



POLLINATE ENERGY

Impact Assessment Report – Solar Lights

Bangalore, India

May 2014





ACKNOWLEDGEMENTS

The Pollinate Energy Solar Lights Impact Assessment was conducted by participants of the April 2014 Young Professionals Program:

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A MESSAGE FROM THE CONTRIBUTORS

As participants of the April 2014 Young Professionals Program, our key objective was to design and implement the Pollinate Energy Solar Lights Impact Assessment. As a group, our strengths were in the diversity of our cultural backgrounds and professional expertise. We represented a range of disciplines, including engineering, science, law and the humanities, and brought with us experience in both the public and private sector. In taking a multidisciplinary approach to the task, we were able to develop comprehensive recommendations based on robust data which we hope will benefit Pollinate Energy as it evaluates and expands its operations.

We commend the co-founders on their vision and the sound implementation of Pollinate Energy. We acknowledge the positive impact Pollinate Energy is making in Bangalore, the evidence of which is clear throughout this report.

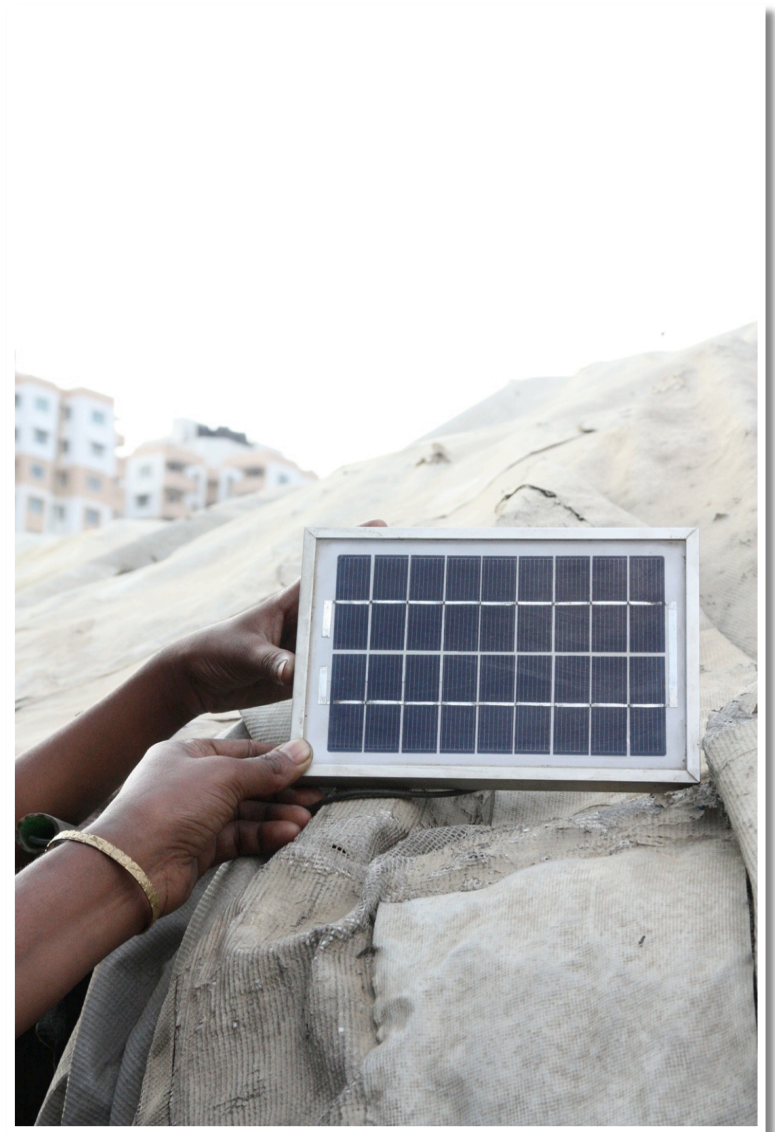
EXECUTIVE SUMMARY

The purpose of the Pollinate Energy Impact Assessment was to objectively assess emerging trends about benefits and problems with Pollinate Energy products and services and to generate robust data to provide an evidence base for future strategic planning and communication.

The data collection methodology was designed to address five Key Evaluative Questions:

1. What are the actual and perceived changes to our customers' lives as a result of purchasing solar lights?
2. To what extent do Pollinate Energy solar lights meet customers' and communities' expectations and needs?
3. What factors drive individuals to purchase/not purchase solar lights?
4. To what extent does Pollinate Energy's repayment schedule meet community needs?
5. To what extent are the solar lights reducing the environmental impacts of lighting in the communities?

Overwhelmingly, the solar lights are having a positive impact on the lives of customers. Key benefits relate to financial savings and an improved ability to cook, study and generally enjoy home life. The primary problem is insufficient battery capacity which impacted customer's ability to utilise the dual light and phone charging functions on a single charge. We have developed recommendations to assist Pollinate Energy to address this issue and improve its business as it evaluates and expands its operations in the near future.



SUMMARY OF RECOMMENDATIONS

1. Pursue the development of solar fans to respond to community issues with mosquitoes.
2. Consider products which have sufficient battery capacity to charge multiple mobile phones whilst still generating 12 or more hours of light.
3. Address community concerns about the effectiveness of the phone charging functionality by:
 - systematically checking the products to determine whether there is a technical fault;
 - managing customer expectations by explaining the time frames for mobile charging and lighting relative to a single charge; and
 - providing customers with a check-list of common issues to enable them to work through any mobile charging issues.
4. Introduce a pipe in the installation kit to protect the cord from rats.
5. Collect additional data at the point of sale to enable ongoing monitoring and evaluation of Pollinate Energy's work, including (per household):
 - reasons why the customer purchased the product; amount of money spent on a) lighting, b) health care, and c) phone charging; number of hours school children spend studying; amount of income earned per week if self-employed.
6. Incorporate a return on investment per income category in marketing materials so that community members are aware how quickly they will recoup the cost of the light in reduced kerosene costs.
7. Strengthen Pollinate Energy's after-sale service approach by:
 - maintaining an ongoing schedule of after-sales visits (possibly quarterly) to communities even if the Pollinator is no longer making sales there;
 - instituting systematic 'cross-pollination' whereby Pollinators visit and service each-others' communities to mitigate against risks of relying exclusively on any individual Pollinator.

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POLLINATE ENERGY

Pollinate Energy is a social enterprise with a mission to improve the lives of India's urban poor. Established in Bangalore, India, Pollinate Energy employs a network of local 'Pollinators' to distribute solar lights to households in urban slum communities.

The Issue

Energy poverty is a significant determinant of poverty in the developing world. For people living in slum communities, energy poverty means a complete lack of access to modern electricity and cooking fuels. Households rely on wood, kerosene and candles for light and fuel. Globally, 1.3 billion people live in energy poverty.*

The Solution

Pollinate Energy chose to launch its operations in Bangalore, India. With over 25% of its population living without access to electricity*, India provided a clear market for sustainable energy solutions. Pollinate Energy supplies solar lights and energy efficient cook stoves to people in urban slum communities across Bangalore. Pollinate Energy is in the process of expanding its business to incorporate further products and service additional locations across India.

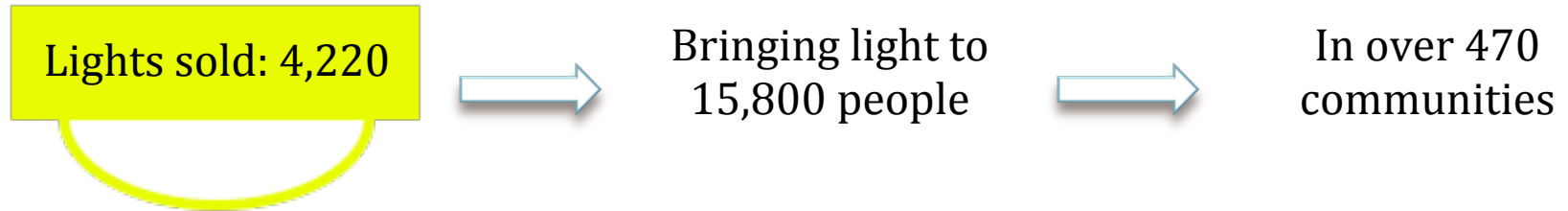


Pollinate Energy is a 'Social Enterprise'
Pollinate Energy aims to be a financially self-sustainable business with a social purpose. Pollinate Energy Australia is a registered charity in Australia and the owner of Pollinate Energy India.

*See Endnote 1, Appendix 1

KEY IMPACTS

At the time of the Impact Assessment*...



Reduction in kerosene usage: 263,328 litres per year saving 13,684 tonnes CO₂e per year

Combined customer savings and additional income:

332,663 rupees per week

(approx \$US 5,655 per week)

17 Pollinators

10 men, 7 women

Pollinators provide door-to-door service to urban slum customers, making sales, collecting repayments and servicing faulty products. Pollinators have weekly sales targets of 30-40 lights (depending on length of their employment).

5 worker bees

3 men, 2 women

Worker bees reside in larger slum communities, assisting the Pollinators with making sales and making a small commission on each sale. The worker bees assist the Pollinators to further penetrate their markets.



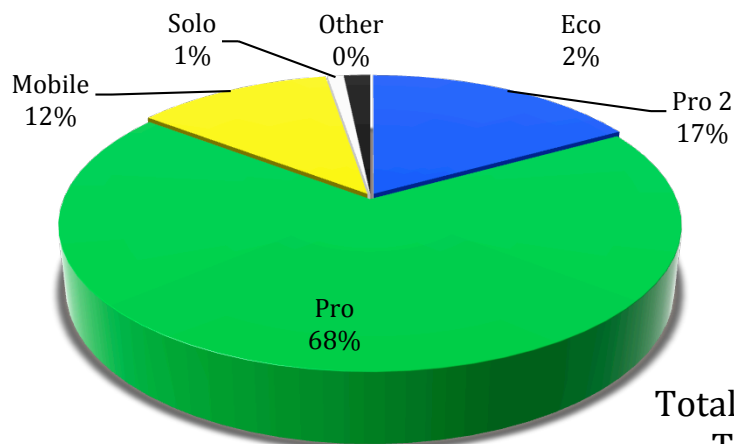
*See Endnote 2, Appendix 1

SOLAR LIGHT PRODUCT RANGE

Pollinate Energy supplies a range of solar light products to meet the varying needs and budgets of its customers. Payment by installment is available to most customers.

SUN KING SOLAR LIGHT	SPECIFICATIONS
Sun King Pro 2	2x Mobile chargers; 15x brighter than kerosene; 36 hours single charge
Sun King Pro	Mobile charger; 10x brighter than kerosene; 30 hours single charge
Sun King Mobile	Mobile charger; 8x brighter than kerosene; 36 hours single charge
Sun King Solo	5x brighter than kerosene; 24 hours single charge
Sun King Eco	2x brighter than kerosene; 30 hours single charge

Products owned by respondents



Total respondents: 220
Total products: 307



COMMUNITY PROFILE

Average
people living
in a
household

5

Average
income
per person
per day

\$1.80 USD

Average
length of
time in
community

7 years

Average weekly
kerosene use
before solar
light

1.4 Litres

Pollinate Energy customers live in the urban slums of Bangalore. These communities are populated by individuals and families who have relocated from rural areas in search of employment and higher incomes.

Most people are employed to do manual labour, including construction, rag picking, street and public facility sweeping, domestic work and waste collection. Most people lack access to savings or credit.



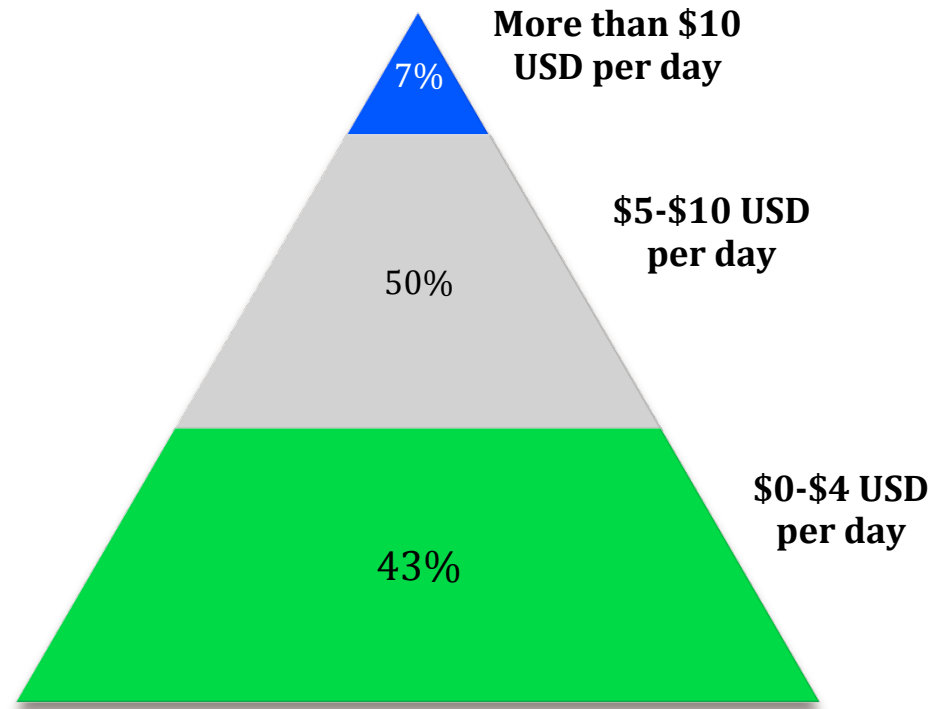
People live in tents, typically made of tarpaulins and organised into rows or clusters. They have a door at the front and no windows.

Slums generally lack basic facilities including electricity, clean water, sanitation and waste management systems.

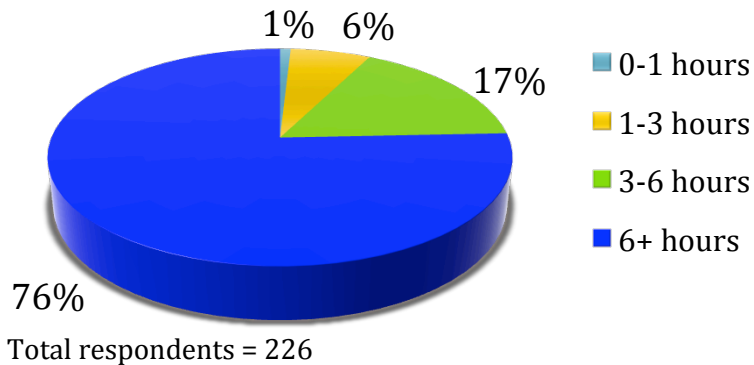
CUSTOMER PROFILE



Average income of members of customer households (\$USD per person per day PPP)



No of hours customers use the light per day



Total respondents = 326
Note: income has been adjusted for purchasing power parity

Pollinate Energy customers...

Use the light every day

Run the light for 6+ hours at a time

Repay the light within 5 weeks

METHODOLOGY

The Impact Assessment was conducted by 11 international volunteers and 4 Indian volunteers as part of the April 2014 Pollinate Energy Young Professionals Program.

Data was collected in person, via 3 methods:

- 262 **surveys**
- 22 card visualisation and ranking **workshops** (up to 5 participants per workshop)
- 23 **evaluative stories**

Data was collected from:

381 people

- 341 customers
- 40 non-customers

53 slum communities

- across 4 regions
- representing 10% of the communities serviced by Pollinate Energy

Existing Pollinate Energy data was used to develop a proportionate sample based on:

- the number of customers in each region
- the length of time customers had owned a light
- the number of customers who had delayed and defaulted on their payment plan

Table 1: Impact Assessment sample target and actual sample			
Category		Target (% of respondents)	Actual sample (% of respondents)
Number of respondents per region	North	50%	41%
	East	26%	40%
	South	13%	10%
	West	11%	9%
Gender	Female	50%	53%
	Male	50%	47%
Length of time the respondent has owned the light	Less than 3 months	20%	29%
	3- 9 months	53%	48%
	More than 9 months	26%	23%
Religion	Christian	N/A	5%
	Hindu	N/A	83%
	Muslim	N/A	12%
	Other	N/A	0%
Number of people who have delayed/defaulted		22%	5%

- Respondents in each community were randomly selected for data collection (stratified random sampling)

METHODOLOGY continued...

The strengths of the methodology, and the strategies in place to mitigate the limitations of its implementation, can be summarised as follows:

Strength	Limitation	Mitigation strategy
Use of three different data collection methods to verify results	Possible inaccuracy of responses	Systematic sampling across communities to capture broad trends
Multi-cultural teams brought diverse skills and experiences to the assessment	Language barriers and possible inconsistency of translation	Indian team members were included in every team, and all members understood data needs
Pollinators' links with communities helped the team to build trust with respondents	Bias arising from data collectors' affiliation with Pollinate Energy	Explaining the purpose of the evaluation to help respondents understand the value of providing objective answers
Diverse insights and experiences identified through different approaches to data collection	Variation in the execution of data collection methods	Mixing up team composition and training all teams on data collection methods
Use of online tool aided consistency of responses	Inaccuracy and inconsistency in data recorded	Ongoing checking and feedback on data accuracy
Gained broad community views and experiences	Multiple people contributing to answers	Sitting in private spaces where possible, focusing in on the respondent's opinion
Efficient data collection	Technology errors affecting data	Ongoing review of data received



Photo: Participants rank benefits of the solar lights in a card visualisation and ranking workshop



SECTION 1: IMPACTS ON CUSTOMERS' LIVES

SECTION 1: IMPACTS ON CUSTOMERS' LIVES

This section responded to Key Evaluation Question 1: What are the actual and perceived changes to our customers' lives as a result of purchasing a solar light?

Key Findings:

- The key benefits of the solar light, both in terms of the number of customers who experienced the benefit and its importance relative to other benefits, were **improved quality of family and community time** and **financial benefits**.
- A greater proportion of women reported **financial benefits** and **ease of undertaking household duties** to be the most important benefits.
- A greater proportion of men reported **mobile phone charging** as the most important benefit.
- There was no discernable difference between Muslim, Hindu or Christian respondents.

Recommendation:

1. Pursue the development of solar fans to respond to community issues with mosquitoes.

KEY IMPACTS

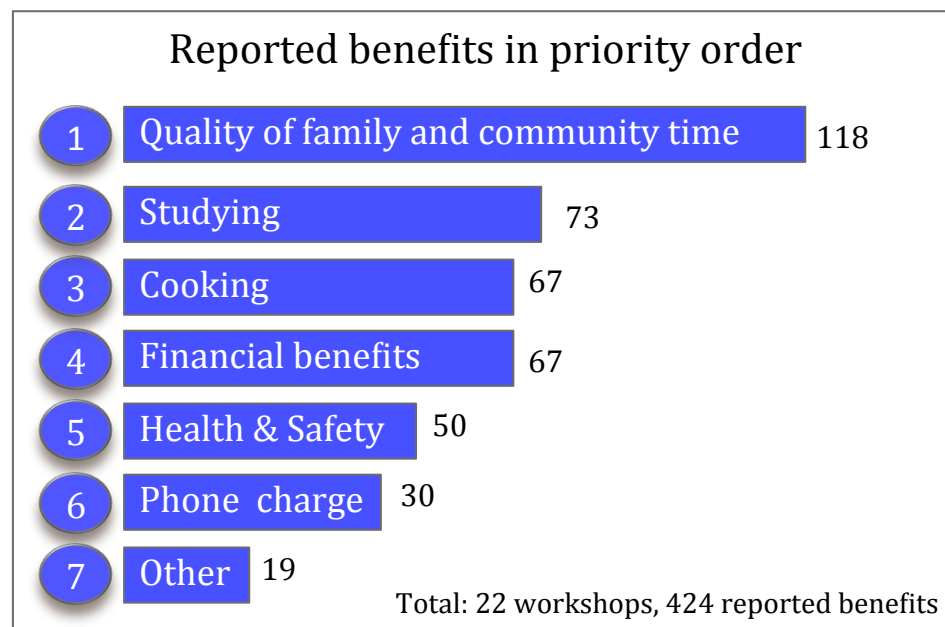
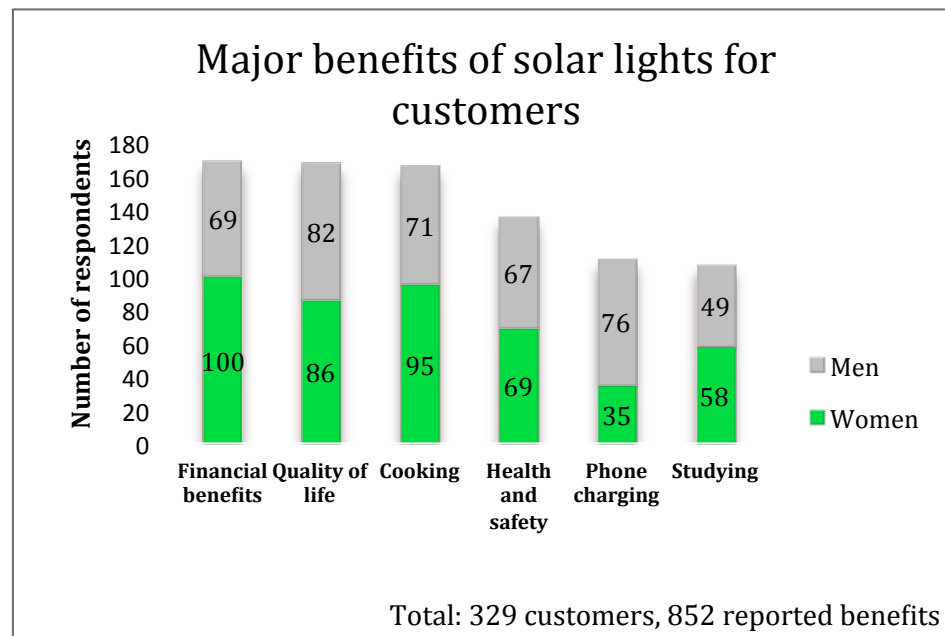
6 Key Benefits:

Customers reported six key benefits of the Pollinate Energy solar light:

- **Financial benefits**- 98% (169 customers)
- **Improved quality of family and community time**- 50% (168 customers)
- **Ease of undertaking household duties**- 50% (166 customers)
- **Improved household health and safety**- 41% (136 customers)
- **Mobile phone charging**- 34% (111 customers)
- **Children are better able to study**- 47% (107 customers)

Note: Percentages do not total 100 as customers reported more than one benefit per light.

Diagram (right) shows the benefits in priority order as ranked by customers in the card visualisation and ranking workshops.



KEY IMPACT: Financial benefits

Customers are achieving significant financial savings and increased income from the use of solar lighting.

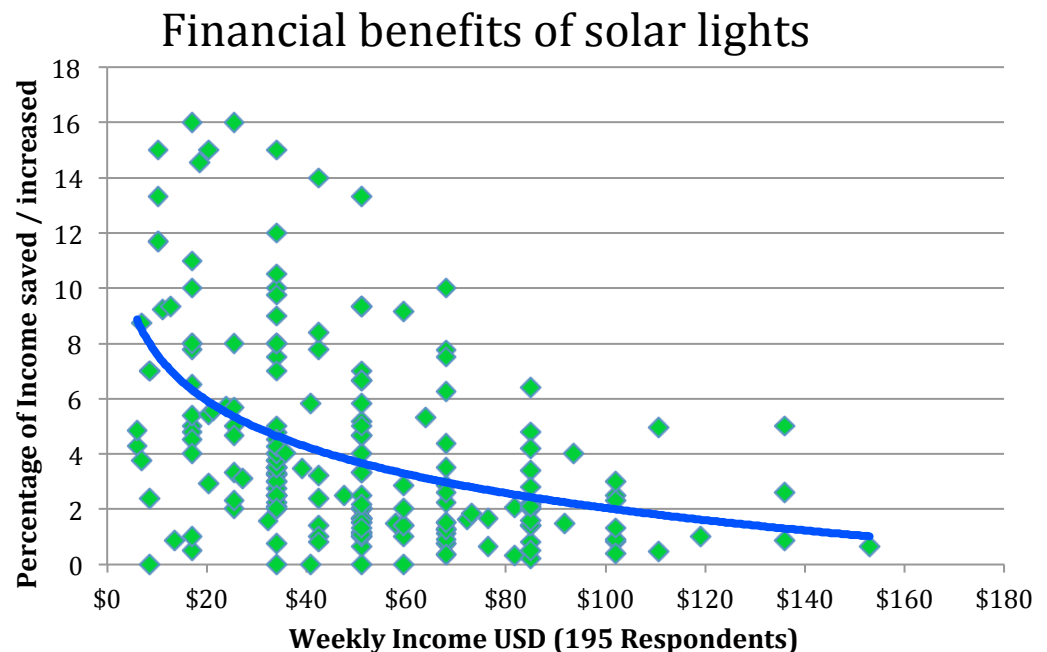
98% of customers reported financial benefits from using the solar light, including:

- 90% of customers had reduced expenditure on lighting
- 27% of customers had reduced expenditure on mobile phone charging
- 4% of customers earned additional income due to the light

Full return on investment in < 6 months

Customers are financially better off by an average of \$US86.00 (5000 Rupees) per year. This represents a saving of 4.2% of customers' average annual income. Those in the lowest income bracket were impacted the most, saving 5.7% of their annual income as a result of the solar light.

Financial impact per income bracket of respondents	
Average weekly income	Net financial gain as % of average weekly income
\$US0-49	5.7%
\$US50-99	2.9%
\$US100-200	1.9%
All income brackets	4.2%



KEY IMPACT: Financial benefits

4% of respondents reported earning additional income as a result of increased work activities enabled by the solar light (Total: 9 customers, approximately 50% men, 50% women).

Examples included:

- Small shop owners whose businesses grew due to lighting in the shop and longer opening hours.
- People who worked from home (i.e. tailoring) who were able to work longer hours.



CASE STUDY

Name: Amresh

Occupation: Shop owner

Amresh invested in a solar light from Pollinate Energy because he saw the opportunity that better light would bring to his business.

Amresh is now able to open his shop longer each day and can work more effectively preparing food. The light has made the shop a more social place and customers can now see when the shop is open so they visit more often.

In just four months since he bought the light, Amresh has been able to double his weekly income. This has allowed him to bring his wife, mother and two children to Bangalore and move out of the slum. He now rents a room in a house close to his shop.

KEY IMPACT: Quality of family and community time

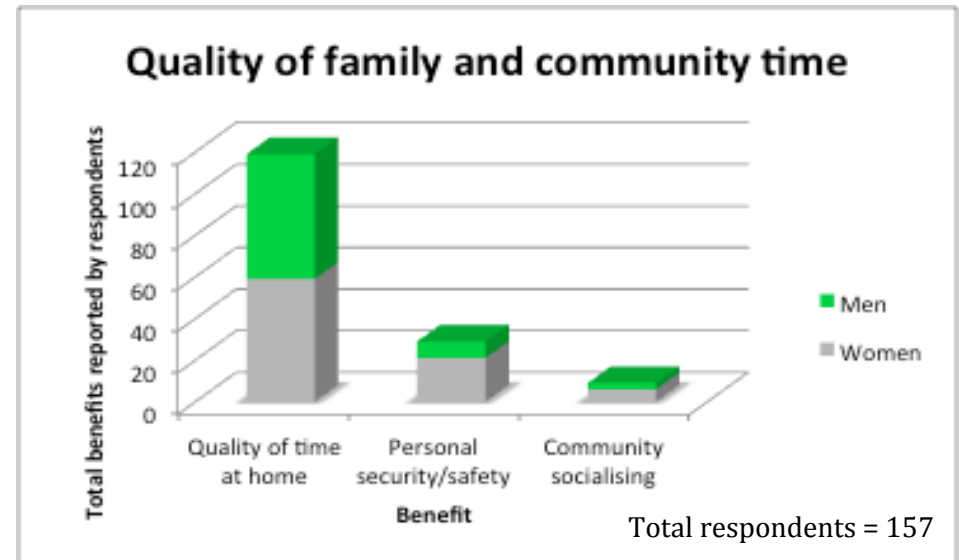
50% of respondents reported improved quality of family and community time as a benefit of the solar light. When asked to rank the benefits, customers reported this as **the most important benefit**.

Responses categorised as 'improved quality of family and community time' included:

- the **brightness** of customers' homes which led them to enjoy their homes more (119 respondents)
- improved **personal security** (29 respondents)
- improved ability for communities to **socialise** (9 respondents)

Women were more likely than men to report **personal security** as a benefit of the solar light

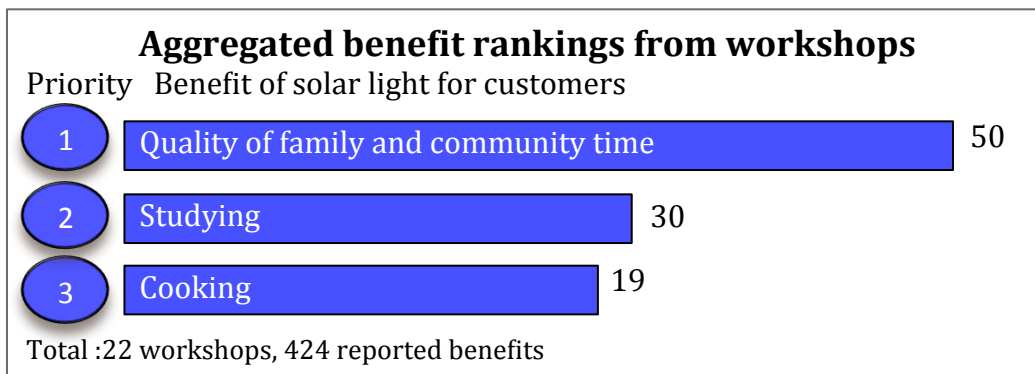
Photo: Pampanna feels that a key benefit of the light is the improved safety of his wife and children as they use the light to go to the toilet at night.



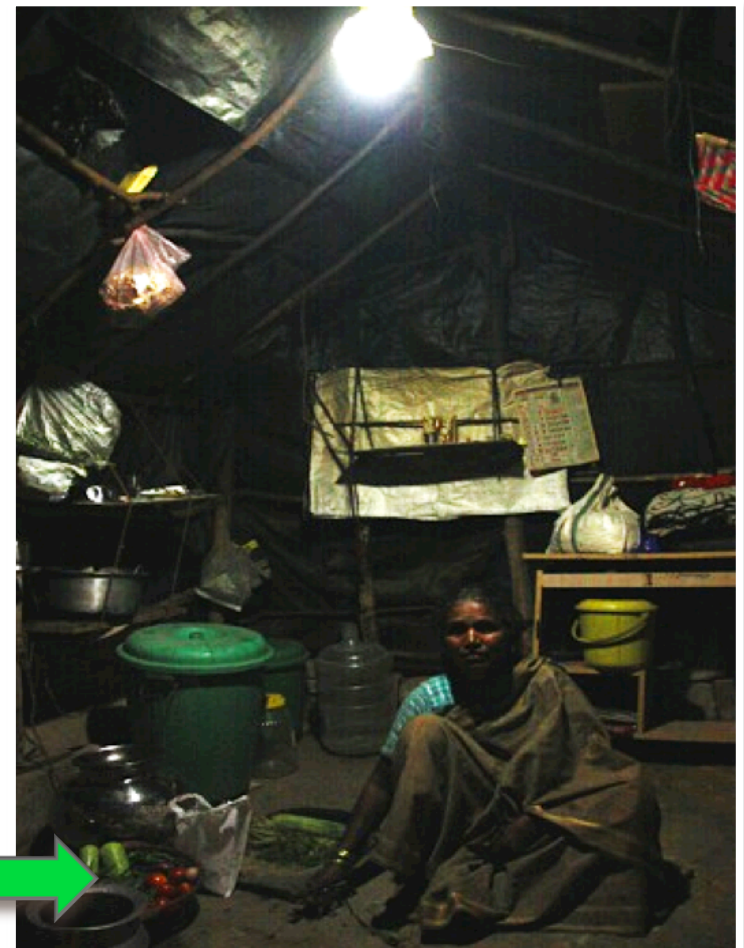
KEY IMPACT: Ease of undertaking household duties

50% of respondents reported the ease of undertaking household duties as a benefit of the solar light (Total : 166 respondents).

Improved ease of cooking was ranked as the **third most important benefit** of the light. Women in the communities cook up to 4 or 5 hours per day, often starting at 4am to have meals prepared before their family members go to school or work. Unsurprisingly, this benefit was reported by a greater proportion of women, who are typically responsible for cooking.



Cooking with a kerosene lamp compared to cooking with a solar light

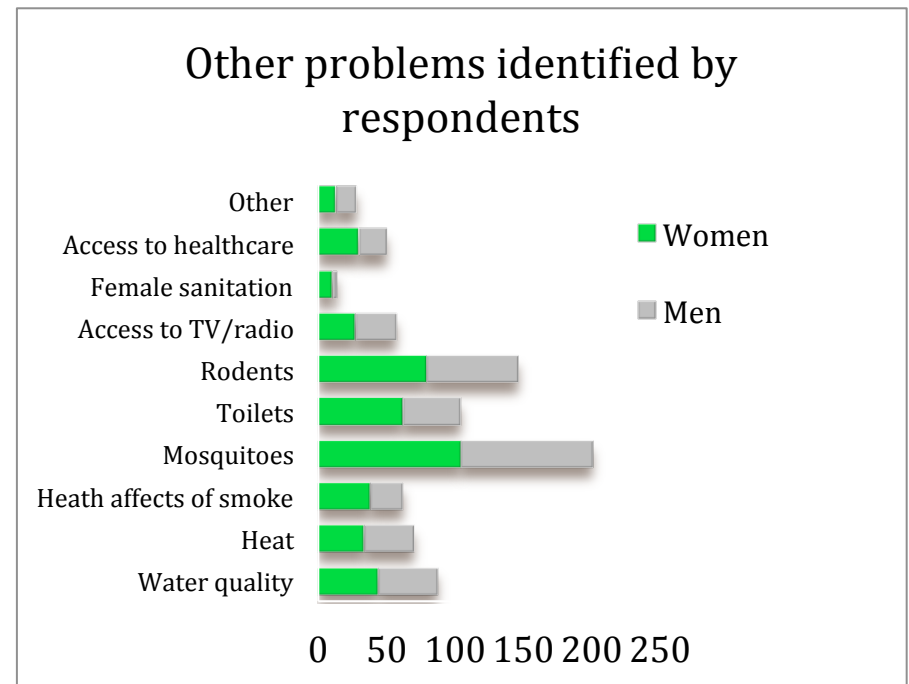
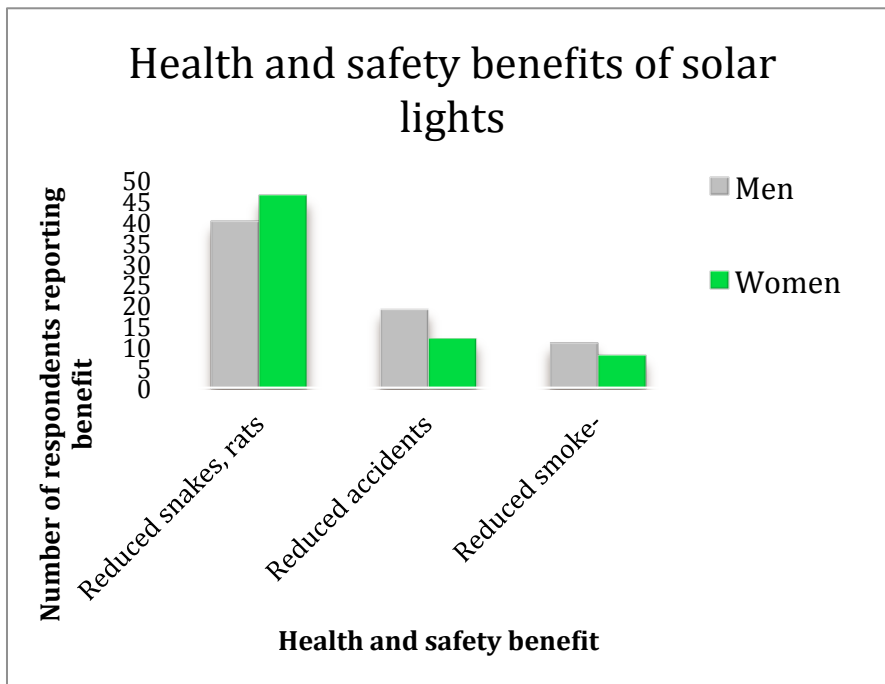


KEY IMPACT: Improved household health and safety

41% of respondents reported improved household health and safety as a benefit of the solar light. Improved health and safety was ranked as the **fifth most important** benefit.

The primary health benefit reported by customers was the reduction of issues related to the threat of snakes, rats and mosquitoes in the home.

The table below sets out other health and safety problems reported by respondents. Problems with mosquitoes was the most common issue reported by both men and women. Solar fans were proposed as a solution to this issue and raised as a major community need. We recommend Pollinate Energy continues to focus on identifying and supplying solar fans as a solution to the issue of mosquitoes in the communities.



Total: 136 respondents

Total: 232 respondents, 818 reported problems

KEY IMPACT: Improved household health and safety

Although some customers continue to use kerosene for other purposes such as cooking, the distribution of solar lights has resulted in a significant reduction in kerosene usage for lighting:

- **88% of households** stopped buying kerosene altogether after purchasing the light
(Total: 163 households, 886 people)
- **11% of households** reduced the amount of kerosene they bought after purchasing the light
(Total: 20 households, 108 people)
- On average, households have reduced their kerosene usage **from 1.4 litres to 110 millilitres per week**

The health benefits of reducing kerosene use in households have been widely documented (see Endnote 3). Exposure to kerosene is a proven risk factor for respiratory disease, lung cancer and other illnesses. The reduction in kerosene use by households represents a positive step towards a reduction in the prevalence of these diseases.

Health benefits arising from a reduction in kerosene use were only rarely reported by customers. This is perhaps because the impacts of kerosene exposure are not immediately apparent in the lives and health of customers. Also, many customers were still using a small amount of kerosene for supplementary lighting, as well as wood fires for cooking, which meant that kerosene and smoke still featured in their homes.



88% of
households
no longer use
kerosene

11% of
households buy
less kerosene

KEY IMPACT: Children are better able to study

47% of households with children attending school reported children being better able to study as a benefit of the light (Total: 55 households).

These households had a total of **139** students attending school

Improved ability to study was ranked as the **second most important** benefit of the solar light.

On the basis of this evidence, it can be inferred that **over 1500 students are better able to study** because of the Pollinate Energy solar lights sold to date.



“My children study every night” – Basawraj

CASE STUDY

Name: Basawraj

Father of two

Basawraj was one of the first people in his community to buy a solar light. His two sons use it to study every night and he is proud that his eldest son is now in the first rank of his class.



SECTION 2: MEETING CUSTOMERS' NEEDS



SECTION 2: MEETING CUSTOMERS' NEEDS

This section responds to Key Evaluation Question 2: To what extent do Pollinate Energy solar lights meet customers' and communities' expectations and needs? It provides an assessment of overall customer satisfaction with the products and an analysis of issues reported.

Key Findings:

- Overall, the lights met customers' lighting needs and few problems were reported.
- The key issue reported related to the mobile phone charging function of the light and the desire for greater battery capacity.
- Pollinate Energy could take further steps to ensure that its post-sale service meets the particular needs of its customers.

Recommendations:

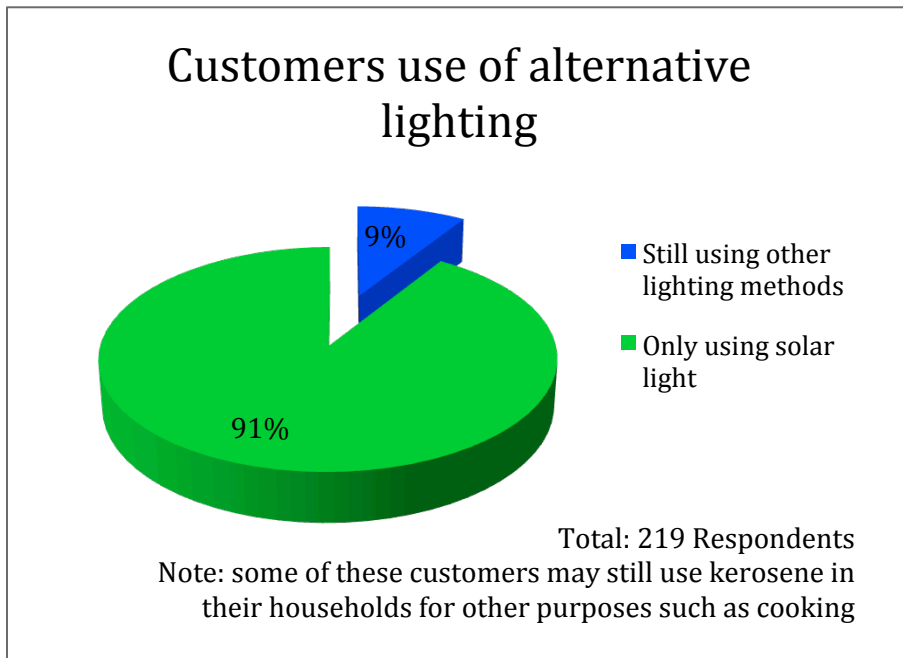
2. Consider products which have sufficient battery capacity to charge multiple mobile phones whilst still generating 12 or more hours of light.
3. Address community concerns about the effectiveness of the phone charging functionality by:
 - systematically checking the products to determine whether there is a technical fault;
 - managing customer expectations by explaining the time frames for mobile charging and lighting relative to a single charge; and
 - providing customers with a check-list of common issues to enable them to work through any mobile charging issues.
4. Introduce a pipe to protect the cord from rats in the installation kit.

MEETING CUSTOMERS' NEEDS: Customer satisfaction

Since purchasing a solar light, **91% of respondents** no longer use other forms of lighting. This provides a clear indication that Pollinate Energy solar lights are meeting the lighting needs of customers.

Of the 9% of respondents who reported using other lighting methods, most stated insufficient battery life or a problem with their solar light as the reason for doing so (as opposed to the presence of more suitable alternative).

- 94% of customers reported that they were satisfied with the solar light
- 96% said they would recommend the solar light to others



96%

of customers would recommend the Pollinate Energy solar light to others

MEETING CUSTOMERS' NEEDS: Problems reported

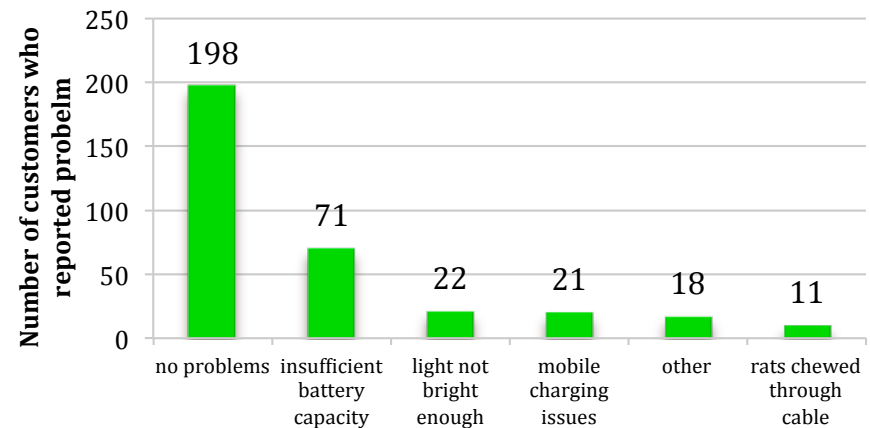
When asked about problems with the lights, two thirds of customers reported zero problems, and one third of customers reported one or multiple problems.

The most commonly reported problems, in order of the number of times the issue was raised, were:

- **19% of respondents reported insufficient battery capacity**- customers wanted the light to last for longer on the brightest mode or reported that they had insufficient battery for their lighting needs if they used the light for phone charging. For these reasons, **30% of the 208 respondents with mobile phones chose not to use the phone charging function** and instead charged their phone commercially.
- **6% of respondents reported technical problems with mobile phone charging**- customers reported that the mobile phone charge function had problems and did not effectively charge their phone.
- **3% of respondents reported rats chewing through cables**- customers reported that rats had chewed through the light cables, making the light unusable. Whilst this is a small percentage of customers, providing a protective pipe for the wire in the installation kit would be a very cheap and simple way to mitigate this issue.



Problems reported by customers



Products with reported battery capacity and mobile phone charging problems	
Model of light purchased	% of problems which were associated with this model
Pro 2	8%
Pro	17%
Mobile	19%

SECTION 3: WHY DO INDIVIDUALS PURCHASE/ NOT PURCHASE?



SECTION 3: FACTORS DRIVING INDIVIDUALS TO PURCHASE OR NOT PURCHASE A SOLAR LIGHT

This section responds to Key Evaluation Question 3: What factors drove individuals to purchase or not purchase a solar light?

Key Findings:

- The most commonly reported reason for purchasing the light was the **need for a brighter light** in the home and the prospect of **financial savings**.
- The primary reason for customers not purchasing the light was that it was **too expensive**.
- At the time of data collection, most respondents had used the light and experienced its benefits for some time. As such, we acknowledge that it may have been difficult for respondents to objectively report on the reasons for purchase without also reporting on the observed benefits. For this reason, the data on reasons for purchase may be conflated as a result of intertwined data on the observed benefits.

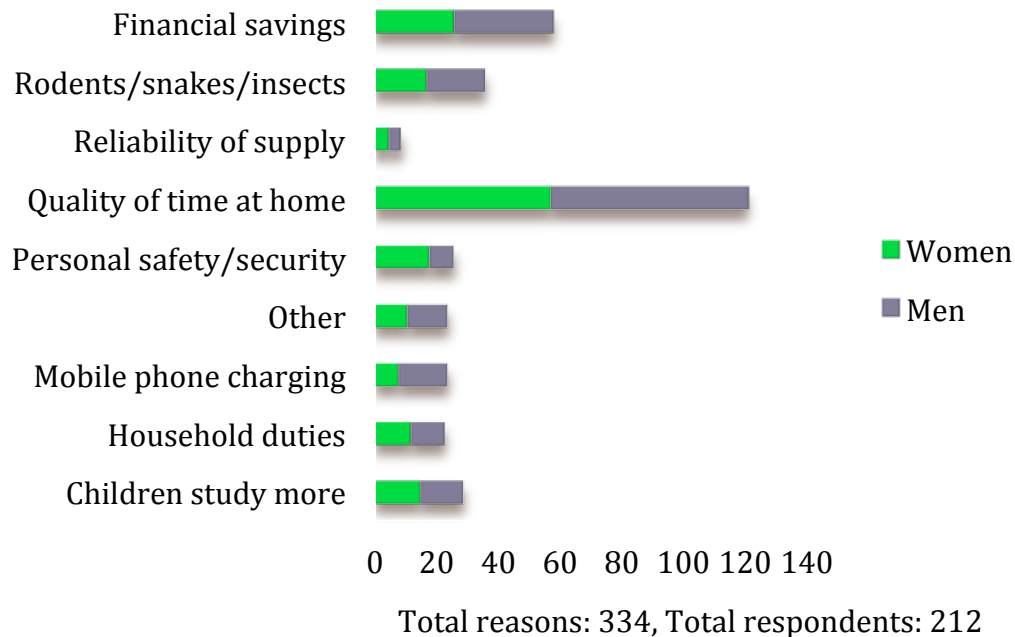
Recommendations :

5. Collect additional data at the point of sale to enable ongoing monitoring and evaluation of Pollinate Energy's work, including (per household):
 - reasons why the customer purchased the product; amount of money spent on lighting; number of hours school children spend studying; amount of income earned per week if self-employed; amount of money spent on health care; amount of money spent on phone charging.
6. Incorporate a return on investment per income category in marketing materials so that community members are aware how quickly they will recoup the cost of the light in reduced kerosene costs.

FACTORS DRIVING INDIVIDUALS TO PURCHASE OR NOT PURCHASE A SOLAR LIGHT: Reasons for purchasing

The primary reason for customers to purchase the light were the **need for brighter light** in their homes and the prospect of **financial savings**.

Reasons customers purchase solar lights



Aminbir bought a solar light for her restaurant to reduce the smoke for herself and customers

Observation

The Impact Assessment team identified that customers did not consistently differentiate between the original reasons they decided to purchase the light and the benefits they experienced from using the light. As such, the reasons provided for purchasing the light are relatively unreliable.

To inform ongoing marketing of products in communities, we recommend that Pollinate Energy collects data on reasons that customers decided to purchase a given product at the point of sale, to maintain the accuracy of data on this indicator.

FACTORS DRIVING INDIVIDUALS TO PURCHASE OR NOT PURCHASE A SOLAR LIGHT: Reasons for purchasing

CASE STUDY

Name: Aminbir

Restaurant owner and cook

Originally from Gulbargar, Aminbir lives in a tent in an urban slum community with her husband Rajesh and two sons. Aminbir has constructed a second tent next door to her home from which she operates a shop and restaurant business for locals. Her special dish is bhajis served with tea.



A month ago, Aminbir purchased a Pollinate Energy solar light from her local Pollinator to use in her restaurant. Her husband told her she needed to buy the light to replace the kerosene lamp because she was suffocating in smoke. Aminbir is happier at work now – she can see the food she is cooking and there is less smoke in the tent from the kerosene. She says that her customers are also happier. They sit inside and socialise as they eat, so her business is better.

Aminbir intends to return to Gulbarga once she has paid off her debt, and plans to take the solar light with her.

FACTORS DRIVING INDIVIDUALS TO PURCHASE OR NOT PURCHASE A SOLAR LIGHT: Reasons for not purchasing

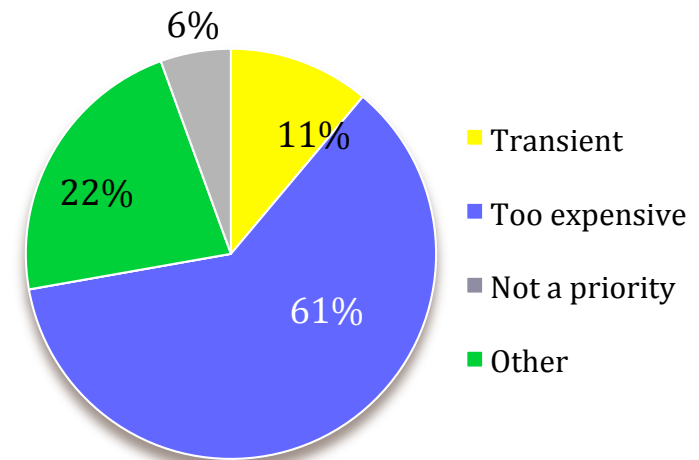
The primary reason for customers not buying the light was that it was **too expensive**.

This did not correspond with data on the household income of customers and non-customers, which indicated that non-customers' average income is marginally higher than that of customers (see table).

It is possible that other factors influence the decision to spend money on a light. For example:

- Non-customers had fewer children living in their household (0.5 children per household, compared to an average of 2.6 children in customers' households).
- Anecdotal feed-back suggested that community members often leave their children in their native place and send money back to them. Therefore it is possible that non-customers' disposable income was lower than the data collected by this study would imply.
- Women, more than men, reported that they had insufficient money to buy the light, which could be a product of women having less control over their household money rather than the household having insufficient funds to buy a light.

Reasons community members did not purchase a light



Total respondents = 38.

Average household weekly income	
Customers	Non-customers
\$52 USD	\$56 USD

SECTION 5: REPAYMENT AND POST-SALE SERVICE

This section responds to Key Evaluation Question 4: To what extent does Pollinate Energy's repayment schedule meet customers' needs?

Key findings:

- Customers did not typically raise issues with the repayment system.
- Whilst the sample size was too small to make clear conclusions, there are indications that the main reason customers delayed on repayments was fluctuations in their income.
- Some anecdotal evidence emerged regarding how Pollinate Energy could improve post-sale service to better meet customers' needs.

Recommendations:

7. Strengthen Pollinate Energy's after-sale service approach by:
 - Maintaining an ongoing schedule of after-sales visits (possibly quarterly) to communities even if the Pollinator is no longer making sales there.
 - Instituting systematic 'cross-pollination' whereby Pollinators visit and service each others' communities to mitigate against the risks of relying exclusively on any individual Pollinator.

REPAYMENT AND POST-SALE SERVICE: Repayment

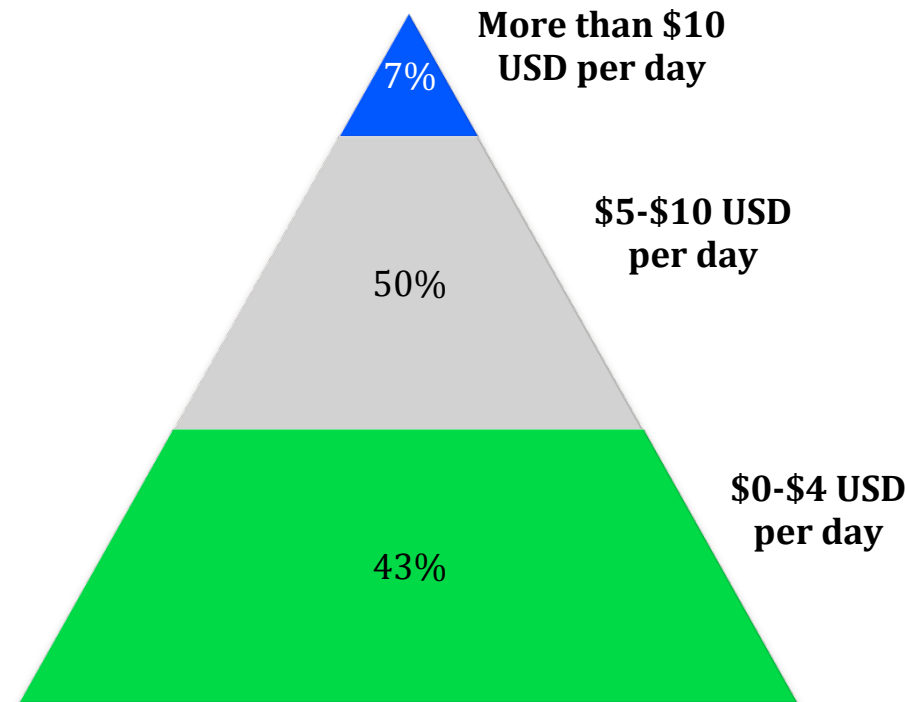
Customers did not typically comment on the repayment schedule. The sample size was too small to make any clear conclusions about benefits or problems with the repayment schedule. The data did provide some indication that the primary reason customers delayed on repayments was due to **income fluctuation**. **8 customers** reported delaying their repayments due to having insufficient money to pay.

The Impact Assessment collected data from 20 customers who had delayed or defaulted on their repayments. This represented 5% of total customers sampled, which was a much lower actual sample than the target of 22% of customers. The sample of these customers was small as they were difficult to identify and locate in the community.

Of the 20 respondents, the reasons for delaying and defaulting on repayments were:

- **Income fluctuation**- lack of money to make the repayment (8 customers)
- **Reported irregularity in visits by the Pollinators**- unable to make repayments on time (4 customers)
- **Transience**- returning to their native place and not being present to make repayments (4 customers)
- **Faulty product**- choosing not to make repayments until an issue was resolved (2 customers)

Average income of members of customer households (\$USD per person per day PPP)



Total respondents = 326
 Note: income has been adjusted for purchasing power parity

Average weekly income per household	
Customers	Customers who delayed or defaulted
\$52 USD	\$40 USD

REPAYMENT AND POST-SALE SERVICE: Post-sale service

Throughout the Impact Assessment, team members were provided with anecdotal feedback on the service offered by Pollinate Energy. Customers reported having good relationships and regular contact with the Pollinators in their region. Observational data showed that Pollinators appeared to be well known and liked in the communities.

Whilst data was not systematically collected on post-sale service, 6% of customers commented on post-sale service and some recurrent feedback emerged:

- Positive feedback was provided on Pollinate Energy's physical presence in communities, as customers were able to resolve any issues with their products.
- Several customers were not able to, or did not call Pollinate Energy when they had problems. A physical visit was required for communities to raise and resolve issues.
- The Pollinators' relationships with communities are very important. Issues arose when a Pollinator was suddenly unable to continue servicing a community.



Pollinators are well known in their communities

Effective customer service requires:

- Ongoing physical visits of Pollinators to communities to ensure strong post-sales service.
- Mitigating the risk of relying exclusively on any single Pollinator to effectively service communities.

REPAYMENT AND POST-SALE SERVICE: Post-sale service

CASE STUDY

Name: Veramna

Community Member

Veramna, along with other members of her community, purchased solar lights in 2012. At that time, Pollinate Energy was selling a different model of light. This model turned out to be faulty, which led Pollinate Energy to adopt an improved model in early 2013. Pollinate Energy offered to exchange Veramna and her community's lights for the new model, but they chose not to exchange their lights because they appeared to be fully functioning. One year later, their lights stopped working.



The regional Pollinator had not visited the community for several months because he had suffered a car accident and was unable to work. The lapse in physical visits by the Pollinator meant that Veramna had not been able to follow up on the faulty product. Although she had the phone number of Pollinate HQ, she was not able to use her husband's mobile phone. This lapse in Pollinator presence in the community was not consistent with Pollinate Energy's usual model of service delivery.

Veramna's story illustrates the importance of physical visits to customers, particularly female customers who sometimes lack access to mobile phones. More broadly, this story highlights the need for Pollinate Energy to establish strategies to mitigate the impacts arising from the unexpected absences of Pollinators.

Since the Pollinate Energy Solar Lights Impact Assessment, Pollinate Energy has introduced more rigorous systems to ensure that all communities receive regular visits from Pollinators as well as spot checks from management staff

SECTION 5: ENVIRONMENTAL IMPACTS

This section responds to Key Evaluation Questions 5: To what extent are the solar lights reducing the environmental impacts of lighting in the communities?

Replacing kerosene lanterns with solar powered lights has a significant environmental benefit, due to the reduction in black carbon and carbon dioxide emissions from the combustion of kerosene. Black carbon emissions from kerosene lanterns are significant due to inefficient combustion of the fuel.

This table below sets out the CO₂e reductions from Pollinate Energy solar lights distributed to date. This reduction is equivalent to the annual emissions reduction that would be achieved by taking 3400 cars off the road.

Environmental Impact Reduction (see endnote 41 on slide 41 for calculation methods)	
Kerosene Saved per week	1.2 Litres per customer
Annual Kerosene savings	62.4 Litres per customer
Annual Kerosene savings (4220 customers)	263,328 Litres
Annual CO ₂ e savings excluding black carbon	658 tonnes
Annual CO ₂ e savings from black carbon reduction	13,026 tonnes
Total annual CO ₂ e savings	13,684 tonnes



Collecting kerosene in Bangalore

APPENDICES



Photo: drawings by respondents and facilitators depicting 'benefits' and 'problems' made in the card visualisation and ranking workshops

APPENDIX 1: Resource list

Endnote 1

Figures taken from the Pollinate Energy website. For original sources visit <http://pollinateenergy.org/issue/>.

Endnote 2

The figures on this slide were extrapolated on the basis of the number of lights sold, and evidence collected through the Impact Assessment on the average number of people per household, average financial benefit of households and average kerosene reduction for households who had purchased a light. Figures were taken from Pollinate Energy data. For more information visit <http://pollinateenergy.org/impact/progress/#statsexplained>.

Endnote 3

Health impacts of kerosene have been demonstrated through these studies:

- World Health Organisation (2014), Household air pollution and health fact sheet, available at: <http://www.who.int/mediacentre/factsheets/fs292/en/>
- International Finance Corporation (2010), Solar Lighting for the Base of the Pyramid, available at: www.ifc.org/wps/wcm/connect/a68a120048fd175eb8dcbc849537832d/SolarLightingBasePyramid.pdf?MOD=AJPERES
- Lam N, Kirk R, Gauthier A and Bates, M (2012) 'Kerosene: A review of household uses and their hazards in low- and middle-income countries', *J Toxicol Environ Health B Crit Rev*, 15(6) 396-432.

Endnote 4

Black Carbon Emissions factor was calculated using figures from:

- Jacobson A et al., (2013) 'Black Carbon and Kerosene Lighting: An Opportunity for Rapid Action on Climate Change and Clean Energy For Development', *The Brookings Institute*.

Photo Credits

All photographs (excluding product image on Slide 9) were taken for Pollinate Energy by participants of the April 2014 Pollinate Energy Young Professionals Program.

APPENDIX 2: Evaluation indicators

The following indicators and data sources were used to guide analysis for each evaluation question:

Impact	Outcome	Indicator/s	Survey data	Workshop data	Evaluative stories data
Key Evaluation Question 1: To what extent are Pollinate's solar lights improving customers' lives?					
Improved education outcomes	1. Students are able to spend more time studying	1. Children are better able to study	x	x	x
	2. Students perform better at school	2. Reported improvements in academic achievement	x		x
Improved health and safety	3. Customers' households are safer	3. Reduced rodent/snake/ insect issues in household	x	x	x
		4. Reduced dangers from dimly lit household	x	x	x
		5. Reduction in danger from an open flame	x	x	x
	4. Customers have healthier home environments	6. Less smoke from lighting	x	x	x
		7. Fewer kerosene-related health problems	x	x	x
Reduced financial poverty	5. Customers' households are financially better off due to the solar light	8.Total net financial impact on household (as % of household income)	x		x
	5A Customers' households spend less on lighting and phone charging	9. % reduction of expenditure on lighting	x	x	x
		10. % reduction on expenditure on phone charging	x	x	x
	5B Customers earn more money	11. Increased income earned (as % of total income)	x		x
		12. Increased ability to fulfill job requirements	x		x
Improved family and community life	6. Customers have more time available to spend in their household and community	13. Reduced time spent fetching kerosene	x		x
		14. Improved ease of cooking	x	x	x
		16. Enjoy home life more	x	x	x
	7. Customers are better able to engage in community activities	17. Customers can better socialise	x	x	x
	8. Improved personal security/safety	18. Reported improved personal security/safety	x	x	x

APPENDIX 2 continued...

Impact	Outcome	Indicator/s	Survey data	Workshop data	Evaluative stories data
Key Evaluation Question 2: To what extent do Pollinate's Solar Lights meet customers' and communities' expectations and needs?					
Leading service provider to urban slum communities in India	9. Pollinate's solar lights meet customers' expectations	19. Level of satisfaction with solar lights	x		
		20. Purchase of multiple lights (proxy) (% of customers)	x		
		21. Willingness to recommend lights to others (% of customers)	x		
		22. Amount of problems reported by customers	x	x	x
		23. Relative priority of problems reported by customers		x	
	10. Customers are able to resolve issues with faulty products	24. Examples of problems resolved by Pollinate	x		x
Key Evaluation Question 3: To what extent does Pollinate's repayment schedule meet community needs?					
Effective pro-poor service delivery	13. The repayment schedule is appropriate for customers financial situation	25. Reported improvements required to repayment schedule	x		x
		26. % of customers with delayed repayments	x		
		27. Trends in reasons for default	x		x
		28. % of customers who default on repayments	x		
	14. The repayment schedule meets the needs of diverse members of the community	29. Income of customers vs non-customers	x		
		30. Demographic trends in customers vs non-customers	x	x	x
Key evaluation question 4: What factors influenced customers purchasing or not purchasing the light?					
Leading service provider to urban slum communities in India		31. Evidence of trends in reasons for purchase	x		
		32. Evidence of trends in reasons for non-purchase	x		
Key evaluation questions 5: To what extent are the solar lights reducing the environmental impacts of lighting in the communities?					
Reduction in CO2 equivalent	15. Reduced negative environmental impacts of lighting methods	33. Amount of kerosene used for lighting	x		x 43