CULTURAL CHANGE AND FINANCIAL BENEFITS
in Rio de Janeiro, Brazil

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Ecoponto in Santa Marta
Source: Light

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KEYWORDS

- SUSTAINABILITY
- ELECTRICITY ACCESS
- INCLUSION
- OLYMPIC GAMES
- LIGHT

Launched in 2011 in Rio de Janeiro, "Light Recicla", an electricity access project, provides a wide range of benefits to low-income communities. It was launched because regularized electrical connections and waste of "free" electricity made bills a financial burden. The project promoted bill payment, recycling, reduced consumption while generating income, encouraging financial education. We describe the project history from its inception to its potential during major events such as the Rio 2016 Olympics.

INTRODUCTION

In Rio de Janeiro, "favelas"[1], with traditionally irregular habitations, are located in different geographies: from hillsides to along riverbanks. They lacked and continue to lack basic public services, including access to electricity, accessed informally and precariously. The number of favela households with electricity access is hard to assess as the 2010 census data was questioned as under-estimated[2] (Paraisópolis.org, 2015; Schmidt and Almeida, 2011). Light is the major electricity distributing company in the Greater Metropolitan Region of Rio de Janeiro and serves the entire State of Rio de Janeiro. Its concession area counts approximately 600,000 low-income household clients in the city of Rio de Janeiro (Light, 2016).

Illegal connections ("gatos") to electricity are made in both favela and non-favela areas. In 2007, Rio de Janeiro had Brazil's largest number of "gatos": 200,000 (Nadaud, 2012). In 2010, irregular electric connections represented a BRL 1 billion/year loss (Prates and Soares, 2010). By 2015, the estimated loss due to "gatos" was BRL 850,000/year (Schmidt, 2015).

Given this context, in 2011, Light launched the Light Recicla project to reduce irregular connections, prevent payment default, electricity theft risks, promote recycling and waste management and ensure that favela households have a sustainable access to electricity.

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1 Much debate exists on the use of the word *favela* or *communidade*, the former is defined by public authorities as predominantly housing, characterized by low-income population occupation, precarious urban infrastructure and public services, irregular passageways, lots and unauthorized construction (not compliant with Art. 147 of the 1992 Rio de Janeiro Master Plan). The latter, *"communidade"*, or community, intends to transmit a more positive perception. The Central Única das Favelas (CUFA), Brazil's Union of Favela leaders, specifically chose the term favela to show pride in the roots of this social, cultural and economic area. We use favela as it is used by CUFA and the municipal government (see for more information Luna Freire, 2008).

2 For instance, the Instituto Brasileiro de Geografia e Estatístico (IBGE, 2010 and 2014) estimates the Rocinha favela population at only 70,000, whereas community leaders and researchers estimate it at least 125,000.

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1. PROJECT PRESENTATION

1.1. ORIGINS

Light is a century-old company based in Rio de Janeiro City serving Rio de Janeiro State. It built the region's power plants. Key to the country's development, it introduced electric lighting, the telephone, and was one of the first to provide service in low-income communities.

Up to the 1950s, informal electricity access was precarious, but tolerated. During the military dictatorship, access was used for clientelistic purposes. In the late 1970s-1980s, Light was nationalized and official electrification of the favelas began as part of opening to democracy. In 1979, electricity began being installed in favelas when local groups demanded basic services (water, electricity, garbage collection). By 1982, 186 communities relied on metered direct electricity consumption.

In the 1990s, the electricity sector was privatized. Light's first regularization program in the city of Rio de Janeiro (1996-2002), Programa de Normalização de Áreas Informais (PRONAI), sought to regularize informal connections (Observatório das Metrópoles, 2015).

Federal Law 9.991/2000 requires that electricity providers invest a minimum of 0.5% of net operating income in Energy Efficiency Programs (EEPs) of the National Agency of Electric Energy (ANEEL) (BRASIL, 2000; Nadaud, 2012)[3]. In 2003, Light began the Efficient Community Project[4]: social inclusion and education for conscious and safe electricity use. It installs electricity in favela homes and provides for the exchange of appliances for National Electrical Energy Conservation Program (PROCEL) labeled lower electricity consumption ones: refrigerators, fluorescent for incandescent bulbs.

In 2008, the State of Rio de Janeiro Security Secretary sought to recover areas under the control of drug traffic, militias and promote the social inclusion of favelas. The Rio de Janeiro State public security program policy was to occupy and "pacify"[5] favelas controlled by a so-called "parallel power" (trafficking or militia). Once occupied, the policy implemented Pacifying Police Units (UPPs)[6]. The state government asked utility service providers to regularize service as part of the pacification process. The process is a two-step partnership: the State rids areas of armed groups, setting up security monitoring, then Light technicians replace old electricity networks, expand the system and electricity is regularized (Nadaud, 2012).

Prior to regularization, in some favelas there were paying clients, but many had to depend on narcotrafficker or militia-controlled service provision. These "providers" were under no obligation to provide services, among other imaginable problems. Upon regularization, the client received a bill that served as a legal document, proof of residency, required for many administrative processes, facilitating access to other citizen rights. Becoming a client also created consumer rights and responsibilities.

As part of the regularization process, in 2008, Light established a "Special Tarif"[7] for low-income clients, gradually increasing bills. This consisted of offering a 50% reduction on the price of electricity consumption the first month and, for each additional month, the 50% was reduced by 2% until there was no more reduction (FGV, 2012).

1.2. THE LIGHT RECICLA CONCEPT

In part, a culture of waste existed pre-regularization because electricity was considered "free", leading to high consumption rates and, after regularization, high bills. One example of high consumption is leaving the refrigerator door open to "cool" the home. Also, access to credit cards with installment payments permitted purchases of high energy consumption products: refrigerators, TVs, irons, water heater, lighting, microwave oven, sewing machine, hair dryer, electric fans, air conditioners (only 1/5 favela households), etc. (Nadaud, 2012; BRASIL, 2012), further contributing to increase electricity consumption and bills.

Three factors, regularization, increased demand and bills, led to high electric bills, which had a major impact on household budgets in the favelas with UPPs units where Light regularized electricity access. This represented a payment default and electricity theft risk.

To respond to this risk, in 2011, Light launched an EEP under the ANEEL, a public-private partnership called "Light Recicla"[8]. It creates electric bill credits for collected recyclable materials. The materials are sold for market value by Light to recover partially the project cost. The goal is to facilitate bill payment, limit defaults and provide long-term access to electricity in favelas while promoting waste management and recycling. From its inception to the present, BRL 6.8M has been invested in Light Recicla. The current cost of running the project is around BRL 1.2M/year (Light, 2015a). As of February 2016, there are 13,900 clients registered in the project.

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3 For example, in 2012, Light had to invest BRL 25M.

4 For registered Social Tariff participants, part of the ANEEL's EEP. Since 2003, more than 9,000 electricity installations have been made in favelas. (World Resources Institute, 2016; Diário do Vale, 2014; Light, 2015b).

5 Much polemics exist around the term "pacify", we use it to reflect official use by government bodies as this paper's focus is electricity access (Andrade, 2013; Carneiro, 2011; Catcomm.org, 2015).

6 This program began on December 18, 2008. Currently, there are 50 UPPs in place (UPPRJ, 2015).

7 Light created this tariff policy in 2008. Separately, in 2002, the Federal Government created an Electricity Social Tariff subsidy for low-income families, providing a discount on electricity bills up to 65%, depending on monthly consumption (Law 10.438). The criteria are national and do not consider the residence site.

8 The inspiration was Ceará electric company's (COELCE) initiative Ecoelce, launched in 2007, in which recyclables are exchanged for electric bill credit. Ecoelce is implemented in Fortaleza and other Ceará cities. Light Recicla focuses only on UPPs.

How the project works

The Light Recicla system is shown in Figure 1:

Step 1: Client registers and receives a Light Recicla card.

Step 2: Client separates recyclable waste, brings it to the collection point (ecoponto).

Step 3: Recyclables weighed and valued.

Step 4: Light carries the credit issued onto one of four possibilities that the client selects.

Figure 1. The Light Recicla system
Source: Mayrink et al., 2015

Fixed and mobile ecopontos both exist. Fixed ecopontos are implemented in favelas and are run by two professionals. Mobile ecopontos are used in fairs, exhibitions, etc. to introduce people to the project.

The recyclable waste (paper, metal, glass, plastic and vegetable oil) is weighed and converted into credit amounts reflecting the recycling market value. For example, on March 31, 2015 the credits granted in the city of Rio de Janeiro were BRL 1.55/kg for aluminum cans, BRL 0.75/kg for other aluminum products or BRL 0.80/kg for PET plastic (Light, 2015c).

The four different ways the client can use credit are:

1. Apply it to his personal electricity bill;

2. Donate it to a project-accredited social institution's bill. (Only non-profit institutions are accredited. Currently, there are 51 registered institutions including the Santa Marta Samba School, a Rocinha community center, a children's hospital, etc.);

3. Donate it to another project participant or;

4. For community businesses only: apply 50% of the credit towards bill payment and donate 50% to a participating social institution.

1.3. PILOT PROJECT (JULY 2011 – SEPTEMBER 2013)

At least in the short term, the regularization implied by the UPP policy was very efficient with regard to the percentage of bills paid and the amounts collected by Light. For instance, in Santa Marta, before the regularization (pre-2009), only 15% of bills were paid, for a total amount collected of BRL 242.17. After the regularization (prior to Light Recicla implementation in 2011), 93% of bills were paid, with a total amount collected of BRL 87,729.95 (Light, 2015a). Hence, an increase of 36,126.6%, representing a huge financial burden shock, and a very important long or medium term risk of payment default. This large amount also

shows the massive electricity consumption that had become the habit (regularized consumption was metered, so counted; irregular consumption was unmetered).

In July 2011, the pilot Light Recicla project was implemented in the Santa Marta favela, Humaitá and Botafogo with a holistic methodology. The two first ecopontos opened in Santa Marta during the summer 2011, and three other ecopontos opened between October and November 2011 in Humaitá and Botafogo. Communication and educational activities in synergy with civic and sustainability practices were developed to encourage a change in daily habits and consumption attitudes.

Professionals working at ecopontos were trained in selective collection and environmental issues. An in-situ communication methodology was used at the ecopontos. Each ecoponto had an educational booklet available for use. Banners, posters, etc. informed the public about the price of recyclable materials, accredited social institutions, electricity savings achieved by selective collection, events, campaigns, etc. Wide communication contributed to project transparency and provided information to all passersby.

Machine recording credit amounts, Light Recicla card and transaction receipt, digital weighing of recyclable material - Source: Light

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Different media were used. For example, community radio stations[9] disseminated specific events, provided project information and tips to encourage residents to adopt positive attitudes and habits regarding electricity consumption and selective waste. Traveling collapsible booths transformed easily into information booths. These were used at events and fairs. Educational games, talks, campaigns and events increased participation.

One key tool was home visits, which were crucial at the beginning to increase buy-in and participation. Culturally, it ensured a close connection with the client by providing individualized information. This helped reduce the fear of novelty. In Santa Marta, home visits reached almost 100% of households.

Transparency is key to the success of this project. Participants can consult the value tables for each recyclable material paid for by the project. They watch as the deposits are weighed and see the monetary amount given in credit.

Finally, partnership creation encouraged wide reach, especially in the private sector. Private schools donated recyclables' value as credit to accredited social institutions (daycare, community centers, shelters, church groups, etc.). A restaurant's recyclables generated credit that was applied to the electric bills of its employees.

Thanks to the system's flexibility, wide dissemination and partner promotion, it encouraged "hill-asphalt"[10] integration, since credit from waste collected in wealthier neighborhoods can be donated to social institutions or other participating accounts.

Since its inception, the project has had the City's support, cooperating with different departments (Depts. of Environment, Social action and Public Space Conservation, Companhia Municipal de Limpeza Urbana the Instituto Pereira Passos and Southern Zone (Zona Sul) Subprefecture[11]). It also counts on the partnership of companies

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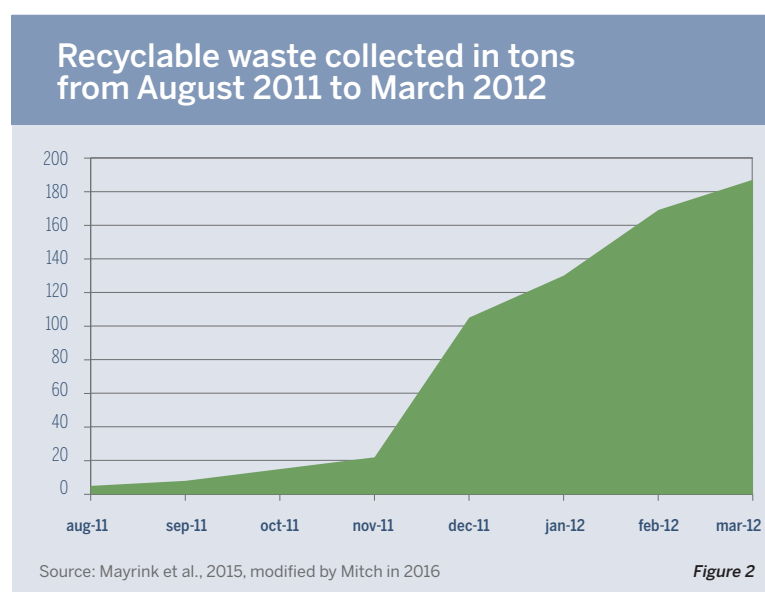
and cooperatives. 3E Engineering Company operates the computer system responsible for billing data transmission and oversees report control and production. A cooperative, COOPAMA - Cooperativa Popular Amigos do Meio Ambiente Ltda., is responsible for collecting vegetable oil. The NGO Doe Seu Lixo is responsible for other logistics, ecoponto operation, collection and transport of recyclable materials.

The project pilot helped generate visibility so that the project could be scaled up, create new partnerships and replicate in other UPPs.

One of the best means of increasing participation was "word of mouth". Figure 2 shows the sharp increase in recyclable waste amounts collected with the opening of the three new ecopontos in Humaitá and Botafogo. By March 31, 2012, 187 tons of recyclable materials were collected at the 5 initial ecopontos, generating BRL 29,920 in credit on electricity bills.

1.4. PROJECT DEVELOPMENT

After the successful pilot phase, the project was expanded to other areas. The evolution of the number of fixed ecopontos created per year is shown in Table 1. We note that after 2011, ecopontos were created sparingly as Light sought to provide the necessary resources to running each ecoponto correctly: quality, not quantity was the main objective of expansion. The first city outside of Rio de Janeiro to receive the project was Mesquita[12] (one ecoponto in Chatuba and one in Banco Nacional de Habitação neighborhoods) in 2014. In 2015, Japeri and Paraíba do Sul welcomed their first ecopontos.

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9 Some favelas have speakers installed on top of poles connected to a central radio station, usually the neighborhood association.

10 "Asphalt" refers to the planned city and "Hill" to the hillsides where favelas arose.

11 Rio is somewhat separated into the Northern Zone, traditionally more disadvantaged and the Southern Zone, traditionally more wealthy.

Recyclable waste collected in tons from August 2011 to March 2012

Source: Mayrink et al., 2015, modified by Mitch in 2016

Figure 2

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12 The result of the partnership between Light, Mesquita City Hall, the Renascer Association of Waste Collectors of Mesquita and the Hope Association of Workers Collectors of Recyclable Materials of Mesquita.

Table 1. Evolution of ecopontos in the city and in the Greater Metropolitan Region of Rio de Janeiro

	2011	2012	2013	2014	2015	Total	Projected for 2016
City of Rio de Janeiro	5	3	2	0	1	11	1
Outside the city	0	0	0	2	2	4	2
Total	5	3	2	2	3	15	3

Source: Light modified by Mitch in 2016.

Figure 3. Location of ecopontos and length of operations (in months) at December 31, 2015 - Source: FERDI

2. RESULTS AND IMPACTS OF LIGHT RECICLA

2.1. DISSEMINATION, PARTICIPATION AND POPULARITY

This expansion policy can be seen in Figure 3, representing the distribution of the ecopontos in the State of Rio de Janeiro and in a zoom on the city of Rio de Janeiro and their length of operation. We note that the main cluster of longest-operating ecopontos is in the Botafogo neighborhood. This can be explained by the fact that Santa Marta became the first UPP in 2008. We note that other neighborhoods do not count as many ecopontos. While the ecoponto in Rocinha, Latin America's former largest favela, has been operating for over 48 months, it is the sole one for 143.72ha (Rocinha received its UPP in September 2012).

By December 31, 2015, there were 13,752 clients registered in Light Recicla. Among them, 6,143 actually benefited (44,7%) from the project. 4,893 clients were considered as regular participants (35.6%).

It is interesting to note the evolution of Light Recicla participants over time. The pilot phase (July 2011 – September 2013) succeeded in involving more participants than the following phase of the project. Thus, 61,7% of the Light Recicla card were distributed during the first 27 months of the project.

This can be explained in part by the difficulty in maintaining community motivation and program loyalty, even with the greater variations in the buyback price table used in Light Recicla. Moreover, there were operational difficulties that arose due to closing of ecopontos due to public works on the steep slopes of the favelas and internal conflicts in the community also contributed to the participation reduction. Participation fluctuated also due to the

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Collected waste in tons from July 2011 to March 2015

Source: Mayrink et al., 2015, modified by Mitch in 2016 — *Figure 4*

In Figure 5, we can see the distribution of credit granted from July 2011 to January 2016 (no available data for the 50/50 option only used by participating businesses). The large majority of the individual clients (97.06%) opt to apply the credit to their own bills.

Allocation of credit uses
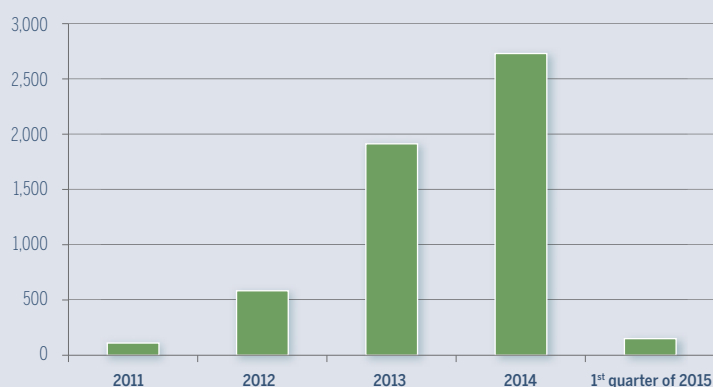
Source: Mayrink et al., 2015, modified by Mitch in 2016 — *Figure 5*

relative distance between ecopontos. A higher density in an area provides more deposit opportunities for the population, not to mention greater dissemination to increase participation.

Nevertheless, the number of deposits made at the ecopontos increased by 33.8% between the pilot project and the following of the project. By December 31, 2015, 169,193 deposits have been made at the 15 ecopontos. And, as shown by Figure 4, the collection of recyclable wastes kept on increasing.

By December 31, 2015, more than 6,132 tons of recyclable wastes have been collected by the project Light Recicla. The main products collected are paper, plastic and glass, representing respectively 43.3%, 33.1% and 18.2% of the weight of the total amount collected.

By December 31, 2015 the recyclables collected at the 15 ecopontos had generated BRL 649,129.70 in credit. From July 2011 to December 2015, the average credit per month per Light Recicla participant was BRL 1.96 (approx. EUR 0.5), and on average deposits at ecopontos were made every two months. These averages mask the fact that some people participated a lot while others did so only occasionally, which explains the low average. Indeed, as the project depended on self-discipline and organization, some residents participated more and saved more than others. Some made enough credit to use towards electric bill payment for several years. For three years, Severino, a resident of Santa Marta, paid his electric bills by exchanging recyclables for credit. Vera Lucia da Costa, a resident of Cruzada São Sebastião, did so for two years.

In May 2012, a satisfaction survey was conducted among 119 Light Recicla participants. The results showed that 23 % of the participants rated the project "excellent" and 57% "good", showing the project's popularity.

2.2. IMPACTS OF THE PROJECT

As explained earlier, at least in the short term the regularization was very efficient with regard to the percentage of bills paid and the amounts collected by Light. The main objectives of Light Recicla were to relieve Light customers from the huge financial burden shock implied by regularization and to prevent a risk of payment default.

Table 2 presents the situations in Santa Marta before regularization (pre-2009), after regularization before Light Recicla implementation (2011) and in December 2015, allowing a before/after comparison.

Table 2. Impacts of Light Recicla in Santa Marta

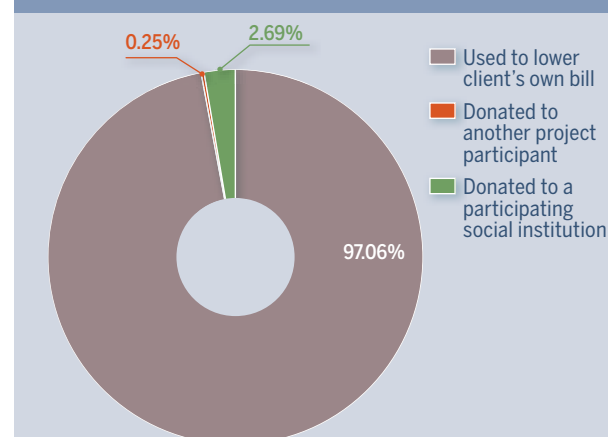|	Pre-regularization (pre-2009)	Post-regularization (2011 before Light Recicla)	December 2015
Number of clients	73	1593	1664
Amount billed	BRL 1,585.64	BRL 93,914.21	BRL 170,225.32
Amount collected	BRL 242.17	BRL 87,729.95	BRL 163,410.71
% bills paid	15.3%	93.4%	96%
% illegal connections	93%*	~ 7%**	~ 0%
% commercial loss for Light***	-93%	-10.9%	-5%

* Based on 1991 Census data (Zaluar and Alvito, 1998).
** Based on 2010 Census data (RIO, 2016).
*** Light method of calculations based on % of unpaid bills and % of illegal connections
Source: Light modified by Mitch in 2016.

In December 2015, Santa Marta was 100% regularized. Illegal connections almost disappeared among the community. While, the amount billed increased by 81.3% between 2011 (before Light Recicla) and 2015, the amount collected rose by 86.3%. 96% of bills were paid against 93.4% in 2011 before Light Recicla.

The credits allowed by Ligth Recicla eased the cost burden for the project participants, improved bill payment and reduced disconnections and electricity theft risk.

In addition to facilitating electricity access post-regularization through the credit scheme, the recycling encouraged by the project also promoted electricity savings (Table 3).

Table 3. Energy calculation from July 2011 to December 2015

Recyclable	Total collected (Kg)	kWh saved*	Household consumption/ month equivalent**
Paper	2,654,837.41	12,106,058.59	60,530
Plastic	2,029,424.94	10,755,952.18	53,780
Glass	1,116,669.01	714,668.17	3,573
Metal	253,846.79	1,345,398.59	6,727
Tetrapak	46,155.60	235,393.56	1,177
Oil	31,535.31	118,257.41	591
Total	6,132,471.06	2,5275,728.5	126,379

* EPA, 2000
** Calculation = kWh saved/Average household consumption. Method based on Calderoni, 2003
Source: Mayrink et al., 2015, modified by Mitch in 2016.

From July 2011 to December 2015, 25,275,728.5 kWh were saved thanks to Light Recicla. This total energy saved is equivalent to the consumption of 126,379 households/month (Mayrink et al., 2015). This represents a population size equivalent to about 49% of Dharavi in India, the world's largest slum (Rai, 2015).

"TRANSPARENCY IS ONE OF THE KEYS TO THE SUCCESS OF THIS PROJECT. PARTICIPANTS CAN CONSULT THE VALUE TABLES FOR EACH RECYCLABLE MATERIAL PAID FOR BY THE PROJECT. THEY WATCH AS THE DEPOSITS ARE WEIGHED AND SEE THE MONETARY AMOUNT GIVEN IN CREDIT."

3. LESSONS LEARNED AND SCALABILITY OF THE PROJECT

3.1. KEY DIFFICULTIES FROM 2011-2014

One major difficulty was the time and effort required to align government needs with those of the private companies operating as Light's project partners. Constant negotiation was required, upsetting project timelines. This impacted the expansion of the project in a more clustered fashion.

Another difficulty arose in process logistics as recyclable materials required removal from ecopontos on a constant basis. In Rio de Janeiro, laws restrict the circulation of loaded trucks to specific times, which resulted in a logistically difficult and costly transportation process.

Limited space for ecopontos in the communities made operations difficult. Mobile ones required more maintenance and transportation logistics to set up, remove and store.

Recycling market price volatility, which depends on the amount of recyclable waste circulating, was a major difficulty because it resulted in fluctuating credit values. This impacted the credit granted.

Finally, Rio de Janeiro lacks recycling companies able to work at the project scope.

3.2. SCALABILITY

Replicable in other favelas, this project generated income to pay household electric bills, helping facilitate access to regularized electricity.

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Currently, there are ecopontos in 15 locations. All favelas in Light's concession area do not have ecopontos. In many, electricity access has not yet been regularized, so there are areas in which the population has irregular, unstable access and in which Light has great commercial losses.

Light has received more than 40 applications for expansion to other areas, the municipalities of Nova Iguaçu and Barra Mansa, Public Defender's Office and the Federal Accelerated Growth Program (PAC).

Since 2012, many private sector companies are interested in the project. Some became ecoponto sponsors. These are: Supergasbrás, Coca-Cola, Hortifruti and Leblon Shopping Centre.

This project can be scaled for different situations – for small permanent ecopontos to temporary ecopontos for major events. Like the sister project in Ceará, it can expand state-wide.

Major events, like the World Cup and the Olympic Games are great opportunities. In 2014, the Organising Committee of the Olympic and Paralympic Games Rio 2016 (Rio 2016) and Light tried to establish a partnership to benefit the Host City's most vulnerable populations and provide the tangible and intangible benefits of realizing the Games (Rio 2016, 2009; Minnaert, 2011).

The initial plan was to promote and establish recycling ecopontos, especially to benefit the City Center's Complexo São Carlos Community, located right across from the Rio 2016 headquarters. The plan was to encourage engagement, promote civics and sustainable daily practices as part of the Olympic and Paralympic Movement. Rio 2016 in-house recycling could be donated in part to low-income community participant organizations. During Games-time, Rio 2016 would donate part of the credit resulting from recyclables to project-accredited social institutions.

Problems arose given the commercial monopoly of the Games sponsors (Louw, 2012). Although Light is the only electricity distributor in the Games concession area and Rio 2016 pays an electric bill, concern arose about sponsors who had paid for branding privileges. For example, when the Central Única das Favelas (CUFA), Brazil's main organization centralizing favela leaders and communities, tried to organize the "Favela Olympics" so that community residents might benefit from the Games dynamic, they were contacted by International Olympic Committee (IOC) lawyers who threatened legal action for any use whatsoever of the word "Olympic", as it is considered the intellectual property of the IOC[13].

Also, there was a relative lack of interest in the proposal. Light inaugurated the Complexo São Carlos ecoponto without Rio 2016.

Since electricity access for low-income populations is a key to development, allocation of subsidies is a telling factor. Federal subsidies allocated for low-income consumers, promoting electricity development, universalizing electric power and expanding natural gas networks from the Energy Development Fund (CDE) (Eletrobras, 2015) are to be used for electrical Games works, causing polemics (Larkins, 2015; Konchinski, 2014). Some alleged that this reduced the amounts for fund-dependent actions. It was alleged that energy subsidies paid by the CDE and determined by the government would be greater if the fund was not being used to pay for Rio 2016 works. Indeed, supposedly, the Ministry of Sports will pay for the electric works with its own funds; however, only a small portion, BRL 42M has been allocated. For the Olympic Park alone an estimated BRL 152M is needed for these works (Konchinski, 2014).

While some argue the legality of this use, the Olympic Act (BRASIL, 2009) establishes that the federal government must provide the services needed for the realization of the Games.

3.3. PROJECT FUTURE

While the Light Recicla project provided great benefits by offsetting bills, improving community cleanliness, encouraging wiser electricity consumption and recycling, not everyone was able to pay their electric bills. A 2012 World Bank study indicates that some people surveyed in UPP focus groups had monthly electricity bills of more than BRL 50, in comparison to BRL 35 to BRL 41 in 2011 (World Bank, 2012). This is quite high given the Rio State monthly minimum wage average of BRL 929.90, 5.35% of monthly income[14]. Data from a FIRJAN (Federation of Industries of Rio de Janeiro) report on UPPs indicates average household

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13 Conversations with CUFA in 2014.

14 It has not been possible to get a viable estimate for average income in favelas (FGV, 2012; ADVFN, 2015).

income as BRL 644 in the Southern Zone (BRL 422 for the Northern Zone) and unemployment levels are 7.3% to 11.3% (FIRJAN, 2012).

While some participants of World Bank focus groups criticized the quality of the electricity infrastructure renovation, they recognized that the main benefit is that people began to believe again in public institutions and insurance of utility provision (World Bank, 2012). Furthermore, people saw regularized Light service as a positive measure because they could count on service repairs and restoration when problems arose. Becoming a client came with rights and duties that included service fulfillment. Previously, if the irregular electricity connection was lost, people had no recourse to re-establishing electricity connections unless there was a generalized problem.

People also noted habit changes, from appliance and electronics accumulation and use to selling them and reducing electricity consumption (Ibid.).

Nonetheless, fear of not being able to pay electricity bills continues. This factor is aggravated by the upswing in electricity bills due to new government rates due in part to low hydro power water levels and lack of water to generate electricity. From March 2014 to March 2015, the electricity rate rose by 50%, leading to a 42% rise in payment default disconnections among Light clients (Barros, 2015).

According to the ANEEL, the increased electric bill cost led to a 113% increase in payment defaults among the lower-income consumers (Barros, 2015). Light Recicla helped ease the burden of electric bills for participants by helping them to reduce bills in exchange for recyclables. In addition, the project raised awareness of the importance of lower consumption, so participants purchased lower energy consumption appliances, like light bulbs, refrigerators, etc. An added benefit was the improvement in waste disposal in favelas thanks to participants' recyclable collection.

CONCLUSION

Exclusion is due to lack of basic infrastructure and the inability to pay the costs associated with its consumption (Dieese, 2015). Light Recicla increases electricity access in low-income peri-urban communities, promotes conscious consumption and sustainability by promoting a behavioral change. It supports social, environmental, economic and cultural transformation. This permits the return on public and private actions and investments made by reducing illegal connections and facilitating bill payment.

While the new (2016) electricity rate scheme is indexed on hydro power production, reducing rates when it rains a lot and much electricity is distributable, bill payment is still a challenge for low-income populations given the lack of access to better employment opportunities and pay. Moreover, recent droughts in Brazil have made hydro power a not so sustainable option and, if rates are indexed on rainfall and if there is little rain, rates remain high.

Given this scenario, electricity providers can play a role extending beyond traditional Corporate Social Responsibility missions, building partnerships in areas falling under government competence. It is important to focus on conscious consumption, as Light Recicla does, so that electricity access for low-income populations could be made long-term, rather than just on income transfer. Noteworthy in this project is the change in consumer behavior towards electricity efficiency. This behavioral change promoted access for low-income

clients because it educated consumers on ways to save electricity, reducing bills and disconnections due to payment default. Furthermore, as the consumer became a regularized client, electricity service became reliable, and the client learned that he/she should enjoy full benefits. By limiting illegal connections to electricity provided dangerously and unreliably, Light Recicla helps promote dependable electricity access to low-income clients.

The project´s methodology and results can be used to work in synergy with public authorities, civil society and private initiative to promote a real transformation for sustainable development. The key tenets are civics, income generation, education, social inclusion, transparency, cultural change and environmental preservation. These depend on ethics and transparency as guidelines for material and electricity use decisions made in companies. They are key to changing peoples' daily behavior.

Despite varying electricity rates, we believe that this project has great merit and can be expanded to other regions and other projects like the Rio 2016 Olympic and Paralympic Games. Major events like the Olympics are key opportunities to scale up and acquaint people with the project so that they will have already participated once, making reiteration easier. In other regions or areas of the world, this project can be scaled up to include an entire state, as the inspiration for this project, Ecoelce, demonstrates.

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