputs and Outcomes for LA JV

Component	Output/Outcome	Indicators Defined	Verified?
Access to Finance	▪ Output: number of new financial products designed: 1	▪ Output: (i)Trade finance facility for manufacturers (ii) Trade Finance for importers (iii) Facility/Recommendations for MFIs (iv) opportunities from off-grid markets	✓
	▪ Outcome: number of new financial products launched: 0	▪ Outcome: Number of new financial products launched to meet the needs of manufacturers	✓
Quality Assurance (technical notes)	▪ Output: number of reports completed: 15	▪ Output: Technical Briefing Notes and Eco-Design Notes to guide manufacturers on how to develop high-quality and environmentally friendly products	✓
	▪ Outcome: number of unique product models improved: 44	▪ Outcome: Number of manufacturers that used LA reports for their business plans or improved products from technical briefing notes	Unable to verify
Quality Assurance (testing)	▪ Output: number of off-grid lighting products tested: 183	▪ Output: Number of unique solar lamps submitted for the QTM, ISM, or MCM tests	✓
	▪ Outcome: number of off-grid lighting products tested: 66	▪ Outcome: Number of unique solar lamps that passed the QTM tests	Unable to verify
Quality Assurance (lab capacity building)	▪ Output: number of entities receiving in-depth advisory services: 8	▪ Output: Number testing labs received training, guidance from LA	✓
	▪ Outcome: number entities that implemented recommended changes: 6	▪ Outcome: Number of testing labs went on to test solar lamps for LA after receiving training/ advisory	✓

Quality Assurance (carbon finance methodology)	▪ Output: Number of procedures/ firm-level policies/practices/standards recommended for improvement or elimination: 1	▪ Output: Number of testing methodologies adopted by other institutions for carbon credits assessment for off-grid products	✓
	▪ Outcome: Number of recommended procedures improved/eliminated: 1	▪ Outcome: LA testing methodology that has been adopted by UN for carbon credits assessment for off-grid products	✓
	▪ Output: Number of entities receiving advisory services: 1	▪ Output: Number of institutions advised on carbon finance methodology in relation to off-grid lighting products	✓
	▪ Outcome: Number of entities that implemented recommended changes: 1	▪ Outcome: LA minimum quality standards approved by International Electrotechnical Commission (IEC) as a reference point for quality assurance of off-grid products	✓
Private Sector Development	▪ Output: Number of entities receiving advisory services: 1	▪ Output: Established GOGLA	✓
	▪ Outcome: Number of entities that implemented recommended changes: 21	▪ Outcome: Number of International Off-Grid Lighting Association members (made up of stakeholders in the off-grid lighting industry)	✓
Communication	▪ Output: Number of reports completed: 1	▪ Output: Number of reports on how to develop website for such programs	✓
	▪ Outcome: Number of entities that implemented recommended changes: 102	▪ Number of organizations that have been impacted positively by the materials that they have downloaded from website	✓
	▪ Output: Number of Website Hits: 700,290	▪ Output: Number of Website Hits	Unable to verify
Market Intelligence (outside Kenya and Ghana)	▪ Output: Number of entities receiving advisory services: 144	▪ Output: Number of companies using LA research reports	✓
	▪ Output: Number of reports completed: 33	▪ Output: Reports detailing consumer preferences, willingness to pay, distribution networks	✓

	▪ Outcome: Number of entities that implemented recommended changes: 101	▪ Outcome: Firms who reported reports reported how useful reports were in a survey	✓
Market Intelligence (knowledge management)	▪ Output: Number of entities receiving advisory services: 0	▪ Output: beneficiaries from the development of a replication toolkit for market transformation programs	✓
	▪ Output: Number of procedures recommended for improvement or elimination: 0	▪ Output: Number of recommendations from the kit	✓
	▪ Output: Number of reports completed: 0	▪ Output: Development of a replication/best practice toolkit for market transformation programs	✓
	▪ Outcome: Number of entities that implemented recommended changes: 0	▪ Outcome: Number of beneficiaries utilizing the toolkit for their activities	✓
	▪ Outcome: Number recommended procedures improved/eliminated	▪ Outcome: Number of specific recommendations adopted	✓

Table H.2: Results Verified for Sample of Outputs and Outcomes for LA Kenya

Component	Output/Outcome	Indicators Defined	Verified?
Market Intelligence	▪ Output: Number of entities receiving advisory services: 24	▪ Output: Number of organizations directly receiving marketing intelligence reports to support their operations in the market	Unable to Verify
	▪ Outcome: Number of entities that implemented recommended changes: 12	▪ Outcome: Number of entities receiving the reports that implemented any of the recommendations indicated	Unable to Verify
	▪ Output: Number of reports (assessments, surveys, manuals, Phase I/strategic option reports) completed: 20	▪ Outputs: Reports detailing consumer preferences, willingness to pay, distribution networks, etc	✓
Business Development	▪ Output: Number of workshops, training events, seminars. Conferences, etc.:16	▪ Output: Number of business linking workshops, outreach, trainings, held in Kenya	✓

(workshops/ training)	▪ Outcome: Number of people reporting on knowledge/attitude/practice: 107	▪ Outcome: Months after workshops, participants were surveyed to indicate how they used information received	Unable to Verify
Business Development (conferences, trade fairs)	▪ Output: Number of workshops, training events, seminars. Conferences, etc.: 5	▪ Output: Number of conferences in Kenya	✓
	▪ Outcome: Number of SME contracts signed: 11	▪ Outcome: Number of business agreements facilitated among supply chain	Unable to Verify
Business Development (workshops/training for quality assurance)	▪ Output: Number of workshops, training events, seminars. Conferences, etc.: 8	▪ Output: Number of workshops specifically related to technical/ technician training in Kenya	✓
Business Development (linkages for manufacturers, distributors, bulk buyers)	▪ Output: Number of entities receiving advisory services: 26	▪ Output: Number of potential non-traditional organizations reached out to enter the off-grid market	✓
	▪ Outcome: Number of entities that implemented recommended changes: 8	▪ Outcome: Number of non-traditional channels (NGOs, plantations, corporates, self-help groups) in Kenya who made agreements to work together	✓
Consumer Education	▪ Outcome: Number of people reached by IFC partners/clients: 29,518,000	▪ Outcome: Number of people reached through above the line media (TV, radio, fliers)	Unable to Verify

	▪ Output: Number of workshops, training events, seminars. Conferences, etc.: 1,157	▪ Output: Number of forums run during consumer education campaigns	✓[154]
	▪ Output: Number of participants in workshops, training events, seminars, conferences, etc.	▪ Output: Number of people reached through education campaigns in Kenya	✓
Access to Finance (link distributors to financial institutions)	▪ Output: Number of reports (assessments, surveys, manuals, Phase I/strategic option reports) completed: 2	▪ Output: Reports presented to financial institutions	✓
	▪ Outcome: Number of reports (assessments, surveys, manuals, Phase I/strategic option reports) completed: 17	▪ Outcome: This counts the numbers of Associate distributors and FIs who eventually engaged following the LA intervention	✓

[154] Note that the number was off by one. Figure is 1,158

H.2 Verifying Impact Results

Verification results are presented below for the impact indicators that required additional explanations from those reported in the body of the report.

Number of People Receiving Access to Improved Services

IFC calculates the number of people receiving access to improved services by multiplying the total LA-certified lamps sold by the average number of people living in one household. The first number is an outcome result, and the second is an assumption. Both inputs to this calculation are verified below.

The assumption on people per household was verified by referencing a 2008 survey report by the Kenya National Bureau of Statistics[155].

The total sales of LA-certified lamps was verified through two steps. First, IFC provided a spreadsheet with the sales recorded by year (from 2009 to 2013) and by country for the LA-certified products. The total sales in this spreadsheet added up to the figure reported.

Second, a sample of sales figures from the spreadsheet were validated either directly with manufacturers (where possible), or through emails forwarded by IFC containing the original data sent by the manufacturers and distributors. Sample data was collected from 2009 to 2013 for manufacturers that made up 76 percent of the market in Africa. This included 31 data points to verify. Checking this sample, **all numbers reported by IFC matched those reported by manufacturers except for one.** In addition, there were a few inconsistencies:

- **Inconsistencies in dates reported**—IFC inconsistently reported the dates for sales volumes recorded in 2013. Specifically, the dates read January to June for sales in Kenya, Ghana, and all of Africa (including Kenya and Ghana). However, sales reported for the rest of Africa are for January to July. Because these sales figures sum the Kenya, Ghana, and rest of Africa sales to produce the total Africa sales, the time period used should be consistent among the four regional categories. Also, one of the input data points collected from manufacturers refers to January to June 2013.

  Because LA operated through July 2013, this inconsistency in reporting suggests that the sales figure reported may be slightly underestimating the true figure for at least the sample we checked, and maybe others that were not in the sample.

- **Six data points are off by exactly six months**—six data points provided indicate that IFC has correctly recorded the sales data but mislabeled the date this sale was achieved. We recommend IFC reaches out to these manufacturers to confirm the dates all sales were achieved.

  This indicates that while the timing is off, the totals are still accurate. Because the totals are what is used in the impact results, this is what is important.

[155] According to a Kenya demographic and health survey for 2008 to 2009, the average size of a rural household is 4.6 people. Accessed at http://statistics.knbs.or.ke/nada/index.php/catalog/23. See table 2. According to a survey by Ghana Statistical Service in 2008, the average size of a rural household in Ghana in was 4.6. Accessed at: http://www.statsghana.gov.gh/docfiles/glss5_report.pdf. See table 1.1

- **One data point was not summed correctly, off by 10 lamps**—while IFC correctly recorded all input data for one manufacturer in 2013 (sales in Kenya, Ghana, and the rest of Africa), they incorrectly summed these inputs throwing off the total lamps sold in all of Africa by 10 lamps.

  This is a minor inconsistency for three reasons. First, the amount that the total was off—10 lamps—is quite small relative to the totals. Second, this was clearly an error in calculation not in retrieving the correct inputs. Finally, the impact indicators report results for Kenya, Ghana, and the rest of Africa (for LA JV). Therefore the figures for all of Africa are not used to record impact.

Given that the numbers in the sample matched what IFC reported, and given that the inconsistencies were minor, we can reasonably assume that the remaining sales data are also accurate.

GHG Emissions Reduced

The Greenhouse Gas (GHG) emissions indicator quantifies the total GHG emissions reduced because of the LA program.

The result is quantified by multiplying four figures:

- The GHG emission factor per kerosene lamp
- The amount of kerosene consumed per lamp
- The carbon dioxide (CO2) displacement factor
- The total LA-certified lamps sold.

The CO2 displacement factor is the percentage kerosene burn time that is replaced by a solar lamp. Because solar panels are difficult to charge during rainy or cloudy weather, consumers may not be able to use a solar lamp each day of the year. Thus LA assumes that during the time a solar lamp is not used, the kerosene lamp will still be used and release emissions.

IFC's calculation was replicated with only slight differences (0.10 percent) due to differences in rounding.

The assumptions for each of the four input numbers are verified in Table H.3 below.

Table H.3: Verifying Assumptions for GHG Impact Indicator

Assumptions	LA figures	Figures Found through Research
Kerosene emission factor	0.0026 t Coe / L	0.0024 t Coe / L [156]

[156] "Technical Report #5: from carbon to light". 2010. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr5.pdf and "Household Light Makes Global Heat: High Black Carbon Emissions from Kerosene Wick Lamps" accessed at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3531557/

Kerosene consumption	55 L / year	52.72 L /year [157] [158]
CO2 displacement factor	70 %	Ranges 50% - 1.0% [159]
Total LA-certified lamps sold	LA Kenya: 686,685 LA JV: 1,993,165	Confirmed in previous section

As the table shows, LA figures are similar to those found through research. For the emission factor, Lumina Report "From Carbon to Light" references a similar figure to LA's assumption.

A range of CO2 displacement factors were found from the Lumina report mentioned above, Dalberg's Mid Term Review of LA, and from the United Nations carbon displacement methodology (CDM). LA's estimate is within this range, thus it is reasonable.

The average consumption of kerosene tended to vary. Taking an average of these consumption estimates and scaling up to annual consumption gives 52.75 litres per year, very similar to LA's estimate.

The total LA-certified lamps sold was verified in the previous section.

Given that LA's assumptions are in line with what we found, we conclude the impact result is accurate.

Value of financing facilitated

This IFC financing facilitated indicator refers to all **non-IFC** loans, equity, and grants mobilized to solar lamp end-users or the supply chain. This included funds provided by MFIs and donor programs. This financing is included in the result only if it was provided because of the LA programs.

IFC provided documents to verify these results. The documents included the inputs to the calculations, and reasons for attributing the financing to the LA programs. For LA Kenya, a sample of the result inputs was verified by checking the original emails sent to IFC with the data. For example, emails indicated how much in loans a certain MFI provided to consumers of LA-certified lamps.

For LA JV, LA provided a copy of a survey used to collect this information.

The verification exercise indicated that the reported results for financing facilitated were accurate.

[157] Kerosene usage, Reports show a range of daily usage of kerosene from 1.6 to 3.8 hours per day. Our estimate takes an average of this rage: "Technical Report #3: solid-state lighting on a shoestring budget". 2008. The Lumina Project. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr3.pdf. table 4 and UNEP e.lighten Kenya off-grid lighting assessment. accessed at: http://api.ning.com/files/yrG0YlPnk7HdT2RLgBvpBjXwWJQEuZwO7XGEBTRM3qd5LPG5gLQgODDl2nuBNi2rHt8ORTMLkzVXrO4nX-fWZYUcQFAaz7mh/OGL_KEN_v1.pdf

[158] Kerosene burn rate: average of fuel usage range 0.018 to 0.089 litres of kerosene per hour (p12) "Technical Report #5: from carbon to light". 2010. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr5.pdf

[159] Upper bound: http://cdm.unfccc.int/methodologies/DB/1ERDOJQX62OD2BH65G74XM28Z2CL53 Lower bound: "Technical Report #5: from carbon to light". 2010. accessed at: http://light.lbl.gov/pubs/tr/lumina-tr5.pdf

Value of IFC financing facilitated

This IFC financing facilitated indicator refers to all loans, grants, and equity mobilized through **direct participation** of IFC. This includes IFC-guaranteed financing facilities for the supply chain.

For IFC financing facilitated in Kenya, LA reported the value of a planned financing facility for distributors. IFC planned to partner with Bank of Africa (BoA) to provide this US$5.0 million financing facility. The facility was approved during the time of the LA program but did not disburse funds during the LA programs. The planned facility was confirmed through a PDS Concept Note.

For LA JV, the reported result was zero.

The verification exercise indicated that the value of IFC financing facilitated in Kenya should be adjusted to zero.

H.3 Verifying Consistency of Targets and Results

Table H.4 below to check with IFC why these indicators are not included in the Completion Reports or Implementation Plans.

Table H.4: Indicators Included in Logic Models but not in Completion Reports and Implementation Plans

Component	Output Indicator	Outcome Indicator
LA JV		
Access to finance	Number of reports completed	N/A
Quality Assurance (lab capacity building)	Number of reports completed	N/A
Quality Assurance (carbon finance methodology)	Number of reports completed	N/A
Private Sector Development	Number entities receiving in-depth AS	N/A
Communication	Number of reports completed	N/A
Communication	Creation of online platform for B2B networking	N/A
LA Kenya		
Business development (AS for Distributors)	Number distributors with products passing QA test	Number entities implemented recommended changes
Business development (linkages for manufacturers, distributors, bulk buyers)	Number corporates and other organizations (not Associates) receiving AS	N/A
Consumer Education (launch campaign)	N/A	Number people reporting on knowledge/attitude/practices

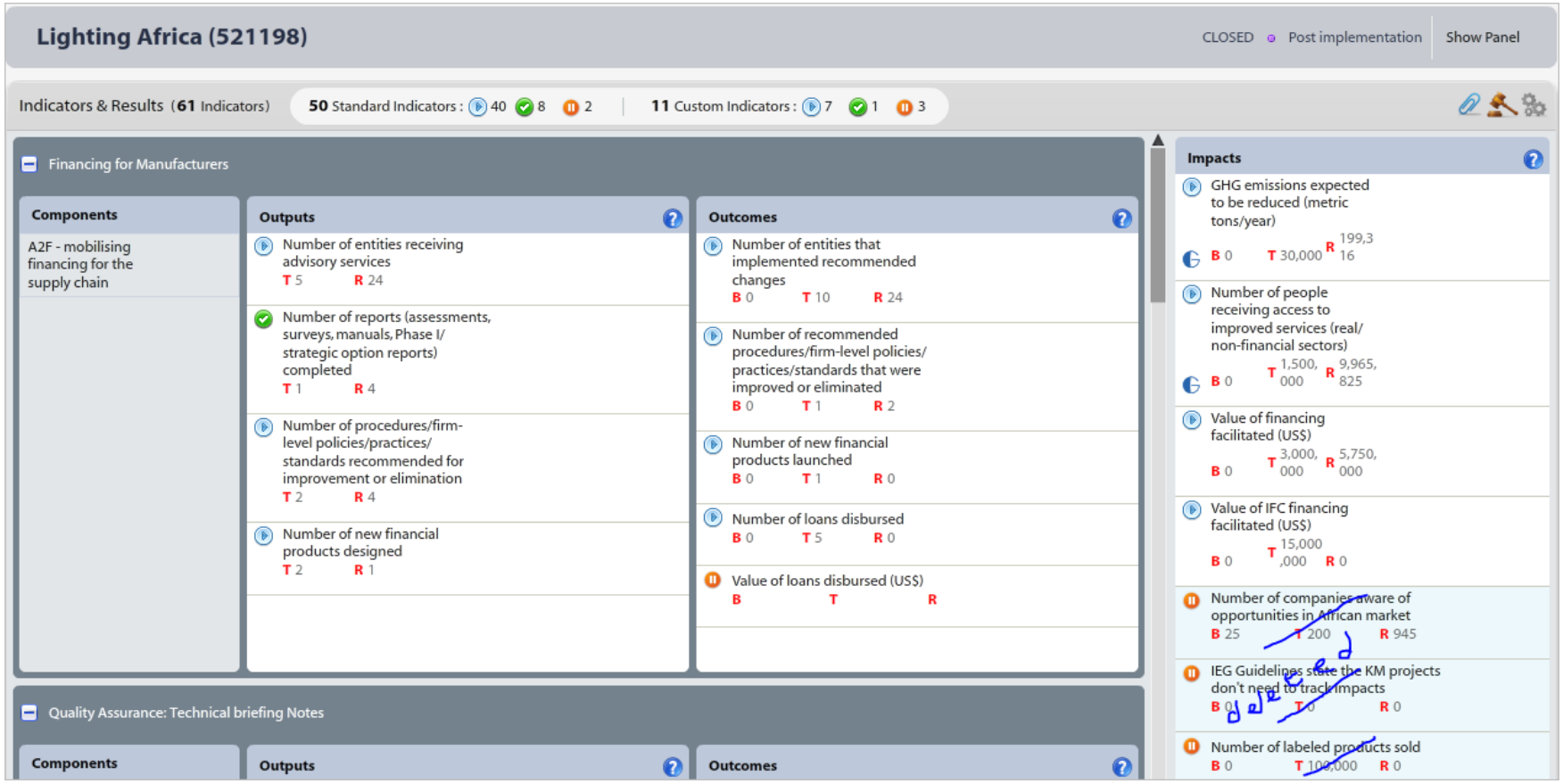
Consumer Education (launch campaign)	N/A	Number of people reporting improved knowledge/attitude/practices

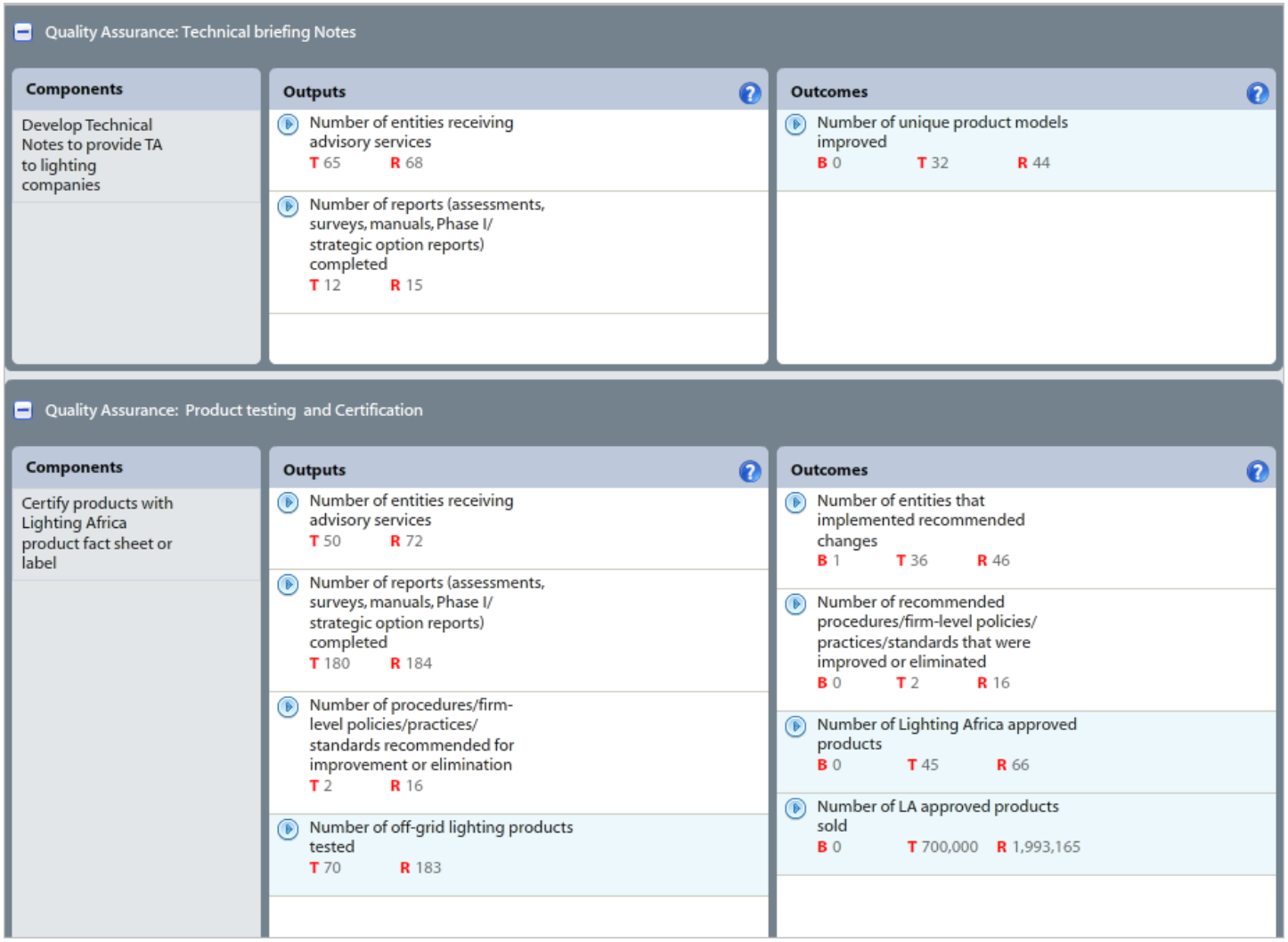
Source: Logframes

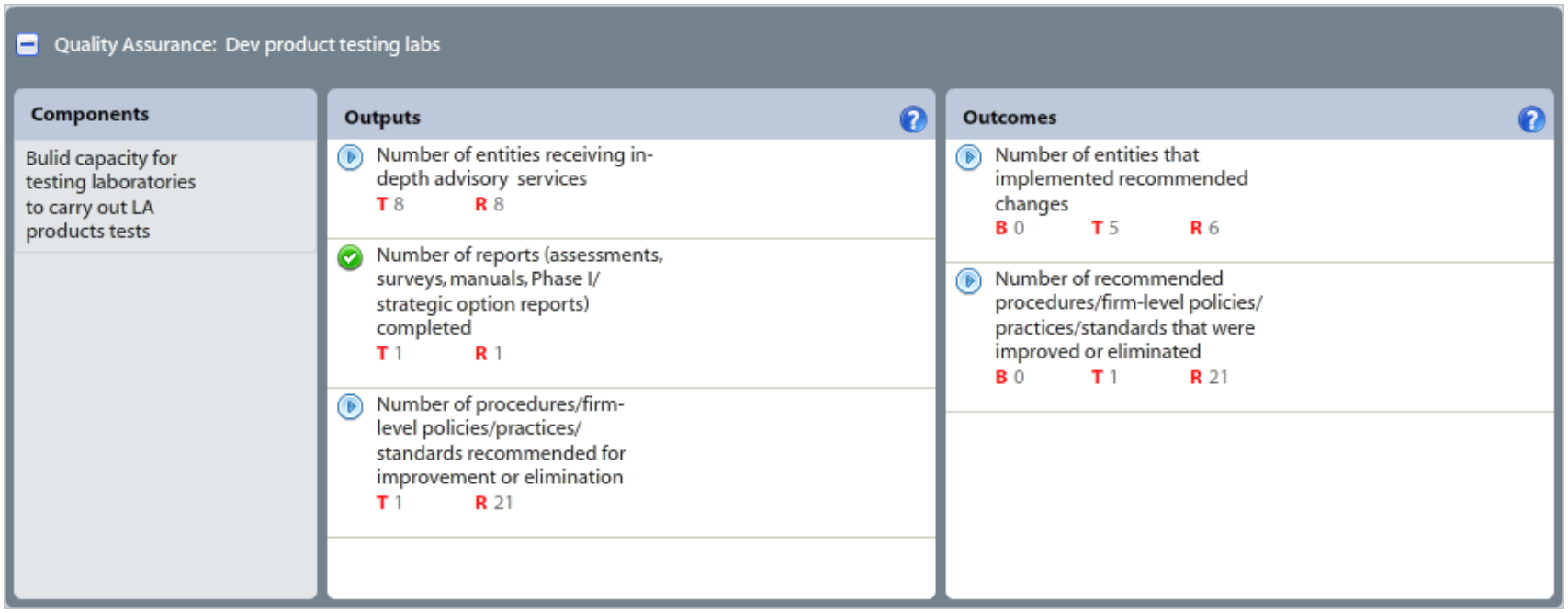
Appendix I LA Logframes

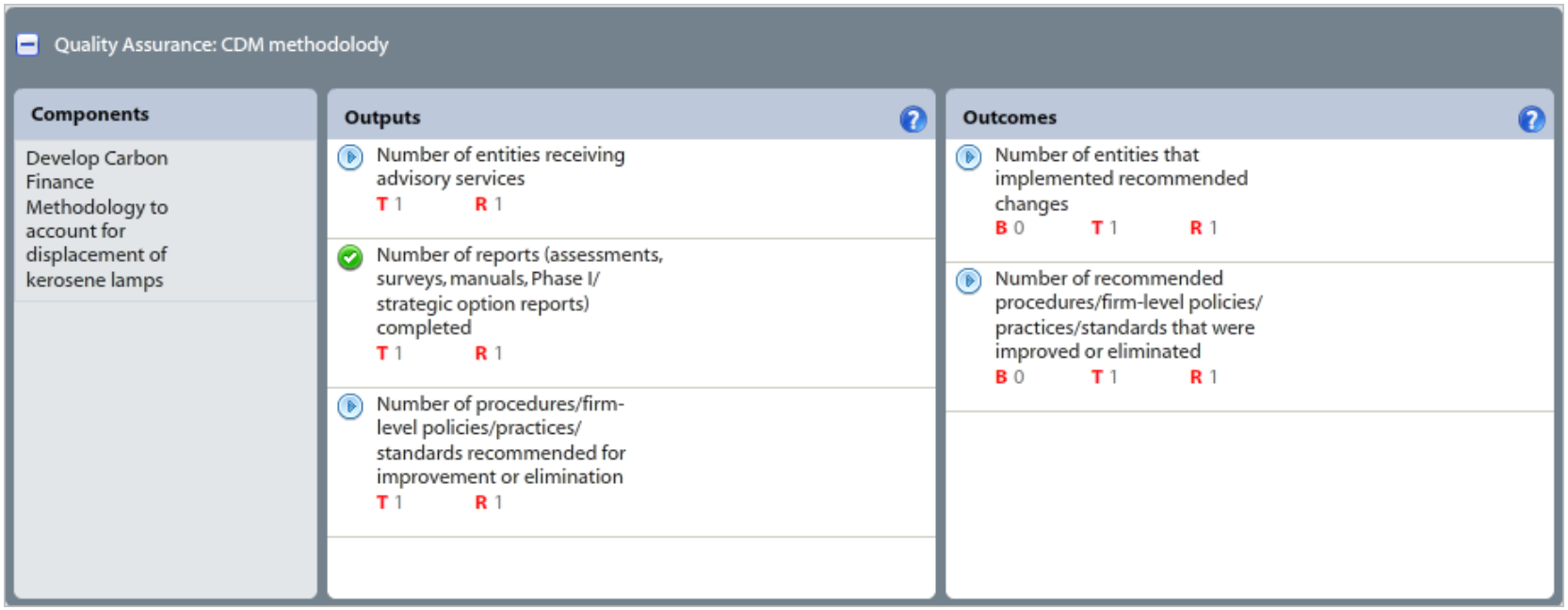
I.1 LA JV Logframes

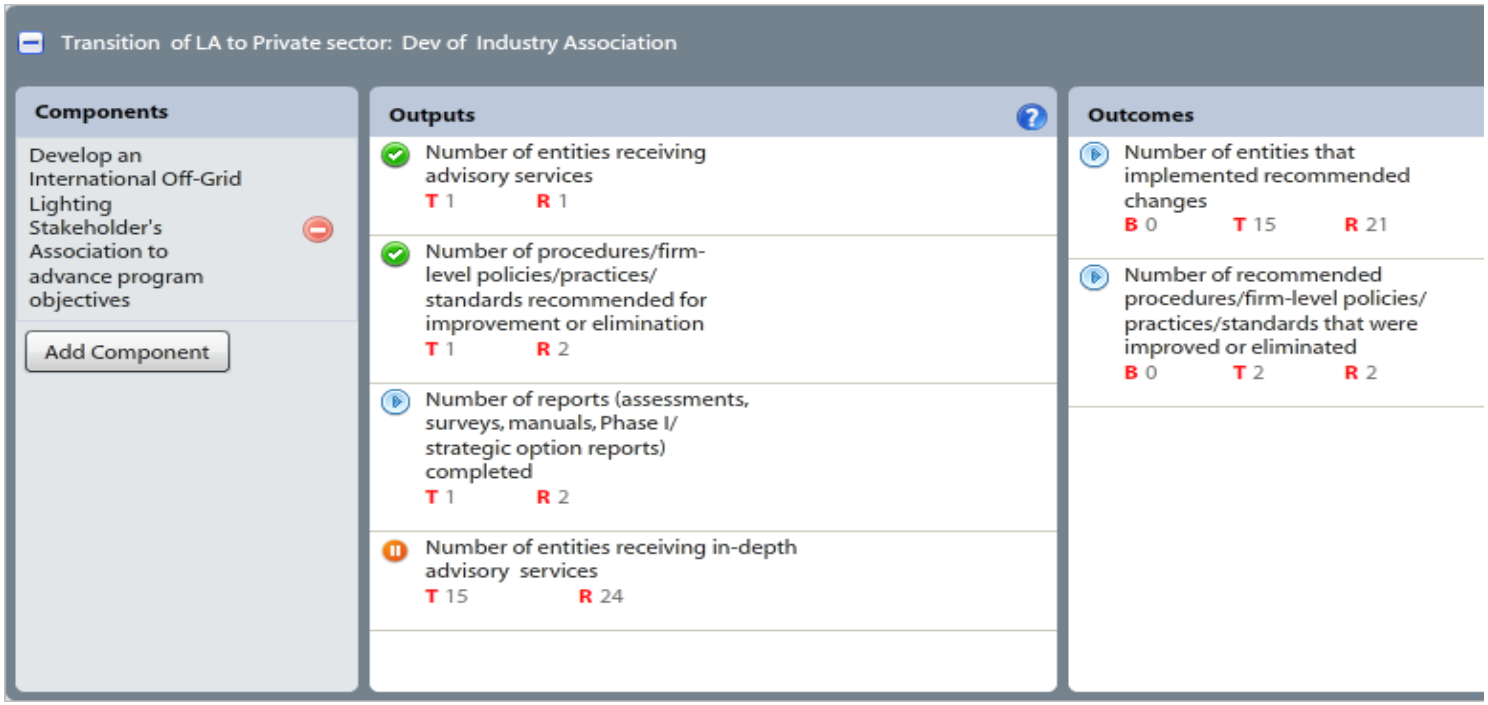
Table I.1: Logframe Tables: LA Global

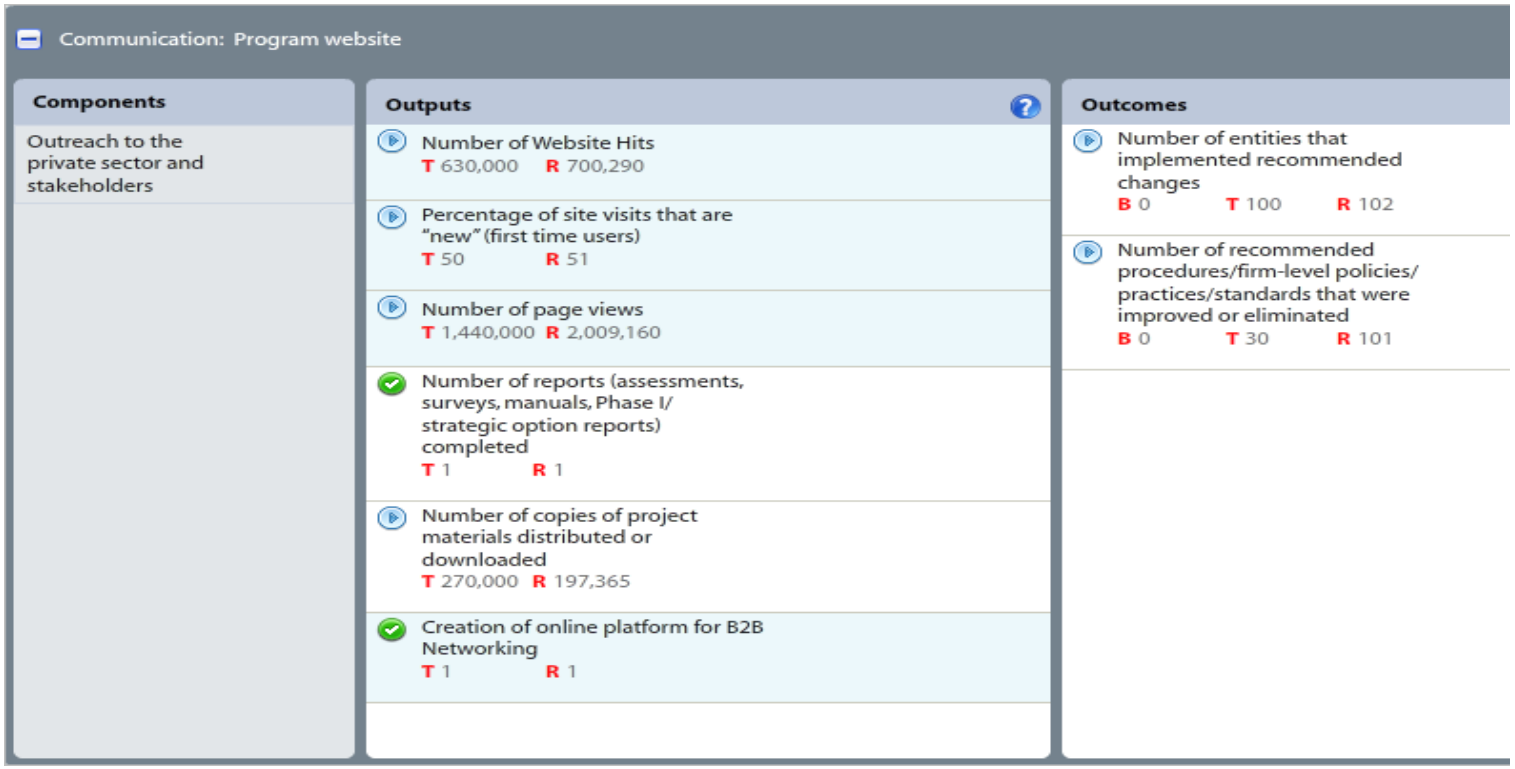


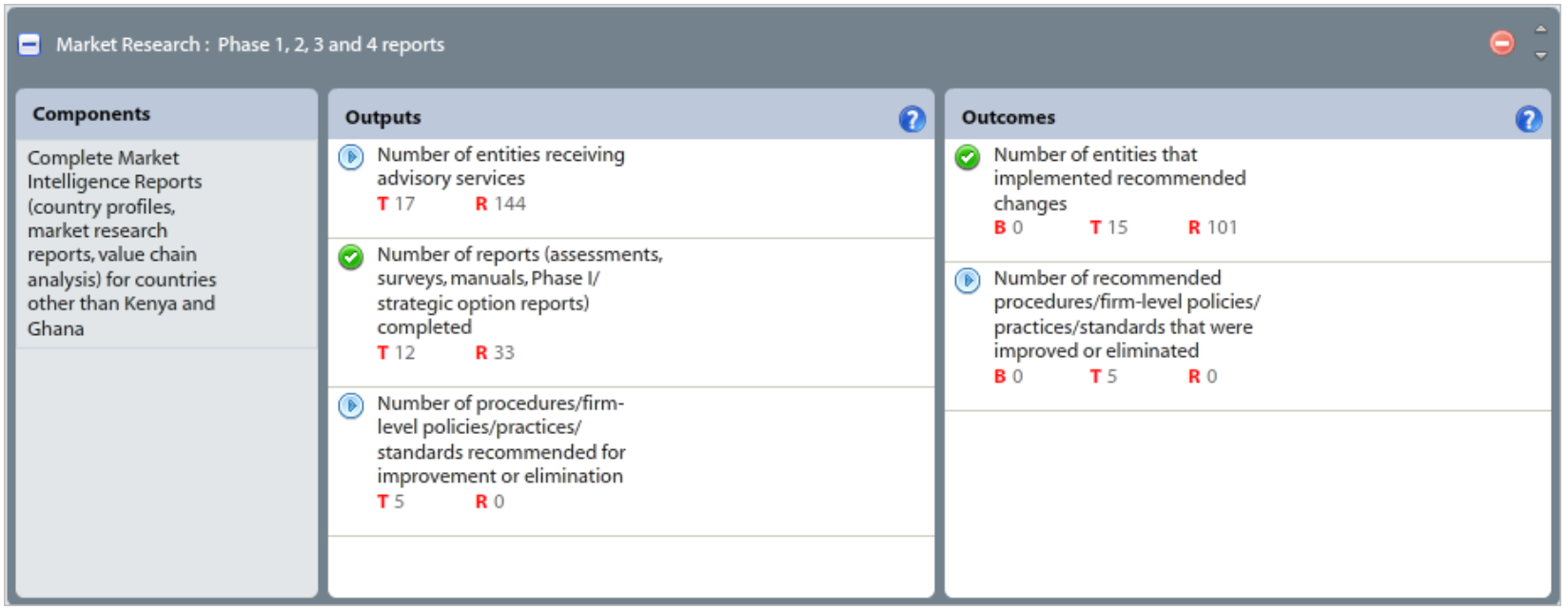

Quality Assurance: Technical briefing Notes
Components
Develop Technical Notes to provide TA to lighting companies
Outputs
Number of entities receiving advisory services
T 65 R 68
Number of reports (assessments, surveys, manuals, Phase I/ strategic option reports) completed
T 12 R 15
Outcomes
Number of unique product models improved
B 0 T 32 R 44
Quality Assurance: Product testing and Certification
Components
Certify products with Lighting Africa product fact sheet or label
Outputs
Number of entities receiving advisory services
T 50 R 72
Number of reports (assessments, surveys, manuals, Phase I/ strategic option reports) completed
T 180 R 184
Number of procedures/firm-level policies/practices/ standards recommended for improvement or elimination
T 2 R 16
Number of off-grid lighting products tested
T 70 R 183
Outcomes
Number of entities that implemented recommended changes
B 1 T 36 R 46
Number of recommended procedures/firm-level policies/ practices/standards that were improved or eliminated
B 0 T 2 R 16
Number of Lighting Africa approved products
B 0 T 45 R 66
Number of LA approved products sold
B 0 T 700,000 R 1,993,165

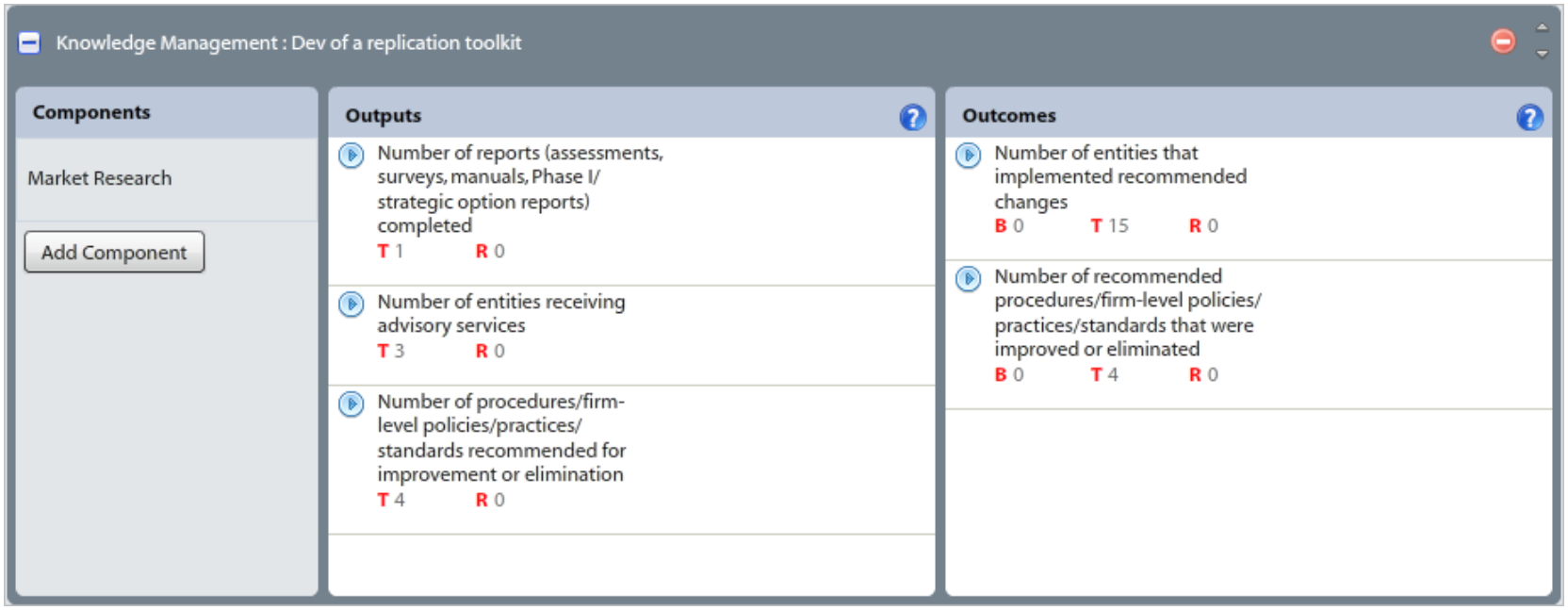

Quality Assurance: Dev product testing labs
Components
Bulid capacity for testing laboratories to carry out LA products tests
Outputs
Number of entities receiving in-depth advisory services
T 8 R 8
Number of reports (assessments, surveys, manuals, Phase I/ strategic option reports) completed
T 1 R 1
Number of procedures/firm-level policies/practices/ standards recommended for improvement or elimination
T 1 R 21
Outcomes
Number of entities that implemented recommended changes
B 0 T 5 R 6
Number of recommended procedures/firm-level policies/ practices/standards that were improved or eliminated
B 0 T 1 R 21


Quality Assurance: CDM methodolody
Components
Develop Carbon Finance Methodology to account for displacement of kerosene lamps
Outputs
Number of entities receiving advisory services
T 1 R 1
Number of reports (assessments, surveys, manuals, Phase I/ strategic option reports) completed
T 1 R 1
Number of procedures/firm-level policies/practices/ standards recommended for improvement or elimination
T 1 R 1
Outcomes
Number of entities that implemented recommended changes
B 0 T 1 R 1
Number of recommended procedures/firm-level policies/ practices/standards that were improved or eliminated
B 0 T 1 R 1


Transition of LA to Private sector: Dev of Industry Association
Components
Develop an International Off-Grid Lighting Stakeholder's Association to advance program objectives
Add Component
Outputs
Number of entities receiving advisory services
T 1 R 1
Number of procedures/firm-level policies/practices/ standards recommended for improvement or elimination
T 1 R 2
Number of reports (assessments, surveys, manuals, Phase I/ strategic option reports) completed
T 1 R 2
Number of entities receiving in-depth advisory services
T 15 R 24
Outcomes
Number of entities that implemented recommended changes
B 0 T 15 R 21
Number of recommended procedures/firm-level policies/ practices/standards that were improved or eliminated
B 0 T 2 R 2


Communication: Program website
Components
Outreach to the private sector and stakeholders
Outputs
Number of Website Hits
T 630,000 R 700,290
Percentage of site visits that are "new" (first time users)
T 50 R 51
Number of page views
T 1,440,000 R 2,009,160
Number of reports (assessments, surveys, manuals, Phase I/ strategic option reports) completed
T 1 R 1
Number of copies of project materials distributed or downloaded
T 270,000 R 197,365
Creation of online platform for B2B Networking
T 1 R 1
Outcomes
Number of entities that implemented recommended changes
B 0 T 100 R 102
Number of recommended procedures/firm-level policies/ practices/standards that were improved or eliminated
B 0 T 30 R 101

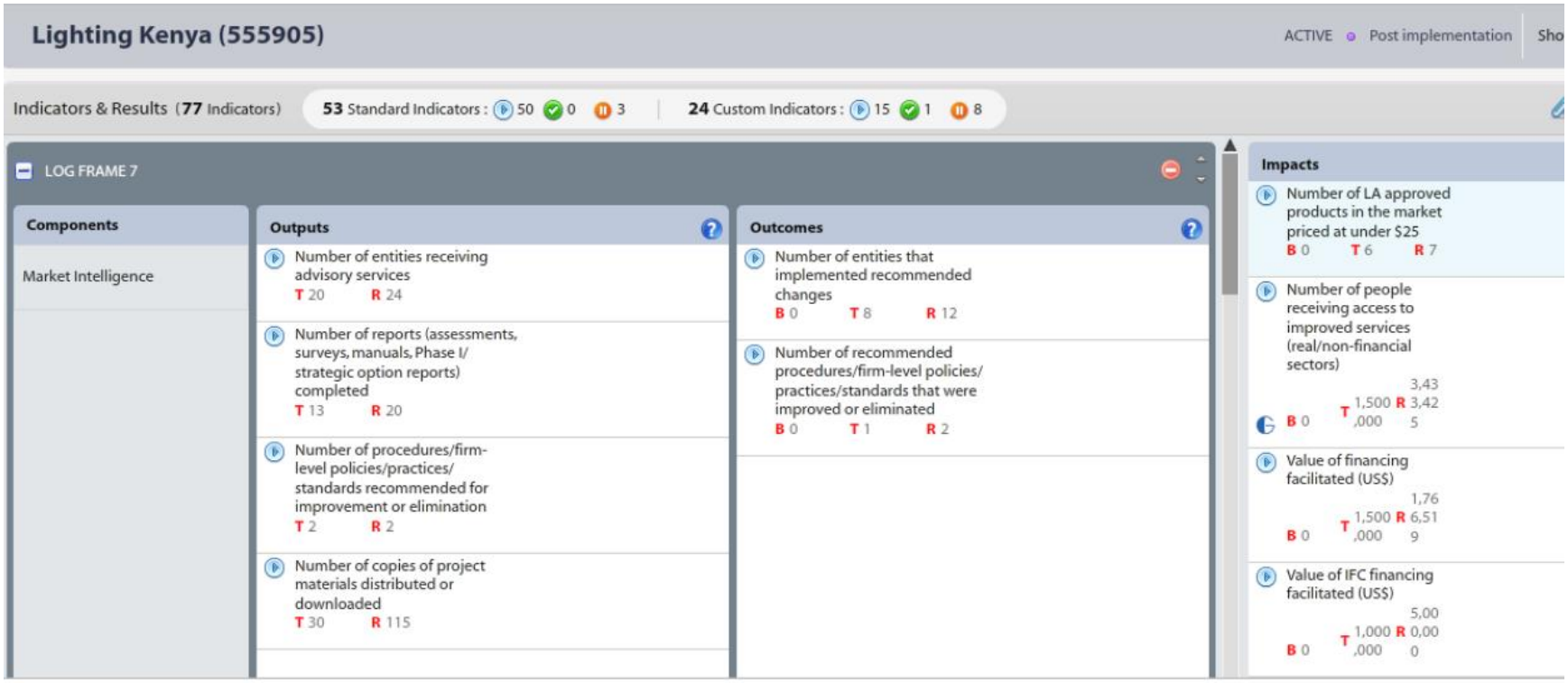

Market Research : Phase 1, 2, 3 and 4 reports
Components
Complete Market Intelligence Reports (country profiles, market research reports, value chain analysis) for countries other than Kenya and Ghana
Outputs
Number of entities receiving advisory services
T 17 R 144
Number of reports (assessments, surveys, manuals, Phase I/ strategic option reports) completed
T 12 R 33
Number of procedures/firm-level policies/practices/ standards recommended for improvement or elimination
T 5 R 0
Outcomes
Number of entities that implemented recommended changes
B 0 T 15 R 101
Number of recommended procedures/firm-level policies/ practices/standards that were improved or eliminated
B 0 T 5 R 0

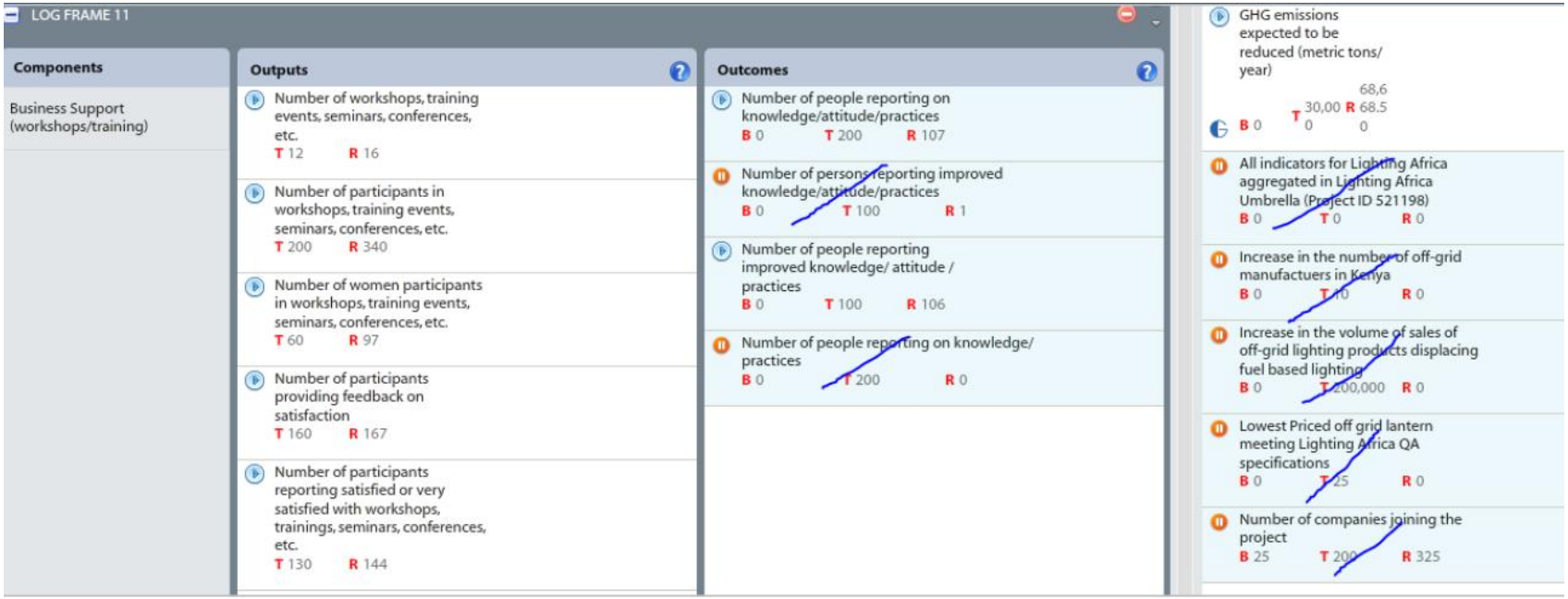

Knowledge Management : Dev of a replication toolkit
Components
Market Research
Add Component
Outputs
Number of reports (assessments, surveys, manuals, Phase I/ strategic option reports) completed
T 1 R 0
Number of entities receiving advisory services
T 3 R 0
Number of procedures/firm-level policies/practices/ standards recommended for improvement or elimination
T 4 R 0
Outcomes
Number of entities that implemented recommended changes
B 0 T 15 R 0
Number of recommended procedures/firm-level policies/ practices/standards that were improved or eliminated
B 0 T 4 R 0

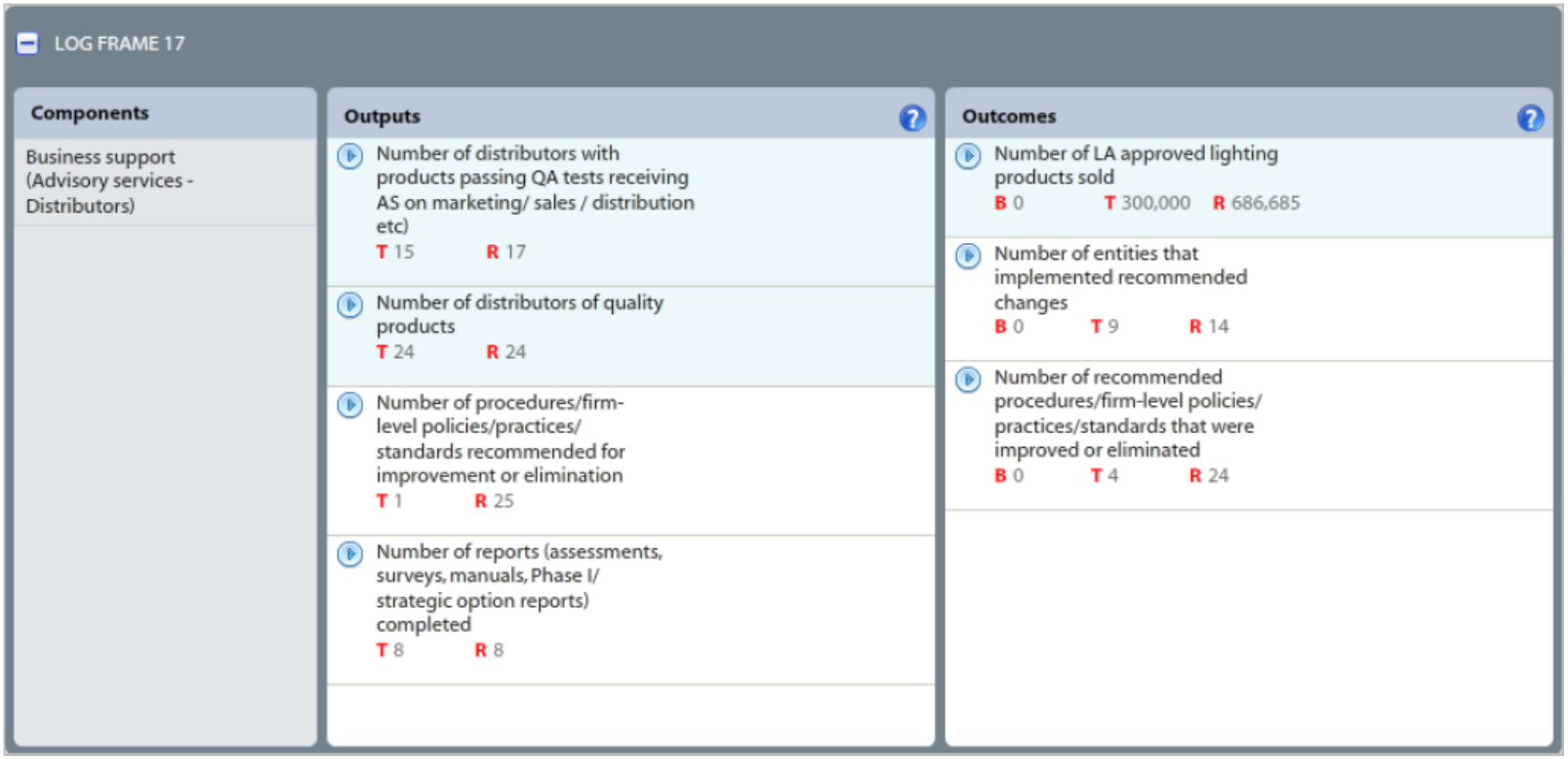
Source: IFC

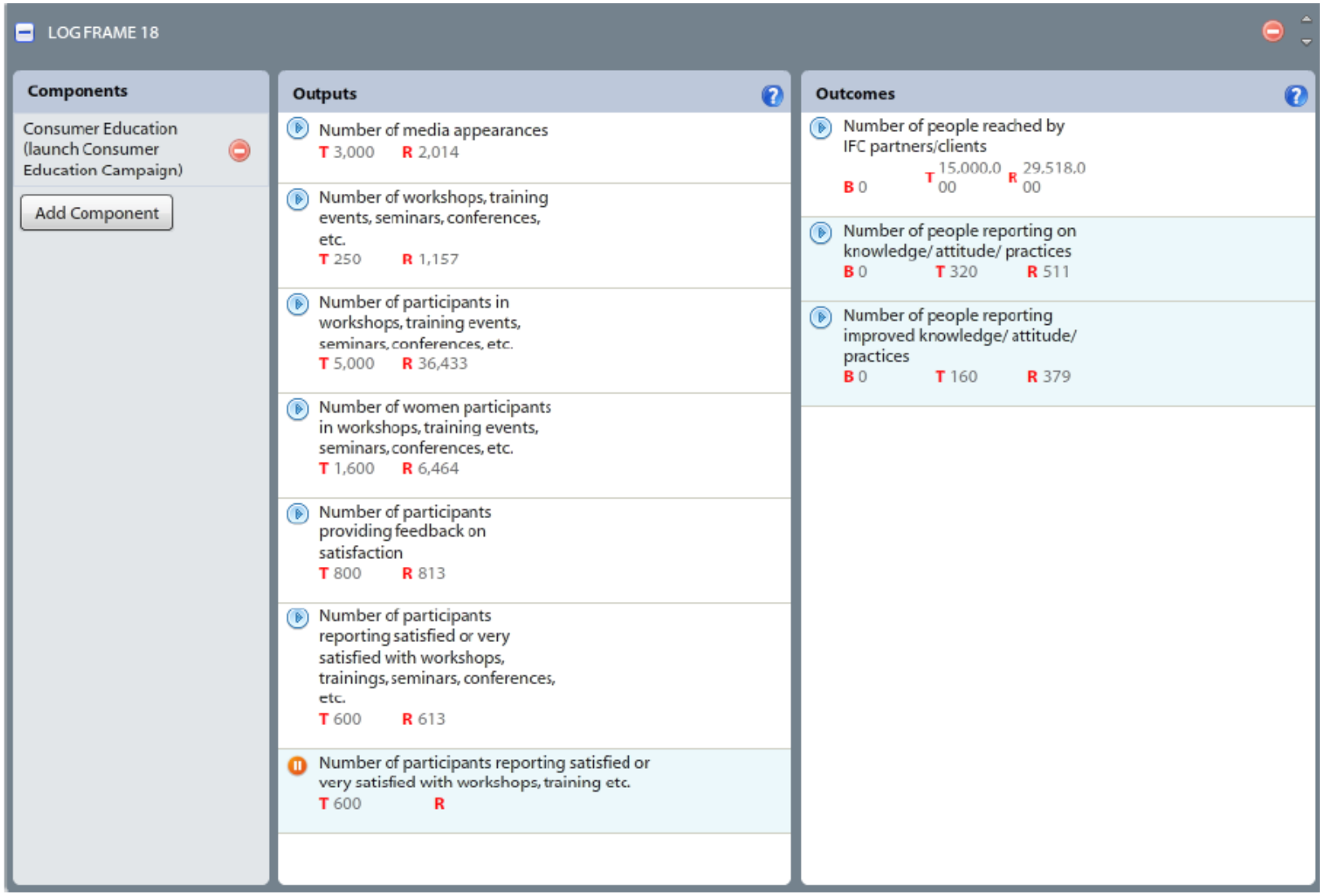
I.2 LA Kenya Logframes

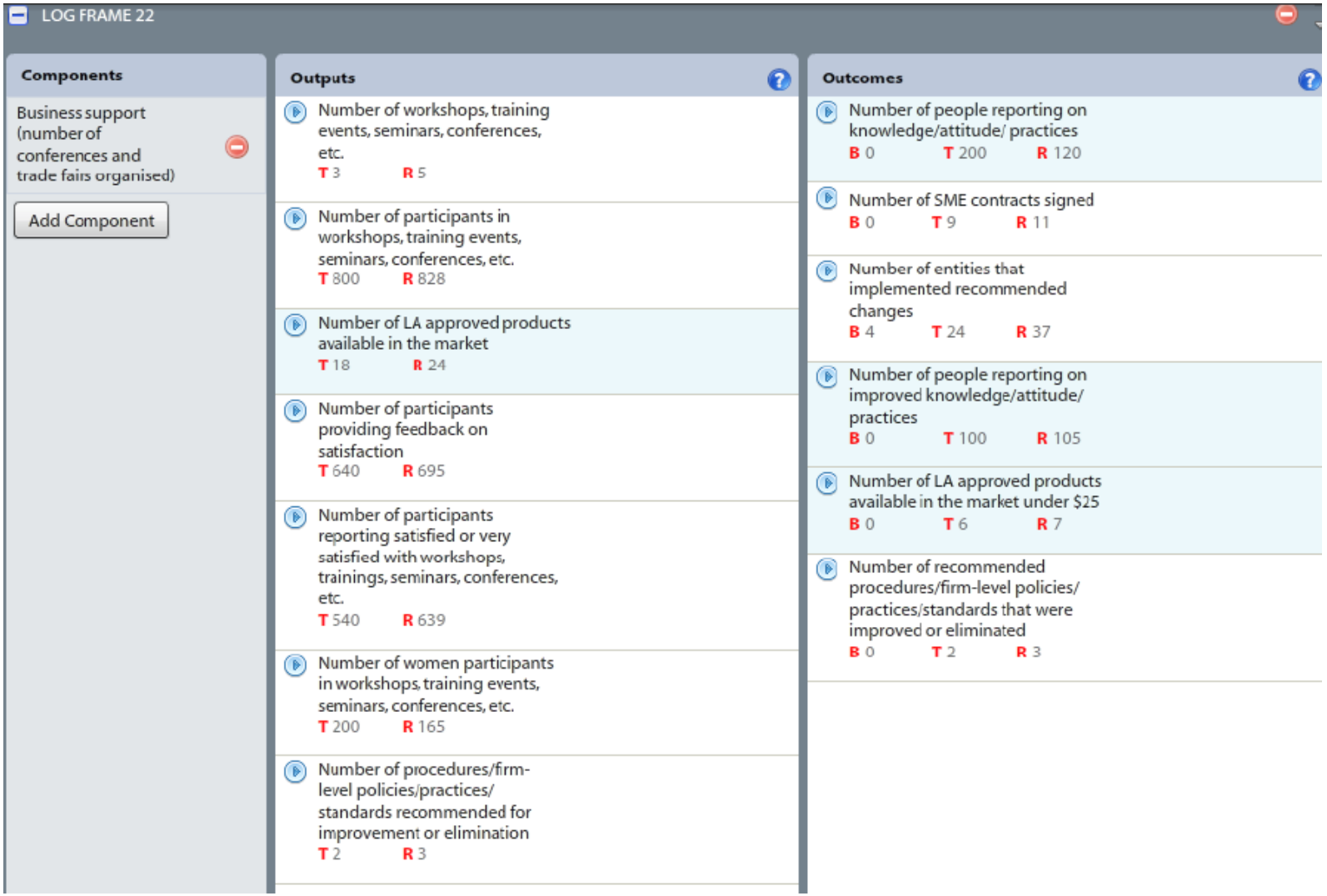
Table I.2: Logframe Tables: LA Kenya

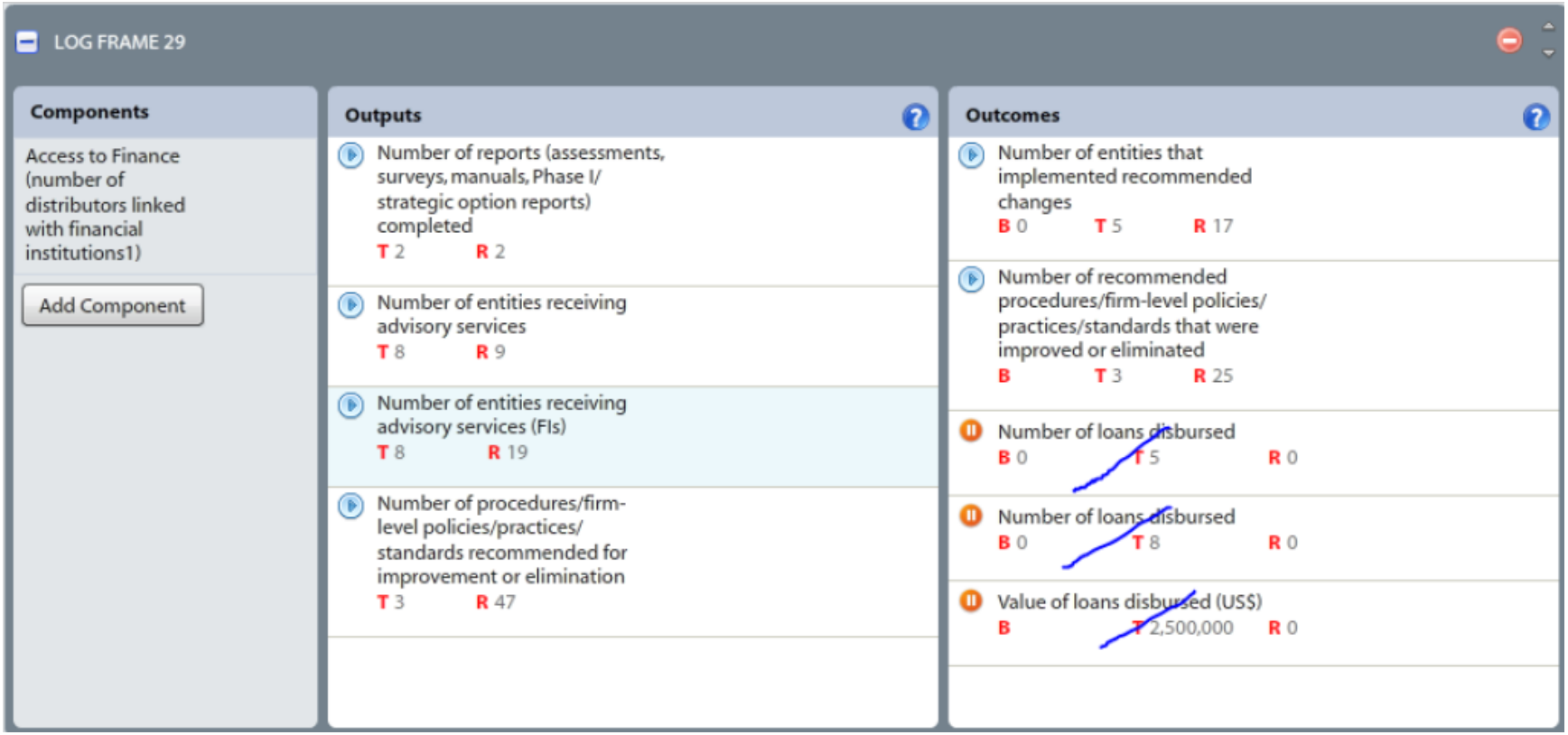


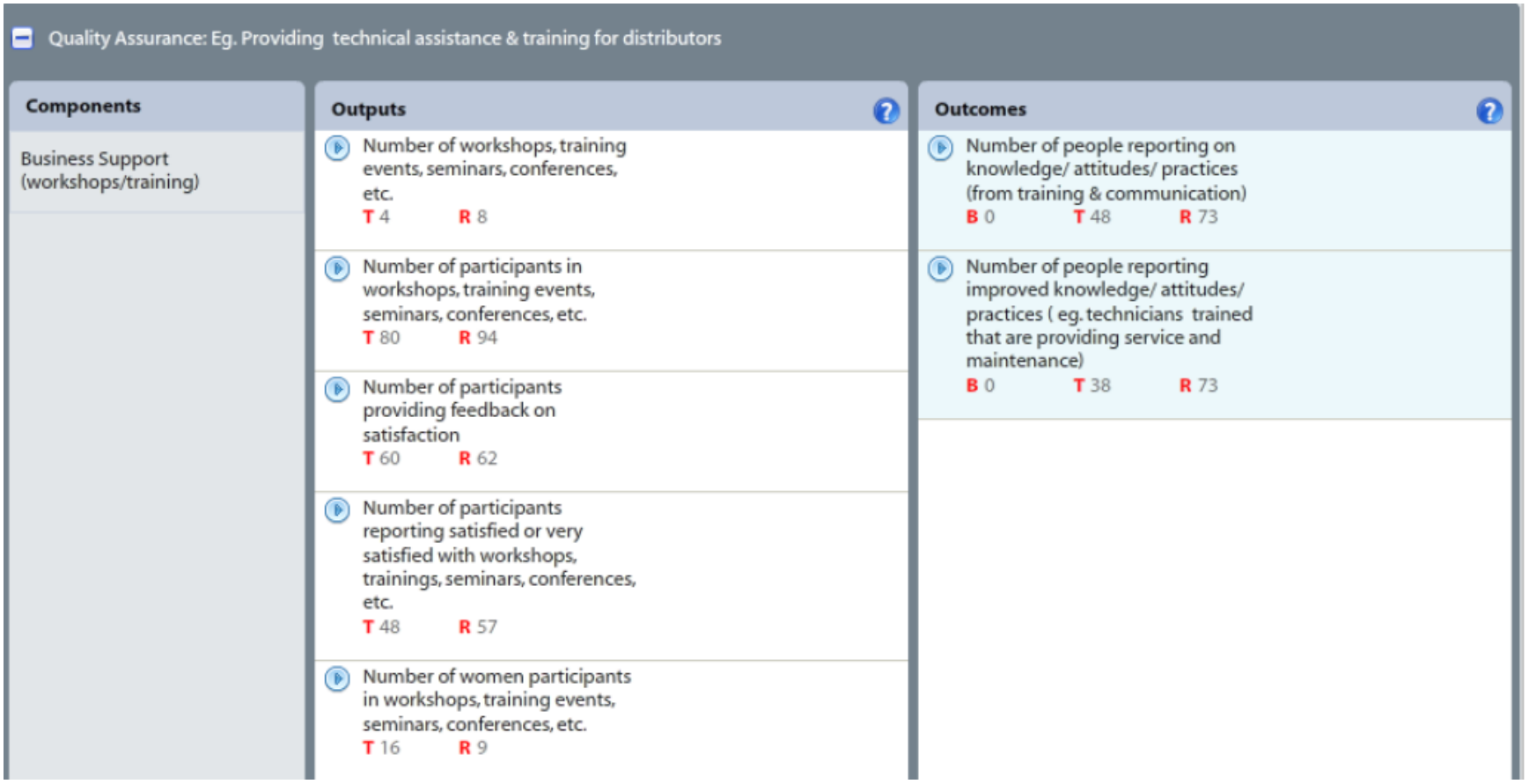

LOG FRAME 11
Components
Business Support (workshops/training)
Outputs
Number of workshops, training events, seminars, conferences, etc.
T 12 R 16
Number of participants in workshops, training events, seminars, conferences, etc.
T 200 R 340
Number of women participants in workshops, training events, seminars, conferences, etc.
T 60 R 97
Number of participants providing feedback on satisfaction
T 160 R 167
Number of participants reporting satisfied or very satisfied with workshops, trainings, seminars, conferences, etc.
T 130 R 144
Outcomes
Number of people reporting on knowledge/attitude/practices
B 0 T 200 R 107
Number of persons reporting improved knowledge/attitude/practices
B 0 T 100 R 1
Number of people reporting improved knowledge/ attitude / practices
B 0 T 100 R 106
Number of people reporting on knowledge/ practices
B 0 T 200 R 0
GHG emissions expected to be reduced (metric tons/ year)
B 0 T 30,00 0 R 68,6 68.5 0
All indicators for Lighting Africa aggregated in Lighting Africa Umbrella (Project ID 521198)
B 0 T 0 R 0
Increase in the number of off-grid manufactuers in Kenya
B 0 R 0
Increase in the volume of sales of off-grid lighting products displacing fuel based lighting
B 0 T 200,000 R 0
Lowest Priced off grid lantern meeting Lighting Africa QA specifications
B 0 T 25 R 0
Number of companies joining the project
B 25 T 200 R 325

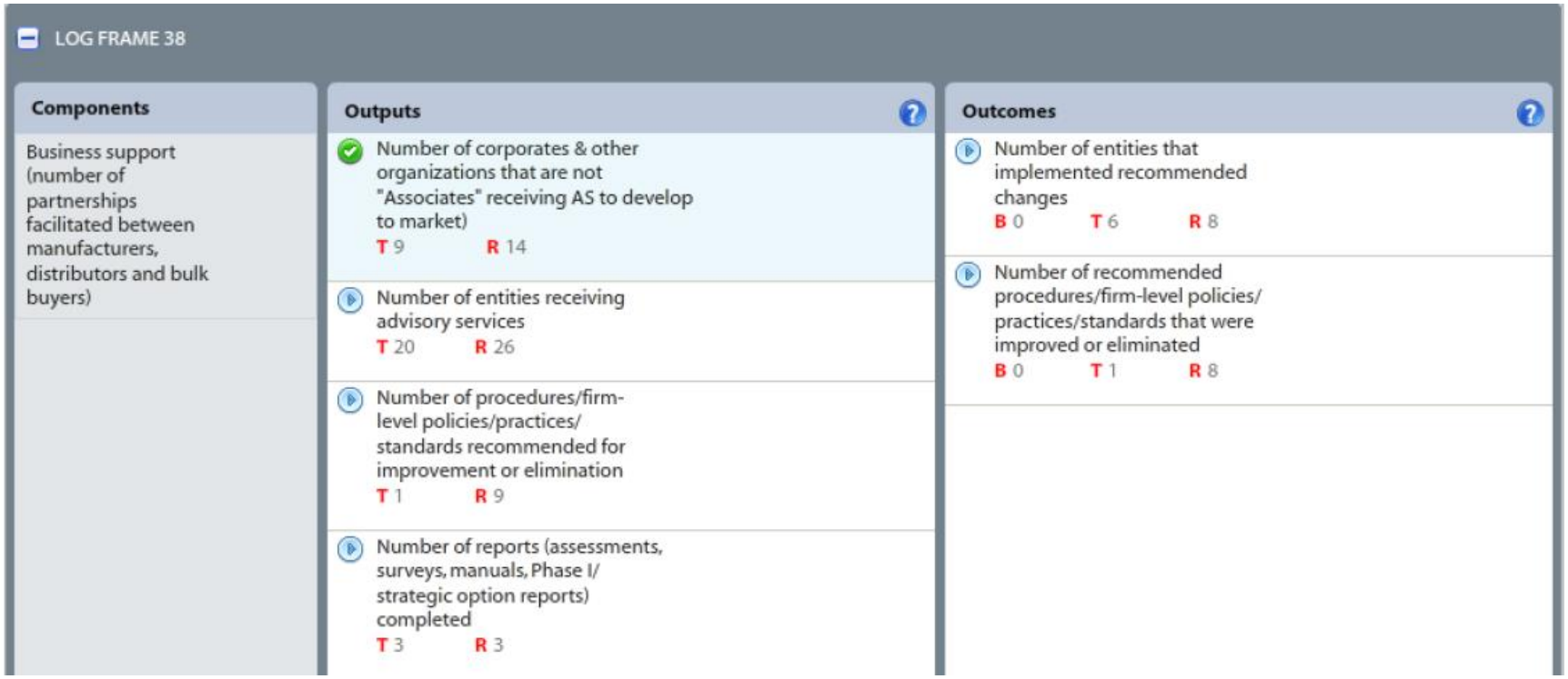

LOG FRAME 17
Components
Business support (Advisory services - Distributors)
Outputs
Number of distributors with products passing QA tests receiving AS on marketing/ sales / distribution etc)
T 15 R 17
Number of distributors of quality products
T 24 R 24
Number of procedures/firm-level policies/practices/ standards recommended for improvement or elimination
T 1 R 25
Number of reports (assessments, surveys, manuals, Phase I/ strategic option reports) completed
T 8 R 8
Outcomes
Number of LA approved lighting products sold
B 0 T 300,000 R 686,685
Number of entities that implemented recommended changes
B 0 T 9 R 14
Number of recommended procedures/firm-level policies/ practices/standards that were improved or eliminated
B 0 T 4 R 24


LOG FRAME 18
Components
Consumer Education (launch Consumer Education Campaign)
Add Component
Outputs
Number of media appearances
T 3,000 R 2,014
Number of workshops, training events, seminars, conferences, etc.
T 250 R 1,157
Number of participants in workshops, training events, seminars, conferences, etc.
T 5,000 R 36,433
Number of women participants in workshops, training events, seminars, conferences, etc.
T 1,600 R 6,464
Number of participants providing feedback on satisfaction
T 800 R 813
Number of participants reporting satisfied or very satisfied with workshops, trainings, seminars, conferences, etc.
T 600 R 613
Number of participants reporting satisfied or very satisfied with workshops, training etc.
T 600 R
Outcomes
Number of people reached by IFC partners/clients
B 0 T 15,000,000 R 29,518,000
Number of people reporting on knowledge/ attitude/ practices
B 0 T 320 R 511
Number of people reporting improved knowledge/ attitude/ practices
B 0 T 160 R 379


LOG FRAME 22
Components
Business support (number of conferences and trade fairs organised)
Add Component
Outputs
Number of workshops, training events, seminars, conferences, etc.
T 3 R 5
Number of participants in workshops, training events, seminars, conferences, etc.
T 800 R 828
Number of LA approved products available in the market
T 18 R 24
Number of participants providing feedback on satisfaction
T 640 R 695
Number of participants reporting satisfied or very satisfied with workshops, trainings, seminars, conferences, etc.
T 540 R 639
Number of women participants in workshops, training events, seminars, conferences, etc.
T 200 R 165
Number of procedures/firm-level policies/practices/ standards recommended for improvement or elimination
T 2 R 3
Outcomes
Number of people reporting on knowledge/attitude/ practices
B 0 T 200 R 120
Number of SME contracts signed
B 0 T 9 R 11
Number of entities that implemented recommended changes
B 4 T 24 R 37
Number of people reporting on improved knowledge/attitude/ practices
B 0 T 100 R 105
Number of LA approved products available in the market under $25
B 0 T 6 R 7
Number of recommended procedures/firm-level policies/ practices/standards that were improved or eliminated
B 0 T 2 R 3


LOG FRAME 29
Components
Access to Finance (number of distributors linked with financial institutions1)
Add Component
Outputs
Number of reports (assessments, surveys, manuals, Phase I/ strategic option reports) completed
T 2 R 2
Number of entities receiving advisory services
T 8 R 9
Number of entities receiving advisory services (FIs)
T 8 R 19
Number of procedures/firm-level policies/practices/ standards recommended for improvement or elimination
T 3 R 47
Outcomes
Number of entities that implemented recommended changes
B 0 T 5 R 17
Number of recommended procedures/firm-level policies/ practices/standards that were improved or eliminated
B T 3 R 25
Number of loans disbursed
B 0 T 5 R 0
Number of loans disbursed
B 0 T 8 R 0
Value of loans disbursed (US$)
B T 2,500,000 R 0


Quality Assurance: Eg. Providing technical assistance & training for distributors
Components
Business Support (workshops/training)
Outputs
Number of workshops, training events, seminars, conferences, etc.
T 4 R 8
Number of participants in workshops, training events, seminars, conferences, etc.
T 80 R 94
Number of participants providing feedback on satisfaction
T 60 R 62
Number of participants reporting satisfied or very satisfied with workshops, trainings, seminars, conferences, etc.
T 48 R 57
Number of women participants in workshops, training events, seminars, conferences, etc.
T 16 R 9
Outcomes
Number of people reporting on knowledge/ attitudes/ practices (from training & communication)
B 0 T 48 R 73
Number of people reporting improved knowledge/ attitudes/ practices (eg. technicians trained that are providing service and maintenance)
B 0 T 38 R 73


LOG FRAME 38
Components
Business support (number of partnerships facilitated between manufacturers, distributors and bulk buyers)
Outputs
Number of corporates & other organizations that are not "Associates" receiving AS to develop to market)
T 9 R 14
Number of entities receiving advisory services
T 20 R 26
Number of procedures/firm-level policies/practices/ standards recommended for improvement or elimination
T 1 R 9
Number of reports (assessments, surveys, manuals, Phase I/ strategic option reports) completed
T 3 R 3
Outcomes
Number of entities that implemented recommended changes
B 0 T 6 R 8
Number of recommended procedures/firm-level policies/ practices/standards that were improved or eliminated
B 0 T 1 R 8

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