LIGHT UP ATAURO

IMPACT ASSESSMENT

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Executive Summary

Kopernik made 204 d.light S250 solar lights available to communities in remote parts of Atauro Island, Timor-Leste. Kopernik Fellow, Rob Weiss conducted a 3-week assessment of d.light solar light distribution by local partner Roman Luan. Rob, with the assistance of bilingual (English-Tetum) Roman Luan staff, took a 'cluster sampling' approach and conducted 33 interviews with people from 3 random villages, Makili, Beloi and Makedadi.

Participants were asked:

- how their household used the solar lights;
- what their prior and current fuel use was;
- how the light effected their educational and income-generation possibilities;
- whether they were satisfied with the solar light's features, quality and price;
- whether they had a desire to purchase more lights.

At the subsidized price of US$12.50 the light was seen as good value and the payback time for the family was quite short. Demand far exceeded supply.

The d.light solar lights were being used for a variety of activities and were having a positive impact on the lives of people in Atauro Island. The people used them to:

- **set and repair fishing nets at night**, as well as salting/drying fish immediately after the night time catch;
- **open a small store** to sell coffee or produce handicrafts and traditional Timorese weavings (tais);
- **study longer** compared to when fuel was unsafe, dim or intermittently available;

- **walk long distances safely** in the early morning and evenings to travel to school;
- **prepare and serve dinner**;
- **walk to get water** or to go to the community centre at night; and
- **hold evening gatherings**.

The fellow also traveled to a village outside the current project's target area, Bikeli to conduct a needs assessment with a community focus group of 35 participants and village leaders. The community here were also keen to purchase the d.light solar light if they had the opportunity in the future.

Project Background

Project Objective

Kopernik is an online marketplace connecting people in the developing world with innovative, life-changing technologies. Kopernik partnered with Roman Luan to make solar light technologies available to people living in remote communities in the Atauro Island, Timor- Leste.

Through Kopernik's Fellowship programme, Rob Weiss was deployed to work closely with Kopernik's local partner organization between December 2011 and January 2012 to conduct research on the impact of solar lights (d.light S250) distributed in the region.

The purpose of the impact assessment was to:

1. Develop a clear understanding of the ongoing needs of the customers; and
2. Determine if the solar products are continuing to have a positive impact on the customers' lives.

This assessment was designed to test the following hypotheses:

Solar lights will:

1. Save people money on lighting fuel (and charging mobile phones)
2. Be a safer, healthier and more convenient lighting source
3. Increase the range of activities people can pursue in the dark
4. Increase the length of time people can spend on nightly activities
5. Ease pressure on the environment
6. Increase the use of mobile phones

Snapshot of Location

Atauro Island is a sub-district of the Dili district, situated approximately 25km from mainland Timor-Leste. It is a mountainous island with poor infrastructure, seasonal rains and challenging terrain. Some villages can only be reached by canoe when the sea is calm.[1]

The assessment was conducted in Makili, Beloi and Makedadi villages. Residents there are mainly engaged in fishing and agriculture. Their children attend government and NGO-supported schools across the island, sometimes walking substantial distances to attend. Cash income is generally low, around US$20-30/month (although this figure was not systematically collected). Subsistence farming supports the livelihoods of many residents and is supplemented mainly by fishing income, miscellaneous projects and labour work.

[1] HART Australia, East Timor < http://www.hart-australasia.org/aid_easttimor.htm>

Common Practices Relating to Lighting Technology

Communities predominantly use kerosene or one of several local sources of light: battery powered flashlights, a special oily fruit that burns brightly, twigs of bamboo as a torch, or an LED set up that uses readily-available parts from a cigarette lighter. All of these sources of light were reported to be inferior to the solar light. Kerosene is expensive at US$1.50/liter, and poses significant health and safety risks. The battery-powered flashlights are also expensive (US$0.50/battery, 3 batteries per torch) and low-quality. Improvised LED lamps installed in homes are comparatively dim and not transportable.

Local Partner: Roman Luan

Roman Luan, a Timor-Leste based NGO, conducts educational, environmental, and eco-tourism related programming on Atauro Island, Timor-Leste.

Roman Luan's mission is to create a sustainable, healthy, educated and active community on Atauro Island in order to maintain the values of the local culture and natural resources of Timor-Leste.

Project Implementation

The Technology

The d.light S250 solar light is a white LED light equipped with an external solar panel that can also charge mobile phones. It has four brightness settings and can provide from eight to 100 hours of light after each full charge, depending on the brightness required. The product description from the manufacturer indicates that the light has a lifetime of five years or more when handled properly.

Distribution Mechanism, Pricing & Payment[2]

Number of Lights Distributed: 204

Price: US$12.50 – paid in one single installment at the time of purchase.

Locations: The three (3) chosen villages: Makili (coastal), Beloi (coastal) and Makededi are all far from electricity access.

Socialization: Roman Luan went out to the villages to do a demonstration/socialization talk about why the lights are important & to show people how they work using the product sample sent by Kopernik.

Selection Method: Roman Luan first conducted a demonstration in the village. After the interested community members submitted their name to the head of the village, the village heads were asked to reduce the list of people by choosing those were in greatest need of the technology. They left out the higher-income applicants for the first distribution. Even after doing this there were still more people interested in purchase than solar lights available for sale. A random lottery was then conducted to determine who would get to purchase the d.light solar lights. The ticket-holders then purchased the lights for US$12.50.

Expectations for Use: Roman Luan expects the lights to enable night time income-generating activities. Before the solar lights, the community used small lamps. Fisherman would work only during daytime hours and under a full moon. The Roman Luan team also expects the lights to be useful for students. The d.light S250 solar lights can also be used to charge cell phones which are prevalent in the region. Timor Telecom recently built two cell towers on the Island.

[2] Interview with Marcelo Belo Soares (project manager, NGO Roman Luan). 1/03/2012

Financing: The estimated revenue was around US$2,550 minus US$600 for administration costs. In America the lights cost US$25, but in Atauro their price was set at half that. The subsidy comes from Kopernik donors.

Impact Assessment

Process & Methodology

The three-week assessment consisted primarily of interviews with community members who had already received the solar light. Thirty-three (33) interviews with users were conducted at random in three villages and three selected sub-villages [*cluster sampling*]. Customers were asked how their household uses the solar lights, their prior and current fuel use, the light's effect on educational and income-generation possibilities, their satisfaction with the solar light's features, quality, price, and their desire to purchase more lights. The fellow also met with key NGO staff working with Kopernik's local partner, Roman Luan, to learn about their operations, how the lights were distributed, and their goals for future dissemination of solar lights. The fellow was assisted in the field by bilingual (English-Tetum) Roman Luan staff who were invaluable in his work.

The fellow also traveled to a village outside the current project area, Bikeli, to conduct a needs assessment. He facilitated a community focus group with about 35 participants and village leaders. He also briefly met with the head of a second NGO partner, Move Forward who are also seeking to raise money for d.light S250 solar lights via Kopernik.

Results of Impact Assessment

Demand Greatly Exceeds Supply[3]

The most frequent comment from customers, often unprompted, was that they wanted to purchase more solar lights. As the first distribution had limited supply, much of the demand for the lights at the price of US$12.50 went unmet. A lottery was conducted to choose those customers who could purchase to make things fair. Interviewees and community leaders frequently noted that their friends and neighbors hoped to buy the solar lights in the future. Surprisingly, the price did not deter existing customers from wanting to purchase additional lights. More than a dozen of the interviewees expressed that they would even be willing to pay the wholesale price of US$25 for a light and expressed confidence that other residents would as well. They did however note that the future first-time buyers from the community would most likely expect to pay the same price as their neighbors did.

Table 1. Market Demand (broken down by village) for additional lights, S250 or S1.

	Makili	Beloi	Makadade	Total
Do you want to buy more lights?	2 of 3	8 of 10	5 of 6	**15 of 19 said yes (79%)**
Are you interested buying a US$8 light?	5 of 8	8 of 10	0 of 0	**13 of 18 said yes (72%)**

[3] We could think about four different areas of unmet demand on Atauro. One is the households in beneficiary villages who did not get selected from the lottery to be able to buy a solar light. A second source of demand is the many beneficiary families who would like to buy a second, third, or fourth light if given the chance. A third source of demand is the non-beneficiary population in Bikeli, which is off-grid. And finally, I project there is substantial demand among the large, on-grid villages (e.g. Vila, Manutasi) that were not offered an opportunity to buy subsidized lights, but who only have intermittent grid power access every other day.

d.Light Solar Lights Seen as Affordable

Demand for the light was at least in part driven by the fact that the customers found it to be well-priced. 22 interviewees mentioned using kerosene before the solar light. They used between one and five liters of kerosene per week at a cost of US$1.50/liter. For these families, the payback time for the d.light solar light is quite short. Even at the minimum rate of US$1.50 per week, it would only take three months to pay off the subsidized price of US$12.50.

Solar Lights Rated Highly on Performance and Quality

The lights were thought to be long-lasting and of high quality by the respondents, in part because they were thought to be American-made. Although d.light is an American company, their lights are in fact manufactured in China, which people in Timor associate with low-quality goods that break easily. Despite this fact, and perhaps because of reliable performance so far[4], the solar lights are perceived to be an American import and thus likely to be durable. There is little apparent name recognition of the d.light company. Even the NGO staff at Roman Luan, who socialized the community on the S250 light's use, were briefly confused when the fellow mentioned the name d.light. In the field, the light was referred to as *solar lanturna* - the Tetum phrase for solar light.

Light Uses

The d.light solar lights were found to be used for a variety of activities:

1. Work-related activities included setting and repairing fish nets at night, and doing related work like salting/drying fish immediately after the night time catch. A handful of customers reported other income-generating activities such as opening a small store to sell coffee, or producing handicrafts or traditional Timorese weavings (*tais*).

[4] None of the thirty-three interviewees reported a problem with breakage, damage, or loss of functionality.

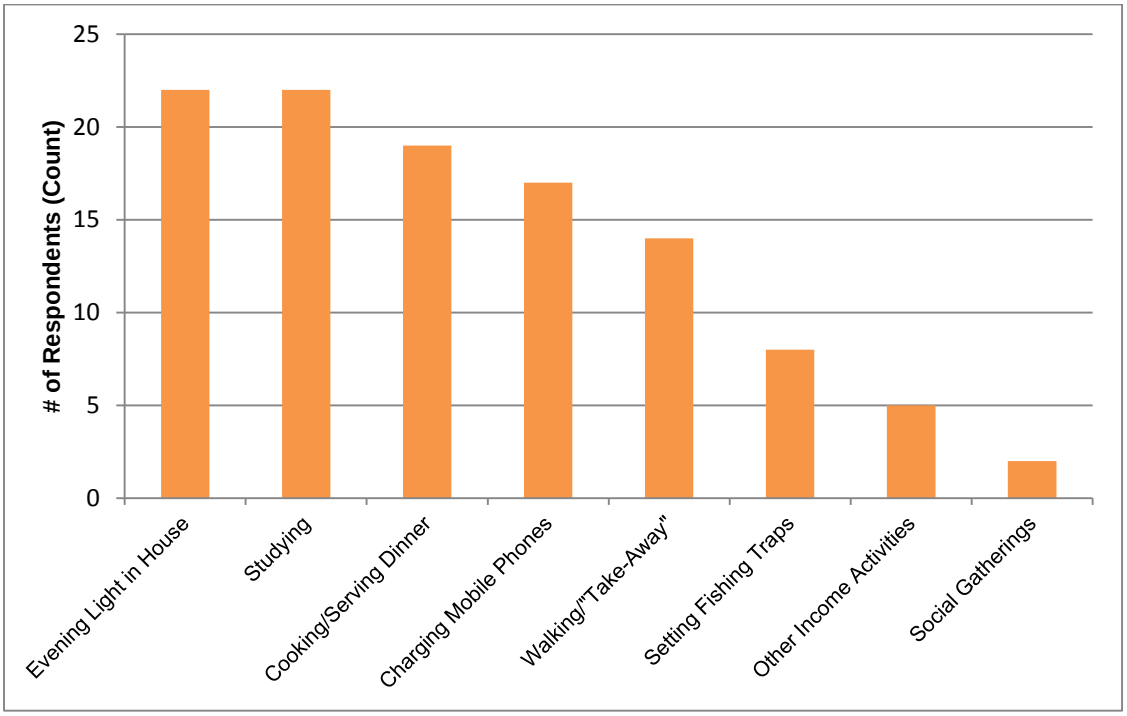
2. Most residents were concerned about their children studying by the light of dim and unhealthy kerosene lights. The majority of customers indicated that their children were studying longer as compared to when fuel was unsafe, dim or intermittently available.

3. Respondents in Arlo sub-village (of Beloi) on the far side of the island were particularly glad to have the light so their children could safely walk long distances to school in the evenings and early mornings. They reported that their children needed to walk over six kilometers to school.

4. Many women reported using the lights for preparing and serving dinner, for use around the house, for walking to get water or for walking to the community center.

5. A handful of residents mentioned examples of using the lights to socialize. In Makili village, the customers got together on Christmas Day when the power went out and brought all their lights to the community center. Another customer in Makedadi reported having family friends over to socialize at night on a holiday where they could chat by the light of the solar light hung up high.

Figure 1. Primary Uses of D-Light Solar Light on Atauro Island (N=33)



d.light S250 Effectively Replaces Kerosene and Battery Lights

For the vast majority of respondents who used kerosene in the past, purchasing the d.light solar light was an easy choice. The majority of customers indicated a high rating on durability, price, quality, and functionality for the S250 light. Many customers reported throwing away their kerosene lights; only two interviewees reported continuing to use kerosene, and only one of these two reported using the same amount of kerosene as previously (the other vastly reduced kerosene consumption).

Mobile Phone Usage and Other Results

50% of respondents used the light to charge their mobile phones one or more times per week. They felt that charging mobile phones was a secondary benefit with the primary use being for light.

Customers generally preferred the S250 light at US$12.50 to a cheaper light like the d.light S1 for US$8. This was apparent in individual interviews and in a focus group in Bikeli, a village outside the current project area where more than two-thirds preferred the larger, more expensive light.

Little Interest in Installment Financing

Few residents reported that they found the light's price prohibitive. As noted above, compared with kerosene the initial cost is quickly paid back by the savings from the reduction in use of kerosene fuel. The fellow and the Roman Luan team did suggest a repayment plan for the few customers that expressed some financial difficulty but they did not indicate much interest. They explained that it would be a waste of time to travel to Roman Luan multiple times to pay in installments as the villages where the lights were distributed were quite far away. All residents who received solar lights paid upfront and in full.

Future Distributions Must Consider Community Dynamics

Atauro is a relatively small island with a population of under 10,000. Many communities are related, and people generally know each other. Word travels quickly as information is shared among friends, relatives and colleagues across Atauro. This creates a tight-knit and friendly atmosphere that the fellow found extraordinarily welcoming. It also creates several dynamics of relevance to future light distributions:

1. Both customers and non-customers will be aware that the S250 was offered for US$12.50 in the initial distribution. Although many residents admitted they would be willing to pay even more, if the same light was offered at substantially higher cost in the future, the residents who did not have access to the first distribution might be unhappy.

2. There is no strong culture of profit-seeking. Dozens of customers reported lending the light to their neighbors to charge cell phones, but none would charge their neighbors for such a service.

3. The village chiefs *(xefe suko)* and sub-village chiefs play a major role. They determined which residents could participate in the lottery, and sometimes arranged transportation of the solar lights around the island. They also keep track of the customers in the community; and assist with the community interviews and focus groups.

4. For the village of Bikeli, which did not receive solar lights yet but wants them, there are two potential NGO distributors. Move Forward has applied to partner with Kopernik but has not yet raised sufficient funds. Roman Luan is also able and willing to distribute the lights in that village.

Annex

Case Studies

Manuel

Manuel is a fisherman in the village of Makili. He has two children, a ten year old and a seven year old in grades four and two respectively. His biggest reason for purchasing the d.light S250 solar light was to enable his children to study at night with more light, as well as the health benefits of the light. In the past, his family used a kerosene light, which they shared among the family using one liter per week at a cost of US$1.50 per litre. If they

couldn't find kerosene, or didn't have the cash to afford it, they would go without light in the evenings. In the past, it was often very difficult for his children to do their homework. To save money, even when they had kerosene, they had to use it sparingly – the children needed light to study, and Manuel needed light to set the fishing traps in the evening.

As a result, it was often difficult for his two kids, that love studying Portugese and Mathematics, to read their books in the evening. Often in the morning, if his kids had spent a long night staring over the dim light of a kerosene light, Manuel would see black soot on the bridge of their noses from the kerosene smoke. He also knew people who had been burned in kerosene fires, and had a story of his own about kerosene's hazards. In the past, they would put the kerosene fuel in water bottles. One time he started to drink from the water bottle with the kerosene in it thinking it was water! He laughed about the story, but then became serious when he said "we worry more about the kids doing it [drinking kerosene by accident]."

When local NGO partner Roman Luan offered the d.light S250 solar light for US$12.50, Manuel was keen to buy it. He eagerly signed up for the lottery, and was thankful to have won the opportunity to buy the light. It was difficult to collect the US$12.50 to buy the light, but well worth it. He loved the multiple light settings, and the ability to have free light all evening – he can now both set the fishing traps, and his children can study by a bright, clean light.

Albertina

Albertina (pictured on the right with her daughter on the left) is head of a household of 6 people, three adults and three children. Her husband, who was a fisherman, passed away so there is no male income-earner in the household. The family instead relies on agricultural work – the women work in the community garden and tend their own plot on the slopes of Atauro. The Kopernik fellow found himself huffing and puffing just to get up the winding stairs to the garden (stopping a few times to enjoy the beautiful view – and to take a break), much less labour in them in the heat of the day.

Albertina's family, like the others we met, was really thankful to have been able to purchase the light. She described how her family uses it: they keep it on the lowest light setting until dinner is ready, and then put it on level 2 so the family can eat with the light. When the three children are studying in the evening, they put it on level 2 or 3 for approximately one to two hours. Like other users, Albertina really valued the functionality

of the S250 model with its multiple light settings, and appreciated how long-lasting the light is on just a single charge. Although Albertina doesn't own a phone herself, her daughter uses the light to charge her mobile one to two times each week.

In the past the family used kerosene for light in the evenings, sometimes using two to three liters in one week at a cost of US$1.50 per liter. Once they were able to purchase the d.light S250, with its free energy from the sun, they literally threw away the hated kerosene light. Albertina and her daughter told the Kopernik fellow this with a huge smile and a laugh. The things they like most about their solar light are being able to light up a big room at night; not having to buy any more kerosene; and the ability to take it anywhere.

Osaias

Osaias is a young man employed as a teacher at a local primary school. The Kopernik fellow and the Roman Luan team met him on a sticky Wednesday afternoon, jamming the latest Timorese dance beats outside his home in Makedadi village. He welcomed everyone to his home with a warm smile, like so many of the residents here. He lives together with his family, his parents, brother and sister, all of whom use the d.light. solar light they bought in November 2011.

They use the light primarily for work around the house – he prepares his lessons in the evening by it, and his younger brother studies for school. His sister is not yet old enough for homework. They also use it for "take-away" to walk in the evenings and early mornings. Many students we met in this and other villages must walk between six and 11 kilometers in the morning to attend school. Some stay with relatives the night before. You can see school-age children with their backpacks walking along the beach in the evening on a

Sunday night, traveling to stay with relatives closer to their school. Due to the great distance kids need to walk, they end up traveling at night or before sunrise in the morning, and many families have found the solar light very great convenience for this kind of travel. Osaias' younger brother doesn't have to walk six kilometers to school, but Osaias reports that his brother is studying longer and better now that they own the solar light.

Like many families, Osaias' family used to spend US$3 to US$4 a week on kerosene fuel. He found the price of the d.light solar light well worth it, but noted that a few community members that initially signed up to buy the light later dropped off the list because they didn't feel they had the finances to purchase the light. He hopes that in the future more lights will be made available, and some at a lower price.

Questionnaire Sample

1. For Staff
Beneficiary Name: _____
Ita naran saa?

Age: _____
Ita tinan hira?

2. Household Composition

- How many people are in your household?
  Ema na'in hira maka iha ita nia uma laran?

- How many people in your household use the solar lamp?
  Ema na'in hira maka uza solar light iha ita nia uma laran?

3. Livelihood/Incomes

- What is your household's main source of income? Who is the primary income provider?
  Aktividade saida maka sempre produs rendementu ba ita nia uma laran? Se maka sempre buka osan iha ita nia uma laran?

- Do you have any alternate sources of income? If so, what are they?
  Ita boot sira iha alternative ruma nebe uza hodi buka osan? Se iha karik, aktividade saida?

4. Fuel Use

- Before owning the solar light, what fuels did you use for light?
  Antes imi hetan lanter solar, imi uza ahi saida?

- How much $ per week did you spend on these fuels prior to owning the solar light?
  Osan hira maka imi gasta iha semana ida ba naroman antes imi hetan light solar?

- Now that you own the solar light, do you still use (prior named fuel) for light?
  Agora imi iha ona light solar, imi sei uza ahi oan seluk hodi produz naroman?

- Currently, how much $ per week do you spend on fuels for lighting?
  Osan hira maka imi gasta kada semana ba a hi nebe imi uza?

5. Solar Light Usage

*Now I'd like to ask about your use of the solar light…could you please tell me about what sorts of things you use the solar light for?

Agora imi uza light solar hodi halo saida

- How often (how many times/week)?
  Imi uza iha tempu hira kada semana?

- Who uses it for that activity?
  Se maka uza ne'e no hodi halo aktividade saida?

- Could you do this activity at all prior to the d.light light?
  Imi bele halo aktividade sira ne'e hotu antes de imi hetan light solar?

- If yes, what fuel did you use? Is it better to use the solar lamp for this activity?
  Se hatan los, imi uza ahi saida? diak liu uza lanter solar hodi halo aktividade sira ne'e ka oinsa?

- Do you use it to charge cell phones at all? Primarily?
  Imi hotu uza hodi karega telephone?

6. Impacts

- How has the d.light affected your children's education/ability to study?
  Oinsa efeito husi light solar ba estudante sira?

- How has the d.light affected your income-generating possibilities?
  Oinsa light solar ninia efeito hodi hetan rendemento?

7. Finance, Purchasing and Distribution

- Do you think the price you paid was too high or just right?
  Imi hanoin light nia folin nebe imi selu nee as liu ka normal?

- What is the most amount of money you'd be willing to pay for it?
  Presu hira maka ita boot sira bele selu karik presu ne'e sa'e tan?

- Was it difficult to find $12.50 to buy the light?
  Ita boot sira sente dificil atu hetan osan $12.50 hodi sosa light ne'e?

- Would you prefer to pay in 2 or more installments, even if the total price was higher?
  Karik ita boot sira sente katak presu ne'e as liu ba ita no hakarak selu dala rua ou liu?

- Was it easy for you to come to Roman Luan to purchase the lamps?
  Ita boot sira sente fasil atu ba hetan ahi ne'e iha Roman Luan?

- Would you prefer to purchase through a local market?
  Ita boot sira sente diak liu ba sosa direta iha merkadu?
- Do you plan to re-sell the light or sell the cell phone charging capacity?
  Ita boot sira iha hanoin atu faan fali ou aluga hodi karega telephone?