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MNEs' Contribution to Sustainable Energy and Development: the case of 'Light for All' Program in Brazil

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ABSTRACT

Access to affordable and sustainable energy is crucial for the improvement of the well-being of modern societies. Most energy technologies require comparatively high up-front investment which adds to the challenge of electrification, despite the recognized multiple benefits. Partnership with multinational enterprises (MNEs) can provide necessary investment in infrastructure, finance and technology for renewable energy and contribute to improving development indicators. However, remote areas with poor infrastructure do not have access to MNEs who are profit seekers. The Brazil experience with MNEs and 'Light for All' (LfA) program shows that people invest more in businesses, education, health, and women reduce their drudgery at household chores. However, areas having a poor infrastructure in the North remain out of electricity and attempt to make the universal access was failed until regulatory incentive framework and particular attention from the government level established. This is a great learning for the developing countries aiming to achieve sustainable development goals. A host country can gain development cooperation from MNEs with rightly formulated and implemented policies and regulatory conditions.

Key words: MNE contribution, Renewable Energy, Sustainable development, LfA program

1. INTRODUCTION

Environmental sustainability is at the core of the 2030 sustainable development agenda, as part of a number of sustainable development goals (SDGs). Goal 7 of the SDGs is to ensure access to affordable, reliable, sustainable and modern energy for all. SDGs set a target of universal access to modern energy by 2030. Environmental sustainability requires replacement of energy sources (fossil fuel) with non-polluted renewable energy. In 2015 COP21, also known as the 2015 Paris Climate Conference, arrived at a universal agreement on climate, with the aim of keeping global warming below 2°C requiring the use of non-polluted sources of energy.

Access to electricity is crucial for the improvement of the well-being of modern societies. The literature found a clear correlation between poverty and access to electricity (Chaurey, Ranganathan & Mohanty, 2004; Ketlogetswe, Mothudi & Mothibi, 2007; Kanagawa & Mogawa, 2008; Kooijman-van Dijk & Clancy, 2010). Electrification allows more time available for income generation activity. Businesses, households, lighting systems, health centers and clinics, and water pumping for irrigation all require electrification. With the increase in population and development, the demand for electrification has been rising. Underdeveloped areas have shortages of supply. According to World Energy Outlook for 2016 (WEO-2016), 1.2 billion people, accounting to 16% of the global population, did not have access to electricity. The absolute majority of these people live in remote rural areas. Electricity is one of the necessary components of development and an important means to end poverty and hunger.

Supply of sustainable electricity from renewable sources like the wind, water (wave machines, tidal barrages and hydroelectric power), geothermal, solar, and biomass (wood and agriculture products) is necessary to meet the growing demand. However, most energy technologies have comparatively high upfront investment involving large sunk and irreversible costs with longer payback period adding to the challenge of electrification, despite the recognized multiple benefits. Therefore, financing in energy, particularly rural energy has always been a challenge

and a central issue in the development of the renewable energy market (Waddle & Perlack, 1992; Haanyika, 2006).

Many governments in developing countries have inadequate capacity to provide universal supply although they have a good intention. In spite of widespread government intervention in the electricity production and supply process, demand remains higher than supply. Here MNEs and private sector, with their capacity, can invest in the generation and distribution of electricity from "low carbon" sources. Unilever is an example of a global company makes a history by doing sustainable businesses for the world. It has declared using 100% of energy in all of its operations from renewable sources by 2030. To achieve this goal, it has been working in the areas of renewable energy, deforestation and sustainable livelihoods including agriculture in partnership with large global NGOs. It also has a strategy to advocate public policy tackling climate change and helping consumers to use less water, less energy and nutritious food.

However, due to the public good, externality and other features of the power system, MNEs and the private sector may not play their roles adequately/appropriately without government supportive/controlled policies. The private sector and MNEs (technology manufacturers, suppliers/distributors and/or installers which are also known as service providers) can generate entrepreneurship, create employment and build wealth, which eventually can benefit the local people in multiple ways. In addition, MNEs invest in capacity development, transfer knowledge through multiple channels and invest in social enterprises to build trust. MNEs through technological developments can help in the electrification of rural areas in developing economies.

In the current globalized world, FDI (foreign direct investment) by MNEs (serves an increasingly important source of investment for economic development and poverty reduction. Theoretically, MNEs' positive contributions through inward FDI include 1) development financing; 2) direct and indirect job creation; 3) knowledge/technology transfer and spillovers

through demonstration effect, movement of trained labor, and knowledge transfer within the supply chain (te Velde & Xenogiani, 2007); and 4) competition effect when foreign entry forces local firms to enhance efficiency so as to survive and compete with foreign-invested firms (Borensztein, De Gregorio & Lee, 1998; Narula and Dunning, 2000; Javorcik, 2008). In addition, through partnership and social enterprises, MNEs often play roles in poverty reduction, livelihoods security (including, food, nutrition, health and energy security), and women empowerment. Forming joint ventures with foreign investors and sub-contracting to foreign invested firms are also argued to be effective channels for local firms to enter into the global production chain (Carlo & Saliola, 2008).

Certainly, FDI is not an un-annoyed blessing (Fu & Buckley, 2015). There may also be negative effects of FDI on the host economy (Aitken & Harrison, 1999; Barrios et al. 2005). These include the crowding out effect when the affiliates of multinational enterprises (MNEs) crowd out the domestic firms especially the small business from the local market (Caves, 1996). FDI may also create high foreign dependence in the host economy and divert the limited resources in the host economy from developing indigenous economic and technological capabilities. There are also opportunity costs of resources such as land and labor as well as costs due to damage to the environment (Fu & Buckley, 2015). Moreover, foreign invested firms may remain as enclaves in the host economy and lead to polarization or sharpened dualism within the economies of the host country (Driffield & Taylor, 2000; Lall, 2001). MNEs take over the management of local firms or often employ skilled workers and material resources in short supply from local enterprises and increase unemployment of local workers (Kuwahara, Harada & Mizuno, 1979).

MNEs are supposed to maximize profit and as because the generation, transmission, and distribution of renewable electricity require a large up-front investment, market power is a reason for market failure in the electricity market. Government regulation is necessary to

channel the benefits towards development goals like poverty reduction and universal access to electricity.

Given the gains and costs of inward FDI and the mixed empirical evidence, it is argued that the benefits from FDI are subject to a list of pre-conditions. For example, the strength of the growth effect of inward FDI depends on the presence of effective linkages between foreign and domestic firms (Rodriguez-Clare, 1996; Javorcik, 2008); the absorptive capacity of the domestic firms in the host economy (Fu, 2008), and the presence of complementary institutions and infrastructure (Balasubramanyam, Salisu, & Sapsford, 1996). Therefore, the strength of the growth effect of FDI depends on the characteristics of FDI and the host country (Javorcik, 2008). In other words, the type of FDI, the source of FDI, and the sector where the FDI flows to in the host country also matter. The 'green field FDI' is argued to have greater growth and employment creation effect than FDI engaged in 'merge and acquisition' activities. FDI from innovation active countries is regarded to have greater knowledge spillover effects than FDI from lagged behind countries (Javorcik, 2008). FDI in resource exploitation activities is found to have less local linkage and limited spillovers than FDI in knowledge intensive manufacturing and services sectors. Finally, as discussed earlier, the capabilities of host-country firms, the presence of favourable institutions and policies in the host countries also matter (Narula and Dunning, 2010).

In this context, this paper examines the following broad objective.

Under what conditions multinational enterprises make positive contributions in developing countries?

Specifically, in relation to LfA program the questions which we address are:
Do MNEs contribute to the electricity supply of Brazil?
Why MNEs are interested to work in the South of Brazil?
Why are they successful in the South, but not in the North?

We address these questions using the literature in general and critically examining the data

from light for all (LfA) program of Brazil. The paper is organized as follows.

Section 2 follows the introduction and includes a review of the literature on the contribution of MNEs/FDI in developing countries. Specifically, this section includes an overview of multinationals in developing countries contributing to innovative technology transfer in relation to sustainable energy/electricity. Section 3 will include the overview of Brazil renewable electricity sector with reference to regional differences and involvement of multinationals. Section 4 critically address LfA program and its impact on development goals along with its success, constraints. This section also discusses the sustainability issues of the electricity sector in Brazil. Section 5 concludes.

2. LITERATURE REVIEW

Energy policies promoting sustainable development in developing countries are often subject to implementation barriers (Jacobsson, S & Lauber, 2006.. They include poor infrastructure, weak governance structures, weak financial institutions (Waddle and Perlack, 1992; Haanyika, 2006), trade barriers, and large underdeveloped markets. Enormous challenges are ahead on achieving the target of universal access to energy for all. The government intervention in developing countries is widespread in the electricity production and supply process, but cannot meet the rising demand for electricity. MNEs have capabilities to invest in the sectors which require large upfront costs like the electricity sector. Financing in energy has always been a challenge and a central issue in the development of the energy market (Waddle and Perlack, 1992; Haanyika, 2006) where MNEs can play their role. However, MNEs are profit makers and so consider opportunities and risks when investing in businesses. In this review, we discuss several important challenges.

2.1 Infrastructure

Lack of infrastructure is a common barrier to development in the developing countries. MNEs

do not consider expanding markets where weak infrastructure makes it hard to exploit scale economies (Karnani, 2007). However, there are several reasons for which MNEs contribute to infrastructure development including the electricity sector. Sourcing resources (labour, natural resources, etc.) and selling products are two important reasons. MNEs source cheaper resources in countries with comparative advantage and help the government of such countries to meet the increasing demand for infrastructure to get access to such resources. MNEs often contribute to the construction of relevant infrastructure to expand their product markets in countries where domestic markets are large. For example, India has poor infrastructure but its domestic market is large due to the huge population and growing middle-class population (OECD, 2002). Some MNEs are already showing their commitment to do good businesses for the world with the use of sustainable energy sources.

In respect to rural areas electrification programs, absence of infrastructure become especially critical. The operation in remote regions are hardly profitable which creates additional difficulties both for providers and for locals (Chaurey et al., 2004).

Coelho and Goldemberg (2013) provide the classification of possible energy supplies in respect to various aims.

Time and investments required for grid expansion may preclude the implementation of other energy solution in the region delaying the electrification process. On the other hand, localized mini-grids based on renewable sources power generators (e.g. wind or solar) may be deployed relatively quick enabling provision of electricity at least at minimal level and then scaled-up in response to growing demand. Palit and Bandyopadhyay (2016) suggest that on-grid and off-grid solutions should be considered as complementary rather than contradictory approaches.

2.2 Linkages with local firms and technological knowledge

According to Driffield et al. (2002), technology and knowledge spill overs depend on the intensity of linkages between subsidiary and the local firm. Substantial claims are available

that MNEs transfer technologies to host countries (Buckley et al., 2002; Liu, 2008).

Dunning and Fortrainer (2006) observed MNEs impact through the lens of the new development paradigm (NDP). The important feature is the strong focus on the establishment of the institutions which should facilitate the positive impact of FDI on host country development. Firth and Ghauri (2010) presented a comprehensive framework describing the interconnections between MNEs, local firms and host country policymakers.

Studies found that FDI generates positive knowledge spillover effects in host country economies (Buckley, et al, 2010) and reverse spillover effects on parent firms (Chen, Li & Shapiro, 2012). Theoretical literature mostly supports positive spillover effects of MNE activities in the host countries (Aitken & Harrison, 1999; Haddat & Harrison, 1993), but the empirical evidence shows mixed results such as a positive, a weak positive and a negative.

2.3 Government regulation and incentives

In general, governments across the world try to attract MNEs to locate in their country, using generous financial and fiscal incentives (Hanson, 2001). The incentives are debatable, but are justified on the ground of positive development effects, which are realised only under certain conditions. A positive technology and knowledge spillovers can be increased by governmental regulatory policies.

In this respect, it may be interesting to analyse the interplay between MNEs (FDI) and host country government in electrification programs and especially in the adoption of green energy sources. While FDI and associated economic growth lead to an increase of energy consumption, MNEs tend to discourage the usage of unclean energy. Lee (2013) studied the impact of FDI on clean energy adoption in developed countries and found no strong relationship between FDI inflow and reduction in CO2 emissions.

Urmee and Anisuzzaman (2016) discussed the issues of successful implementation of

electrification programs in developing countries and emphasized the importance of political, social and cultural factors of innovation diffusion as well as local communities' involvement. Community members should participate in the actual program design and implementation. The ownership of installed equipment is another important issue. The proposed framework builds on the innovation diffusion model (Rogers, 2003) and delivers the recommendation on rural areas electrification.

2.4 Employment effects of multinationals

In an ILO research project on employment effects of multinational enterprises in home and host countries in 1978/79 Kuwahara et al. (1979) examined the employment effects of FDI in five ASEAN countries - Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Their economic analysis with limited data expressed two conflicting views as to how FDI affects the local labor market of developing countries. Foreign firms brought capital, technology and know-how of market development to the host country and absorb surplus labor. The contrasting view is that the foreign companies take over the management of local firms or employ skilled workers and material resources in short supply from local enterprises and increase unemployment of local workers. Feenstra and Hanson (1997) explained that the activities outsourced by developed countries MNEs are low-skill from developed countries' perspectives, but are relatively skill-intensive from the perspective of the developing country host. Also, te Velde and Morrissey (2004) found that MNEs create human capital in host developing countries with the skills necessary to meet MNEs' demand. This means that MNE investments are biased towards skill-intensive technology in developing countries. So, unskilled labourers and women in particular are usually less skilled in developing countries, are less benefitted from MNE investment. This in fact may mean that the abundance of cheap unskilled labour may not alone attract investment from MNEs. The question then follows,

what else is necessary to attract FDI and make a positive contribution?

te Velde and Xenogiani (2007) combined data from WDI, UNESCO, UNCTAD and other sources for 1970-2003 and constructed a panel data set for 111 low and middle income countries. With econometric analysis, they found that the impact of FDI on skill development is insignificant. Higher demand for labor in the sectors where MNCs concentrate translates into rising employment in those sectors and, at the same time, rising unemployment among the traditional sector laborers resulting in a dual economy pattern. Technology spillovers to the domestic sector contribute to increasing domestic firms' demand for skilled labor too. The extent of this depends on the absorption capacity of the domestic sector (Driffield and Taylor, 2000).

2.5 Gender inequality

MNEs operating in sectors such as textile and electronics usually tend to employ more women, so job opportunity and employment creation is boosted in the long-run (despite inevitable lay-offs undertaken to improve productivity). The question is not so much around whether employment is created, but more around what working conditions are guaranteed (Cotton and Ramachandra, 2001). However, energy sector MNEs are dominated by male workers.

MNE jobs give women independence and better salary, but very few women get these opportunities (Braunstein, 2006). Partly as a result of brand and image marketing policies, as well as of increased corporate responsibility pressure, MNEs from developed countries tend to apply home country regulations and standards – e.g. equal-pay schemes. Moreover, workers in larger enterprises tend to be better protected by labor legislation and are more likely unionized and receiving benefits.

MNEs may as well offer greater job security for both men and women relative to locally-owned firms, as their resilience better insulates employees from economic cycles. However, Seguino

(2000) argues that developing country governments – knowing MNEs tend to prefer to employ women as they are perceived to be more reliable and obedient - may use the repression of women's rights as a strategy to attract MNEs looking to reduce labor costs.

As another way of cutting costs and maximizing profits, MNEs are increasingly adopting the practice of sub-contracting to locally-owned firms. The latter employ women working from their homes, which, essentially, amounts to shifting all infrastructural costs onto them. At the same time, it also implies that the isolated workers cannot organise and unite to improve their working conditions (Richards and Gelleny, 2007). This sort of activities will be expanded with the access to electricity.

However, studies are not available on the hours saved by women in household chores due to access to electricity and labor saving technologies available for household activities. Women may get extra time to spend on home-based businesses.

2.6 Role of FDI on poverty

Many macro studies measured growth impact of FDI and discussed poverty reduction outcome assuming trickle-down effects of economic growth. The most important mechanism by which trickle-down occurs is via economic growth-led employment creation. Sumner (2005) reviewed a large number of studies on the impact of FDI on poverty. Evidence of impact is mixed, negative, no causal link or positive. Different indicators of poverty are used in the literature, such as economic growth, HDI, and inequality. MNEs can boost exports to developed country markets, which is likely due to lower tariff rates (Cotton and Ramachandran, 2001). This in fact creates extra demand for products creating more employment and contributes to poverty reduction.

From these literature, we find mixed evidence of MNE contributions to the development of host countries. In the next section we examine the Brazil case to identify the conditions under which MNEs make positive contributions to development.

3. OVERVIEW OF THE LfA PROGRAM OF BRAZIL

The Human Development Atlas, based on 2000 Census data of Brazil, mapped that 13 million people had no access to electricity. These include approximately 2 million farm homes. The excluded areas were mainly located in the northern Brazil, approximately two-third of national areas. It was also found that the energy insecure households were mostly located in the lower regions of the Human Development Index (HDI) and about 90% of them had incomes below three minimum salaries. About 80% of them were located in rural areas (Ghandour, 2005).

Considering this context, the Light for All Program (LfA) -a national program for universal access and use of electric power - has emerged as an alternative and a strategy to combat poverty and social inequality in these locations, assuming that the energy could be a vector of social and economic development (BRAZIL. MME, 2013). The program uses three technological solutions to reach this goal such as grid extension, decentralized power generation with isolated grids and stand-alone systems.

The LfA program was launched in 2003 to end the country's electricity exclusion problem through network expansion, generation and distribution of renewable energies. The program is coordinated by the Ministry of Mines and Energy (MME), managed by Centrais Elétricas Brasileiras SA (Eletrobras) and and implemented by the public and private distribution companies under its control (BRAZIL. MME, 2013). Eletrobras is a major power utility

company where the Brazillian government owns 52% stake. The key features of LfA are:[1]

- Serving goals were fixed per concessionaire and per Municipality, through the indication of the year in which the electricity universalization should be concluded. The compulsory completion of specific and prioritized targets by the electricity companies has promoted the development of projects that had previously low priority at the company level.
- 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.
- The concessionaires must 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.
- Use of renewable energy sources in the process of supplying electricity and securing inclusion of isolated areas.

The Electric Sector is split among public, mixed and private companies including multinational enterprises.

LfA is a government program, but the government generated funding from multiple sources including MNEs by sharing the generation and distribution businesses. The investments in this program until 2008 is divided as follows.

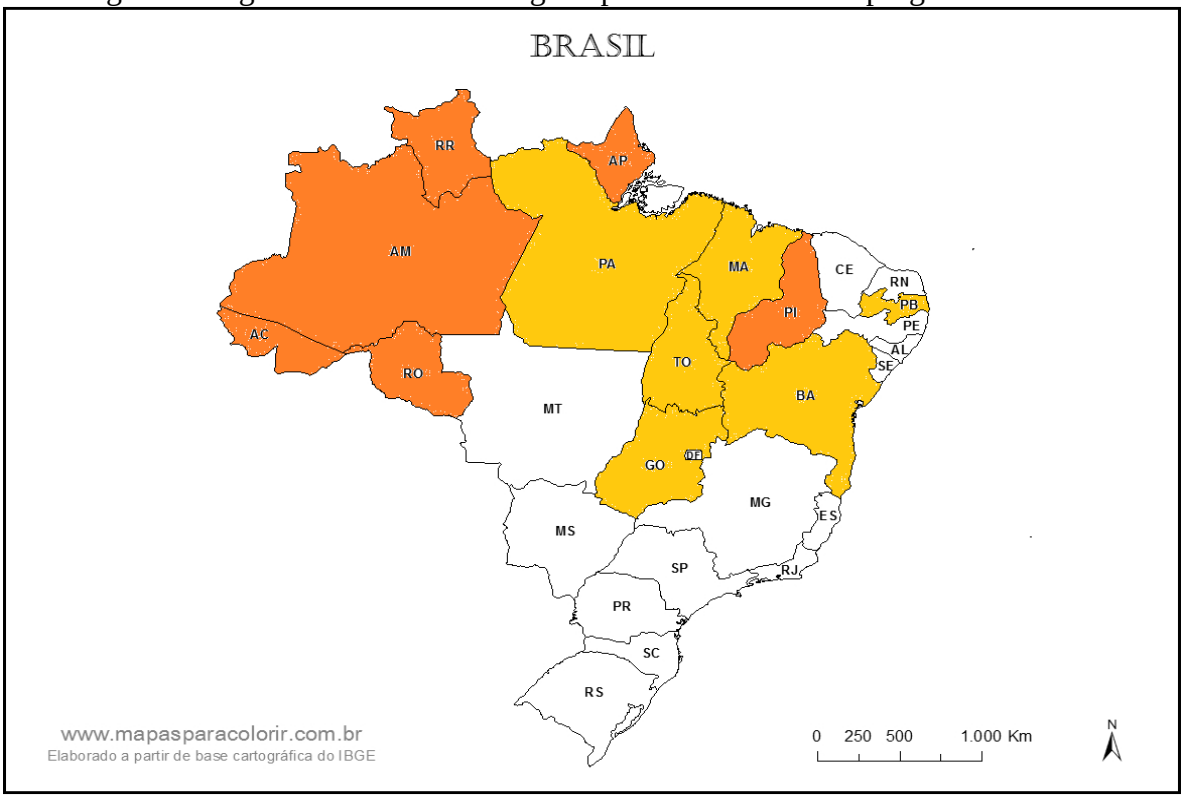
- 50% is provided by the federal government;
- 20% is provided by the state government;

[1] http://energy-access.gnesd.org/cases/32-energy-access-program-in-brazil-lighting-for-all.html

- 15% is provided by the concessionaires (including MNEs);
- The federal government via Global Reversion Reserve, provides 15% to the concessionaires, with 5% per year and shortage of two years.

The LfA performance until 2008 and 2014, may be is summarized in Table 1. It presents the performance of the program in different regions. The low and average performances are highlighted in Figure 1. The performance is measured by the percentage of estimated households without access to light to be benefited from the LfA program.

Figure 1. Regions of Brazil showing the performance of LfA program until 2008.



Legend: Orange= low performance, Yellow= Average performance, White= Very high performance.

As can be noticed, the performance was lower in the north and north-east regions. The center-west, south-east and south regions are higher performing regions until 2008. Of course, there are some lower performing remote villages in the higher performing regions. For example, AL, CE and PE were high performing areas in the north-east region. The program was initially planned to conclude in 2008 by reaching all households without electricity, but in Table 1 we

note that the goal was ambitious. The challenge arises from the lower initial estimation of the number of households without light, the difficult infrastructure in remote rural places and the rainforest in Amazon. During the program execution, more households without power at home were located, and the program was extended to 2010 and then was extended gradually to cover all households with electricity exclusion and it is still on-going in 2016.

Table 1. Performance of LfA in 2 rounds of intervention by the government.

UF (Regions)	% carried out until Dec 2008 (Round 1: 2003-2008)	Performance in Round 1	% carried out until July 2014 (Round 2: 2009-2014)
BA (North-east)	84%	AVERAGE	150%
GO (Center-west)	88%	AVERAGE	127%
MA (North-east)	78%	AVERAGE	132%
PA (North)	89%	AVERAGE	148%
PB (North-east)	89%	AVERAGE	135%
TO (North)	77%	AVERAGE	174%
AL (North-east)	106%	HIGH	173%
CE (North-east)	104%	HIGH	160%
PE (North-east)	113%	HIGH	128%
AC (North)	51%	LOW	88%
AM (North)	29%	LOW	119%
AP (North)	29%	LOW	198%
PI (North-east)	29%	LOW	97%
RO (Center-west)	50%	LOW	144%
RR (North)	31%	LOW	110%
ES (South-east)	371%	VERY HIGH	491%
MG (South-east)	189%	VERY HIGH	290%
MS(South)	131%	VERY HIGH	201%
MT(Center-west)	184%	VERY HIGH	306%
PR (South)	121%	VERY HIGH	221%
RJ (South-east)	220%	VERY HIGH	289%
RN (North-east)	141%	VERY HIGH	180%
RS (South)	157%	VERY HIGH	208%
SC (South)	212%	VERY HIGH	236%
SE (North-east)	169%	VERY HIGH	234%
SP (South-east)	192%	VERY HIGH	262%

Total	97%		162%

Note: % was calculated from the estimated households without light based on 2000 Census, but the estimate was lower than the actual number of houses without light during the implementation period and so the % is higher than 100.

In the initial phase of intervention, the north and north–east areas lagged behind for several reasons.

First, these areas were underdeveloped and requiring more investments to build the infrastructure for electrification. The underdevelopment criterion was not taken into account in this phase. The engaging agencies were unable to reach these areas due to poor infrastructure.

Second, MNEs were more located in the south and south-east regions because of the developed conditions of these regions. These regions comprise more local resources, industrial and commercial clients attracting more MNEs. This evidence shows that MNEs are attracted by the developed infrastructure, resources and market conditions of the regions. These conditions are in fact necessary for making profit from a business.

In the second round of the program after 2008, the government, through its wishful thinking, concentrated its efforts to benefit the northern regions, where the infrastructure was very difficult. The government used Human Development Index (HDI), which is correlated with energy access, to identify poor regions and took initiative of development and energy access through LfA accordingly. Policy measures include tariff reduction to companies for providing electricity supply to northern regions. Table 1 shows the increase in the performance in these areas. By December of 2012, more than 3 million families had already been benefitted by the LfA program. The southern regions were covered highly during the first phase until 2008, but policy changes improved the access of the north and northeast regions of the country. Most of the solutions applied in these regions were from the electricity supply of the renewable energy technology, supported by the government policy.

In June 2016, some stakeholders in the north of Brazil (in Boa Vista of Rorima state) were interviewed to learn the reasons for low access to electricity in the region other than unfriendly geography. The interviews include a family in a rural settlement (the settlement is known as *Nova Amazônia)* and a manager from Eletrobras (an electrical distribution concessionaire of the region). The following reasons emerge.

Supply is less than demand: the region is not connected to the National Interconnected System. The energy was imported from Venezuela. The transmission lines connected both countries were less than the demand in the region. Electrobras is a state-owned company and is responsible for electrification of rural households through the extension of the electric grid. The company failed to build adequate electric grids due to la lack of human resources (engineers, technicians and other professionals), lack of technology/industry in the region, given the distance of the region of operation from city centers, partner companies (all of them were local, partnership with MNE was not possible) were not interested to provide necessary service, and bureaucracy of the government department made delay to deliver financial resources which were not enough.

Inaccurate statistics: This first part of the LfA program was a phase of adjustments: there was no study of the number of households that needed electrical energy and since the region is supplied with energy provided by Venezuela, it was necessary to construct thermoelectric plants in order to meet the demand. Government budget was lower than necessary due to underestimation of households with a lack of electricity. There was not enough financial support from the government, which delayed the program in the region.

High electric bill: The cost of supplying electric grids, equipment and human resources was high. Human resources were hired from other departments in order to develop LfA projects, and most of the equipment had to be bought from *São Paulo,* which increase the cost of the

program. This made electric bill high and the failure rate to pay the electric bill was also high. So the government subsidy was also high.

The LfA program reached its goal of universal energy supply in the north in 2014 with more investment in the north without the partnership with MNEs, unlike the south regions. However, some indigenous areas still have no access to electrical energy and no forecast is available for new developments.

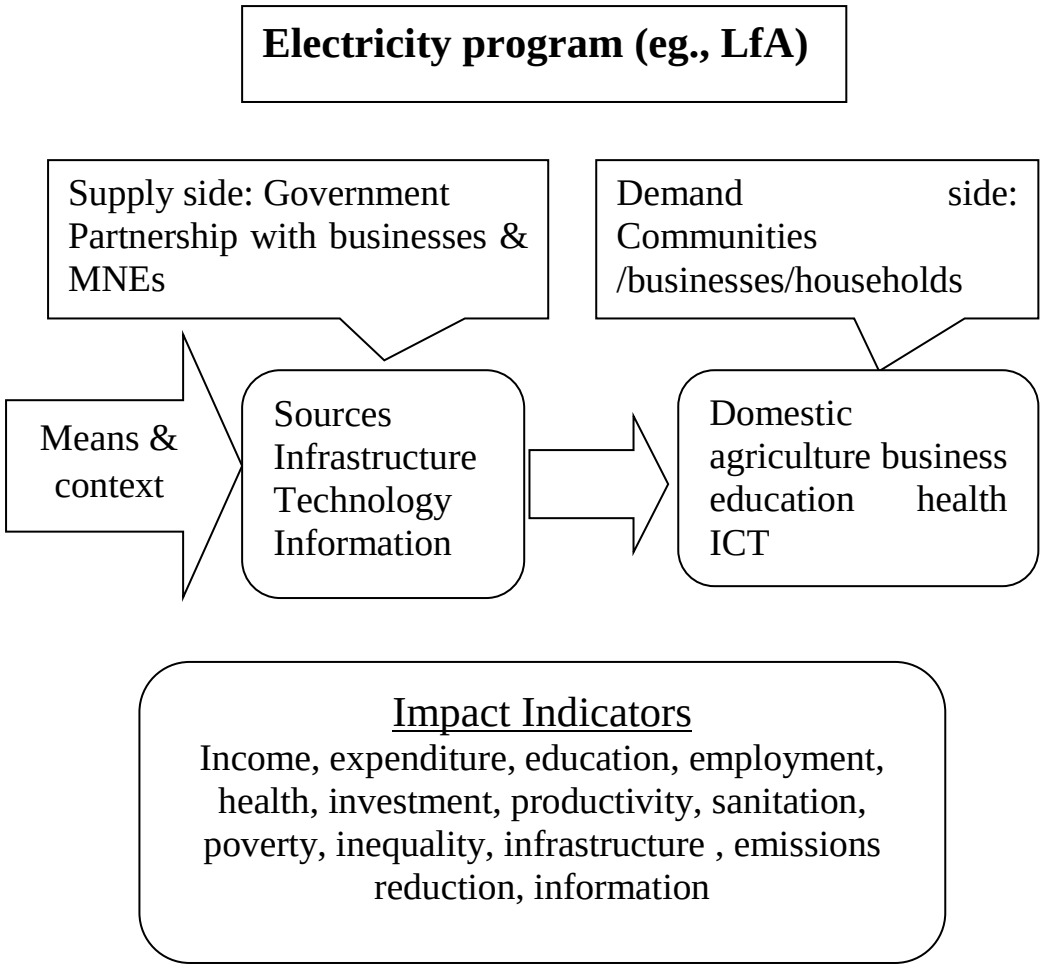
4. IMPACT OF LfA

LfA intervention is the supply of electricity by the government and partnership. Households and businesses would benefit from the program in various ways. We have organized this section in several sub-sections.

4.1 Conceptual Framework for Impact Assessment

.Figure 2 shows a conceptual framework linking the intervention with outcome indicators.

Figure 2. Impact of electrification- stakeholders and impact dimensions.



The framework assumes that the intervention ensures electricity to rural households through government and private sources through various partnership programs. Electrification would create opportunities of employment through businesses, technology, and information for both men and women. The use the opportunities arising from the electrification will depend on household capabilities and absorptive capacity. Households would be able to develop human capital through education and health facilities and would choose pathways of development such as diversification, specialization or migration. Electricity would help agricultural households use irrigation based technologies, produce products that have better market access, give them access to information. Rural educated youth would get internet access helping to choose better migration option, both internally and internationally. Children would study more, school attendance, quality of education are expected to rise. The program creates direct jobs in the

electricity sector and indirect jobs through expansion of businesses, farm, and non-farm activities. Business opportunities would help livelihood diversification. Households should have more choices as we expect growth of businesses in the rural sector. Access to information would help people to commute and find better jobs in other areas. So we expect more mobility. Access to information would help to obtain better health care facilities. All these opportunities would then translate into various welfare indicators, such as productivity, income, consumption, health, education, investment, etc. Households and the community as a whole would benefit from employment opportunities, a cleaner environment and better infrastructure. Without the electricity, women usually spent most of their time in domestic activities. Access to electricity would enable them to use electric home appliances and so they would save time for income generating activities, such as self-employment in small and medium enterprises like the craftwork.

Regarding the role of MNEs, they contribute to host country electricity supply through businesses and partnership with government and private organizations. Their investment (FDI) can be channelled through government bodies, joint ventures and subsidiaries. Host country firms would gain from partnership businesses and spillovers depending on their capabilities, absorptive capacity and market condition. MNEs can contribute to electricity supply through business consortiums with local and international organizations. They can generate new technology for development by increasing investment in research. Households as consumers would gain from MNE and local firms. This in turn would contribute to development goals.

Usually, MNEs have resource and scale advantages over local actors, particularly in the large scale electricity generation. This sector involves a large initial investment and capital intensive technology. MNEs are capable to develop products and services that require a large investment as well as have high potential for developmental impact. MNEs through technological developments can help the electrification of rural areas and can contribute to face this challenge

(Haanyika, 2006; Karnani, 2007).

4.2 Quantitative assessment of impact of LFA

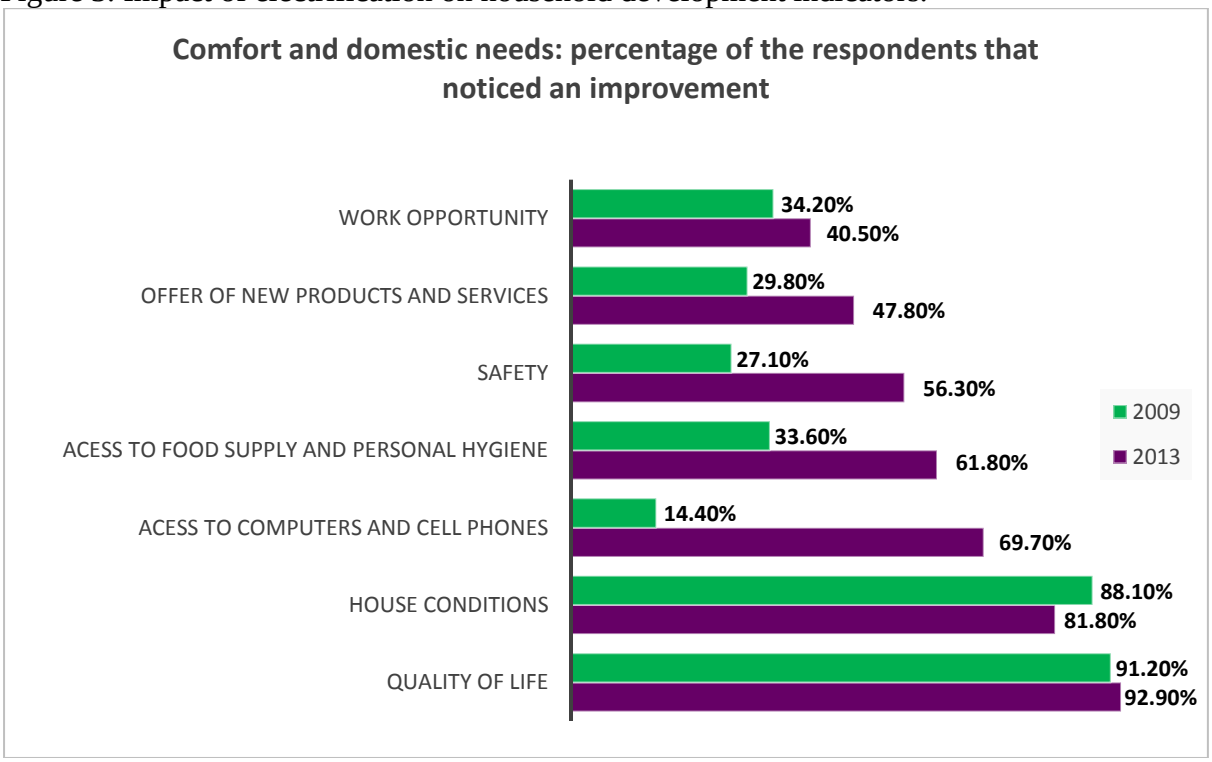
Brazil is the largest and most populous country in South America. The country is divided into 5 regions: North; Northeast; Central-West; Southeast; South. These regions differ in many aspects, such as geographical, financial and social. LfA, started in 2003, was a challenging program requiring a large investment for the generation, transmission and distribution of electricity to excluded people. The government financed the program from various sources including the partnership with executor agents which include MNEs. The agents paid tax to the government and are coordinated by Eletrobras, the largest electricity company of Brazil.

With the help of specialized companies, the Ministry of Mines and Energy (MME) of Brazil conducted research to see the impact of the program on the households who were benefited from LfA. In the year of 2009, the company *Zaytecbrasil Serviços de Pesquisa Ltda* interviewed 3,892 beneficiaries and in the year 2013, MDA PESQUISA interviewed 3,105 beneficiaries.

The results show an impressive impact of LfA on electricity inclusion and the resulting development indicators such as income/expenditure, employment, education, health, women empowerment and overall quality of life. After 10 years of intervention, more than 15 million population were benefited by the LfA program, improving the quality of life of the population and bringing new opportunities to remote areas of the country. Along with providing access to electricity, the LfA program has been contributing to social development by improving education and healthcare. Figure 3 shows the change in the quality of life indicators and overall quality of life due to LfA based on the survey households' opinion. For example, electricity created job opportunities. More than 34% of the 3,892 beneficiary respondents interviewed in 2009 considered improvement of work opportunities due to LfA program, and 40.5% of the

3,105 respondents interviewed in 2013 opined that work opportunities have increased due to LfA. For all indicators except housing conditions, the respondents rated higher achievements in 2013 than 2009. The program started in 2003 and the first round of intervention was completed in 2008 and so housing improvement may be already picked in 2009.

Figure 3. Impact of electrification on household development indicators.

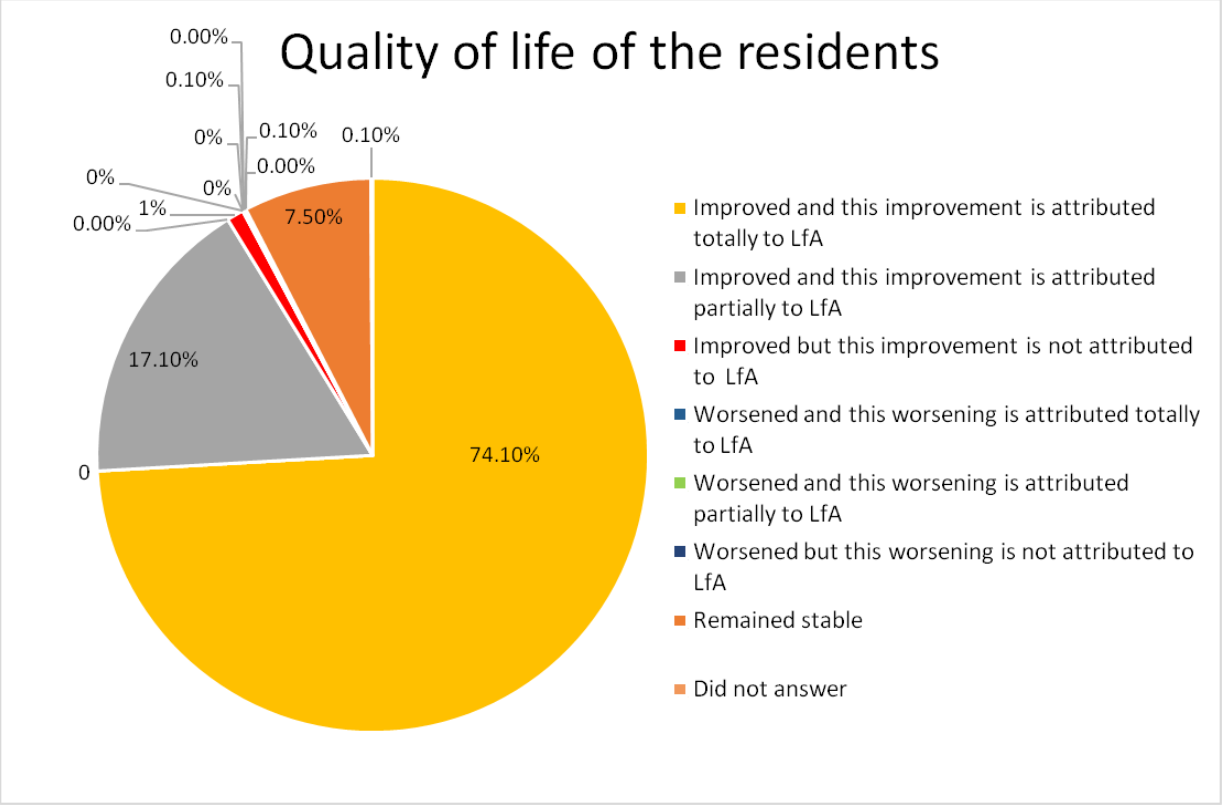


In addition, upon the widespread electrification by LfA, the regional inequality reduced. The infrastructure of less developed regions was improved. People from more developed but crowded areas move to less developed areas after the arrival of electricity. Many people returned to rural areas from shantytowns in large cities, causing a vegetative growth in rural areas reducing regional inequalities.

In order to obtain the opinion of the respondents the survey instrument included several qualitative options to obtain answer to the question for each of the indicators of development. For example, the overall quality of life question included seven options (Figure 4). More than

74% of the respondents said that the quality of life improved and the improvement was totally due to LfA program, whilst another 17.1% said the improvement was partially due to LfA program. A minority of the respondents negatively, such as the quality of life worsened, but some of the respondents said that those worsening quality of life resulted from another source. The surveys also show improvement in individual development indicators. The results show that electricity created better healthcare, improved educational activities and adult education at night, as well as improvement in personal hygiene. We have included more graphs in the appendix. A considerable improvement occurred in the school activities, health centers, self-employment, income and expenditure pattern and market conditions.

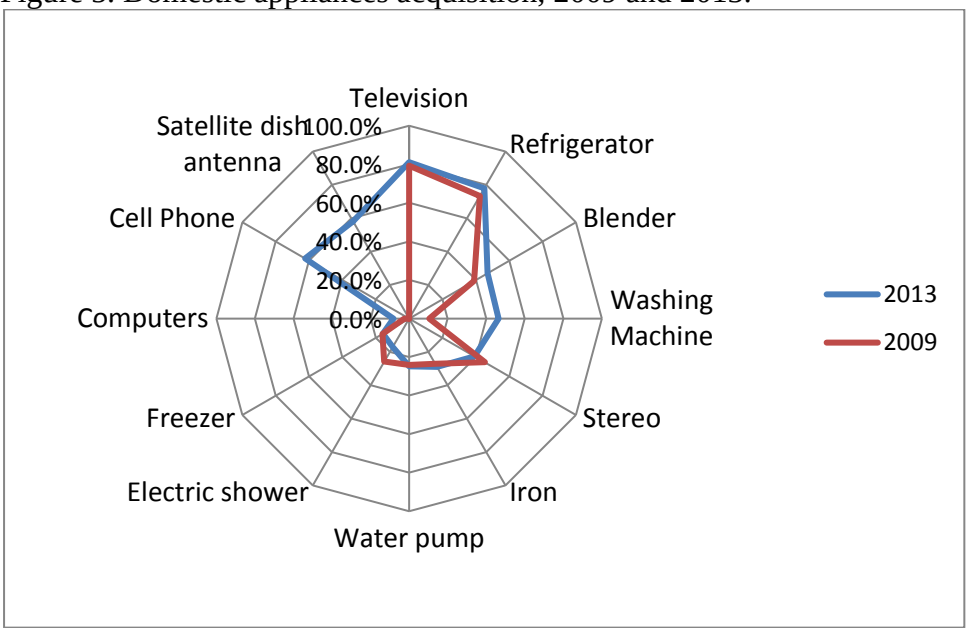
Figure 4. Impact of electrification on the quality of life of the residents, 2009.



Trading activities including supermarket outlets also increased. Women felt more secure, both socially and economically and therefore more women considered them safer. Some of them returned to education. More women were involved in commercial activities. The use of

electricity operated domestic appliances increased (Figure 5). Demand for electricity rises due to the rising demand for household appliances.

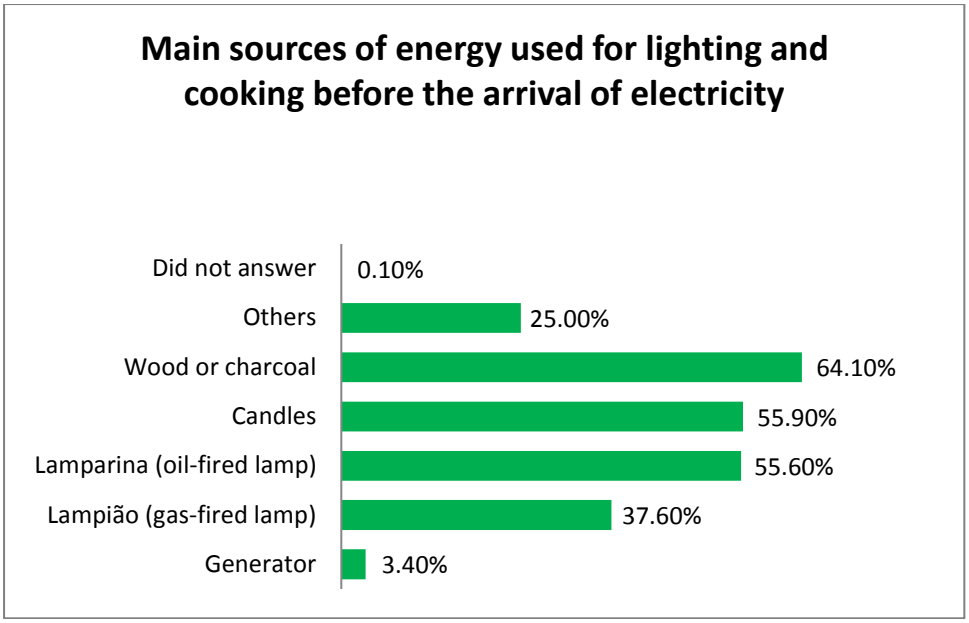
Figure 5. Domestic appliances acquisition, 2009 and 2013.



4.3 Impact on the sources of electricity and the critiques

The National Interconnected System (SIN) comprises the electricity companies in the south, southeast, center-west, north-east and part of the north region. Only 3.4% of the country's electricity production is located outside the SIN. Hydroelectricity meets over 80% of its electricity demand. However, before the electricity access through LfA, energy insecure households had to depend on alternative sources for cooking, heating and lighting in their residences. Figure 6 shows the main sources of energy used by households before the arrival of LfA electricity. Only 3.4% of households used a generator, others mostly depend on wood, charcoal and fired lamp.

Figure 6. Main sources of rural energy before electricity, 2009.



Brazil's concentration on the hydroelectricity, though good for generating clean energy, is not free from drawbacks.

First, the hydroelectricity sector is vulnerable to drought and low river flows during the dry season in some places. Moreover, this sector is expected to be more affected by the increased variability of weather pattern due to climate change. With the rising demand for power, it may be difficult for Brazil to provide a safe and reliable electricity supply without further diversification of the sources.

Second, in the remote rural Amazon region, there are still unconnected communities, which depend on candles and lamps for lighting, or pay for diesel or oil-powered generators. LfA program still fails to provide them with light. These are dispersed small communities, separated by rivers and difficult terrain. These are suitable to be served by off-grid and mini-grid solutions because grid expansion is difficult and expensive in these isolated areas. The private investments of MNEs and other companies are channeling towards constructing big and giant dams, which may help cities and large businesses/industries, but disconnected communities require medium and small projects applying biomass, wind, solar energy and hydropower

technologies.

Third, the government of Brazil is being blamed for not consulting with the Brazillian energy experts and regulatory bodies when taking decision to build power plant. Decisions are made behind the closed doors by a narrow government circle. The government imposes the energy policy in the pursuit of business interest with the support from major companies and so, in reality the problems of poorer communities get less priority.

4.4 Impact of LfA: Qualitative interview 2016

In 2016, researchers visited locations beneficiated by the LfA program: a rural community in the south and a rural settlement in the north of brazil. Both regions had the electricity supplied by grid extension from the nearby cities. Given the vast territory of the country, it is possible to highlight many differences of the exploited regions.

South region of Brazil reached universalization of electricity access through the LfA program, but the north region still lacks the quality of electricity supplied and in some regions, still lacks access to electrical energy.

4.4.1 Interview - South

Linha Betânia is a rural community, composed of 18 families, settled outside the city of Sananduva, in the State of Rio Grande do Sul. Before electricity, most of the families light their homes with candles and use wood for the winter heating. There was no viable method to stock food; thus the dietary habits of the population were based on the production of seasonal vegetables and fishing. Family members carried out cultivation manually and with animal traction. The fieldwork demanded full-time work for food production, mainly for home consumption. Income from subsistence agriculture was low and there was no time to earn extra income from non-farm activities. Most of the young adults had to leave the community in the

search for a better life in the nearby cities. There is no primary school in the rural region, forcing the children to cover 30 km in a precarious road with no illumination to get to the closest school.

In 2007 the LfA and the Regional Cooperative of Rural Electrification (CRERAL) of the Alto Uruguai started to install electricity – through the extension of the existing network and a small manufactory to develop the community. The CRERAL decided to install an alcohol distillery. Most of the machinery was donated by Eletrobrás and a technical team from CRERAL took care of the maintenance of the structure and the equipment. Due to a machinery problem, the first two attempts in making alcohol failed. This lead to an evasion of the families from the distillery and eventually the inactivation of the factory.

In 2009 a family decided to use the infrastructure of the distillery for processing other products like brown sugar, molasses and rapadura. With the support of other government programs, such as Mais Alimentos of the Ministry of Agrarian Development and loans with low-interest rates, they started adding value to other products. The founded agro-industry of Linha Betânia helps many family members improving their living. They search for professional courses in order to improve the agro-industry and now they have the perspective of growth in the cultivation and diversification of their products. With the profit of the agro-industry, the families were able to mechanize their cultivation systems and buy appliances for household activities giving the families a more comfortable life. Nowadays, between 10 and 12 families of the regions work together in the agro-industry and the volume of production increased from 300 kg of sugar per year to 10,600 kg.

Even with all the investment made by the government, no extra infrastructure was build: the roads that lead to Linha Betânia were still unpaved and had no lightning, none of the schools were reactivated, no commerce was installed in the region or health center created for the population.

4.4.2 Interview - North

The rural settlement of Nova Amazônia was created from an old farm donated to the federal government as debt payment by the owner of the land. It is located 40 km outside the city of Boa Vista, the capital of Roraima and reaches 77,688.38 hectares (approximately 192,742.2 acres), with a capacity for 800 families to live and farm. The settling of the families began in 2004 and there is still land left without owners. When the area had no electricity, agriculture was subsistence, irrigation was difficult, crops were mostly bananas and rice. Given the lack of electricity, the meat had to be salted in order to store and the water was picked directly from the nearby rivers. No school or health center was located in the region and the roads were recurrently flooded, preventing the families from the settlement to reach the closest city.

During the division of the land for the families, no aide or instructions were given, and the families only received the land and bricks, in order to build a house. The electrification of the area was made by extension of the electric grid from Boa Vista. In order to supply for the new consumers, Eletrobras Distribuidora, the concessionaire responsible for the area, had to construct a new thermoelectric plant (fuelled by diesel). No study was conducted in order to determine the viability of alternative sources of energy for the region and, given the high rates of failure to pay the bill, the government implemented a reduced fee and the allowance of RS 30,00 per family if the family consumed less than R$ 30,00 (approximately 9 USD), there would be no energy bill. Given the many different origins and culture of the resettled (many families came from the south of the country, others from the north-east and some are indigenous), grouping these families in order to form cooperatives, was not successful. Even after the electrification of the area, many families preferred to keep the subsistence agriculture and other invested on turning the land into tourist attractions.

The families which chose to farm in the area had financial aid in the form of loan taxes reduction. Most of the families decided to grow soybean and rice – cultures well established in

the region, but that required a high investment. One well-known farmer along with his family cultivate 100 hectares of land. They produce bananas, papaya, pumpkin and sell the products through middlemen in the markets of Boa Vista and Manaus (state of Amazonas). In four years of cultivating the land, the family was able to buy house appliances (such as refrigerator, air conditioners) and to mechanize the farming with a water pump, a tractor, an excavator and vehicles.

Despite the increase in the quality of life of the settled families, the infrastructure of the region was not developed: no roads received pavement, no commerce was established in the nearby area, no health center or school was constructed. Given a large number of families with school-age children, the municipal government provided a school bus to take the students to the city. Since the roads are still not enlightened, the security of the houses is still the main issue.

4.5 Contribution of MNEs in the renewable energy supply

The energy sector is a typical industry dominated by large MNEs. Amazon Region of Brazil has characteristics of low demographic density, small villages and individual consumers located far away from the big cities having low income and precarious infrastructure. An introduction of hybrid renewable energy systems (HRES) allows people access to energy. According to 2007 data, private companies include MNEs contribute 31% to the electricity generation and 35% to the distribution. an example of an MNE is the GDF SUEZ, which established its activities in the Brazillian territory in 1998 through the acquisition of Gerasul, a previous state-owned company. The GDF SUEZ is a French-Belgian group with structured offices in 70 countries, 147,000 employees around the world and with an average annual revenue of approximately 80 billion euro. GDF SUEZ operates across all the energy value chain, with expertise in electricity, natural gas and energy services. Its subsidiary in Brazil gained the head office trademark "Tractebel Energy" in 2002. The company manages the generation of energy through implementation and operation of generating plants and

commercialize of the generated energy, its main product. The major service provided by the brand is the transmission of that energy. Tractebel has its shareholding control held by the GDF SUEZ Latin America Participation (GSELA) that holds 68.71% of all social capital of Tractebel Energy. On the other hand, GSELA is controlled by the GDF SUEZ.

The company's activities affect directly the environment of the regions, where its operations are installed, causing a dislocation of entire communities, geomorphologic modifications and alteration on the local landscape. Another important consequence is the emission of liquid and carbonated effluents in the atmosphere, which contributes to the disturbance of the natural fauna. However, from all 21 units of the company, 15 (95% approximately) have ISO 14.001 (environmental management). Therefore, the activities of the company are aligned with the environmental standards.

Tractebel addresses social issues with a portion of its profits, which are given to social programs, helping to improve the quality of life of children in poor communities around the country. The company focuses on providing education for school-age children and professional qualification for the youth. In the environmental field, the company invests in sustainable renewable sources of energy in its generation plants. Its efforts were acknowledged by the the American Chamber of Commerce of Rio de Janeiro, which granted Tractebel with the Brazilian Environmental Award in the special category of "Clean Development Mechanisms". Other examples of programs endorsed by the company are the establishment of a partnership for social and health assistance in needy communities and campaigns for public awareness to improve social inclusion for children and adolescents in the risk situation. Besides the program fostered by the company, once it locates an operation plant in a distant area it generates direct and indirect employment, helps to boost the local economy by contracting local suppliers and provides long term employment vacancies.

Another important multinational group in Brazil is the AES Corp. The AES group acts in the

generation, distribution and commercialization sectors. In 2014, the group supplies energy for 8 million consumers, 5.6 mil GWh of distributed energy, 9 hydro generation plants, three small hydro plants, one thermos plant, 8.7 thousand employees and had a profit of 0.5 billion reais. At a national level, the group invested 113.5 million reais in social programs. The management structure of the companies of AES Brazil Group is decentralized and relies on the relationship between shareholders, managers, independent auditors and audit committee to align corporate policies and decisions. The company has constructed linkages with local actors in the places that its subsidiary are structured.

The company has as its strategy to define public commitments with the society. For instance, the AES group is classified as one of the Child Friendly Companies. To be classified in this way, the company meets the following five commitments:

- Not exploit child labor and does not employ adolescents in evening activities, dangerous and unhealthy, respecting the law 8.069 / 90 - Statute of Children and Adolescents;
- Alert contracted suppliers that proven charge of child labor will cause disruption of the business relationship;
- Perform customer awareness actions, suppliers and the community about the hazards of child labor;
- Develop actions for the benefit of children and adolescents, children (as) employees (as) in the areas of education, assistance, health;
- Carrying out social actions for the benefit of children and adolescents from communities as values established by the Abrinq Foundation.

Among other social goals, the MNE is also committed to eradicate hunger, achieve universal education, equality, reduce child mortality, provide health services to pregnant women, combat

AIDS and other diseases, keep environment clean and contribute to overall development.

In 2014, the group was acknowledged with five awards regarding the environmental sustainability and innovation.

One important contribution of the company is regarding the environmental sustainability. The program 'Recycle More, Pay Less' is a project that offers discount on energy bills for customers who deliver recyclable materials (paper, plastic, metal, glass and TetraPak packaging) at collection points scattered around the concession area of AES Eletropaulo and AES Sul (Electrical Distribution Companies of the AES Group). The main benefits of the project are to reduce the energy bill of the cost (customers can even reset the value of the electricity bill through the delivery of materials) and the proper disposal of recyclable solid waste contributing to the environmental sustainability in urban centers, rural areas, and mainly, marginal areas.

Regarding the sustainability of the power sources, the AES group is investing 20% of its research and development program to the development of new technologies to clean generation. The company also invests in its hydro plants. Since 2012, AES Tiete advanced in Reservoir Management, having created a specific area for the subject, internalizing and optimizing processes, which enabled the improvement of results in the field of inspections related to the use and occupation of the environment and erosion, in the implementation of environmental programs and to agencies and regulators support.

Other perspective is regarding the solar electrical energy production. AES group is developing a solar plant named *Projeto Solar Água Vermelha*, which consists of a solar plant with 34 MWp located in Minas Gerais (MG in the map in Figure 5) close to the *Água Vermelha* hydropower plant. This proximity is strategic because it allows the reduction of electrical losses and implementation costs. The project participated of the energy auction occurred in October 2014.

The expansion of power generation infrastructure is directly related to the formation of the market for machinery and electrical equipment. The market for goods and services in the

Brazilian electric sector is predominantly constituted by multinational enterprises. The arrival of MNEs and, consequently, foreign direct investment launch the technology in the electric sector. An example is the ABB Group (ASEA Brown Boveri), an MNE headquartered in Zurich, Switzerland. As a technology company, the directors of ABB bet in the development of future clean technologies to enable smart grids in the Brazilian territory. ABB was the first company to provide a universal car charger for an electric station on the highway in Brazil. ABB also nationalized generators and inverters technology for Brazilian wind market. Nowadays, these products are totally produced in Brazil. The ABB products are, in general, energy efficient. Besides the technology nationalization program, ABB also invests in social programs. The Child Future Hope is a social program that guarantees the social inclusion throughout professional courses. The best students have positions at the ABB company.

In fact, according to the Foreign Capital Census in Brazil, the MNE contribution is dominant in the financial sector of Brazil and thus MNEs help investing in the energy sector. Due to the market liberalization policies, the share of foreign capital in GDP increased from 8.6% in 1995 to 12.3% in 2000 and 14.7% in 2005. The share of foreign banks in the total assets of the national financial system increased from 14.8% in 1995 to 30.7% in 2000. The foreign companies account for about 20% of the total production value in the financial sector. It is worth noting that the participation of MNEs in production is higher than 30% in the manufacturing industry and increased significantly in many activities including the energy sector. However, for workers, innovations occurred through the involvement of private companies tend to increase the risks and intensify the conflicts in the production of everyday. At that time, in São Paulo, which is the state with bigger electric generation and consumption, privatization has led to negative social consequences (Scopinho, 2002).

On the one hand, unemployment and, on the other, stepping up the pace of the activities of those who remain in business, increased unhealthy, the danger and hardship in the workplace,

the worsening health situation, increased frequency and severity of accidents, among others. The author conducted interviews with the workers and found that increased pressure for productivity, combined with lack of training and protective equipment, as well as synergy between directly contracted and outsourced employees, led to a significant increase in employee accidents of dealerships electricity in the state of São Paulo.

A case study shown by SINDELETRO, related that the Enel Brazil Group, which is a holding company of companies operating in distribution, generation, transmission and sale of electricity in Brazil, almost lost their concession over the Coelce (Electric Distribution Company in the northeast region). SINDELETRO is the Union of the State of Ceará Electricians and presented a case study, which evaluated the privatization impact of such company in the period of 1998-2006. During this time, the electricity bill increased over 213%, job positions decreased, 40 occupational accidents with death were recorded, especially in outsourcing companies by Coelce, along with job insecurity and a decline in quality of service (energy and customer service). The Enel/Coelce group increased demand for companies providing electricity service in Ceará. Working conditions are poor (work overload, low wages and benefits). After seven years of struggle, the SINDELETRO managed to sign the first Collective Bargaining Agreement. Most base salaries ranging from US $ 195 (administrative) to $ 376 (electro technical). The electrician has floor of US $ 216. The meal card was only US$ 2.14 per working day.

The main problems were:

- the workers received no training;
- haste in hiring service providers companies resulted in accidents;
- many occurrences were caused by the use of insecure and inadequate equipment;
- individual equipment was provided collectively;
- the demand and the pressure for productivity increase stress;

- excess demand increases the risk of potential accidents.

The pressure of Sindieletro about the issues surrounding outsourcing forced Coelce to create a third-party management department. The social and union pressure forced a retreat from the company that had to make heavy investments in its structure and in advertising to rescue your image. Coelce made 867 million reais of profit by increasing the electricity bill. The salary was increased by about 61% while the inflation rate was, between 1995-2002, about 100.6%.

4.6 International activities of Brazilian electricity companies

Through its LfA program, Brazil popularized the power generated by solar, wind or mini-hydro as the most practical solution to bring power to remote places of the world. Brazil has the largest electricity market in South America. In 2014, Brazil was the eighth-largest energy consumer in the world and it is a significant energy producer[2]. It is the 9th-largest liquid fuel producer in the world. For the purpose of boosting the reliability of electric power supplies in northern South America, in addition to leveraging a culture of sustainable development through enhancement of the electric power grids, Brazilian company Eletrobras with partner countries, aiming to construct transmission system based on pollutant sources to interconnect the target countries (Guyana, Suriname, and French Guiana) and connect them to Brazil. The Brazilian companies .

4.7 Reasons for positive contribution in Brazil

Brazil is one of the rapidly growing high emitting developing countries that has historically taken a most cautious line of carbon emission. It has enhanced the investment in renewable energy, which is grounded in sustainable development. In doing so it has taken a

[2] BP Statistical Review of World Energy, 2015 http://www.bp.com/content/dam/bp/pdf/Energy-economics/statistical-review-2015/bp-statistical-review-of-world-energy-2015-full-report.pdf

groundbreaking initiative of LfA keeping the scope of investment open for the MNEs under certain conditions. The MNEs which are investing in Brazil are originated from Brazil, other emerging economies like China and from the developed countries. The following may be considered the reasons for successful participation of MNEs in Brazil, although there were downsides as mentioned earlier in this paper. Particularly, MNEs participated more in the richer regions where infrastructure, natural resources and other local facilities were economically supportive.

4.7.1 Local expert development along with the development of local MNEs

Brazilian executives and government decision makers avoided risk of pursuing a strategy that involves more dependency on foreign experts. Instead they strategically developed enormous strengths in human resources and technology by focusing development of their key sectors such as renewable energy and agribusiness. The government of Brazil was committed to invest in home-grown talents (www.boyden.com). European, US and Chinese multinationals have subsidiaries in Brazil using Brazilian executives because they are able to navigate the complexities of the taxation system and other elements of the government bureaucracy. This implies that multinational can make positive contribution if host countries are capable to develop their management system with training of manpower to the highest capacity level as required.

Brazillian companies attracted investment of MNE subsidiaries from around the world due to their strength of institutional and firm-level influences. The MNEs that are originated from Brazil have the technological/knowledge capabilities in the renewable energy sector and expanded their market in developing and developed countries. For example, Eletrobras is a Brazillian electric utilities company is the tenth largest in the world and the fourth largest clean energy company in the world. The Brazillian federal government holds 52 % of its stake, but

it holds stakes in a number of Brazillian companies and many foreign companies hold its stake. Its shares are traded on stock exchanges in rich countries. MNEs invest in Brazil through this large company.

4.7.2 Infrastructure

LfA is a government program aiming to remove electric exclusion. This public program is coordinated by the Ministry of Mines and Energy (MME) and operated by Centrais Elétricas Brasileiras SA (Eletrobras), the concessionaires and licensed companies (MME BRAZIL, 2009). The Electric Sector is split among public, mixed and private companies including multinational enterprises. Private companies along with MNEs made 15% of the investment in the program. The rate of rural households with electricity was 71% in 2000. After LfA program this rate increased to 92,6% in 2010, but the underperformed areas were the north and northeast regions (shown by red and yellow colors in the map in Figure 1). The underperformed areas are characterized by sparse population, hard accessibility and Amazonian rainforest. The MNE participation was even lower in these regions until alternative renewable electricity were identified. So, MNE requires good infrastructure to make a positive contribution.

4.7.3 Banking system

The transparent and impressive banking and fund management sector of Brazil attracted subsidiaries of MNEs from the developed country and emerging economies. The financial supports of Brazil's major development bank for the LfA program are noteworthy. All onshore funds must provide daily liquidity reports to Brazil’s Security and Exchange Commission, funds must disclose every month what they were holding 90 days prior and financial institutions must maintain an 11% capitalization rate, compared with 8% under the Basel regulations that other global banks follow. So, Brazil was capable of attracting development financing from MNEs for the LfA program.

4.7.4 Brazil is a global leader of renewable energy

Brazil has been investing in hydro-electric plans and ethanol fuels for many years and developed expertise. The nation sources more than 80% of its energy from hydro-electric projects and Brazil has the largest and most successful ethanol industry in the world. As the rest of the world struggles with rebalancing their renewable energy credential, the technology and experts of Brazil attracted multinationals to share human resources and technological capabilities of Brazillian MNEs specialized in the renewable energy sector.

There are a significant number of structural and ethical challenges in doing business in Brazil. Executives, therefore, need to have a certain flexibility to get things done well. Companies need executive who can execute on the ground with all the restrictions that exist in Brazil, but who can also execute according to the rules of an American or foreign company. So, non-Brazil MNEs hire executives from Brazil who shared management knowledge globally.

4.7.5 Policy incentives

In the renewable energy sector, MNEs built a partnership with local companies because of the government incentives. An example is the case of electricity supply in the isolated areas through mini-grids during the second round of LfA. The use of mini-grids with renewable technologies is a new approach in Brazil. Mini-grids stand out as a long-lasting solution for communities and they are considered as special projects and are supported with large incentives, including subsidies up to 85%.

4.8 Downside

4.8.1 Self-interest

Of course, companies have their own interest to invest in a host country. These include increasing market share, securing cheaper premises and labor and often avoiding tax or trade barriers. Some origin countries have strategies to attract companies invest in countries of specific policy interests and offer grants to MNEs investing in those host developing countries. Such host countries may not always be in a position to bargain for the better deals on wages,

overheads and clean environment. multinationals are often blamed for exploiting the workforce, rising inequality, overlooking social and environmental responsibility and many other mischiefs.

4.8.2 Corruption

Among many problems, corruption is an endemic one. As an example, Petrobras is a semi-public Brazillian energy company, measured the largest in the Southern Hemisphere by 2011 revenue. It is a world leader in the development of advanced technology from deep-water and ultra-deep water oil production, but in October 2013 it was rated the most indebted in the world. It has been facing a corruption scandal which is a case that involves powerful businessmen and politicians.

5. CONCLUSIONS

Access to affordable, reliable, sustainable and modern energy is crucial for the improvement of the well-being of modern societies. Most energy technologies have comparatively high up-front costs which add the challenge to the universal of electrification program, despite the recognized multiple benefits. Environmental sustainability and universal access to energy require adequate energy supply from renewable sources. Partnership with multinational enterprises (MNEs) can provide necessary finance and technology to meet up-front cost, but MNEs require well managed regulatory conditions. A stronger regulatory measure cannot attract MNEs contribute to the poor isolated regions with harsh infrastructure. If MNE is given uncontrolled access then they will reach the regions where infrastructure and market are already favorable to remain competitive. The experience of the universal electricity program of Brazil shows that during the first round of intervention when the regulations were not carefully designed, the MNEs reached the south part of Brazil where infrastructure was better and the people were richer buying electric goods. To take the MNEs to the Amazonian isolated region was not possible without adequate incentives. This indicates that ensuring access to affordable,

reliable, sustainable and modern energy for all is not an easy task. SDGs set a target of universal access to modern energy by 2030. This required responsible authorities support with appropriate infrastructure and financial support. MNEs and private sector will share if they find their investment would worth them adequately. LfA program in Brazil shows that energy provision has a huge potential to improving the welfare of the people. Renewable energy schemes have good levels of sustainability, but they may perform below their optimum and fail to account for the full needs of the community without sufficient focus on the issues constraining the inclusion of the excluded communities. The LfA experience shows that a host country can gain from MNEs with rightly formulated and implemented policies. Otherwise, benefits of investment may take by the profit-seeking companies. The host government could consider a combination of tariff and non-tariff measure, further research is necessary to identify the right measures to attract MNEs to isolated regions.

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