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Energy poverty in developing countries' urban poor communities: assessments and recommendations

Country Report 2014

Case Study Brazil

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Front cover photo of High tension power cables strung across the creek in Vashi, Navi Mumbai. Photo courtesy of Deepak Sharma, 2011.

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Executive Summary

This study has focused on the Brazilian experience in increasing energy access, mainly of the low-income urban population, identifying and analysing key challenges and policies to improve energy services and to alleviate poverty, while enhancing environmental protection and the efficiency in the use of energy.

Within this study, three municipalities were analysed in Brazil: São Paulo, Rio de Janeiro and Recife, providing a perspective of the country's contrasts related to energy access.

As indicated before in the previous study - UPEA II, the types of fuel currently available and used in peri-urban households in Brazil can be categorized as natural gas, LPG, kerosene, fuelwood/solid residues, charcoal, electricity and diesel oil. However, since in Brazil the main energy sources used for domestic consumption in urban and peri-urban areas are electricity and LPG, this study has focused exclusively on the access to such types of energy.

This report shows that the universalization of access to electric power in cities and peri-urban areas is a reality already achieved in Brazil. Several laws have established deadlines for the complete universalization in each region and have compelled the concessionaires to provide electricity to every citizen that requests this service. Nowadays the electricity access is no longer a problem; the new difficulty is the high number of consumers in slums using illegal connections, causing accidents like electrical shocks, fires, and considerable economic losses. These losses are for the consumers as a whole, since their cost is included in the tariff. The challenges that Brazil currently faces is the regularization of the consumers, transforming them into regular clients of the utilities and assuring that these new clients can pay regularly their bills.

Discounts in the electric power bill (*Social Tariffs*) and funds to be split evenly for energy efficiency and renewable energy have been found as the best practices to help low income costumers to afford the burden of his/her electric bill. This document lists the technologies installed at some slums in Brazil in order to reduce electricity consumption and fight against the energy theft culture. Pilot projects and programs of electric power regularization already implemented have tested these methods, showing economic viability for the distribution companies.

Besides electricity access, access to LPG (Liquefied Petroleum Gas) has already been achieved in most households in Brazil, in some cases replacing the use of firewood. This report also includes information about LPG use in Brazil mainly in peri-urban regions, obtained from stakeholder interviews.

The report starts with an introduction to the study area at national level illustrating the urbanization pattern and energy access situation and providing insights into the characteristics of the urban poor households. The same approach was followed at municipality level in the three cities selected.

The next section contains a review of various relevant policies/plans for the urban poor and for urban development, analysed to check to what extent the energy needs of urban poor have been addressed. After that, energy programs at national and local level are described and analysed, including case studies of implemented projects.

The consecutive chapter on barriers identification includes the main characteristics of the energy distributors and key findings in terms of supply side barriers to clean energy access for the urban poor.

This report also contains a chapter on the best practices identified that may be useful for other developing countries. Finally, specific recommendations and conclusions are presented in the last two chapters.

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1. Setting the Context

The “State of the World’s Cities 2006-2007” United Nations report (UN-HABITAT, 2006), mentioned that the Brazilian slums could reach the figure of 55 million habitants in the year 2020, in other words around 25% of the country’s population. Despite the slums growth, this population proportion will be stable or even decline because of several programs started in Brazil. The United Nations report points that the life condition in slums is in general getting worse, there is a tendency of more going hungry, fewer education and employment opportunities in the formal sector and slum residents have more diseases than the rest of the population. The UN Habitat report cited showed that living in a Rio de Janeiro slum is considered by population a barrier to obtaining employment more important than racial or gender discrimination (USAIS, 2009).

In Brazil, several kinds of precarious low-income settlements can be found under three categories that could be included in the “slum” definition:

- *Favelas*: They are precarious inhabited sites, with self-built households, formed from the occupation of public or private estate. They are characterized by the low indexes of infrastructure, absence of public services and low-income population.
- Irregular allotments: Allotments that cannot be regularized because they do not abide by the land subdivision and use. As defined by Pamuk and Cavallieri, 1997, irregular and clandestine allotments are “a kind of popular settlement that differentiates itself from *favelas* as its inhabitants did not invade the properties of third parties (the Public Power or private owners, in most of the cases), but bought allotments from a land promoter that did not fulfil the legal urbanistic demands”. Even though the inhabitant is a buyer, s/he does not have the land ownership guaranteed. Moreover these household are self-built and the families have low income levels.
- Urbanized Cores: Urbanized Cores are slums that already have water, sewage, public illumination and drainage, as well as garbage collection infrastructure.

In 2003 there were 16,433 registered *favelas* in the country. From 1999 to 2001, the number of households in *favelas* increased from 900 thousands to over 2.3 millions. The Municipal Information Research conducted by the Brazilian Institute for Geography and Statistics (IBGE) in 2008 confirms that the existence of *favelas* is greater in the most populous municipalities: when considering the total of 5,564 Brazilian municipalities, approximately 33% declared that they have *favelas*; however, considering those with 100 thousand to 500 thousand inhabitants, the percentile reaches 84.7% and, out of the 37 municipalities with a population of over 500 thousand inhabitants, only one of them did not inform the existence of *favelas*. The percentage of municipalities that declared the existence of *favelas* is higher in the North and Northeast regions (41%), while the presence of irregular allotments is more informed in the South (62.4%) and Southeast (59.0%) regions.

BOX 1. Profile of the extremely poor in Brazil

The Ministry of Social Development and Hunger Combat (MDS) considers as extremely poor families whose per capita income is less than R\$ 70. This parameter is used in social policies, like “Brazil without Poverty” Plan,

- 59% are concentrated in the Northeast Region – 9.6 million people;
- From the total Brazilian people that live in rural areas, one in four people live in extreme poverty (25.5%);
- 51% are up to 19 years old;
- 40% are up to 14 years old;
- 53% of the households are not connected to the general network of storm sewage or septic tanks;
- 48% of the rural households in extreme poverty are not connected to the general water distribution network and do not have well or water source in the estate;
- 71% are black people (black and brown);
- 26% are illiterate people (15 years old or more).

	Total People	%	Urban		Rural	
			People	%	People	%
Brazil	16,267,197	100%	8,673,845	53%	7,593,352	47%
North	2,658,452	17%	1,158,501	44%	1,499,951	56%
Northeast	9,609,803	59%	4,560,486	48%	5,049,317	52%
Southeast	2,725,532	17%	2,144,624	79%	580,908	21%
South	715,961	4%	437,346	61%	278,615	39%
Center-West	557,449	3%	372,888	67%	184,561	33%

Source: 2010 Demographic Census (IBGE) – Private households permanently occupied.

In UPEA I and II main figures related to energy access in Brazil, as well as existing policies were discussed. In this section only a brief updated summary is presented.

The historical series of the percentage of households with electric power in Brazil is the following one:

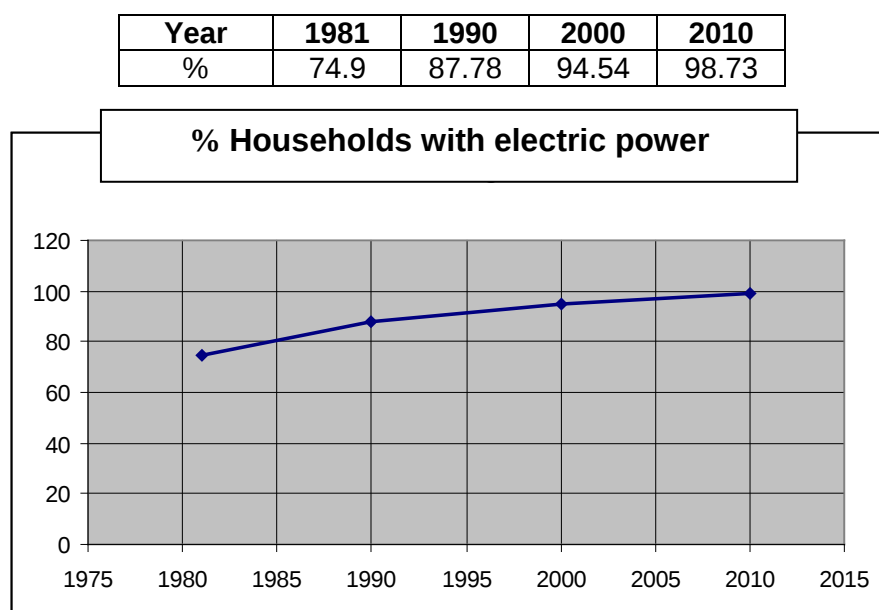


Figure 1 Historical series of the percentage of households with access to electric power.
Source: IBGE (2010)

Table 1 Percentage of urban and rural households with access to electric power.

CENSUS	Household condition	Households		
		Total	Urban	Rural
2000	Total	44,721,434	37,363,856	7,357,579
	Service percentage	94.5	97	71
2010	Total	57,324,185	49,226,767	8,097,418
	Service percentage	98.7	99.7	92.6

Source: IBGE, 2010

According to the household census of the year of 2010 accomplished by IBGE, Brazil has been meeting in average the level of 99.7% of universalization of electric power access in urban areas. This means that out of the over 49.2 million households in cities, only 133,000 of them are still with no access to electric power. In this census, it is not considered the regularity of connection or quality of supply. A photovoltaic panel or a Diesel generator is enough to include a household in the group with access to electricity.

	Household with electricity	Household without electricity	% Electricity Access
Brazil	49,093,032	133,097	99.7
North Region	2,993,228	19,122	99.4
Northeast Region	11,137,927	61,887	99.4
Center-West Region	3,851,820	7,655	99,8
Southeast Region	23,510,520	28,905	99,9
South Region	7,599,537	15,528	99,8
Pernambuco State (Northeast Region)	2,084,773	6,377	99,7
São Paulo State (Southeast Region)	12,333,766	10,211	99,9
Rio de Janeiro State (Southeast Region)	5,075,216	4,303	99,9

Table 2 Household electricity access in Brazil.

Source: IBGE 2010.

These data show that the universalization of access to electric power in cities and peri-urban areas is a reality met in Brazil.

Nevertheless, there is still an important proportion of consumers that are not regularized, that is, using the service through illegal connections¹. According to data from ANEEL in 2010 (DCI, 2011), the energy volume irregularly used, without knowledge of the companies, surpasses the 27 thousand gigawatts-hour (GWh), which represents 8% of the Brazilian electric captive market². The region with the highest

¹ Illegal Connections: Consumers that make their connections by themselves directly in the secondary network without metering.

² Captive markets are markets where the potential consumers face a severely limited amount of competitive suppliers.

index of irregular consumption is the North one, with 20% of the distributed energy, followed by Southeast, with 10%, Northeast, with 9%. In the Center-West region, the percentage is of 5%, and in South, of 3%. CELPA - The Pará Power Plants leads the ranking of losses, with 24.4% of the distributed energy. The Light, public utility in the municipality of Rio de Janeiro, estimates that the consumer would pay up to 17% less if all the electric power thefts no longer existed, and the company would increase the billing in R\$ 1.4 billion per year. Pernambuco Electricity Company (Celpe) informed that the clandestine consumption is responsible for 9% of the losses, what corresponded to R\$136 million per year.

The great challenge that Brazil currently faces is not to grant access to electric power, but to regularize the consumers transforming them into (regular) clients of the electric power distributors (utilities) and assure that these new clients will pay regularly their bills.

Illegal electricity connections cause at least one fire per month and more than 50 houses burned in average just in the São Paulo municipally (AES Eletropaulo, 2009) and many accidents with electrical shock (no official data). The economic losses are considerable, many domestic equipment burns because of the poor quality of the electrical energy; also the lack of culture for using and paying electricity causes inefficiency in the energy consumption level.

Three municipalities were selected to conduct the research: São Paulo, Rio de Janeiro and Recife, in order to have a perspective of the contrasts existing in the country related to energy access. The following sections give a snapshot of these study areas, profile of the urban poor and a discussion on the situation of energy access among the urban poor.

Background of Municipalities

São Paulo

a) Location

São Paulo is located in Southeastern Brazil, in Southeastern São Paulo State, approximately halfway between Curitiba (Capital of Paraná State) and Rio de Janeiro (former capital of Brazil and now capital of the State which bears the same name).



Figure 2: Municipality of São Paulo Location.
Source: Wikipedia

b) Demographic Profile of the City

Capital of the State, São Paulo has a population estimated by the IBGE that in 2011 was 11,316,149 inhabitants, what corresponds to 6% of the total population of Brazil, which consists of approximately 190 millions. Added to the inhabitants from the other 38 municipalities that compose the São Paulo Metropolitan Region, the total population reaches 19.8 millions, being one of the biggest megalopolises in the world. In 2010, the population in the municipality was counted by IBGE in 11,244,369 inhabitants and presenting a population density of 7,383.11 inhabitants per km². According to the same census, 99.1% of the population lives in the urban area (11,125,243 inhabitants lived in the urban zone, and 119,126 in the rural zone).

Besides being most populous, the city of São Paulo is also the city with the highest economic participation in the country's production of wealth, being responsible for approximately 9% of the national GDP. From 1950s to 1980s, the São Paulo Metropolitan Region begins to concentrate the durable goods production industries, leading the industrialization process in the country. This explains the strong demographic attraction that the region exercised over populations coming mainly from the Northeast region of the country. The demographic growth rates for the metropolitan region are of around 5% per year. In these years, the population of the municipality went from 2,151,313 inhabitants in 1950 to 8,493,226 inhabitants in 1980. From the 1990s on, the industrial production is redistributed to other municipalities in the State of São Paulo and to other regions of the country, what explains partially the sudden fall of the demographic growth rates, to the rate of 1% per year.

c) Profile of the urban poor in the city

The Municipal Human Development Index (HDI-M) of São Paulo (year of 2000), considered as high by the United Nations Development Programme (UNDP), is of

0.841. However, this average rate does not represent the reality of São Paulo. There is a considerable inequality between sub-regions as it is shown at the following map:

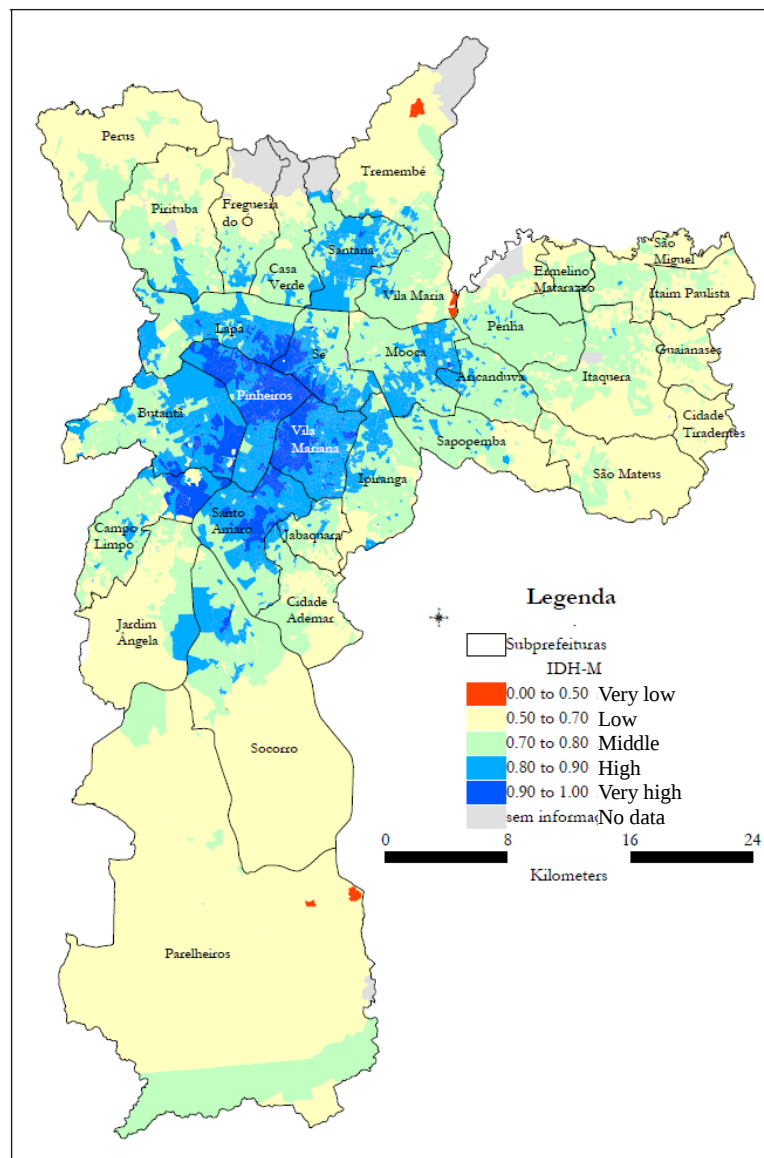


Figure 3: HDI-M in São Paulo city council, 2000
Source: Data – IBGE (2000) and M. PEDROSO (2003)

The São Paulo Municipal Secretariat for Habitation (SEHAB) is the organism responsible for managing the territorial occupation in the municipality of São Paulo, monitoring the conditions of habitation, buildings safety and land use. This institution has registered the number and location of the precarious low-income settlements in São Paulo Municipally:

- *Favelas*: In the city of São Paulo, the *favelas* occupy a 24 km² area – approximately 1.6% of the municipality's surface (July 2010).
- Irregular allotments: In the city of São Paulo, these allotments totalize 92.64 km² - approximately 6.14% of the municipality (July 2010).
- Urbanized cores: The total area of cores in the city is of 2.54 km², what represents 10.49% of the *favelas* area (July 2010).

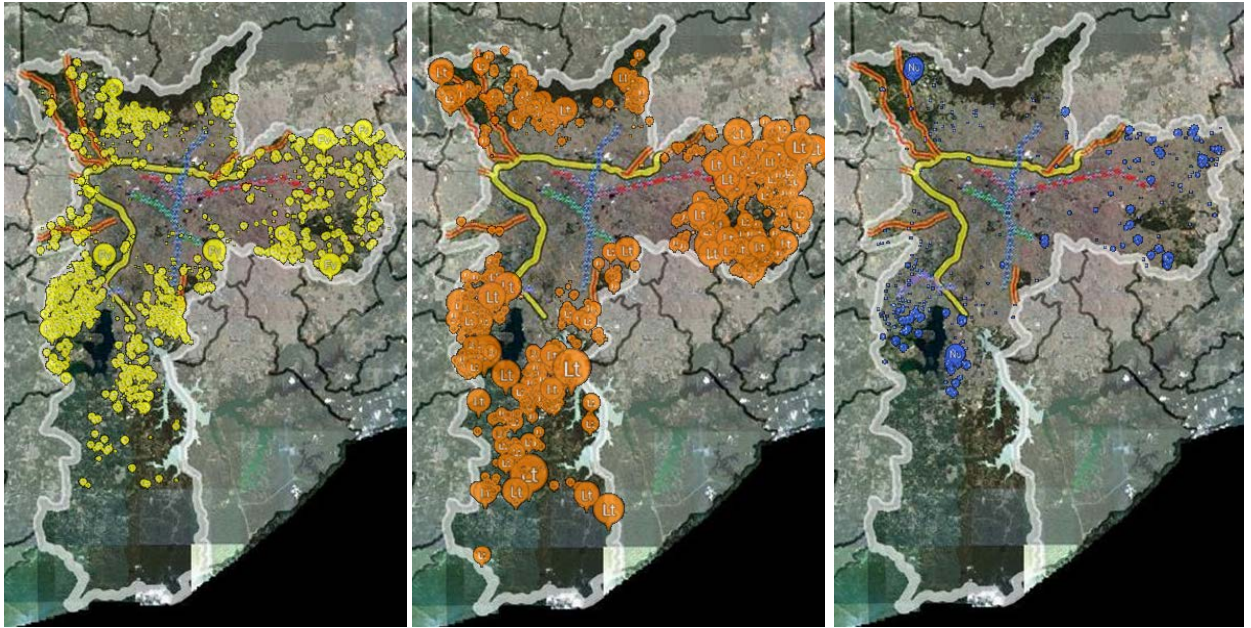


Figure 4: Distribution of the *favelas* (yellow), irregular allotments (orange) and urbanized cores (blue) in the municipality of São Paulo
Source: HABISP, 2011.

As it can be observed in Figure 2, the low-income housing areas are located in the suburbs of the city.

SEHAB created an information system (HABISP) and a system for intervention prioritization in these settlements. One of the indicators used in the decision of intervening is the infrastructure index, which includes regularized access to electric power and existence of public illumination. This information system identified 1,602 *favelas* in the municipality, containing 389,310 households in totality. This same system counted 268,552 households in irregular allotments. Knowing that the average of inhabitants per household is of four people, it is possible to estimate the population that lives in precarious or irregular settlements in the municipality of São Paulo is of approximately 2.6 million inhabitants (23% of total population).

d) Access to clean sources of energy to the urban poor in São Paulo

According to the local energy public utility (AES Eletropaulo), energy universalization is being reached inside the urban area of the municipality, with no existence of households without electric power consumption, although sometimes this usage is very low and is limited to a single lamp. Currently, SEHAB estimates that, despite the local public facility's regularizing efforts, more than half of the households in *favelas* have an irregular electric power connection and do not count on public illumination. SEHAB data concerning the regularization level of electric energy consumption and public illumination installation are resumed in the next tables:

Table 3 Access to electric power of households in *favelas* of the municipality of São Paulo

		Regularized electricity		Total
		Yes	No	
Existence of public lightning	Yes	100,915 (27%)	72,426 (18%)	173,342 (45%)
	No	793,36 (20%)	134,689 (35%)	214,026 (55%)
Total		180,252 (47%)	207,116 (53%)	387,368 (100%)

Source: Self-elaboration with data from SEHAB, 2010.

Table 4 Access to electric power in the existing households in irregular allotments of the municipality of São Paulo.

		Regularized electricity		Total
		Yes	No	
Existence of public lightning	Yes	208,274 (77%)	10,416 (4%)	218,692 (81%)
	No	20,369 (8%)	29,491 (11%)	49,860 (19%)
Total		228,643 (85%)	39,908 (15%)	268,552 (100%)

Source: Self-elaboration with data from SEHAB, 2010.

It can be observed that there is higher proportion of households with supply regularized by the electric power distributor in the allotments than in the *favelas*, as well as a greater supply of public lightning. This fact is due to the allotments be lands that were sold and not occupied as it happens in *favelas*, therefore the buyers demand the existence of energy supply services to acquire the land.

Rio de Janeiro

e) Location

Rio de Janeiro is the capital city of the State of Rio de Janeiro. This state is located within the Brazilian geopolitical region classified as the Southeast. So, as the city of São Paulo, the city of Rio de Janeiro is in Southeastern Brazil – approximately halfway between Vitória (Capital of the State of Espírito Santo) and São Paulo.

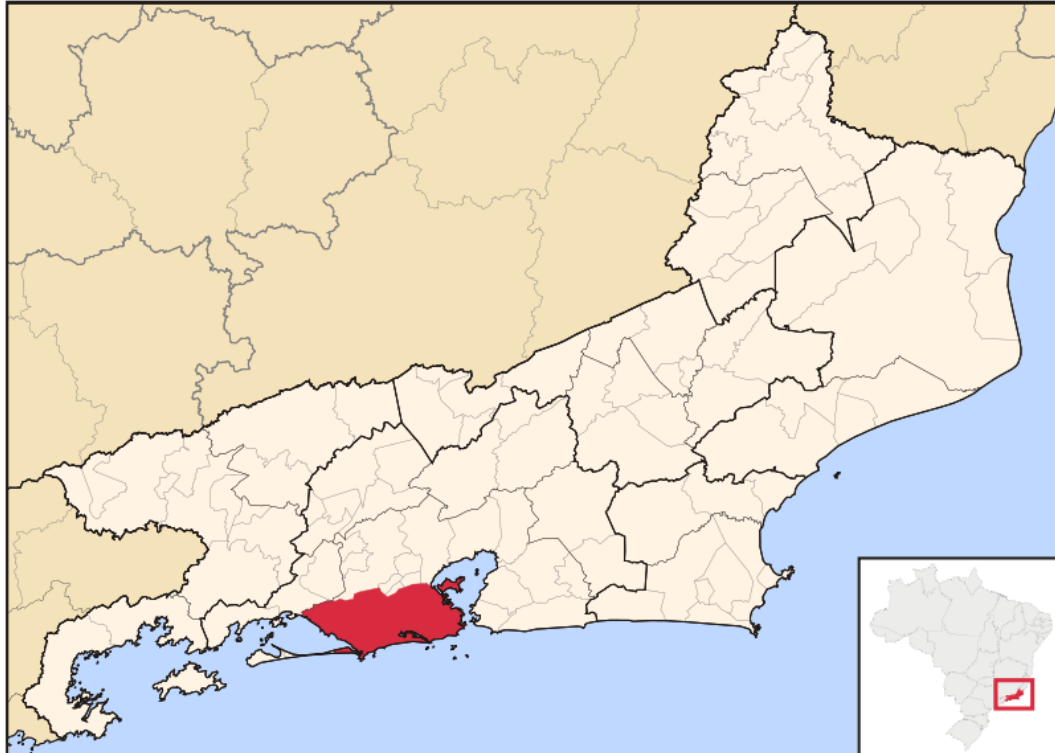


Figure 5. Map locator of Rio de Janeiro's Municipality

Source: ABREU, 2006.

f) Demographic Profile of the City

The population of Rio de Janeiro, according to IBGE, is of 6,323,037 inhabitants in the city and 11,711,233 in the metropolitan region (IBGE, 2010), corresponding to the second largest urban agglomeration of Brazil.

g) Profile of the urban poor in the city

Rio de Janeiro is a city with strong social and economic contrasts, presenting huge discrepancies between rich and poor people. While many districts present a Human Development Index corresponding to the ones in Scandinavian countries like Norway or Sweden, in other districts one can observe levels well below the municipal average, as is the case of the *favelas* called *Complexo do Alemão* (0.711) or *Rocinha* (0.732).

A research developed by Pereira Passos Institute (IPP³), in January 2009, states that Rio de Janeiro already accounts 968 *favelas*, corresponding to 218 more than in 2004.

³ The Instituto Pereira Passos (IPP Rio) is a official organism of the Municipality of the City of Rio de Janeiro whose mission is to provide grants to improve public policies in the city. To do this, perform activities in three main dimensions: (1) encouraging reflection and generation of knowledge about the city;

The research also shows that the *favelas's* area started occupying three million square meters more than in 1999. According to IPP, the *favelas* started to occupy 3.7% of the municipality's territory (Ferreira, 2009).

Although it is classified as one of the main cities of the world, a significant portion of the city's 6.3 million inhabitants lives in poverty conditions. Part of its numerous suburbs is composed by *favelas*, urban agglomerations usually built on slums, where habitation, health, education and security conditions are extremely precarious. One original aspect of the *favelas* in Rio is the proximity to the most valued districts of the city, symbolizing the strong social inequality, which is characteristic in Brazil.

h) Access to clean sources of energy to the urban poor

The use of clean sources of energy, substituting for traditional sources, was a constant in the Brazilian energy policy in the second half of the last years of the XX century. Both the use of liquid petroleum gas (LPG) to substitute for firewood and the use of electricity by the poor population were encouraged. Those substitutions were typical in the case of the city of Rio the Janeiro, which is located very closer of a big refinery that responds for relevant production of LPG (REDUC, a Petrobras – currently one of the most important national oil companies – refinery located in the Municipality of Duque de Caxias, in the State of Rio de Janeiro).

In fact, access to modern forms of energy to shantytown households was the main pillar of the State of Rio de Janeiro energy policy in the 1980's. Although this policy faced resistance, it was supported by the federal government energy policy that offered cross subsidies for both electricity and LPG to low income consumers. Started in 1979, the LIGHT program for *favelas* and unregistered plots of land (Social Benefit Electrification Program) was intended to extend electricity services to all *favelas* located within the limits of the company's concession. The program produced 150,000 new connections in 443 communities from 1979 to 1984. To reach their target, a specific standard of construction of power lines was fixed for shantytowns, taking into account the difficulties of access and construction. The legal limitation imposed for street lighting, due to the lack of payment of city taxes by shantytown householders, was by-passed. A new legal category (community lighting) was created with the corresponding service tax being charged directly to the bills of the consumers in the electrified area (World Bank, 2006).

In the 1990's, the continuity of Light's program hit a strong influence in the income level of the poorest *favelas* population. Tariffs escalated and consumption by the low-income population was relatively high, due partly to the poor quality of the electrical installations and the inefficiency of the electrical appliances used in shantytown homes. Added to the irregular and decreasing family income, these problems led to suspension of supply and to fraud, making the program financially unviable. Nevertheless, actually, Rio can be considered a privileged city in terms of electricity access or access to clean forms of energies by the poor) - all the households, through the "Luz para Todos" ("Light for all") Program, has access to electricity. In such context, it's opportune to mention the success of the financing partnership between Federal Government, State Government and the LIGHT.

(2) production and dissemination of statistical information; and geo-referenced cartographic data about the municipality; and (3) development and coordination of strategic programs of the City Hall.

Recife

i) Location

Recife is the capital and the largest city of the State of Pernambuco, located in the Northeast region of the country.

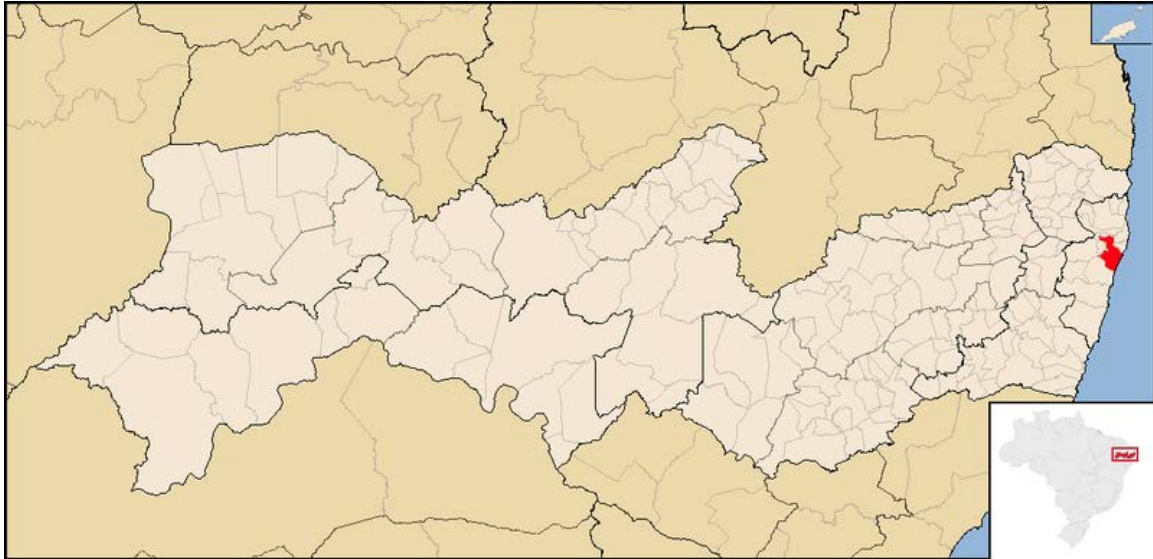


Figure 6. Municipality of Recife Location.

Source: Wikipedia

j) Demographic Profile of the City

Recife is the fourth-largest metropolitan area in Brazil with 4,136,506 inhabitants, the largest metropolitan area of the North/Northeast Regions, the 4th-largest metropolitan influence area in Brazil, and the capital of the state of Pernambuco. The population of the city proper was 1,537,704 inhabitants according to data from IBGE's 2010 Brazilian Census data, in a 217,494 km² area, what results in a demographic density of 7,180.23 inhab./km². In 2008, a R\$ 22.5 billion nominal GDP was registered, obtaining the second highest per capita GDP among the capitals in Northeast region, of R\$ 14,485.67

k) Profile of the urban poor in the city

In Recife, the disposal of areas with high and low human development is a mixture of the standards in Rio de Janeiro and São Paulo. That is, regions with a high HDI-M live side by side with the areas with lesser development, just like the *favelas* at the Rio de Janeiro slums are incrustated in the rich districts of *Zona Sul* (South region). At the same time, there are situations similar to the ones in suburbs in São Paulo, where poverty concentration and social exclusion increase as the districts distance themselves from downtown.

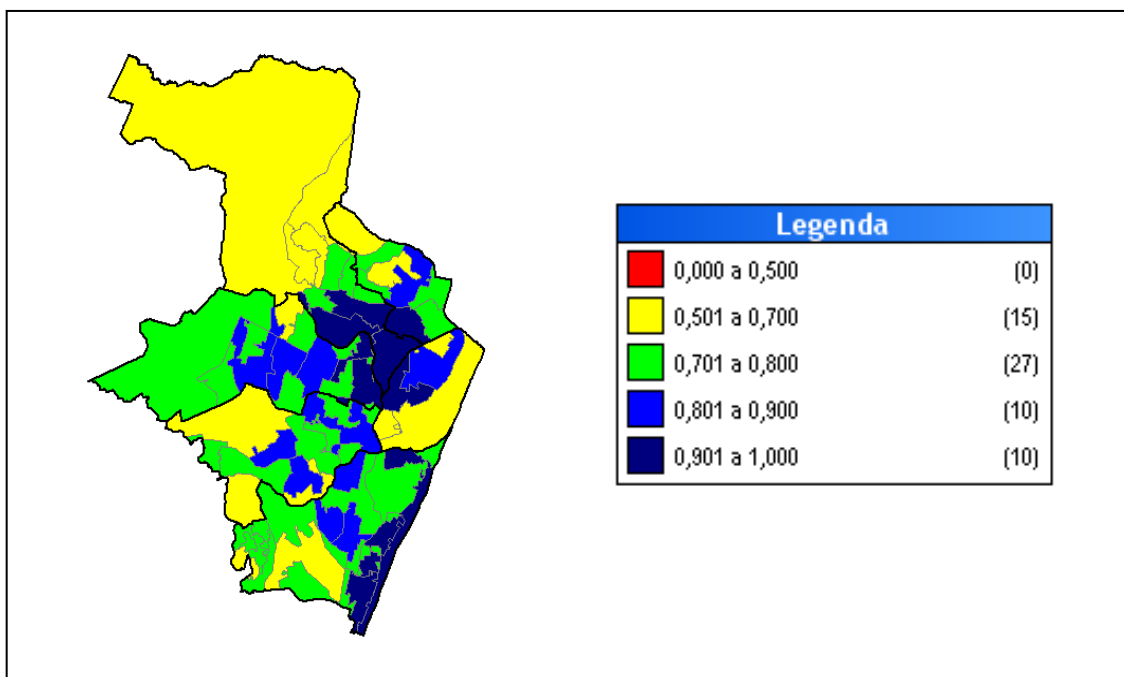


Figure 7: HDI-M in Recife city council, 2000

Source: Data – IBGE (2000) and Atlas de desenvolvimento humano de Recife (2000).

According to the Social Assistance Policy Secretariat of Recife, the poverty situation of the municipality has the following indicators:

- 38% of the population in Recife are among the ones that do not have income or receive up to 1 minimum wage (R\$ 540.00, 2011);
- 29% of the population in Recife receive from 1 to 3 minimum wages;
- 25% of Recife's area are occupied by 490 precarious settlements - *favelas*;
- 40% of Recife's population lives in these settlements (134,790 inhabitants in 34,492 households, IBGE, 2000).

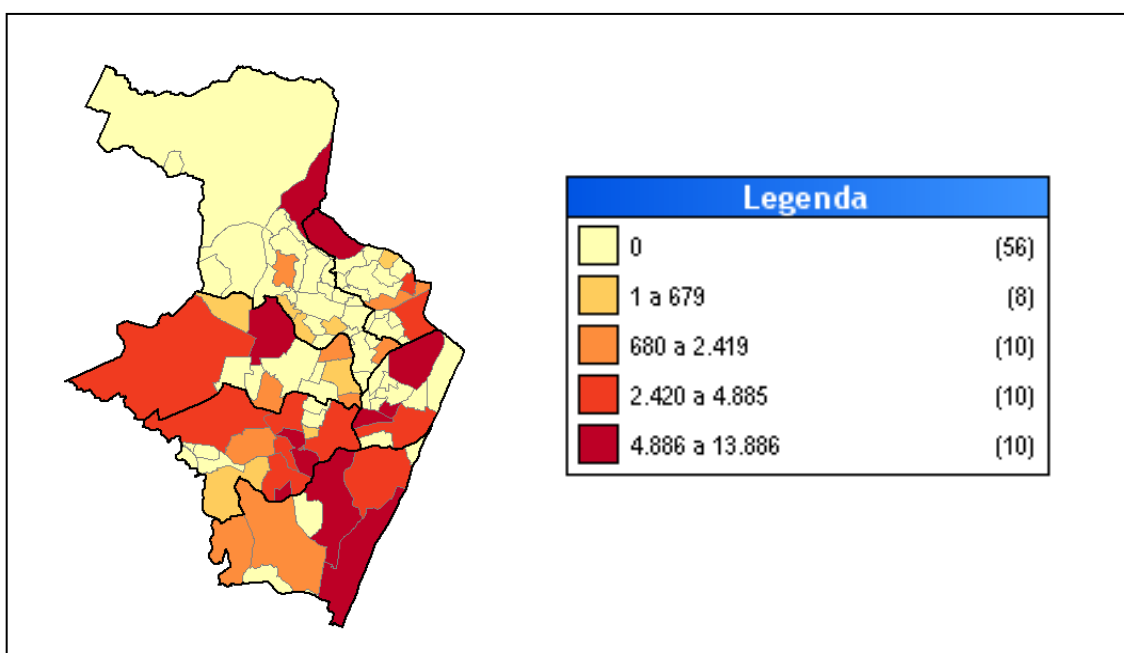


Figure 8: Recife population living in *favelas* per districts

Source: Data – IBGE (2000) and Atlas de desenvolvimento humano de Recife (2000).

I) Access to clean sources of energy to the urban poor

According to the estimations from the Pernambuco Electricity Company (Celpe), in 2008 the electric power access universalization was reached in all municipalities of the State of Pernambuco. Even so, it is estimated that approximately 60 thousand households spread throughout the State are not regularized, clandestinely connected to Celpe's network. As it can be seen in the following map, access to electric energy in Recife in 2000 was already practically total.

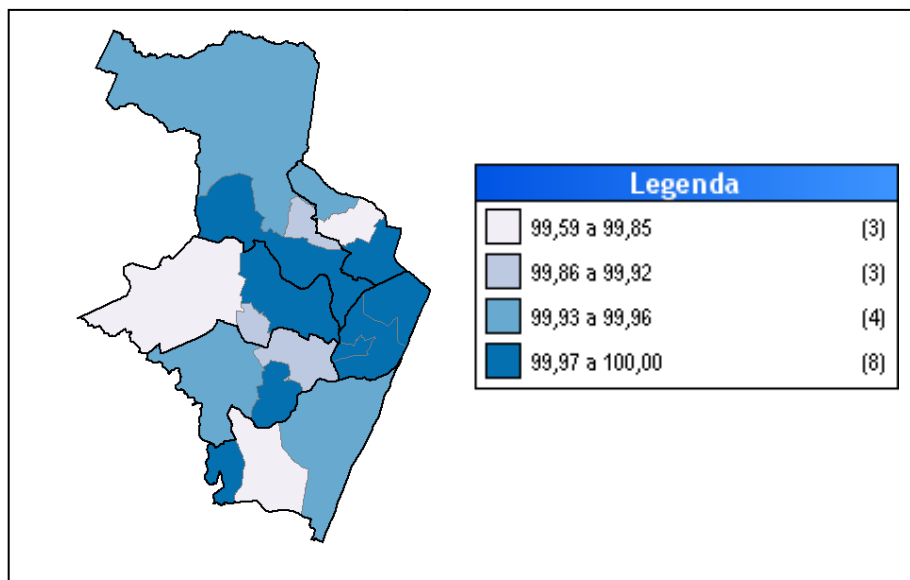


Figure 9: Access to electric power in Recife

Source: Data – IBGE (2000) and Atlas de desenvolvimento humano de Recife (2000).

Energy Planning for the Urban Poor

Plans/Policies for the Urban Poor

The Ministry of Social Development and Fight against Hunger (MSD) was created in January 2004, with the goal of promoting the social inclusion, food and nutrition security, full social assistance and a minimum citizen income to the families living in poverty. In order to do it, the Ministry implements numerous programs and public policies for social development, manages the Social Assistance National Fund (SANF) and approves the general budgets of the Industry Social Service (SESI), of the Commerce Social Service (SESC) and the Transport Social Service (SEST).

Through the direct cash transfer programs, such as *Bolsa Família* ("Family Allowance") program, MSD provides citizenship and social inclusion to the beneficiaries, which are committed to health and education activities. The Ministry also carries out structuring, emergency and sustainable actions of fight against hunger, by food production and distribution actions, family agriculture promotion, regional development and nutritional education, respecting the Brazilian cultural diversity. The Ministry also strives to consolidate the right to social assistance throughout the national territory and to bring agility to the transfer of federal government funding to the states and municipalities.

MSD was originated from three extinct governmental structures: Extraordinary Ministry of Food and Nutrition Security (EMFNS), Ministry of Social Assistance (MSA) and Executive Secretariat of the Interministerial Manager Council of *Bolsa Família*. With its creation, in 2004, the Federal Government centralized the initiatives and began

carrying out its strategy of social development in a more robust and articulated way and with bigger investments in public policies that benefit tens of millions of people.

Nowadays, MSD's actions are carried out in the three spheres of Government and in partnership with civil society, international organisms and financing institutions. This articulation establishes a solid network of social protection and promotion that breaks the poverty cycle and promotes the assurance of citizenship in the Brazilian communities.

Recent analyses point towards the relevance of the income transference programs, specially the *Bolsa Família* program, for reducing poverty and inequality in Brazil. That is, they demonstrate that without distributive policies, the economic growth observed in the last years would not have led towards a decline in inequality (Soares et al, 2006; Medeiros, Brito and Soares, 2007; Neri, 2007; Arbix, 2007).

Right below, the main programs for fighting poverty in Brazil are resumed, at federal and local levels in the São Paulo, Rio de Janeiro and Recife municipalities.

Table 5 Plans/Policies for the Urban Poor at National Level

National Level		
Plans/ policies	Description	Whether energy is addressed
Bolsa Família ("Family Allowance")	<i>Bolsa Família</i> is a program for direct income transference with conditionalities instituted in 2004, which benefits families in poverty and extreme poverty situation. The Program integrates the <i>Fome Zero</i> ("Zero Famine") program, whose goal is to assure the human right to adequate food, promoting food and nutrition security and contributing for the most vulnerable to famine population to conquer citizenship. <i>Bolsa Família</i> serves over 13 million families throughout Brazil. Depending on the family income per person (limited to R\$ 140), on the number and age of the children, the value of the benefit received by the family may vary from R\$ 32 to R\$ 306. The <i>Bolsa Família</i> management is decentralized and shared by the Union, States, the Federal District and municipalities. The three federated entities work together to improve, expand and check the execution of the Program, instituted by Law 10.836/04 and regulated by Decree n. 5.209/04. In order for a family to be able to be a beneficiary of this aid, it is necessary to be registered in the Single Register for Social Programs. The Single Register for Social Programs is an instrument that identifies and characterizes the families with monthly income of up to half the minimum wage per person or up to three minimum wages in totality. This way, the Single Register for Social Programs allows to know the socioeconomic reality of these families, bringing information from the whole family nucleus, from the household characteristics, from the ways to access essential public services, and also data from each of the family components.	This program does not contemplate public funds for clean energies or energy access improvement. The program was instituted from the unification of some social programs for income transference. Among them, the VALE FAS (a subsidy to help poor families to purchase LPG, used mainly for cooking) was substituted. Due to <i>Bolsa Família</i> substituting a support destined specifically and exclusively for obtainment of LPG by money, the program has been contributing to stimulate the replacement of LPG with highly pollutant solid fuels such as firewood. This fact, coupled with the LPG prices deregulation process that took place from the 90s until 2002, produced the aforementioned replacement in fuels

		consumption.
<i>Brasil sem Miséria</i> ("Brazil with no Poverty")	The Federal Government created the <i>Brasil Sem Miséria</i> plan (DECREE N. 7.492) in June 2011, to eradicate extreme poverty in the country. The line that delimits the extreme poverty situation in this plan is a family income per capita lesser than R\$ 70 per month. As it can be observed, this reference is above the line adopted in the Millennium Goals/PNUD (US\$ 1.25). Considering this value, the population reached by the <i>Brasil Sem Miséria</i> plan is currently of 16.2 million people throughout the country. The General Goal of the plan is to promote social and productive inclusion of the extremely poor population, turning the percentage of the ones living above poverty line residual. It has as its specific goals to raise the family income per capita, to expand access to public services and to expand access to opportunities of occupation and income by means of productive inclusion actions in the urban and rural areas. In order to meet these goals, the plan realized the Poverty Map in Brazil, is drawing an Opportunities Map, that identifies the most adequate and efficient means to improve the life conditions of the target population, and a third map that locates territorially the Shortages of Public Services Offer. In urban ambit, the <i>Brasil Sem Miséria</i> plan intends to generate occupation and income for the poorest people, from 18 to 65 years old, by means of professional capacitation study courses, mediation of jobs, expansion of the policy for microcredit and incentive to the popular and solidary economy.	This plan includes the extension of public services offer in the priority areas of the Poverty Map, specifically referencing electric power. Indeed, the access to clean energies and concretely to electricity is dealt by the "<i>Luz para todos</i>" specific program, which will be detailed later in this report.

Table 6 Plans/Policies for the Urban Poor at Local Level

Local Level – São Paulo		
Plans/ policies	Description	Whether energy is addressed
Program for Minimal Municipal Family Income Assurance	In the Municipality of São Paulo, the <i>Programa de Garantia de Renda Familiar Mínima Municipal</i> (PGRFMM), established by Law 14.255, develops actions, programs and joint activities destined to the full treatment of family, child and teenager, in articulation with other secretariats of the Municipality of São Paulo (SÃO PAULO, 2008). Regarding the present criteria, the families that meet the following requirements are eligible: domiciled resident in the Municipality of São Paulo for two years; monthly income per capita lesser or equal to R\$ 175.00; with children and/or dependents with age from 6 to 15 years old, registered in school, with frequency equal or higher to 85% and with updated vaccination card of the children and/or dependents younger than 7 years old (SÃO PAULO, 2006).	The plan does not reference access to clean energies by the target population.

Local Level – Rio de Janeiro		
Plans/ policies	Description	Whether energy is addressed
<i>Programa Municipal de Habitação Minha Casa, Minha Vida</i> ("The Municipal Program My house, My Life")	The Municipal Program "My house, My Life" in Rio, in partnership with the federal Government, has as goal the construction of homes for families that win US\$ 3,850.00R even. Coordinated by the Municipal Secretary of Habitation, the program will prioritize families with income up to US\$ 923.00 with the concession of subsidies and exemption of taxes. For the population that earns up to US\$ 923.00 concentrates 90.9% of the household's deficit in the country - the subsidy is big and varies in agreement with the family income. For these families, the monthly minimum installment will be US\$ 28.55, which will be equivalent to 10% of the income, for 10 years. For the ones that receive US\$ 461.16, for instance, the installment will be of US\$ 46.16. For the ones that win US\$ 923.00, the monthly fee will be of us\$ 92.32. The installments only will begin to be paid after the delivery of the property (RIO, 2012).	The plan does not reference access to clean energies by the target population.
<i>Programa Família Carioca</i> ("Rio de Janeiro Family Program")	The Carioca's Family Program builds on the bases of the Federal Program Federal "Family Scholarship" (focused in poverty alleviation), innovating in the system of payments and in the granted prizes. The total benefits vary in agreement with the poverty and with the school acting. The granted values vary between US\$ 11.54 and US\$ 241.00 for month for family. The program seeks who is poor, and not just who is momentarily poor - privileging the more poor among the poor treating the different ones in the measure of their differences. The Carioca's Family Program joins to the millennium development goals. And, its impacts are constantly evaluated in the search of improvements. In agreement with the City hall of the Municipality district of Rio de Janeiro, the poverty fell instantly for 46% among families contemplated by the Program (RIO, 2012). The students contemplated by the Program had their schools notes increased above the others and the parents' presence (in the schools) doubled comparing with those who is not benefited by the Program.	The plan does not reference access to clean energies by the target population.
Local Level – Recife		
Plans/ policies	Description	Whether energy is addressed
Minimum wage and school-stipend program	It doesn't exist a program to guarantee a minimum wage at city level. The program is the Federal one which has to be applied everywhere in Brazil. In Recife, there is a program to incentive the low-income children to go to school. This program is called School-stipend. For families with one child, there will be provided ½ minimum salary; for families with two children or more – one minimum salary. To be eligible, the families have to proof	This program to not address energy consumption in the house.

	that they live in Recife for at least 5 years and their income is equal or less than 1/3 Minimum salary per capita. Also, the children ages have to be within 7 and 14 years-old. Also, the children has to be present in over 80% of the school-days (confirmed by school) to receive the benefit.	
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Major findings of analysis of plans/policies for the urban poor:

At national level, the *Bolsa Família* program has affected the consumption of clean energy sources by low-income families, due to having eliminated the direct helps destined to LPG. This fact, coupled with the LPG prices deregulation process that took place since the 90s until 2002, produced an exchange in the use of LPG for firewood, as the following graph shows.

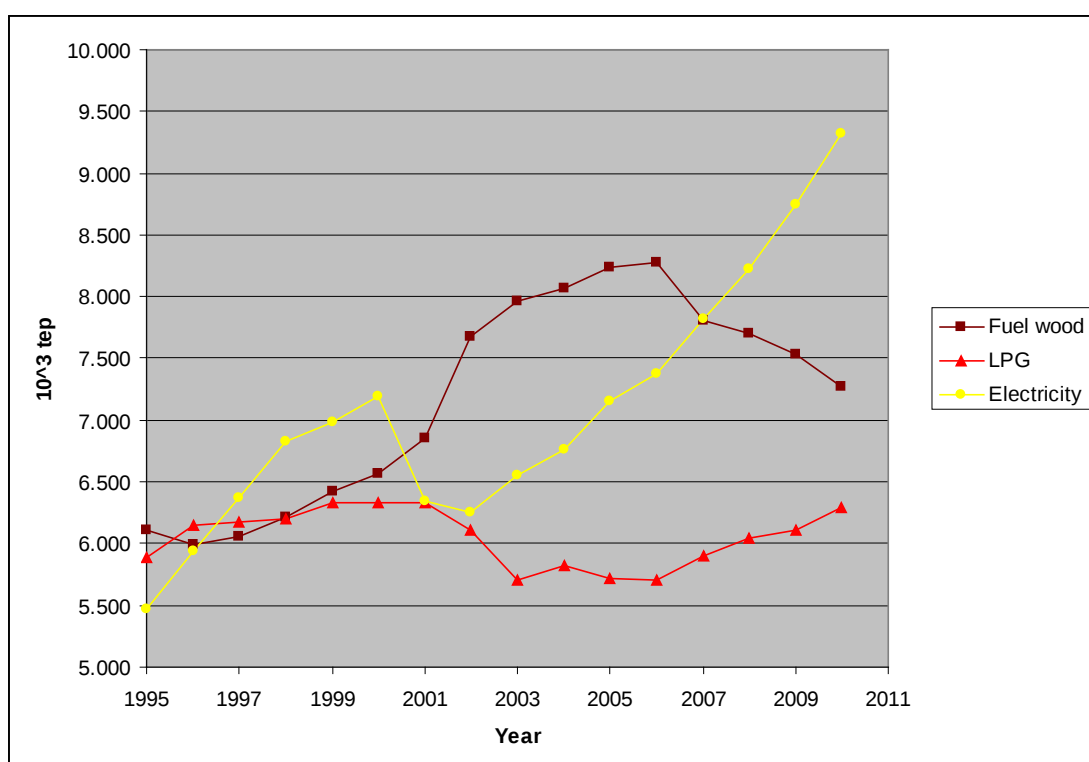


Figure 10 Residential energy consumption
Data source: Brazilian Ministry of Mines and Energy

The *Brasil sem Miséria (Brazil without poverty)* plan mentions the importance of the infrastructure improvement in poverty alleviation. In this plan, it is indicated that the goal of improvement in energy access belongs to another national Plan, explained later in the present document, named *Luz para Todos*, focused specifically in electrification increase.

At local level, the following programs are currently in operation in the Municipality of São Paulo:

Table 7 Income transfers programs in the municipality of São Paulo

Program	Responsible Governmental Sphere	Year when activities started
<i>Renda Mínima Municipal</i> ("Municipal Minimum Income")	Municipal	2001
<i>Ação Jovem</i> ("Young Action")	State	2005
<i>Renda Cidadã</i> ("Citizen Income")	State	2002
<i>Erradicação do Trabalho Infantil</i> ("Child Labor Eradication")	Federal	2001
<i>Benefício de Prestação Continuada</i> ("Continued Provision Benefit")	Federal	1996
<i>Bolsa Família (...)</i>	Federal	2004

Source: Benefits Management Coordination/SMADS, 2009

Considering the variety of existent income transference programs, at local, State and Federal spheres, some aspects should be studied, such as registrations unification, bureaucracy articulation, re-definition of eligibility and priority criteria, among others. Moreover the eligibility criteria are very restrictive and, despite the number of programs, there is lack of capacity to serve the potential population. Besides, the pre-established quotas prevent universal coverage of even the population that meets the eligibility criteria of the several programs (Correa, 2008).

Energy access is considered essential to improving the living conditions of the poor people in peri-urban and urban areas. Access to energy has been a main aspect of the Brazilian energy policies in the last half of the XX century. Utilities keep energy rates for poor families using cross-subsidies. Energy companies (like LIGHT, in Rio de Janeiro) can play a strategic role in the context of improving the access clean energy offering tariffs schemes that allow families and small business to pay their electricity bills and supporting energy efficiency improvements and the use of renewable energy sources.

Table 8 Income transfers programs in the municipality of Recife

Program	Responsible Governmental Sphere	Year when activities started
<i>Bolsa-escola</i> ("School-stipend")	Municipal	1997*
<i>Electricity social tariff</i>	Federal	2002
<i>Erradicação do Trabalho Infantil</i> ("Child Labor Eradication")	Federal	2001
<i>Benefício de Prestação</i>	Federal	1996

<i>Continuada</i> ("Continued Provision Benefit")		
<i>Bolsa Família</i>	Federal	2004

Source: Benefits Management Coordination/SMADS, 2009

*Programa de renda-mínima e bolsa-escola; Panoramas e Perspectivas – Silvia Ramos e Carlos Amaral, 1999.

Plans/Policies for Urban Development

In Brazil, the Ministry of Cities is responsible for urban policies at national level. This ministry defines the general guidelines of the National Policy for Urban Development (Federal Law City Statute, 2001), but the urban and metropolitan planning and management are the municipality's responsibility (or the metropolitan managers', defined by State Law).

Urban planning, land and estate policies (that include zoning, regularization of ownership or propriety, code of works), requalification of central areas, prevention of risks of slopes collapse, recovery of environmentally degraded areas are municipal attributions.

The National Policy for Habitation was elaborated during the year of 2004, having as its main goal to retake the planning process of the housing sector and to assure new institutional conditions to promote access to decent housing for every sectors of the population.

The National Secretariat for Housing of the Ministry of Cities coordinated the elaboration of the National Housing Plan - PlanHab, one of the most important instruments for the implementation of the new National Housing Policy - PNH (*Programa Nacional de Habitação*), provided by Law 11.124/05, which structured the National System for Social Interest Housing – SNHIS (*Sistema Nacional de Habitação de Interesse Social*).

PlanHab is part of a long-term planning process for the housing sector, which presupposes periodical revisions and articulation with other instruments for budget-financial planning of the Federal Government, such as the pluriannual plans, allowing that their goals of physical production and institutional advances can be associated to the planning of the resources needed for their coverage and having the year of 2023 as horizon for the elaboration of strategies and proposals. With this plan, it is aimed to implement a group of actions capable of building a path that allows advancing in the sense of reaching the main goal of PNH: universalize access to decent housing for every Brazilian citizen.

Law n. 11.124 also instituted the National Fund for Social Interest Housing – FNHIS, which in 2006 centralized the budget resources of the programs for Urbanization of Subnormal Settlements and for Social Interest Housing, inserted into SNHIS. The Fund is composed by resources from the Union's General Budget, from the Support Funding to Social Development – FAS, appropriations, resources from external and internal loans, contributions and donations from individuals or legal entities, national or international cooperation entities and organisms, and incomes from operations executed with resources from FNHIS. These resources have application defined by the Law, as, for instance, the acquisition, building, improvement, reform, social location

and housing units leasing, the production of urbanized allotments for housing ends, the land and urbanistic regularization of social interest areas, or the implantation of basic sanitation, infrastructure and urban equipment, complementary to the social interest housing programs.

Nowadays, the most important housing plan at federal level is the *Minha casa minha vida* (My House My Life) plan, which is resumed below.

Table 9 Plans/Policies for Urban Development at National Level

National Level		
Plans/policies	Description	Whether energy is addressed
“Minha Casa Minha Vida” (My House My Life)	The “<i>Minha Casa Minha Vida</i>” is a massive public housing campaign launched by the Brazilian Federal Government in March of 2009, for building one million low-cost units throughout the country by 2014 directed to benefit low rent population, with a federal subsidy of R\$72 billions This National Housing Plan intends to reduce in 14% the housing deficit in Brazil. Nowadays, the deficit reaches 7.2 million households.	In July 08, 2011, the Ministry of Cities Ordinance N..325, from July 07, 2011 which provides for the general guidelines of the <i>Minha Casa, Minha Vida</i> Program, stage II. In this new text, all the enterprise projects composed by single-family units must contemplate a solar heating system, where the new maximum values established for these households already include the costs of the solar heating system. From the beginning of the program, all the projects for building villas included in the <i>Minha Casa Minha Vida</i> program must have their electrical installations, number of taps and minimum specification of materials well defined.
City Statute¹¹	Federal Law 10.257, known as the City Statute, was enacted in 2001. This law represents a significant advance toward improvement of the living conditions of the poorest population groups by recognizing the social function of property and establishing a set of tools that municipalities can use to ensure greater access to urban land and security of possession.	

Local level

The agents involved in formulating and implementing municipal housing policy in São Paulo come from various sectors of the municipal, state, and federal government, as well as from the private sector and civil society. SEHAB, which is responsible for housing policy in the city of São Paulo, has worked in the area of production of social interest housing, as well as the regularization and slum upgrading of existing settlements.

Various programs have been launched by the city government over the past 30 years to ensure that people may continue to live in these areas and enjoy a decent quality of life. Sporadic programs to install infrastructure (*Pró-Água* and *Pró-Luz*, for example, for water and electricity) were followed by complete slum upgrading programs, some of which involved building new housing units on the same site. There have also been more complex programs, such as the Guarapiranga Program. Programs to regularize land tenure are more recent. Among those worth mentioning are *Lote Legal* and the

Program for Regularization of Municipal Public Areas (*Programa de Regularização de Áreas Públicas Municipais*) that issued special use concession titles.

Table 10 Plans/Policies for Urban Development at Local Level

Local Level		
Plans/ policies	Description	Whether energy is addressed
<i>Urbanização de Favelas</i>	Developed by the Municipal Secretariat for Habitation of São Paulo, the Program has as its focus the urbanization and land regularization of degraded lands, occupied and without infrastructure. The goal is to transform <i>favelas</i> and irregular allotments into districts, guaranteeing to its inhabitants the Access to the formal city, with paved streets, basic sanitation, illumination and public services. The program also includes the resettlement of families – in case of risk areas – and the recovery and preservation of protection waters from the water reservoirs, besides housing improvements. To urbanize is to take urban infrastructure to these areas, such as to open and pave streets, to install public illumination, to build water and sewage networks and to create green and leisure areas, besides room for school, day care center and health center. The urbanization of these areas is strategic, since it also grants access to health and security, as ambulances and policing have access to these places, previously degraded, with no paved streets, sidewalks, alleys, etc. Urbanization is indispensable for land regularization of these areas, which, in turn, is fundamental to promote the insertion of this population into the legal context of the city. This is the biggest Program for Urbanistic and Land Regularization of the country and it comprises irregular and precarious allotments.	The program has as its goal the improvement of infrastructure, among them, of public illumination.
<i>PROGRAM CARTA DE CRÉDITO FGTS - (Resolution CCFGTS 460/04):</i>	The Resolution 460/2004 define the policies for the utilization of the resources from the FGTS (Working time Guarantee Fund), initiated in 2005 which establishes the use of the FGTS resources for the low-income families (which receive less than 5 minimum salaries), as the medium classes families can obtain credit from banks/financial institutions to purchase their houses.	
<i>HBB - PROGRAM HABITAR BRASIL BID:</i>	This is a program to execute integrated urbanization projects in degraded or dangerous (risk) areas occupied by houses, in which live families whose income does not exceed 3 minimum salaries. The partners of this program are the Interamerican Development bank – BID, Ministry of the Cities, The Caixa Econômica	

	Federal (Federal Saving Bank), Recife City Hall, The Recife Urbanization Company (URB/DPE) and the Secretary of Habitation of Recife. This program financed 320 houses in the Torre district and is under bidding 759 houses in several areas of Recife.	
PSH – PROGRAM OF SUBSIDY TO SOCIAL INTEREST HOUSES:	This program aims the low-income families, providing subsidies for the citizens to acquire their houses. These subsidies are provided when the contracts with the financial institutions authorized to operate this program are signed. The PSH offers subsidies either in the cost of the financial transactions or in the area of complementation of the price to purchase or sell the houses. The PSH obtains resources from the Federal government budget and state, Federal District and municipalities support as Exchange to complement the total budget required in the transaction. Under the PSH finance 48 houses were concluded and given in the communities of Mangueira and Mustardinha; 71 houses in the north and South hills of Recife; 224 houses in Cordeiro. In addition, 377 houses are under construction in different parts of Recife. Those families receive a monthly stipend to rent houses while theirs are not ready.	
REQUALIFICATION OF THE SPECIAL SOCIAL INTEREST AREAS:	This program aims the improvement of the quality of life of the population living in the areas of special social interest, through the legalization of the property ownership, definition of the urbanistics and special construction parameters and the implementation of the urbanization parameters. The partners in action are: Interamerican Development Bank, The Federal Government (General Federal Budget) – PREZEIS and Recife City Hall.	
PROGRAMA CRÉDITO SOLIDÁRIO (Solidary credit program):	This program objective is to promote the improvement of the standard of living of the low income people by providing access to houses to families that earns up to three minimum salaries, that has be organized into associations and cooperatives. The partners for this program are: Ministry of the cities, the Caixa Economica Federal through the Social Development Fund, Recife City Hall, social movements, cooperatives and associations.	
PAR - PROGRAMA DE ARRENDAMENTO RESIDENCIAL (Residential leasing program)	The objective of PAR is to supply houses for families whose income is less than six minimum salaries. The prospective owner must be at least 18 years old and should not have property in his or her name. The property will be financed by the Caixa Economica Federal and it will be leased to families that have the option to acquire the property after 15 years and still have the benefit of not have to pay property taxes for the next 15 years. Until now, there were given 336 houses in this program.	

Major findings of analysis of plans/policies for urban development

Improvement of efficiency in electricity consumption in low-income families: The Ministry of Cities Ordinance N.325, from July 07, 2011, compels that, from the day of this publication, all the households built inside the *Minha Casa Minha Vida* program must count on solar energy for water heating, collaborating for a reduction in expenses with energy. The showers with solar heating are a great advance in energy efficiency, since the electrical shower is typically responsible for one third of the electric power consumed in a household. According to assessments from the Ministry of Mines and Energy, approximately 5% of the national consumption of electric power is used in water heating for shower. Although efficient from the point of view of electric power conversion into thermal one, its usage is not considered efficient for electricity utilization. Therefore, an electric-solar mixed system makes it possible to obtain up to 80% of solar energy and to use solely 20% of electric power. Logically, this measure largely improves the Access of low-income families to clean energy.

The situation suggests *favelas* need a new energy policy approach. Although subsidized tariffs are still needed, the energy policy must be articulated with social inclusion policies. The two fundamental targets for energy access policies must be the enlargement of citizenship rights to low income families and energy tariffs affordable for its population. Coordination of government social programs with energy companies programs oriented to improve energy efficiency is clearly a win-win strategy that benefits the consumers and utilities.

Plans/Policies and Programs for Energy

m) National level

The privatization of electric companies in Brazil began in 1996 after the approval of the sector's new framework for an operational model, adjusting the existing legislation to allow foreign ownership of utilities.

The Ministry of Energy and Mines (MME) has the overall responsibility for policy setting in the electricity sector while ANEEL, which is linked to the Ministry of Mines and Energy, is the Brazilian Electricity Regulatory Agency created by law in 1996. ANEEL's main function is to regulate and control the generation, transmission and distribution of power in compliance with the existing legislation and with the directives and policies dictated by the Central Government. The National Council for Energy Policies (CNPE) is an advisory body to the MME in charge of approving supply criteria and "structural" projects while the Electricity Industry Monitoring Committee (CMSE) monitors supply continuity and security.

Another important actor of the Brazilian electricity sector is Eletrobras. This company is focus on electric power generation and transmission areas, in which it is the absolute leader in the Brazilian market. Eletrobras supports government strategic programs, such as the program that fosters alternative electric power sources (Proinfa), the National Program for Universal Access of Electric Power "*Luz para Todos*" and the National Program for Electric Power Conservation (Procel).

Universalization of electricity access

The Brazilian Federal Constitution defines electric power distribution as a federal public service. In April 2002, the approval of Law 10.438/2002 attributed to ANEEL the competency to establish, for compliance by each electric power distributor, the targets to be periodically met, aiming at the universalization of electric power usage. In the use of this attribution, Resolution n. 223, from April 29, 2003, was edited, which established the general conditions for elaboration of the Electric Power Universalization Plans aiming at serving new consumer units, and fixating the electric power distribution responsibilities. This resolution fixed electricity coverage targets per concessionaire and per Municipality, through the indication of the year in which the universalization should be concluded, according to the Service Index⁴ existent in the respective area.

Resolution n. 223 established a deadline for the complete universalization in each Municipality, being the most distant deadline the year of 2015, for the Municipalities with Service Index below 53%. Afterwards, these deadlines were reviewed and advanced to the year of 2008, due to fundamentally converge with the country's rural electrification plan, the so-called "*Luz para Todos*" program.

The "*Luz para Todos*" program was launched by the Federal Government in November 2003, and it has as its goal to end the electric exclusion in the country mainly in rural regions, reaching over 10 million people until the year of 2008. The Program have been coordinated by the Ministry of Mines and Energy, operationalized by Eletrobrás and executed by the electric power concessionaires and rural electrification co-operatives. For meeting the initial goal, R\$ 20 billion was invested. The map of electric exclusion in the country revealed that the families with no Access to energy are mostly in sites with smaller Human Development Index and in low-income families. Approximately 90% of these families had income below three minimum wages and 80% are in the rural areas. During the execution of the Program, new families with no electric power in their households were located and, due to the appearance of a great number of demands, "*Luz para Todos*" was extended to be concluded in the year of 2010. The Program was once again extended, now to be finished in 2011.

Each local electric utility was called to present an Universalization Plan, containing Annual Programs for Service Expansion, which must contemplate several indicators such as areas in which the extension of primary and secondary distribution networks will be performed for the connection of new households, kilometers of new extension of distribution networks, and goals of the quantity of consumer units to be attended. An annual report must be sent to ANEEL, informing the number of serviced units and the Service Index. The failure to comply with the goals gives rise to the application of financial sanctions to the responsible distributor companies.

The last approved legislation that regulates the sector is Resolution n. 414/2010, which gathers and condenses several regulations about electric power supply. This resolution serves as a guide for consumers and distributors, defining how should be the initial service (supply solicitation, connections deadlines, budgets for supply works, charge re-handling), what are the pricing methods, how are the contracts, metering and billing, the possible payment methods, the clarification about the bill, the irregular procedures, the responsibilities of the distributor and of the consumer, the suspension of supply, how should be the service to community and the repayment for electrical damages.

⁴ Ratio between the number of households with electricity and the total number of households.

It is important to emphasize that this legislation requires the concessionaires to provide electricity to every citizen that requests this service, always and whenever the household to be connected has its land tenure regularized or in process of regularization.

Low Income Tariffs

Brazil has adopted performance-based regulation⁵ to ensure that fair and reasonable tariffs are paid by the so-called 'captive' electricity customers. A performance-based, price-capped and multi-year tariff is used to achieve quality, reliability and universal service. Tariffs in general are relatively high compared to many other countries, especially those such as Canada with a comparable proportion of hydroelectric generation in its mix. However, it should be noted that the Brazilian tariff on average is more than 30% tax, a significantly larger percentage than imposed in most other countries (USAID, 2009).

The Electric Power Social Tariff is a discount in the electric power bill that can be granted to residential clients registered in the Unique Register for Federal Government's Social Programs (*CadÚnico*). The Energy Power Social Tariff was created by the Federal Government, with the publication of Law n. 10.438, of 2002, and regulated by the ANEEL by means of the Normative Resolution n. 414 of 2010.

The Low Income Tariff (LIT) or 'social' tariff provides those qualifying with a large discount. The discount percentiles applied in energy bills are the following ones:

Table 11 Discounts included in the Electric Power Social Tariff

Range	Discount
Monthly consumption of up to 30kWh	65%
Monthly consumption from 31 kWh to 100 kWh	40%
Monthly consumption from 101 kWh to 220 kWh	10%
Monthly consumption above 220 kWh	0%

Source: ANEEL, 2011

Indigenous and *quilombo*⁶ people also have right to the discount. In these cases, the discount is of 100% until the consumption limit of 50 kWh/month. When consumption is above 50kWh, the discounts from the consumption parcel corresponding to Table 2 above will be applied.

The families that are entitled to this tariff must abide by some of the following criteria:

⁵ Performance-based regulation, is a regulatory approach that focuses on desired, measurable outcomes, rather than prescriptive processes, techniques, or procedures. Performance-based regulation leads to defined results without specific direction regarding how those results are to be obtained.

⁶ A *quilombo* is a Brazilian hinterland settlement founded by people of African origin. Most of the inhabitants of *quilombos* were escaped slaves and, in some cases, a minority of marginalized Portuguese, Brazilian aboriginals, Jews and Arabs, and/or other non-black, non-slave Brazilians who experienced oppression during colonization.

- Registered in *CadÚnico*, with monthly family income, per person, lesser or equal to half of a minimum wage⁷.
- Registered in *CadÚnico* with monthly income of up to three minimum wages, which has an individual with a disease or pathology which treatment or medical procedure requires continuous use of devices, equipment or instruments that, for proper work, demand electric power consumption.
- People with disabilities and people with age equal or above 60 years old that prove that they do not have means to provide their own maintenance or to have it provided by their family. In these cases, there is no need for the family to have *CadÚnico* to receive the discount in their bill.

Each family is entitled to receive the benefit in solely one consumer unit. In case there is duplicity in reception, the benefit will be suspended in all registered households. In order to receive the benefit again, the consumer will need to make a new request and choose one of his/her consumer units.

In order to request the register in the Electric Power Social Tariff, the interested person must inform his/her local concessionaire. The Electric Power Social Tariff benefit is only granted after validation and approval of the ANEEL.

The CDE (*Conta de Desenvolvimento Energético* or Fund for Energy Development)⁸ is a fund for subsidizing rural electrification and tariffs for very low-income consumers, and according to ANEEL, R\$1,408 billion went to the distributors in 2006 from the CDE fund. The 36% of the 50.2 million electricity customers received the LIT in Brazil. Of these, 82% automatically received the lowest tariff because they consume less than 80 kWh per month. In 2007 ANEEL tighten the eligibility for the LIT by requiring that consumers be registered in government low income programs such as *Bolsa Família* as a proof of low income condition. ANEEL has eliminated the low-income self-declaration, requiring instead they register in the government's *CadÚnico* registry and are certified as low income under *Bolsa Família* to receive the benefit, eliminating some non-poor from the LIT rolls like those with vacation homes and single occupancies. Inclusion would improve for low income families that use more than 220 kWh that are now excluded from the LIT. (PNADO, 2009)

Energy Efficiency and Renewal Energy in Low Income Areas

ANEEL created an 'electricity-industry-wide' fund for Research and Development (R&D) and Energy Efficiency (EE) improvements in the late 1990s. Utilities' concessionaire contracts contain provisions to access this fund, which amounts to 1% of the utility's gross revenue for use in their own territory (½% for R&D and ½% for EE). The Federal Law 12.212/ issued in 20/01/2010 modified the destination of the Program of Energy Efficiency, added the requirement that one-half of the set-aside for EE (i.e., ¼%) be used for low-income households. This law also establishes that public utilities

⁷ Brazilian minimum wage is fixed by the federal and states governments. It is R\$ 545 per month in 2011 (Law n. 12.382 of 25/02/2011)

⁸ The Energy Development Account (*Conta de Desenvolvimento Energético* – "CDE") was created by Law No. 10.438 in 2002 as a fund aimed at fostering the energy development of the Brazilian States and the competitiveness of alternative energy projects, natural gas fueled power stations and Brazilian coal fueled power stations in the locations served by the Brazilian Electric Interconnected System, and making the energy services generally available to all people throughout the Brazilian territory (the so-called universalization of the services). The CDE is regulated by the Brazilian government and administered by Eletrobras.

now have to apply, at least, 60% of the resources dedicated to efficiency for consumers benefited with the Social Tariff, in other words, listed in CadUnico.

Annual cycles of planning, application, and approval by ANEEL govern each year's allowable activities and expenditures. Recently, slum electrification initiatives (e.g., reconnection and metering) became eligible for EE activities as they enabled customers to understand and monitor their own energy consumption. In addition, expenditures on energy saving appliances within slum households were also eligible if they achieved at least an 80% cost-benefit ratio.⁹

These resources are also being used to solve the great problem of massive utilization of electric showers. Most of the population and almost the totality of the low-income urban population use this system to heat running water, consuming an average of 20 kW of potency per unit and producing great consumption peak from 5:00 PM and 8:00 PM, time that coincides with the end of labour journey. This problem could be reduced by means of installation of solar heaters in the abodes, but due to the need of installation of copper pipes, such technology is not accessible for its high cost. However, the Government intends to install solar heaters in all the newly built households included in the "*Minha Casa Minha Vida*" plan.

n) Municipal level

Energy access and regularization projects in São Paulo - transforming consumers into customers program.

Since 2004, AES Eletropaulo has operated the program called "Transformation of Consumers into Customers", which aims to improve the conditions of power supply in low-income communities through the regularization of electric connections and the donation of more efficient appliances. Up until 2010, the company had regularized 411,039 connections, benefiting 1.64 million people in 991 of the 2.2 thousand low-income communities in its concession area. A further 80 thousand connections are expected to be regularized by 2012.

AES Eletropaulo allocates 0.5% of its net operating revenue to the Energy Efficiency Program, in compliance with the decision of the Brazilian energy agency, ANEEL, in addition to company funds. It is important to stress that these funds are in fact consumer funds, never resources from public utility. The ANEEL's Energy Efficiency Program is a contribution paid by electricity users to be applied by utility under strict ANEEL's control.

In 2010, investments totalled R\$18.2 million from company funds and R\$62.5 million from compulsory resources. To help the community have the financial conditions to pay their electricity bills, AES Eletropaulo contributes to reducing energy consumption, replacing incandescent light bulbs with compact fluorescent ones, as well as refrigerators in a precarious state, installing smart showers and also renovating internal electric installations in houses in poor condition. In addition to being more efficient in terms of energy consumption, the new refrigerators use iso-butane gas and foam with cycle-pentane gas that does not harm the ozone layer. Moreover, the precarious refrigerators are disposed of correctly by specialist companies, who recycle and reuse the component materials.

⁹ The ANEEL Manual for Elaboration of Energy Efficiency Programs provides a specific methodology for evaluating energy efficient investments, such as refrigerators and lighting, that takes into account factors for the replacement equipment and the coincidence of usage with the system peak.

The Turning Consumers into Customers Project also promotes citizenship, given that the customer ends up with a proof of residence (the electricity bill), enabling eligibility for diverse benefits in society. To measure the project's results, periodic satisfaction surveys are carried out in the regularized communities.

For 2011, the target is to reduce the default rate among new customers. The campaign "*Pagou em dia, é só alegria*" (Happiness is paying on time) was launched in 2010, with a seven-month duration. All customers in the areas regularized by AES Eletropaulo between 2004 and June 2010 and with their bills paid up and their registration regularized take part in the campaign. Participation is automatic, as numbers are generated automatically, with a monthly draw on the campaign site: (www.pagouemdiaesoalegria.com.br). Each month, 60 tickets worth R\$200 are drawn, and one worth R\$5,000. In three months of the campaign, the number of paid-up customers rose by 6.3%.

The program has already substituted 18,226 refrigerators in a poor state of conservation for refrigerators with the Procel stamp, 880,000 incandescent light bulbs for compact fluorescent ones and installed 3,101 lighting points in alleys. Residences also benefited from 1,709 internal electrical renovations, with the installation of new switches, sockets, circuit breakers, fuse boxes and shower heads. In 2010 alone, 55,473 connections were regularized, benefiting 221,892 people. The average investment per customer was R\$ 327.55 and involved the construction and renovation of the distribution network.

AES Eletropaulo has invested R\$ 294 million and it has collected around R\$ 500 million through electric bills along the whole program. This fact demonstrates the viability and economic return of the regularization and energy efficiency program.

Study of case: Paraisópolis¹⁰

In Paraisópolis, the second largest *favela* in São Paulo with approximately 20,000 households, almost all the households and businesses had illegal electricity connections and the quality of electricity service was very poor and dangerous. Households and businesses consumed high amounts of electricity (on average 250 kWh/ month) due to the poor condition of household equipment and the lack of a electricity bill to encourage consumers to reduce they consume.

USAID and International Copper Association (ICA) teamed with AES-Eletropaulo, developed a project to regularizing electricity service in a target area of Paraisópolis. The pilot was initiated in October 2005, the selected area includes 4,365 low-income households and businesses of which 60 households had small home businesses and 423 were stand-alone commercial enterprises. This informal community lacks many municipal services; it has a physically challenging geography and is surrounded by middle- and upper-income residential areas. Despite the land is publicly owned, government is currently implementing a land tenure program to register residents and transfer title to them.

To start the regularization program, AES-Eletropaulo contacted community leaders and then held several community meetings to inform residents about bill payment, their energy consumption and measures to reduce electricity usage. After this, each

¹⁰ This study was publicized, produced and review by the United States Agency for International Development. For more information about this project access:
<http://pdf.usaid.gov/pdf_docs/PNADO642.pdf>

household and business was identified, registered and numbered. Pre- and post-regularization community campaigns and door-to-door visits by community “agents” were carried out over several months both. These campaigns were important to show the importance and advantages of paying the electricity bill and the implementation of efficiency measures that could be undertaken to reduce consumption and costs.

In this project, the distribution network was upgraded and meters were installed in households and businesses. The connection was free and any debts owed were forgiven. A key component was the use of new technologies to reduce theft and improve the efficiency of the distribution network. These included the following:

- Using bi-coaxial cable and individual meters.
- Electronic metering for large commercial consumers to allow remote control.
- Replacing conventional transformers with efficient transformers.

Due to the high level of consumption by households and the need to enhance the affordability of service, the project included measures to increase household efficiency. Every household had an energy audit to identify energy save opportunities, the replacement of three incandescent bulbs with efficient compact fluorescent bulbs in each home, the replacement of refrigerators in bad condition, and rewiring of homes. Information of commercial customers was collected in order to make recommendations for reduce their bills.

Most of the regularized families in the pilot area were highly satisfied with the improvement on quality service and the household energy efficiency measures. The energy efficiency measures taken in the households and distribution network are expected to yield annual energy savings of over 2 million kWh. Bills to households and businesses were capped at 150 kWh during the first three months to help households transition to paying for service as well as to educate them about their actual consumption levels and charges once the cap is removed.

After project implementation, AES-Eletropaulo began to collect new revenue from consumers who had not previously paid for their electricity consumption. The bad debt rate is relatively high (about 35%). This bad debt rate is due to the large number of commercial customers with high consumption levels that are unable or unwilling to pay. The survey results show that nearly a third of households took a ‘great effort’ to pay their electricity bill. This is a challenge to project sustainability and needs to be taken into account by AES-Eletropaulo.

The pilot approach and results were shared at a workshop, entitled “Improving Electricity Service for the Urban Poor” in São Paulo, Brazil from December 4-7, 2007. It was attended by over 100 utility managers, experts, and development officials from 23 countries drawn from Asia, Africa, Latin America, Europe and North America. In addition to learning about the Paraisópolis pilot, workshop participants shared their experiences with SELR programs and explored alternative solutions to the many technical, economic and social issues associated with expanding and improving electricity service for slum communities.

Policies and plans for the Municipality of Rio de Janeiro

In function of the two important global sporting events that the country will base in a near future (World Soccer Cup, in 2014, and Olympic Games, in 2016), many efforts

have been addressed for the revitalization of the most precarious areas of the great urban centres, with improvements in infrastructure, in mobility, reform of homes, construction of social apparels, among others. However, most of the investment is being concentrated in the most exposed areas to the visitors, during the great foreseen movement. Very probably, the peri-urbans *favelas* for instance, for being locate far from the areas in evidence, probably won't be contemplated with improvements in its infrastructure and they will continue sheltering, in precarious conditions, large low income population.

For a while, unfortunately, there is no energy plan (energy access or energy improvements) being addressed for urban poor in the context of the World Soccer Cup of 2014, and of the Olympic Games of 2016.

Policies and Programs currently developed by LIGHT addressed to low income communities

LIGHT is developing several initiatives on the responsible use of electricity, especially for low-income population. Through social, cultural and environmental programs, the utility has been trying to collaborate for the improvement of the life quality of thousands of residents, promoting the education for the responsible consumption.

In 2004, LIGHT created the Community Service Management and, ever since, it has been enlarging its understanding about local people's needs and looking for effective solutions for the quality of energy supply. In 2006, the Company launched its Policy of Service to the Communities. In 2009, the company created the Management of Relationship with the Communities, establishing a global strategy for articulation of the partnership with the Government for the planning, execution, monitoring and service to the communities.

The starting point of the action in a new community occurs through contacts with the residents' associations, mobilization events and of customers' registration process. Later, the utility develops an assessment of the local needs and begins the action planning. To guarantee that the information can reach all residents, including those living in areas of difficult access, Light is adopting several solutions, such as: lectures, organization of events and workshops, distribution of didactic material, use of resources as banners and posters, radios posts, sound-motorcycles and backpacks in order to disseminate its messages.

The table below shows the total households and communities that benefit from LIGHT programs, according to the region where the company operates.

Table 12 Communities that benefit from LIGHT programs

Region	N. Communities	N. Households
Metropolitan Region	200	164234
West	88	77568
Baixada	71	79699
Vale do Paraíba	4	114
Total	363	321615

Source: LIGHT, 2010b

More than 9,000 electrical reforms were carried out in homes and 124 reforms in community institutions such as residents associations and kinder gardens. In 2010, more than 31,000 customers in communities of Rio de Janeiro normalized energy supply through the actions of Light in low-income communities (LIGHT, 2010b).

Sections ahead present examples of programs and actions - direct and indirect - focused to low income-communities, located in the supply area of the utility.

Efficient Community Program

The Efficient Community Program¹¹ was created in 2002 by LIGHT to guide investments close to the lacking populations, mainly addressing educational actions and equipment replacement. The Program aims to support households with the Low Income Social Tariff¹², assisting, in a certain way, the needs of the population, but trying to respect their economical reality.

According to the company, more than 300 communities that received the Program started discussing the theme of energy efficiency. Recently, the company has been enlarging its presence in the so-called "pacified communities"¹³, applying the lessons learned during previous years and stressing its partnership commitment with state and municipal governments and with civil society. In those communities, investments are being done as the installation of new electric grid, utility pole and transformers; electric retrofit in households where the spinning causes losses; change of lamps for more efficient models¹⁴; and donations of appliances (refrigerators, for example) with low energy consumption¹⁵, reducing the expenditures of the families. The appliances are given after the registration of the households in the company. LIGHT acts in 7 "pacified communities" up to 2011 and plan to act in all the existing 14 communities with UPPs.

The table below shows the total number of communities benefiting from the "Efficient Community Program", according to Light's region of operation and according to the complex population¹⁶ or neighborhood to which they belong.

Table 13 Efficient Community Program - Number of communities benefited

Metropolitan Region

¹¹ 2010 Sustainability Report, LIGHT.

¹² This is an initiative of the Brazilian Government to give lower tariffs to poor families - a discount from 10% to 65% in the electric energy bill.

¹³ The term "Pacified Communities" refers to favelas in the Metropolitan Region of Rio de Janeiro that had intervention of the military police, as ordered by the Governor of the State of Rio de Janeiro, against the drug traffic, aiming to eliminate traffic dealers. It was established in those communities - or favelas - Urban Units of Pacificator Police (or, in Portuguese, Unidade de Polícia Pacificadora - UPPs) to guarantee the safety of local people, as well as to mitigate violence. In terms of social goals, the effectiveness of such measures is seen as questionable, considering that several of the local drug traffic organizations migrate for other areas of the State, in general peri-urbans areas, still characterized by the absence of local policy. Note that the pacification of some urban communities in the region of the state facilitated the action of Light. Its professional staff is now working with security and the company has no further damage to facilities that were often damaged by traffickers as a way to hinder the progress of police in their areas of influence.

¹⁴ According to Light, a problem encountered in the replacement of fluorescent lamps is their proper disposal.

¹⁵ The replaced refrigerators are sent to São Paulo, for their proper disposal.

¹⁶ A complex population refers to a set of communities - or slums - gathered in the same geographic area.

Complexo da Rocinha	Complexo Providência	Complexo do Lins	Complexo Cordovil	Complexo da Maré	Complexo do Alemão	Complexo Andaraí Grajaú	Complexo do Caju	Complexo Caricó	Complexo do Turano	Complexo do Boréu	Isolated communities (*)		
10	3	10	4	18	8	5	8	4	7	5	118		
Oeste			Baixada						Vale do Paraíba				
Complexo Cidade de Deus	Complexo Rio das Pedras	Complexo Batam	Isolated communities (*)	Belford Roxo	Duque de Caxias	Mesquita	Nova Iguaçu	São João de Meriti	Queimados	Volta Redonda	Rio Claro	Quatis	Valença
10	9	5	16	11	13	1	38	6	2	1	1	1	1

(*) outside the complex population

Source: Adapted from LIGHT, 2010b

Next table presents selected data relative to the Efficient Community Program.

Table 14 Actions on energy efficiency in the context of the Efficient Community Program

Accomplished actions	2008	2009	2010
Customers visited for educational work	46, 729	20, 354	29, 646
Assisted communities	57	43	160
Events about energy efficiency	63	40	834
Donated efficient refrigerators	-	3, 539	22,451
Donated fluorescent lamps	123, 000	30, 451	403, 109
Contracted labor in the communities	46	50	82
Reform of Electric Facilities	1, 308	1, 340	3, 178

Source: LIGHT, 2010a.

As an example of success of the program in question is the Community of Santa Marta, one of the 118 isolated communities in the Metropolitan area served by LIGHT. The company regularized the supply of electricity to 1600 homes and donated 700 refrigerators and 7000 efficient light bulbs. LIGHT also installed in the community 30 km of new cables and tripling the number of processors (LIGHT, 2010b).

In the period between of October of 2008 and December of 2010, the Efficient Community Program invested US\$ 21.73 million, benefitting more than 300 thousand residents in actions of energy efficiency in 209 communities (LIGHT, 2011).

Together with the community agents and through the partnership with the residents' local associations, the educational action on energy efficiency intends to reach 120 thousand residences in the *favelas* of Rio de Janeiro and communities of the *Baixada Fluminense*¹⁷. It was always assessed information on the energy use and on the

¹⁷ The "Baixada Fluminense" is an area of the State of Rio de Janeiro including from the "Baía da Ilha Grande" (Bay of Big Island) to the Municipality of Campos of Goytacazes, in the limit with the State of Espírito Santo. The "Baixada Fluminense" accompanies the whole coast and occupies about of half of the surface of the State.

safety of electric facilities in the households, through personal contact and through lectures.

LIGHT also identified in those initiatives the opportunity to offer access to the job market for the communities' young people, that are qualified to be the agents, responsible by the visits in the houses and orientations on reducing energy consumption and changing habits.

LIGHT Recycles Project

The project, still in pilot phase, consists, basically, in changing garbage for discount in the electric energy bill. The innovative idea, besides contributing for the cleaning of the streets and for the public health, favors the improvement of social conditions and environment preservation. For people that don't live in the area assisted by the project (Community of *Santa Marta* and neighborhoods of *Botafogo* and *Humaitá*), the participation is possible through the donation of the discount in the electric energy bill for institutions registered in the community of Santa Marta, a famous *favela* localized in the South Region of the Municipality of Rio de Janeiro. The garbage is received and has its weight measured in defined places ("ecopoints"), and the value of the discount is calculated in function of the type of the collected material. The value of the discount is credited in the electric energy bill of the citizen. The project idea would be "to integrate slum-asphalt". However, according information from officials of LIGHT, to date residents of the surrounding slums have not responded to the program so desirable, unlike people of the slums.

Analytical correlation between the Efficient Community Program and the LIGHT Recycles Project

The Efficient Community Program, with no doubts, motivates the regularization of the electric power supply for the households, which very often are not familiarized with this official relationship. The integration and migration of the households for an official energy supply characterized by high-quality can induces the rescue of their citizenship and promote the social integration of the poorest populations. Besides, the regularization of the illegal connections also allows the supply to be more efficient. The next figure illustrates an example of an illegal electric energy connection - called in Rio de Janeiro by *gato* (cat, the name used for illegal connections). This figure - that shows an incredible quantity of electric spinning connected in only one utility pole - also explicates that the mentioned *gato* can affect safety of the population (after all, in this situation an electric discharges in high voltage can't be considered a fatality).



Figure 11 Example of an illegal electric energy connection in a *favela* of the Municipality of Rio de Janeiro
Source: O Globo, 2011.

The program guarantees, in short period, the improvement of the life quality of the population, through the improvement of local electric power infrastructure, in general quite precarious and reducing families' expenditures. The donation of more efficient appliances, mainly refrigerators, previously restricted to large-income classes because of their high cost (CEPAL, 2003), results in a significant progress in terms of energy efficiency.

The program still innovates and dares, when trying to win the social barriers caused by the fear and by the distrust between communities' residents and energy concessionaires, narrowing the relationship among those parts and opening dialogue spaces for the rescue of the citizenship, individual and collective, of the excluded (low-income) population.

On the other hand, obviously the access - formal or not - to the electricity doesn't guarantee to a poor family an effective improvement in the life standards, but certainly is a fundamental step towards that direction, making possible the service of other basic social services, deficient or inexistent, in communities of low income family. To discuss this subject deeply, it would be necessary, for instance, to know how this energy is consumed in the households and how the access to the energy measured could favour the increase of the family income (through small businesses, for instance, helping the families to leave the perverse poverty cycle). Even receiving the *Bolsa Família*¹⁸ as social help from the Federal Government, many poor families do not have enough income to buy foods and to supply a donated efficient refrigerator. In such context, a question emerges. Would be interesting for those families make official the energy service of in their houses (condition for receive the equipment, and still increase their monthly expenses)?

Another subject to be analysed would be the percentile of the family expenses with electric power in relation to the income of the family. This percentile - usually high -

18 The Bolsa Família is a Brazilian Government Program aiming the relief of poverty, which guarantees minimum feeding; however the Program doesn't pay for electric energy bills, even with the Social Tariff.

sometimes can explain the reason of the frauds and of the secrecy, so common in poor communities.

The LIGHT Recycles Project, characterized by innovative conception, besides motivating the formality of the electric power supply, preserves the environment and also redistributes income in the society. The increase of its scale would bring benefits for citizens of all income classes.

Programs as those and others of the LIGHT (or of others energy concessionaires) are not conceived with the pretension of solving the social problems of the country, characterized by historical non-equal income distribution. This fundamental matter (in the context of an effective socioeconomic development of Brazil) should be treated thought structural long period and, above all, with the continuous partnership of the Government, private companies, providers of basic services beyond access to energy (housing, health, sanitation, access infrastructure and transportation) and organized society.

Study of case: Complexo do Alemão

On a side universal and free access to the internet without thread; on the other side, frequent falls of energy, lack of basic sanitation and no garbage collected. Those two realities coexist in the *Complexo do Alemão* - German Complex, in English (next figure shows a view of part of the *Complexo do Alemão*), one of the biggest *favelas* (in fact, *Complexo do Alemão* is composed by 14 *favelas*) of the periurban region of the Municipality of Rio de Janeiro. The community, recently "pacified" (through the action of Police Pacifiers' Units - UPPs, as announced by the authorities of Rio de Janeiro), is included in the Rio State Digital Program, that, in its first phase, will take internet for 40 of the 200 thousand inhabitants.



Figure 12 View of part of the *Complexo do Alemão*, in the Municipality of Rio de Janeiro
Source: O Globo, 2011.

In spite of the arrival of free internet service, community leaderships still complain on the lack of basic services as the garbage collection in the communities and the

constant electricity blackouts that leaves several points of the *Complexo do Alemão* in the dark. Usually, the population of the *Complexo* - estimated in 180,000 inhabitants (Brazil, 2011) - alleges that the maintenance of utility pole is inefficient, and that the largest majority of the energy transformers is damaged. During the day, usually, electricity interruptions occur up to four times. In that context, and considering the high indexes of events associated to the criminality in the area of the *Complexo do Alemão* (as homicides, assaults and several others), the insecurity sensation, especially in the night period, is patent; after all, the streets are dark in several occasions (facilitating the thieves' action).

According to information from the Government of the Municipality of Rio de Janeiro, the amount of US\$ 97.47 million were invested in the constructions of new infrastructures for *Complexo do Alemão*, especially in the *favela* of *Nova Brasília* and along the street *Joaquim de Queiroz*, one of the mainones of the *Complexo*. These constructions are included in the *Morar Carioca* Program, which foresees the urbanization of all of the *favelas* of the city up to 2020, with a total investment of US\$ 4.56 billion, in partnership with the Federal Government.

In January of 2011, after the "pacification" of the *Complexo do Alemão*, the *Morar Carioca* Program was initiated in the place. The Program foresees about of US\$ 228 million in urbanization and improvement of social infrastructure in this area.

LIGHT alleges that has always distributed with quality electric energy for the *Complexo do Alemão* and that is elaborating an energy efficiency project for the community, programmed for 2011. LIGHT also informed that improvements and modernization of the whole electric net are being accomplished, with change and placement of utility poles, replacement of the existent spinning for compact and reinforced cables, change of energy transformers and placement of meters.

The utility informs that, before the pacification of the *Complexo do Alemão*, there was "electric disorganization", with risk of serious accidents, besides clandestine connections, that harm the electric energy supply. The entrance of UPPs, according to LIGHT, tends to facilitate the electric power customers' regularization. Moreover, with the creation of new addresses and the distribution of electricity bills, the company believes that there will be residents' reintegration as citizens.

Visible discrepancy can be observed among the Government and LIGHT's perceptions and the perception of the inhabitants of the *Complexo*. For the residents of this area - considered (one of) the most violent of Rio de Janeiro - the efforts being undertaken in infrastructure (especially concerning the electric energy supply) don't have been providing the basic needs to the citizens -like safety, energy access without common blackouts (through an affordable price for low income families), and basic sanitation, among other fundamental aspects.

According to the National Communication for the Human Right to the Education, based in a mission accomplished in October of 2007, the existing situation of the communities of the *Complexo do Alemão* can be classified in the enlarged concept of armed conflict or in what has been called by the "Declaration of Geneva" of armed violence. Such situation is characterized by frequent confrontations between drug dealers and official safety forces (the police of the State of Rio de Janeiro), generating suffering, civil losses and several violations of the human rights of those territories - including the right for education.

It is opportune to emphasize that the continuity of that this type of intervention, actually, is guaranteed; according to the current (2014) Secretary of Public Safety of the

Municipality of the Rio de Janeiro, José Mariano Beltrame, "the police operations will continue in the way how they are happening until the total destruction of the structure of the organized crime, generating inevitable obligation for the involved communities".

Box 2: The case of the illegal connection in the Complexo do Alemão

The electric power total stolen through illegal connections - popularly known as "gatos" (cats, as mentioned, illegal connections) - in the State of Rio de Janeiro in a period of 12 months (2009) would be enough to supply the 6.2 million inhabitants of the State of Santa Catarina for one year. The amount of diverted energy was 7.8 thousand gigawatts. With smaller revenue, LIGHT invest less in improvements in the net and it ends up reviewing the damage for the consumer in the light bill. The end of the illegal connections would represent an invoice of 17% cheaper for the customers of the company (LIGHT, 2011).

Today, the loss LIGHT today is divided in risk area and no-risk area. About 40% of the loss occurs in risk area located in the Municipality of Rio de Janeiro, basically the slums - as the ones that compose the *Complexo do Alemão*. But, 60% of losses are out of the risk area, basically normal suburbs, normal households. In other words, very probably, the robbery of energy in the case of Rio de Janeiro (State and Municipality) is a problem of cultural origin.

The "pacification" of the *Complexo do Alemão*, through hard police actions, opened way for LIGHT to enlarge the offer of electricity for the residents of the area. And, the company is investing in technological solution to reduce the thefts of energy in Complexo do Alemão, through the electronic measurement.

Today, the net of electricity in *Complexo do Alemão* is a net that the low tension is characterized by be at three meters of height, in the post, and in the customer's house is localized the analogical meter. What LIGHT is doing is to remove the meter of the customer's house and putting it the high of the post, at nine meters of height - sending the net of low tension for a height that hinders the action of the "thieves of energy". This action keeps relationship with the fact that, in *Complexo do Alemão*, today, 70% of the loss occurs in the thread and 30% in the meter (LIGHT, 2011).

That new net is armoured. Besides, possesses a much thicker and more difficult cable of accessing. The meter that is being put in the high of the post is the electronic meter, no more the analogical. Besides, each box that is being put in the post measures 16 residences. For being electronic measurement, the measurement goes direct for the measurement centre in the headquarters of LIGHT. Like this, the company can turn on cut the distribution of energy at the distance - turning unnecessary the sending of work team for an area characterized by high crime rates, as mentioned.

In the slum of Santa Marta (almost as big as *Complexo do Alemão*, in of inhabitants), LIGHT before had 80 customers, 90% of loss and 70% of breach of contract. Now, in Santa Marta, the company has 1,600 customers, 3% of loss and only 2% of breach of contract. The electronic measurement implemented by the company explains those favourable numbers (LIGHT, 2011).

The LIGHT plans to begin, still in the current year, through expansion of the technology of electronic measurement, the regularization of the electric power service in the *Complexo do Alemão*. The expectation of the company is what happened in the slum of Santa Marta, occurs something similar in *Complexo do Alemão* - a region that, due to the violence, the data regarding number of customers, losses and electric power breach of contract are typically imprecise (this reality tends to change with the regularization of the service).

Identification of Barriers

Identification of Supply Side Barriers

Introduction and methodology

Electricity and LPG are the most important sources of clean energy for the urban population in Brazil, including the low-income population. In this chapter is described the main characteristics of the energy distribution utilities in the three municipalities studied.

o) Power distribution in São Paulo- AES Eletropaulo:

In the municipality of São Paulo, the power distributor is AES Eletropaulo, *Eletropaulo Metropolitana - Eletricidade de São Paulo S.A* - AES Eletropaulo is a major Brazilian power distributor in the state of São Paulo, created in the breakup of the old state-owned power distribution company Eletropaulo that monopolized electricity distribution in São Paulo from 1981 to 1999. The similarity of the names makes most old customers call it simply Eletropaulo. Before 1995, Eletropaulo was owned by the State of São Paulo. Today, AES Eletropaulo is part of a holding company called *Companhia Brasileira de Energia* jointly owned by AES Corp (50.1%) and BNDES, the government owned development bank of Brazil, (49.9%). Its stock is traded on BM&F Bovespa, where it is part of the Ibovespa index.

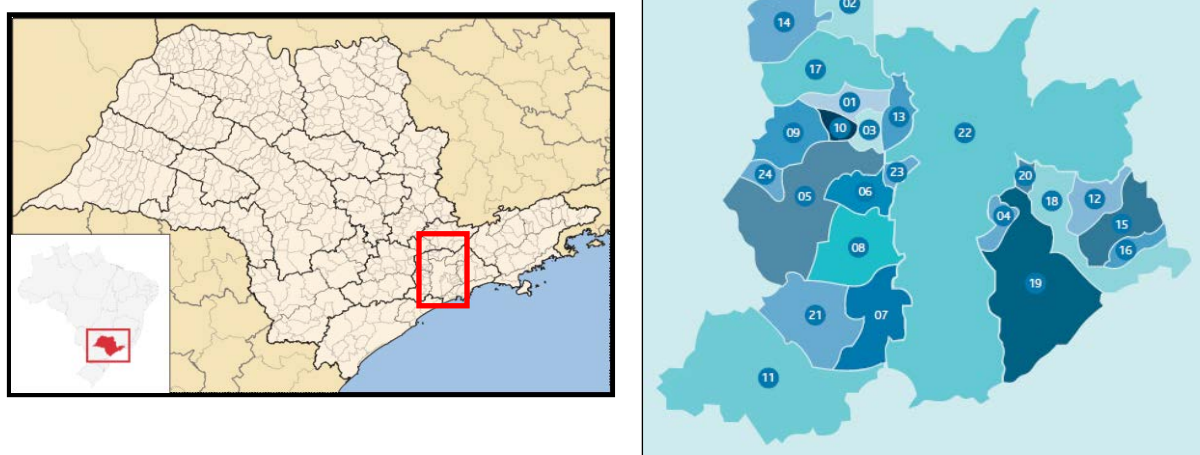


Figure 13: AES Eletropaulo distribution area

Source: AES Eletropaulo 2010

AES Eletropaulo distributes electricity to 24 city councils in the metropolitan region of São Paulo including the capital, which together comprise a population of 16.5 million inhabitants. The concession area of the company covers 4,526 km², which includes the most important socioeconomic region of the country. In 2010, the company sold more than 43,000 GWh of energy, or 5% higher than in 2009, and recorded net income of R\$ 1.3 billion.

Table 15: AES Eletropaulo profile 2010

AES Eletropaulo profile 2010	
Employees	5,663 owned and 7,847 contractors
Customers	6.1 million
Concession area	24 city councils
Electrical System (2010)	149 substations 40,697 km air power distribution lines 3,038 km underground power distribution lines
Economic and Financial (2010)	Income of R\$ 1.3 billion Investments of R\$ 682.3 million
Energy sales to captive market (2010)	35,480 GWh
Energy sales to residential sector (2010)	14,890 GWh
Energy sales to low income residential sector (2010)	655 GWh
Corporate structure (in 2010)	Capital: R\$ 1,057,629,316.47 Free float: 56.18% Shareholders: 62,000

Source: AES Eletropaulo, 2011.

p) Power distribution in Rio de Janeiro - LIGHT:

The electric power supply to the final consumer in the state of Rio de Janeiro is accomplished by the following distribution utilities: LIGHT (Light S.A.), AMPLA (AMPLA Energy and Serviços S.A.) and ENERGISA (Energisa Nova Friburgo – Distribuidora de Energia S/A). Besides the generation from their own power plants, these companies buy energy from the National Interconnected System (interlinked grid) to supply their local markets (BEERJ, 2009).

LIGHT (LIGHT S.A.) is controlled by a national group, the Rio Minas Energia Participações S.A. (RME), and distributes electricity to around 3.9 million customers in the city of Rio de Janeiro and other 31 municipal districts in the State of Rio de Janeiro, distributed by the following areas: metropolitan, highland, medium Paraíba¹⁹ and center-south, including 25% of the State - 10, 970 km². The area of concession of the LIGHT concentrates almost 68% of the population of the state (BEEERJ, 2009).

¹⁹ Paraíba do Sul is an important river of the Southeast Region of Brazil.

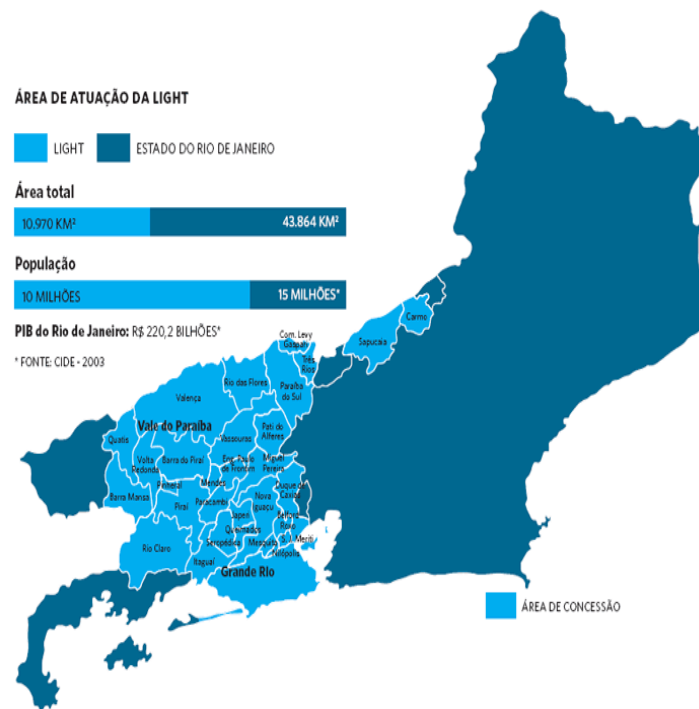


Figure 14: Map of the State of Rio de Janeiro focusing on LIGHT area of action
Source: LIGHT, 2011.

Next figure presents visualization of LIGHT concession area and of the location of the State of Rio de Janeiro (whose capital is Rio de Janeiro) in Brazil.



Figure 15: Map of Brazil focusing the State of Rio de Janeiro (RJ)
Source: Brazil, 2011.

The AMPLA (Ampla Energia e Serviços S.A.) is controlled by the Endesa Group and distributes electric power to about 2.3 million customers in 66 municipal districts of the State of Rio de Janeiro, in an area of actuation of 32,188 km², or 73.3% of the State territory (BEEERJ, 2009).

ENERGISA (Energisa Nova Friburgo – Distribuidora de Energia S/A, new denomination of CENF - Company of Electricity Company of the Municipality of Nova Friburgo) belongs to the Grupo Energisa Group and distributes electric power to the

municipal district of Nova Friburgo, in the highland area of the State, that shelters an important industrial pole and of services. ENERGISA acts in the generation, transmission and electric power distribution for 91 thousand consumers, which corresponds to a population of 300 thousand inhabitants, including an area of 1,000 km², equivalent to 2.0% of the total area of the State (BEEERJ, 2009).

For effects of the present work, and considering the Study of Case foreseen, it will be presented larger details just of the LIGHT, in function of the best access to their representatives; of the readiness of information and data that will be collected opportunely, analysed and systematized; and mainly, for the fact of LIGHT is the utility responsible for the electric power distribution for the Municipality of Rio de Janeiro, one of the city/region studied in the UPEA III-Brazil.

LIGHT Energia S.A is a company of the LIGHT Group focused in the generation and electric power transmission, as well as for the commercialization of its own production.

The utility also has a 230 kW-electric power transmission line, with 115 kilometers of extension, interlinking the Nilo Peçanha hydroelectric power plant and the Santa Cabeça substation, in the municipal district of Aparecida do Norte, in the State of São Paulo.

According to information made available by the company, the operational quality and the environmental excellence are two marks of LIGHT. Its generating park possesses the certifications in quality management, environment, safety and health. For the company, the initiatives of environmental preservation in the area of their reservoirs, many of them in partnership with universities, research centers and Non-Government Organizations, result in direct benefits for the population of the State of Rio de Janeiro. Those facts should be deepened opportunely and best evaluated in the next phase of the UPEA theme.

Regarding the communities of low income in the State of Rio de Janeiro, and considering the regions supplied by LIGHT (please, see next figure) the great majority of urban *favelas* are in the Metropolitan Region of the State. This situation occurs mainly because of the larger opportunities for workers concentrated in this area, besides guaranteeing better mobility for the people. On the other hand the Region of *Grande Rio* (a region larger than the Municipality of Rio the Janeiro, which includes closer municipal districts) and the Region of the of the *Vale do Paraíba* (Paraíba's river valley) possesses both urban *favelas* and peri-urbans.

q) Power distribution in Recife - Celpe

The Pernambuco Electricity Company (Celpe) has as its functions to study, project, build and explore the systems for electric power distribution and commercialization to the final consumers in the whole State of Pernambuco, as well as to perform electricity generation in isolated system for the Fernando de Noronha Archipelago.

Table 16: Celpe profile 2010

Celpe profile 2010	
Employees	1,676
Customers	3.1 millions

Concession area	186 city councils (102,745 km ²)
Electrical System (2010)	131substations 121,433 km distribution lines
Economic and Financial (2010)	Net Profit of R\$ 448.3 millions Investments of R\$ 229 millions
Energy sales to captive market (2010)	10,026 GWh
Energy sales to residential sector (2010)	3,791 GWh
Corporate structure (in 2010)	Capital: R\$ 1,551,371,000

Source: Celpe, 2011.

The company serves the 184 municipalities of Pernambuco, the State District of Fernando de Noronha and the Pedras de Fogo municipality, in the State of Paraíba, embracing a 102,745 km² concession area. There are over 3.1 million clients, being 2.67 million residential ones, 60.64% of whom are classified as low-income ones (1,6 million, in 2010).

Celpe's investment in new connections in 2010 served 106,905 new clients requests, being 85,031 urban and 21,874 rural ones, and regularized 12,997 clandestine connections, with investments corresponding to R\$ 82.6 million. The company estimates that with the regularization, they eliminate 90% of energy thefts. Celpe identifies lack of security of the company's workers in the works on the land as important difficulties met in the regularization processes, due to the high criminality rate that some *favelas* have. They also face difficulties of access to the machinery necessary for electrification because it is very limited and narrow, as well as the difficulty in finding an adequate position for installing the consumption measurement machinery.

As previously indicated, one of the obligations foreseen in the concession contract signed by the electric power distribution public service concessionaire companies with ANEEL consists in applying, annually, the sum of 0.5% of their net operational income in actions that intend to fight electric energy waste. In 2010, Celpe invested in projects to serve the residential, low-income residential, industry and Public Power classes. The company also directed resources for educational projects for conservation and rational energy use. In total, the Company made R\$ 26.8 million available for energy efficiency projects throughout the year. The Company accumulated the donation of 38,286 fridges and the replacement of 512,076 compact fluorescent lamps. In 2010 alone, 21,221 fridges and 86,005 lamps were donated.

In order to serve the necessities of the clients classified as low-income, Celpe created in 2000 the Special Communities Service Unit (Cace). It makes available a permanent communication channel with the urban and rural populations with low purchasing power. One of the contact ways between the Company and the low-income clients is Agente Celpe. The agent is a person from the community itself, selected and trained to guide the clients on correct and efficient energy utilization. S/he also performs personalized visitations for debts negotiation, cadastral update and identification of efficiency opportunities from fridges exchange, fluorescent lamps donation and electric installations reformation.

Findings of electric public utilities

All the electric power distributor companies in Brazil must abide by the procedures for a new connection, established for all the national territory in the Regulatory Resolution n. 414, from September 9, 2010. Key findings are presented in the table below:

Table 17 Key findings of electric public utilities

Description	Electricity Supply Agencies		
	AES Eletropaulo, 2011.	LIGHT S.A	Celpe
Objective/ Functions	To satisfy the society by means of providing services and solutions in energy, acting in a safe and socially responsible manner	<i>Light Energia S.A</i> is the <i>Grupo Light's</i> company focused on electric power generation and transmission, as well as on commercialization of its own production.	To be a reference company in power distribution. To be the light and energy of the State of Pernambuco, contributing for its development. AIM: To universalize quality energy supply by 2011.
Procedure for new connection	The procedures for a new connection are established in Regulatory Resolution nº. 414, from September 9th, 2010. 1st: The interested party effects the solicitation for supply, the public utility must inform the interested party about the obligations, stressing: ➤ The consumer unit must abide by the norms and standards made available by the public utility and by ANEEL's regulation; ➤ It must provide a descriptive statement of the installed charge in the consumer unit; the nature of the activity developed in the consumer unit; the goal of the electric power utilization; it is necessary to communicate eventual later alterations. 2nd: Inspection The inspection of the consumer unit must be effectuated in up to 3 (three) business days in urban area and up to 5 (five) business days in rural area, counted from the supply solicitation date. 3rd Studies of Works for Supply Viabilization The distribution company has a deadline of 30 (thirty) days, counted from the supply request date, in order to elaborate the studies and projects, and to inform the interested party. The public utility must meet for free to the supply request for consumer unit, and it has the maximum deadline of 45 (forty-five) days to begin works.		
Documents required	Presentation of the original copy of the <i>Cadastro de Pessoa Física</i> (Registration for Individual) – CPF, as long as it is not in cancelled or annulled cadastral situation according to Regulatory Instruction of the IRS, and Identity Card or, if this one does not exist, another official identification document with photo, and solely the <i>Registro Administrativo de Nascimento Indígena</i> (Administrative Registration for Indigenous Birth) – RANI in case of indigenous people. Number of Unique Register for Federal Government's Social Programs (<i>CadÚnico</i>)		

Criteria for sanctioning a new connection	➤ To have the household's land situation regularized or to have checked in the legalization process. ➤ The place where the household is not located is part of natural protected areas such as water sources. ➤ The household must not be in risk areas, such as train routes or with risk of landslide. ➤ The quality of the building must be sufficiently solid and must not represent a high risk of fire.
Connection and regularization for poor households	The procedures for new connections are the same, with the difference that low-income people can subscribe to social tariff, previously explained. When it deals with effecting consumption regularization, the following steps are performed: 1st Contacted community leaders to work with them on the scope and scale of the project 2nd Held a series of community meetings to educate residents about the program, bill payment, their energy consumption and measures that could be taken to reduce electricity usage. 3rd Identifying, registering and numbering the individual households. 4th Community campaigns and door-to-door visits by community "agents" and utility staff to each household both pre- and post- regularization, to educate consumers on the importance of paying, understanding their electricity bill. 5th Implementing efficiency measures.
Barriers faced in regularization of electricity access to urban poor, especially those residing in illegal housing colonies	The difficulties and challenges of reaching low income consumers in informal areas during the customer registration and area mapping process must be considered when estimating the time and resources required to undertake these activities. Confusion amongst the households could be caused by not marking each meter with the number of the designated household or commercial customer. In Brazil and most other countries, it is the customer's responsibility to make the connection from the structure to the meter. The unmarked meters could caused households to connect to the wrong meter (there was often a row of meters on one wall, for example), resulting in some consternation when the first bills is delivered to the wrong address. Celpe identifies lack of security of the company's workers in the works on the land as important difficulties met in the regularization processes, due to the high criminality rate that some <i>favelas</i> have. They also face difficulties of access to the machinery necessary for electrification because it is very limited and narrow, as well as the difficulty in finding an adequate position for installing the consumption measurement machinery.
Monitoring mechanism for energy regularization for poor households	The first visit could be limited to just identifying those households where new wiring was needed, stopping prior to assessment of materials required and leaving that job to the electrical contractor. Door-to-door household visits both pre- and post- regularization, commercial and residential mini-audits to determine energy efficiency actions. Mini-audits of households to identify energy efficiency opportunities, particularly assessing the need to replace inefficient refrigerators and unsafe internal wiring. The mini-audits included assessment of the need for rewiring of homes, focusing on those with especially risky internal wiring.
Specific strategies for urban poor	➤ Universalization of electricity access ("Light for Everyone") program ➤ Low Income Tariffs ➤ Energy Efficiency and Renewal Energy in Low Income Areas

Subsidy to the urban poor households	The “ <i>Minha Casa Minha Vida</i> ” is a massive public housing campaign launched by the Brazilian Federal Government in March of 2009, for building one million low-cost units throughout the country by 2014 directed to benefit low rent population, with a federal subsidy of R\$72 billion.
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Supply side Barriers in enabling clean energy access to the urban poor

Key findings about the barriers and the efforts to overcome them are presented in the table below:

Table 18 Supply side barriers for access to electricity

Barriers	Description	Efforts so far to address the barrier
Legal	The legislation requires the concessionaires to provide electricity to every citizen that requests this service, always and whenever the household to be connected has its land tenure regularized or in process of regularization. In occasions the settlements are located in protected natural areas, next to water sources or protected water supply areas, in risk areas such as train routes or areas with landslide danger, for which reason they cannot be legitimated, making energy supply impossible for these settlements.	There are nowadays several programmes to regularise land tenure like “<i>Lote Legal</i>” (“legal allotment”) and the Program for Regularisation of Municipal Public Areas that issued special use concession titles. The Watershed Program began in 2008 with the inclusion of the environmentally protected water supply area near the Billings reservoir, in São Paulo municipality. The programme has a budget of about R\$250 million from the PAC, R\$42 million from the state government (SABESP), and R\$660 million from the city government. The funds are to be used to upgrade 81 settlements, <i>favelas</i> and informal subdivisions, by 2012.
Physical	Difficulties of access to the machinery necessary for electrification because it is very limited and narrow, as well as the difficulty in finding an adequate position for installing the consumption measurement machinery.	-
Security	Lack of security of the workers in the works on the land as important difficulty met in the regularization processes, due to the high criminality rate that some <i>favelas</i> have.	Installation of Police Pacification Units (UPP). This is a public policy initiative from the State government of Rio de Janeiro, in the sense of searching for an instrument for resolution of the serious problem concerning local public security (drug trafficking, “parallel power”, violent criminality, militias, etc.). The desired impact for the UPP program consists essentially in making the local dynamics of organized crime

		cease, by means of the police occupation of “free territories” previously occupied by a “parallel power” in the social exclusion regions known as <i>favelas</i> .
Default in bill payment	Households have limited incomes and were not paying anything for their electricity use prior to the regularization, it can be expected that almost all would find the addition of a monthly expense to be a hardship.	Energy efficiency measures and education to reduce consumption in households and commercial entities and therefore increase affordability of electricity service for the customer

Table 19 Supply and consumers barriers for access to LPG

Barriers	Description	Efforts so far to address the barrier
Legal	The distributor and retailer companies have not any legal obligation for supply for low-income peri-urban settlements.	There is not any determination of a legal nature for new distribution areas in low-income communities in expansion; this is determined by the market itself (demand spots).
Safety	Currently, the main problem in LPG distribution in large cities is not the difficulty for the access to the product, but the large number of illegal retail outlets, which endangers consumer safety.	The Legal Gas Program, launched by the National Petroleum Agency (ANP) in September 2010, aims to combat unregulated trade of LPG.
Security	In some low-income communities, there are criminal groups that control access to services such as electricity, cable TV and LPG, by imposing additional fees and restricting the low-income population's access to these services.	The only way to overcome these problems is by means of a clear action of the supervisory bodies, as well as of the organisms that follow the energy market, and also of the Police agencies and the ANP itself, which recently forwarded complaints on these problems to the federal police.

Best Practices

Policies for energy access universalization

In order to achieve the energy access universalization, the Brazilian Government fixed specific goals for energy access per utility and per Municipality, through the indication of the year in which the universalization should be concluded. Each local electricity concessionaire has to present a Universalization Plan, containing Annual Programs for Service Expansion.

Resolutions have been created to guide consumers and distributors, defining how the initial service (supply solicitation, connections deadlines, budgets for supply works, charge re-handling) should be handled.

The concessionaires must provide electricity to every citizen that requests this service, with no connection cost for this new customer, always and whenever the household to be connected has its own land tenure regularized or in process of regularization.

Social Tariffs

Brazil has adopted performance-based regulation to ensure that fair and reasonable/affordable tariffs are paid by low-income customers. The low-income tariff or 'social' tariff provides those qualifying with a large discount. For more information, go to Table 11.

Indigenous and *quilombolas* people are also entitled to the discount. In these cases, the discount is of 100% until the consumption limit up to 50 kWh/month.

Best practices for preparation of Consumers for Regularization

1° Involving Community Leaders and Stakeholders

The first step in the regularization program is the contact formal and informal community leaders, the municipality, other service providers and NGOs, to inform them about regularization project and to ensure that the activities coordination ongoing in the slum.

2° Mapping, Registration, and Meter Setting

The first activity is to locate and to register the customers. Detailed maps must be created in order to lay out the new distribution system.

3° Community Campaigns

To prepare consumers for regularization, door-to-door visits must be conducted both pre- and post- implementation, to explain the process and to assist them to resolve any problems that had occurred during the project. The community events are useful for registrations of consumers who were not located during the initial registration effort.

The arguments with best impact to encourage to receive electric power in a regular way are:

- Life quality improvement.
- Safe and reliable use of electricity.
- Avoid burn of appliances caused by clandestine connections,
- Citizenship recognition that establishes the inhabitant's address.
- Consumer rights established in the legislation.

4º Affordability and Energy Efficiency Assistance

Reducing the costs of becoming regularized must be a priority. The following measures could be undertaken:

- Free meter, service drop and grounding.
- Assistance to heads of household to prove eligibility to receive the low income tariff.
- Capping of billed consumption at 150 kWh for a minimum of 3-6 months or until all consumers in the slum had been regularized. This helps to transition customers into paying for their service and, as the bills showed what their actual consumption was and what they would have paid for it, would educate them on the extent to which they would need to reduce their consumption once their bill was uncapped.
- Mini-audits of households to identify energy efficiency opportunities, particularly assessing the need to replace inefficient refrigerators and unsafe internal wiring.
- Commercial attendance in the big areas and specific positions at the call center;
- Door by door work with communities agents in the cases with high consumption level or to negotiate bad debts;
- Special conditions to negotiate the bad debt.

Energy Efficiency, Renewable Energy and Anti-theft technologies

ANEEL created an 'electricity-industry-wide' fund to be split evenly for Research and Development (R&D) and Energy Efficiency (EE) improvements. Utilities' concessionaire contracts contain provisions to access this fund, which amounts to 1% of the utility's gross revenue for use in their own territory ($\frac{1}{2}\%$ for R&D and $\frac{1}{2}\%$ for EE)²⁰. Recently, ANEEL has added the requirement that one-half of the set-aside for EE (i.e., 0.25 %) ²¹ be used for low-income households as the Federal Law 12.212/ issued in 20/01/2010 specifies.

In order to achieve that the low-income consumer can face the electricity bill, programs for helping to reduce power consumption are necessary. With the goal of improving energy efficiency and fighting the energy theft culture, the following actions can be performed in the communities, which are object of programs for access and regularization:

- Prepaid meters have an advantage over individual residential meters in that they provide poor consumers with the possibility to decide, ex ante, how much of their income they are willing to spend on electricity, and when they want to use the service. By contrast, individual retail meters, not easily readable by the consumer, make it more difficult for the consumers to control their electricity

²⁰ Law n. 9.991, July 24th, 2000.

²¹ ANEEL Law n. 300, February 12th, 2008.

expenditure; furthermore, as these meters do not register the cost of the service, consumers only become aware of the amount of their bills, ex post, after consumption (ESMAP, 2007).

- Introducing electronic metering for some commercial consumers to allow easy disconnection or “social cutting” in the case of non-payment. “Social cutting” is limiting the amount of kWh that a customer can consume but not disconnecting the customer, in the case of non-payment. It is called “social cutting” because the technique allows the customer to keep on receiving a minimum amount of power, even if in arrears, up to a preset limit.
- Installation of consumption management system to monitor time used while taking a shower. This system can limit the usage time or simply help to be aware of the energy consumed.
- Energy efficiency replacement programs: replacement of incandescent lamps, old refrigerators and freezer, rewiring internal installation, replacement of electric shower for solar heating device, replacement of conventional electric showers for economic showers, installation of efficient transformers²², as well as public lightning to replace external lamps in the houses.
- Installation anti-theft drop cable, using twisted cable in the secondary network and bi-coaxial cable in the new service drop to each individual meter.

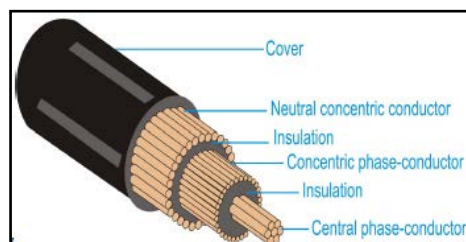


Figure 16: Anti-theft drop cable.
Source: AES Eletropaulo, 2009

Recommendations

Electricity:

In Brazil, the situation suggests *favelas* need a new energy policy approach. Although subsidized tariffs are still needed, the energy policy must be articulated with social inclusion policies. The two fundamental targets for energy access policies must be the enlargement of citizenship rights to low income families and energy tariffs affordable for its population. Coordination of government social programs with energy companies programs oriented to improve energy efficiency is clearly a win-win strategy that benefits the consumers and utilities

²² More information on efficient transformer designs, their application and results obtained when utilized can be obtained from Procobre, Brazil.

Energy access in Amazon remote villages is also a huge challenge in Brazil but this subject is out of the context of such study, which addresses only urban-peri urban regions. In previous UPEA II and UPEA I this subject was discussed in details.

It is needed a better planning/enforcement to allow the expansion of the best practices mentioned here to other regions of the country, in order to expand the legal connection, free of charging, to the lower income population that currently uses unauthorized and dangerous connections, in order to prevent the lack of security and risk of firing

On the other hand, this could enhance the electricity demand. Hence, a complementary policy on energy efficiency and the strengthen of existing programs should be coupled with the aforementioned policy proposal. Reducing the costs of becoming regularized must be a priority.

LPG:

- To expand the already existing distribution network to remote areas where the transportation can increase the final price of LPG. In this way, even consumers with higher power purchase may choose forest products as fuel.
- Reintroduce the previous subsidies: despite the fact that subsidies nowadays are included in *Bolsa Família*, the previous policy appears to be more adequate to stimulate LPG consumption since it reached all LPG consumers.
- Both policies could induce reduction on the use of firewood and charcoal.

Conclusion

The universalization of access to electric power in cities and peri-urban areas is already a reality in Brazil. Nevertheless, there is still an important proportion of consumers that is not regularized, still using the service through illegal connections. The great challenge is not to grant access to electric power, but to regularize the consumers transforming them into clients of the electric power distributors and assure that these new clients will pay regularly their bills.

Energy access is considered essential to improving the living conditions of the poor people in peri-urban and urban areas. Access to energy has been a main aspect of the Brazilian energy policies in the last half of the XX century. Utilities keep energy rates for poor families using cross-subsidies. Energy companies (like LIGHT, in Rio de Janeiro) can play a strategic role in the context of improving the access clean energy offering tariffs schemes that allow families and small business to pay their electricity bills and supporting energy efficiency improvements and the use of renewable energy sources.

It is needed a better enforcement to extend the best practices to other regions, in order to expand the legal connection to the population that is now using unauthorized connections. Hence, reducing the costs of becoming regularized must be a priority. Social tariffs, energy efficiency assistance, pro-energy efficiency replacement programs, new metering technologies (consumption management system to monitor, prepaid meters, social cutting) are the best ways to improve the electricity bill affordability.

Due to *Bolsa Família* direct income transference program substituted a support destined specifically and exclusively for obtainment of LPG by money, the program has

been contributing to stimulate the replacement of LPG with highly pollutant solid fuels such as firewood. Therefore, the previous policy appears to be more adequate to stimulate LPG consumption since it reached all LPG consumers.

References

ABREU, R.,L.. 2006. Available at http://commons.wikimedia.org/wiki/File:RioDeJaneiro_MesoMicroMunicip.svg (accessed on July 1th, 2012).

DCI - Diário Comércio Indústria & Serviços, 2010. **Perdas comerciais geram prejuízo de R\$ 8 bilhões a distribuidoras em 2010**. Access to the following electronic address [http://www.dci.com.br/perdas-comerciais-geram-prejuizo-de-r\\$-8-bilhoes-a-distribuidoras-em-2010-id256906.html](http://www.dci.com.br/perdas-comerciais-geram-prejuizo-de-r$-8-bilhoes-a-distribuidoras-em-2010-id256906.html) (accessed on July 4th, 2012).

RIO - City Hall of Rio de Janeiro, 2012. Access to the following electronic address: <http://www.rio.rj.gov.br/web/guest> (accessed on January 30th, 2012).

FUGIMOTO, S.K., **A universalização do serviço de energia elétrica acesso e uso contínuo**, USP, São Paulo, 2005.

ROJAS, J.M., LALLEMENT, D., **Meeting the Energy Needs of the Urban Poor: Lessons from Electrification Practitioners Energy Sector Management Assistance Program (ESMAP)**, Technical Paper 118/07, June 2007.

MOLLET, J.R., GARCIA, G. J., CAVARETTI, J., LAWAETZ S., **Electricity Services and Reducing Energy Losses for the Urban Poor**, 2008 ACEEE Summer Study on Energy Efficiency in Buildings 178 – 188.

USAID, COPPER, AES ELETROPAULO, **Transforming Electricity Consumers into Customers: Case Study of a Slum Electrification and Loss Reduction Project in São Paulo, Brazil**, February 2009.

AES ELETROPAULO, **Relatório de Sustentabilidade 2010**, Available at www.eletropaulo.com.br/. Accessed in September 2011.

PASTERNAK, S., **Espaço e População nas Favelas de São Paulo**, XIII Brazilian Association for Population Studies Meeting, Ouro Preto, Minas Gerais, Brazil, 4th to 8th 2002.

Pinto, V.C., **Ocupação Irregular do Solo e Infra-estrutura Urbana, o Caso da Energia Elétrica**, published in “Temas de Direito Urbanístico 5”. Imprensa Oficial/Ministério Público do Estado de São Paulo. 2007.

UN-HABITAT- **State of the World's Cities Report 2006/7**, 2006, Available at <http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2101/> Accessed in September 2011.

IBGE. **Census 2000**. Available at http://www.ibge.gov.br/home/estatistica/populacao/default_censo_2000.shtm. Accessed in September 2011.

IBGE. **Census 2010**. Available at <http://www.ibge.gov.br/home/estatistica/populacao/censo2010/calendario.shtm>. Accessed in September 2011.

CAVARETTI, J., **Overview of the Paraisopolis Project**. Presentation December 2007.

HABISP - **Information system for social housing in the city of São Paulo**. Available at <http://www.habisp.inf.br/>. Accessed in September 2011.

RECIFE CITY COUNCIL. **Atlas de desenvolvimento humano de Recife, 2005**. Available at <http://www.recife.pe.gov.br/pr/secplanejamento/pnud2006/index.html>. Accessed in September 2011.

WORLD BANK Energy and Infrastructure (ECSIE). **Dimensions of Urban Poverty in ECA**, World Bank Report, Washington, D.C. 2006.

Annex 1: Interviewed and consulted people

Name	Entity	Function
Marcos Bragatto	ANEEL	Superintendent of Electricity Commercialization Regulation
Jorge Augusto Lima Valente	ANEEL	Expert in Regulation of Public Services for Energy
Oberdan Freitas	ANEEL	Expert in Regulation of Public Services for Energy
Daniel José Justi Beco	ANEEL	Expert in Regulation of Public Services for Energy
Henrique Tavares Mafra	ANEEL	Expert in Regulation of Public Services for Energy
Roerto Meira Junior	MME	General Coordinator of Alternative Sources

Carlos Alexandre Príncipe Pires	MME	General Coordinator of Energy Efficiency
José Luiz Cavaretti	AES- Eletropaulo	Manager of New Markets Income Management Direction
Eliene Corrêa Rodrigues Coelho	SEHAB	Coordinator of the System of Information for Social Habitation in the City of São Paulo - Habisp at the São Paulo City Hall
Roberto Boquetti	CELPE	Manager of Losses Management Department
Erika Rego Ambrósio	CELPE	Superintendent of Commercialization and Market

Annex 2: Minutes of the meeting held in ANEEL

Date of the meeting: September 13, 2011.

Participants

Name	Entity	Function
Marcos Bragatto	ANEEL	Superintendent of Electricity Commercialization Regulation
Jorge Augusto Lima Valente	ANEEL	Expert in Regulation of Public Services for Energy
Oberdan Freitas	ANEEL	Expert in Regulation of Public Services for Energy
Daniel José Justi Beco	ANEEL	Expert in Regulation of Public Services for Energy
Henrique Tavares Mafra	ANEEL	Expert in Regulation of Public Services for Energy
Suani Teixeira Coelho	CENBIO	Brazilian Reference Center on Biomass Coordination

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The meeting

First, ANEEL members showed a table with a summary of the 2010 census of households with electricity. In this table were highlighted major advances in the universalization of electricity.

Table showed:

STATE	REGION	TOTAL HOUSEHOLD	NO ENERGY	%UNIV	RURAL				URBAN			
					With ENERGY	NO ENERGY	TOTAL	%UNIV	With ENERGY	NO ENERGY	TOTAL	%UNIV
	Brasil	5732485	728512	98.7%	7501975	595415	8097418	92.6%	49093032	133097	49226767	99.7%
	North	3975533	251207	93.7%	731067	232085	963156	75.9%	2993228	19122	3012377	99.4%
	Northeast	14922901	339087	97.7%	3445735	277200	3722943	92.6%	11137927	61887	11199958	99.4%
	Center-West	4334673	40028	99.1%	442772	32373	475153	93.2%	3851820	7655	3859520	99.8%
	Southeast	25199799	66.211	99.7%	1622714	37306	1660025	97.8%	23510520	28905	23539774	99.8%
	South	8891279	31979	99.6%	1259687	16451	1276141	98.7%	7599537	15528	7615138	99.8%
Pernambuco	Northeast	2546872	15495	99.4%	446596	9118	455715	98.0%	2087773	6377	2091157	99.7%
Rio de Janeiro	Southeast	5243029	5892	99.9%	161861	1589	163450	99.0%	5075216	4303	5079579	99.9%
São Paulo	Southeast	12827153	15012	99.9%	478111	4801	482917	99.0%	12333766	10211	12344236	99.9%

They were then commented the main features of the Programme LIGHT FOR ALL, this program was launched by the Federal Government in November 2003, and it has as its goal to end the electric exclusion in the country in the rural ambit, reaching over 10 million people until the year of 2008. The Program have been coordinated by the Ministry of Mines and Energy, operationalized by Eletrobrás and executed by the electric power concessionaires and rural electrification co-operatives. For meeting the initial goal, R\$ 20 billion were invested. The map of electric exclusion in the country revealed that the families with no Access to energy are mostly in sites with smaller Human Development Index and in low-income families. Approximately 90% of these families had income below three minimum wages and 80% are in the rural areas. During the execution of the Program, new families with no electric power in their households were located and, due to the appearance of a great number of demands, "LIGHT FOR ALL" was extended to be concluded in the year of 2010. The Program was once again extended, now to be finished in 2011.

It was exposed the tariff system adopted in Brazil. The Social Energy Tariff, reformed by Law No. 12.212/10 and regulated by Decree No. 7583, states that to gain access to bill discount is necessary that the family earn less than half of the minimum wage per person. The discount is between 10 and 65% according to the band consumption. Families Indigenous and *Quilombolas* whose family income is less than or equal to half the minimum wage will be entitled to 100% discount to the limit of consumption of 50 kWh / month.

Finally, ANEEL informed the intention of selling electricity-prepaid cards with the objective is to ensure savings to consumers. With this card, consumers can purchase in advance a certain amount of energy. The system will benefit the residents of low income and who do not have a fixed income, allowing greater control and consumption planning.

Annex 3: Minutes of the meeting held in AES Eletropaulo

Date of the interview: September 14, 2011.

Participants

Person interviewee: José Luiz Cavaretti, Manager of New Markets, Income Management Direction AES-Eletropaulo.

Interviewer: Manuel Moreno Ruiz Poveda, Researcher at CENBIO/IEE/USP.

The interview

1. *What are the differences between the procedure for normal connection and the procedure for connection of a low-income household in a favela?*

Mr. Cavaretti indicates that the procedure is completely different, explaining afterwards the procedure practiced in the regularization of electrical connection in *favelas*:

First, the mapping of residences in the target area is executed. At the same time, we begin to develop relationship and communication with the community's inhabitants and leaderships, with the purpose of making the affected people understand the regularization process. This communication is performed by means of didactical material, conferences, assemblies and visitations to each household.

The second issue is the technology used in the regularization, because this kind of grid is not conventional. In these grids, a technology to prevent energy theft is used as a means to change the culture of clandestine connections. Without this pressure, it is not possible to change the behavior of the inhabitants.

The third issue consists of the commercial policies, which are very different from the ones performed with the average consumer. Due to the dweller's lack of knowledge about how much is the electric power consumption, the billing limit for the first six months is of 150 kWh. This way, the dweller has time to understand how much s/he would pay if s/he should pay her/his total bill, and in the meantime, inspections would be performed in case energy consumption is being too high, in order to teach the dweller how to save energy and detect possible problems with connected equipment.

Last, and coupled with the previous issue, an energy efficiency program is implanted to help reducing households' energy consumption having the purpose of keeping consumption below 200 kWh. According to the experience accumulated with this kind of customers, the proportion of timely payments of the electricity bill is of 90%. When consumption is above this number, the rate of defaults dramatically increases.

2. *What is the procedure for connection of the households with irregular land tenure?*

Mr. Cavaretti answers that most households that AES Eletropaulo connects in *favela* areas do not have their land tenure regularized, stating that the legality of the estate is not a requirement to make the connection. The fundamental requirements are that the household has technical condition to make a grid structure and that it is not located in an environmental protection area.

3. *What are the biggest obstacles faced in the regularization process?*

Normally the regularization is received with much interest and acceptance by most of the dwellers from the target community, due to the consequent solution of several severe problems in these areas, such as the existence of a high risk of fire and accidents by electric shock due to the precarious facilities. The irregular connections provide low-quality energy that causes damages to appliances. When consumers are regularized, they start to have rights to financial reparation to losses caused by failures in the grid. In the connection process, AES Eletropaulo must also regularize the street where the household is located in order to put order on the address, giving a name to the street and attributing a number to each household. This way, the dweller starts having an official address, and this fact is vitally important in order to open a bank account, access to credit, improvement in jobs opportunities, etc.

The main obstacle is to make the dwellers in these areas able to pay the electric power bill. Nowadays, 70% of the clients in *favelas* pay their bills on time. Because of this, the work is focused on reducing the remaining 30% defaults. In order to accomplish this, the main goal is to reduce consumption in these households by means of education and implantation of efficiency measures. Nowadays there is a pilot project where meters were installed inside the households; these meters are very easy to use and check, and they inform both immediate and accumulated energy consumption. This equipment works as a continuous incentive to electric power saving, since these meters provide the consumer with a control over her/his consumption, allowing to adequate it to her/his family budget. The implantation of these systems is justified because the education methods previously adopted, mainly conferences, public events and door-to-door auditing, has been obtaining a very reduced impact. This lack of efficiency has a very short memory due to it being focused on covering the basic day-to-day necessities. On the other hand, it is not viable to install this equipment in all households.

4. *Are the projects for electric regularization in favelas economically sustainable?*

These projects have demonstrated an advantageous financial payback. In fact, there are over one thousand communities where the model performed at the Paraisópolis *favela* was taken to, in which the investment payback was proven.

5. *What kind of monitoring do these projects have?*

This market is totally monitored; consumption is controlled and 150,000 visitations take place per year, mainly in households with high energy expenditures.

6. *Is there a universalization of access to electricity in the AES Eletropaulo concession area?*

Mr. Cavarette states that the universalization of access to electricity is being met in São Paulo; on the other hand, he indicates that a household can be considered as having access to electricity even if it only has an irregular connection and a single lamp.

Annex 4: Minutes of the meeting held in LIGHT

More information about this energy company can be accessed visiting <http://www.light.com.br/web/tehome.asp>:

Profile of LIGHT Company (extracted from the begging of the meeting):

LIGHT Services of Electricity is the company of the LIGHT Group responsible for the distribution of energy to 3.9 million customers, in the 31 municipal districts of the state of Rio de Janeiro included in its area of concession.

In execution to the Law 10.848, of March of 2004, the dealerships of energy as Light had to separate their generation activities, transmission, commercialization, so that the distribution, activity indeed regulated, could reflect the right Real and obligations associated to the concession of an essential public service.

Date of the meeting: October 19th, 2011.

Participants

Prof. Dr. Emilio Lèbre La Rovere - Head Centro Clima/COPPE/Federal University of Rio de Janeiro and Brazilian member of GNESD

M.Sc. Maria Regina Maroun - Researcher at Centro Clima/COPPE/Federal University of Rio de Janeiro

Mr. Paulo Born - Executive Director of the LIGHT Company

Ms. Fernanda Mayrink - Service to the Communities Manager of the LIGHT Company

The meeting

First of all, Prof. Emilio explained the objectives and many other issues (like themes, the excellence centers, phases, etc.), associated to the GNESD network. Prof. Emilio mentioned about the historic fertile scientific cooperation between COPPE COPPE/Federal University of Rio de Janeiro and the LIGHT Company, since when Mr. Jerson Kelman, Prof. Emilio's friend, was president of the Company.

After this, Ms. Fernanda Mayrink - responsible for the "Programa Light nas Comunidades "Pacificadas" (LIGHT Program in the Pacified Communities) - explained, with details, the actions realized by LIGHT in terms of energy for the communities (basically, poor communities). She told about the advances of LIGHT in the following favelas (slums): Santa Marta, Chapéu Mangueira, Babilônia, Cidade de Deus, Morrinhos (which don't have electricity before LIGHT action), Batã, Complexo do Alemão and Formiga.

Ms. Fernanda told about her emotion when she gave, in the name of LIGHT Company, a refrigerator to a 100 years old woman - which never before had this kind of domestic appliance. Ms. Fernanda explained that the obstacles of the Program are related with lamp and refrigerators discharge and about the limitations of the Projeto Recicla (Recycle Project - which means change of recycle material for economic resources for the poor). Mr. Paulo, in such context, suggested that Projeto Recicla should in the

Cidade de Deus ("City of God" - an enormous community/slum localized in Rio de Janeiro). Both them mentioned the difficulties associated with registration of the families in LIGHT actions, because of the lack of some specific personal documentation.

Ms. Fernanda and Mr. Paulo showed a video and two reports about the action of LIGHT in poor communities.

It is important to highlight 3 telephone meetings was realized after the meeting described - and in the same context. All of these information and data were very opportune for the elaboration of the Brazilian report in the context of the theme "Urban and Peri-Urban Energy Access III".

Annex 5: Questionnaire sent to CELPE

The Questionnaire

- 1- *Percentage of households and small businesses that are electrified, and what proportion of such consumption is regularized.*

We estimate that approximately 60 thousand households scattered throughout the State are without regularization, clandestinely connected to the Celpe grid.

- 2- *Areas susceptible for projects implantation.*

These are low-income areas, located at the outskirts of the cities.

- 3- *Projects concluded, in implementation or study stage.*

In general, there are no specific projects, because this profile of client is sprayed throughout the State.

- 4- *Investments done by CELPE.*

R\$ 4 million/year relative solely to regularization of clandestine clients, irregularly connected to the distribution grid.

- 5- *Payback period for these investments or other economic viability indicators.*

The payback period is 9.5 months.

- 6- *Executed actions and implanted technologies*

Installation of the electronic meter for electric power and isolated (concentric) connection branch.

- 7- *Consumption reduction and electricity theft reduction caused by the regularization.*

We estimate that, with regularization, we eliminated 90% of energy thefts. In a first moment, bills are most often paid. The situation evolution depends on consumption administration by the clients.

- 8- *Installed antitheft technologies, such as coaxial cables.*

Multiplexed and isolated distribution grid, isolated (concentric) connection branch, electric power electronic meter.

- 9- *Historic series of accidents related to electric power theft or consumption.*

Number of accidents whose occurrence was communicated to Celpe:

2006	57
2007	35

2008	32
2009	33
2010	52

10- What is the procedure to regularize a connection – must the family pay for the installation or not?

In case there is an installed input pattern in the venue, there will be no costs to the unit. In case there is not, Celpe can install it and the cost will be charged from the client in the bills.

11- Historic series of average consumer per household.

90 KWh/month for low-income clients.

12- Average installed potency per household.

0.5 KW ~ 1.5 KW.

13- Satisfaction levels of the regularized consumers (complaints received).

The satisfaction level is high.

14- Difficulties faced in the regularization processes.

Areas with high criminality rate, limited/narrow access, low-income areas where we have difficulties in finding an adequate position for installing the metering.

Annex 6: Minutes of the meeting held with a former technical director of National Oil, Gas and Biofuels Agency

Date of the interview: November 4, 2012.

Participants

Person interviewee: Luiz Augusto Horta Nogueira, former technical director of National Oil, Gas and Biofuels Agency (1999-2003)

Interviewers: Manuel Moreno Ruiz Poveda, researcher at CENBIO/IEE/USP, and Fernando Saker, journalist.

The interview

- 1. Focusing on the low-income population: Are there or where there plans and policies at national, state or local level, specifically for improvement of access to LPG? Is there any specific subsidy for LPG?*

Yes. In order to compensate the end of subsidy to LPG (around 2001, 2002), a “vale gás” (“gas voucher”) was granted in the FHC government for low-income families. In the Lula government, the vale gás was grouped with other benefits in the Bolsa Família (Family Allowance) program, a part of which (I cannot state how much) is destined to LPG.

- 2. In other programs that are not specifically focused in the low-income population, is access to LPG mentioned? Is there any indirect subsidy for LPG? Does the access to LPG appear in any program for urban improvement and development?*

As answered above, Bolsa Família includes the vale gas, although this is not highlighted by the current government.

- 3. Are there obstacles in the LPG distribution in the urban low-income communities, especially in favelas (irregular households)? Which ones (legal, physical, safety obstacles, etc.)?*

Yes, there are. I would not say that it is a widespread thing, but it is known that, in some low-income communities, there are criminal groups that control access to services such as electricity, cable TV and LPG, by imposing additional fees and restricting the low-income population's access to these services.

- 4. How can distributors and retailers overcome these problems?*

The only way to overcome these problems is by means of a clear action of the supervisory bodies, as well as of the organisms that follow the energy market, and also of the Police agencies and the ANP itself, which recently forwarded complaints on these problems to the federal police.

5. *Do the distributor and retailer companies have any legal obligation for supply for this population?*

Not that I know of.

6. *How is the process for creating new distribution areas in low-income communities in expansion?*

There is not any determination of a legal nature for this kind of ordination; this is determined by the market itself (demand spots).

7. *Is there any kind of monitoring of the LPG use in these communities?*

Not that I know of. The monitoring of volume only reaches the level of distributor companies, not the one for retailers. However, there is the monitoring of price by ANP, and this one includes these communities.

8. *Which difficulties are met by the LPG consumers that live in the low-income communities in order to satisfy their demand?*

Read the answer for question 3.

9. *Which would your recommendations and best practices be, so as to universalize and improve access to LPG in low-income urban communities, especially in favelas?*

It is necessary to increase supervision of such access, in order to stop the criminal practices mentioned in the answer for question 3. Besides, it is necessary to allow the market to act in a competitive way, so that there is not price abuse (market practices).



Luiz Augusto Horta Nogueira after the interview in the CENBIO office. November 4th, 2012.
Photographer: Fernando Saker.