
Electrifying rural Guatemala: central policy and rural reality

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Abstract. Towards the end of the 20th century Guatemala embarked on an ambitious rural electrification plan: central planners in the Ministry of Energy and Mines hope to connect 90% of homes to the national electricity grid by 2004. Energy for the increased demand comes from floating power plants anchored in Guatemala's Pacific port, a new coal-fired power plant, and numerous small-scale hydro-electric plants. So far, rural electrification, in terms of connected households, has proceeded to plan. However, the success of the rural electrification program belies energy realities and the development needs of rural Guatemala. Data from in-depth interviews and household surveys in Ixcán, Guatemala, show that rural residents prefer other forms of development—like the introduction of potable water, or improved schooling. Electricity, farmers state, only provides rural families with a few hours of light at night because they cannot afford to pay for appliances or for increased consumption of electricity. Fieldwork in rural areas also reveals that the introduction of electricity will not change patterns of firewood consumption; firewood is the basic survival fuel for most rural Guatemalans. Development funds may be better spent on locally run and organized forestry initiatives to ensure reliable sources of firewood for the future.

1 Introduction

Rural Guatemalans struggle to meet their everyday needs. Indeed, over 80% of rural Guatemalans live below the international poverty line of US\$2 per day. And, of all Guatemalans living in poverty, 26% live in extreme poverty (Naciones Unidas, 1999; 2000; 2001). That is, their daily income is less than US\$1. The abysmal living standards for Guatemala's majority results from a highly skewed land distribution (2% of Guatemalans own 60% of the arable land), rapid population growth, and a brutal civil war, which lasted almost four decades and laid waste many rural communities and fields (Naciones Unidas, 2000).

In spite of the hunger that ravages indigenous areas of eastern Guatemala, the lack of potable water in the western highlands and northern rainforests, the widespread child deaths from diarrhea, dengue, and malaria outbreaks, and rapid deforestation, the Guatemalan government and Ministry of Energy and Mines (MEM) races to electrify rural Guatemala. This massive rural electrification plan, which relies heavily on centralized generating stations and fossil fuels, ignores energy and economic realities in the Guatemalan countryside: most rural Guatemalans survive by using firewood. Moreover, rural residents report that, despite the introduction of electricity, they will continue to use firewood to survive because electricity, and the appliances it powers, are simply too expensive for their less-than-subsistence pocketbooks.

In this paper I detail the progress and future of Guatemala's rural electrification plan and, by contrast, also provide the perspective of rural folk regarding their perceived needs and wants. I believe that rural development initiatives should be apt for the people they purport to serve and therefore their desires and opinions must be taken into account before implementation of large-scale development projects. In presenting these two views, however, I do not deny the primary role of energy in our lives and its integral role in any development *package*, but I argue for attention to appropriate energy forms that satisfy rural needs. In short, I point to the differences between central policy and local reality.

Before I delve into contrasts between central energy policy and rural realities, I outline my data-gathering methods. As background, I then briefly discuss Guatemala's economic and social situation, and the specifics of the rural study sites chosen for this research. I then provide details about Guatemala's rural electrification plan, how this plan plays out in the research area, and the reactions of locals to development by electrification. Finally, I examine centralized energy policy in the context of development in Guatemala and less developed countries as a whole.

2 Methods

Results presented in this paper rest on seven months of fieldwork in Guatemala. I studied energy issues in Guatemala, starting in January 2000 and finishing my research in August 2002. This approach gave me a longitudinal perspective on the progress of rural electrification over two and a half years. In Guatemala City, I interviewed the director of the energy division of MEM regarding rural energy policy. MEM also provided reports on the national energy budget and rural electrification plans (MEM, 2000; 2001). To examine energy realities in rural Guatemala, I interviewed 24 rural residents and completed 158 household surveys in 3 communities in the remote Ixcán *municipio* (equivalent to a US county) (figure 1). I conducted the surveys at the end of the fieldwork in Guatemala to ensure that questions were valid and based on an informed and in-depth understanding of the communities. Local schoolteachers helped administer the surveys. In San Lucas I surveyed 82 of the 154 households, 30 of 58 households in Paraíso de Adán, and 46 of 153 households in Kaibil Balám.⁽¹⁾

My living in the Ixcán communities of San Lucas, Kaibil Balám, and Paraíso de Adán for six months allowed for a deeper understanding of rural life and added warmth to cold, fact-gathering surveys. I coded in-depth interviews by using methods set out by Schensul et al (1999), and input survey responses into the Statistical Package for the Social Sciences (SPSS) to obtain descriptive statistics.

3 Guatemala and the Ixcán study area

3.1 Land, population, and poverty at the country scale

Guatemala's population is still predominantly rural: rural residents account for two thirds of the almost twelve million people (Naciones Unidas, 2001). In rural Guatemala 54% of farm plots are not large enough for subsistence farming (table 1). In addition, the average plot size of the holdings below 1.4 ha decreased from 0.7 ha in 1964 to 0.19 ha in the 1990s (Bilsborrow and DeLargy, 1990; Brocket, 1998; Elías et al, 1997). This desperate land situation is a result of the long-term evolution of unequal land distribution,⁽²⁾ and population increase on a land base that is not getting any larger (Davis, 1997). Below-subsistence agriculture and a lack of employment alternatives in Guatemala's cities drive widespread poverty and a large informal economy (Jonas, 2000).

⁽¹⁾I completed fewer surveys in Kaibil Balám in proportion to number of households simply because fieldwork is more difficult and dangerous there than in San Lucas and Paraíso de Adán. Many Kaibil residents fled their community during the war. Refugees attempting to return to their original community and land parcels after fourteen years of refuge found their path blocked by new, army-sponsored settlers who occupied 'abandoned' land. The community is now made up of original settlers from the 1970s, and newer settlers from the 1980s. Tensions still run high. Also, a resident of Kaibil was involved in the kidnapping of a United Nations official in 1996. To make matters worse, the nearby community of Xalbal is the home to a gang of AK47-toting youngsters who returned from refuge in Mexico and cannot cope with the remote conditions of Ixcán. These gang members often cross the Xalbal river and threaten Kaibil residents.

⁽²⁾The Gini coefficient for land distribution in Guatemala is 0.85—the highest in Central America and one of the highest in the Western Hemisphere (Southgate and Basterrechea, 1992).

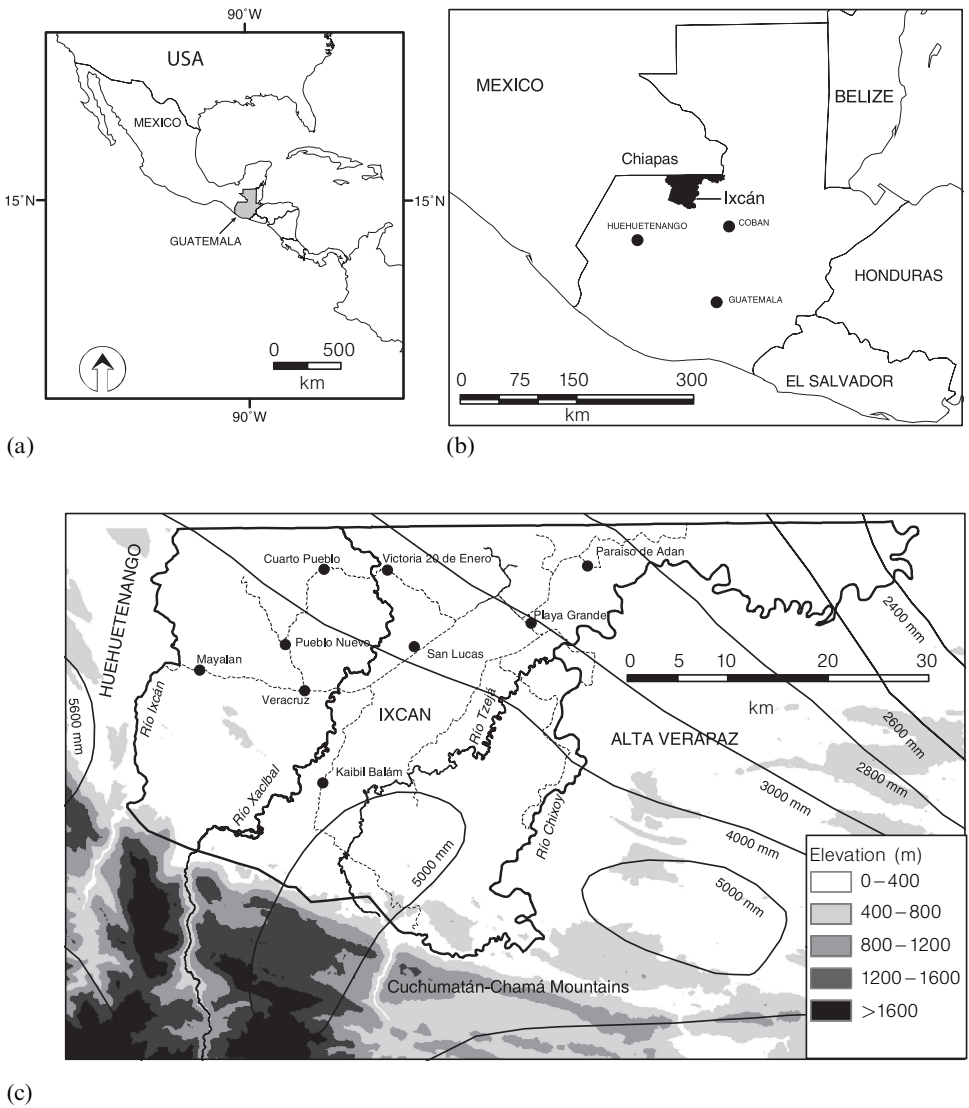


Figure 1. Location of (a) Guatemala, (b) Ixcán *municipio* (county), and (c) location of rural study sites, with average rainfall shown in mm.

Table 1. Distribution of farmland in Guatemala. Data are derived from the latest agricultural census in 1979 (Naciones Unidas, 2000).

	Below-subsistence plots (<1.4 ha)	Sufficient for subsistence (1.4–3.5 ha)	Plots that can produce for internal market (3.5–45 ha)	Large, export-oriented farms (>45 ha)
Percentage of total number of farms	54	24	19	3
Percentage of total farmland area	4	7	25	65

Forty years of conflict from (1954 to 1996) between guerrillas and the state exacerbated poverty in most rural areas (CEH, 1999; Diocesis del Quiché, 1994; Falla, 1992; Naciones Unidas, 2001). Rural and urban populations now struggle to secure access to basic resources such as land, firewood, potable water, education, and health care (Naciones Unidas, 1999; 2000). During the same forty-year period Guatemala's population quadrupled from three to twelve million, and environmental change, such as deforestation, soil erosion, microclimate change, and pollution, is clearly evident (Eliás et al, 1997). Mounting peasant impoverishment now comes face to face with growing ecological impoverishment. The state, nongovernmental organizations (NGOs), and foreign governments targeted regions previously involved in the conflict for a wide range of development efforts that include rural electrification (Jonas, 2000; MEM, 2001).

The civil war officially ended in 1996 with the signing of an internationally brokered peace accord, but the wounds created by the conflict are far from healed (Nelson, 1999; Nunca Más, 2000; Remijnse, 2001; Steinberg and Taylor, 2003). Rural residents still fear members of ex-civil patrols (*Prensa Libre* 2001a; 2001b), distrust neighbors and any form of community organization for fear of reprisals, lack basic services, and continue to live in the midst of poverty.

3.2 Land, population, and poverty in Ixcán

Ixcán is one of the most remote and least developed regions of Guatemala. Ixcán (1575 km²) occupies the northernmost extremes of the departments (equivalent to US states) of El Quiché and Huehuetenango. The Mexican state of Chiapas and the vast Lacandón Forest form the northern border of the municipio. The southern limit of the Ixcán abuts the massive 3000 m-high Cuchumatán–Chamá mountain range. Three major rivers which drain these mountains flow through the study area. The Ixcán and Chixoy Rivers form the western and eastern boundaries of the municipio, respectively (see figure 1).

Most of Ixcán lies below 400 m above sea level; much of the land, however, is hilly with steep karst slopes. Average temperature ranges between 25°C and 28°C and annual precipitation is between 1500 mm and 5000 mm (Dennis et al, 1988; Garst, 1993; Municipio de Ixcán, 1995). The thin rainforest soils are extremely susceptible to erosion upon removal of vegetation. Only 16% of the Ixcán contains fertile alluvial soils that are suitable for annual agriculture. Ideally, the nonalluvial soils of the Ixcán would lend themselves to the cultivation of permanent crops such as rubber, coffee, and cardamom. Most families, however, plant corn, beans, and rice for subsistence—but initial yields are not sustained and much land is severely degraded. Of the natural subtropical humid forest that covered 100% of Ixcán in the 1960s, only 65% remains [per 1992 estimates (Garst, 1993)]. The human population grew from a few thousand in the 1960s to over 70 000 today. The current growth rate, including migration, is 3.47% per annum (Salud Pública, 1999).

In response to mounting population pressure on resources in rural Guatemala, many landless farmers, or farmers with small plots, migrated to the lowland rainforest of Ixcán (figure 1). Church-sponsored and spontaneous migration began in the late 1960s and continued through the mid-1970s (CEIDEC, 1990; Garst, 1993; Manz, 1988). State-organized and USAID-funded migrants made their way to the Ixcán in the early 1980s, paradoxically, at a time when violence peaked in the region (Dennis et al, 1988).

Soon after the successful establishment of farmers on relatively large parcels of land, that varied in size from approximately 10 ha to 30 ha (versus 0.2 ha in Guatemala's western highlands), guerrilla insurgency and subsequent military repression radically

altered the lives of Ixcán residents and Guatemalan society in general. This period of ‘unrest’, arguably the most turbulent and bloody conflict in recent Latin American history, left an astounding 200 000 killed or disappeared, 150 000 refugees, and 1.5 million internally displaced (CEH, 1999; Jonas, 2000). Many Ixcán residents fled to refugee camps in nearby Chiapas, Mexico (Manz, 1988; Montejo, 1987; 1992; 1999; Nolin Hanlon, 1999; Taylor, 1998). Community members who would not, or could not, flee the conflict eked out a living under the tight grip of the Guatemalan military. Refugees slowly returned to devastated home communities during the 1990s and began to reweave the fabric of everyday life that had been shredded by the internal conflict. Today, four fifths of Ixcán residents live in poverty and more than 95% lack basic services like potable water, drainage, and electricity (Naciones Unidas, 2001; Salud Pública, 1999).

The tumultuous history and harsh environment of Ixcán provide the backdrop against which the energy-development game is enacted; it is to this game that I now turn—a game where the various actors are unaware of each other’s motives and moves; a game that can result in lost time and money if all actors are not fully consulted regarding their talents, wants, and roles.

4 Guatemala’s reliance on firewood and national electrification plans

4.1 Balances and centralized plans

Firewood plays an important role in Guatemala’s energy balance. Although the overall contribution of firewood to the energy balance declined by 10% between 1992 and 1998, the actual amount of firewood employed by Guatemalans for cooking and space heating increased by 12% (see table 2). Nationwide, two thirds of Guatemalans use firewood for cooking and heating. In rural areas 90% of residents use firewood to meet basic needs such as cooking, boiling water, and heating (Naciones Unidas, 1999).

Table 2. The role of firewood in Guatemala’s energy balance from 1990 to 1998, and the rate of rural electrification from 1992 to 2000 with estimates for 2004 (MEM, 2000, 2001).

	1992	1998	2000	2004 (estimated)
Contribution of firewood to national energy balance in terms of consumption (million BOE) ^a	19.5	21.4	no data	no data
Contribution of firewood to national energy balance in terms of consumption (%)	61	51	no data	no data
Number of users provided with electricity (thousands)	800	1250	1575	1999
Percentage of total population provided with electricity	46.3	65.7	76.4	90

^a BOE—barrel of oil equivalent.

Although most rural residents rely on firewood to survive, the Guatemalan government embarked on an ambitious nationwide electrification plan. The plan takes steps toward ameliorating the substandard condition of most Guatemalan households and livelihoods. Indeed, in 1996 the internationally brokered peace accord between the state and guerrillas included provisions and funding for economic and social development (Jonas, 2000). Since 1966 the Guatemalan state has failed on many development fronts: corruption, war, and mismanaged development programs ensure that much-needed funding never reaches the ground (Elías et al, 1997). Rural electrification, however, seems, on the surface, to be one of the government’s well-developed and executed programs.

The goal of MEM is to increase the share of Guatemalan households with electricity connections from 66% to 90% by 2004 (MEM, 2001). So far, connections made

have met or exceeded projections (Lewington and Zilli, 2002; MEM, 2001). A closer inspection of results, however, reveals that, although the national electrification rate in 2000 stood at 76%, urban areas boasted 94% coverage and rural areas only 55%. Remote rural regions of Guatemala such as Ixcán, El Petén (the northern third of the country), and Alta Verapaz (east of Ixcán), fare even worse, with electrification rates as low as 29% (MEM, 2001; Naciones Unidas, 2001).

The high rate of connection can be attributed to incentives provided by the government to the private distribution company, Spanish-owned Union Fenosa, for each verified connection. Using Guatemala's main social fund (which received enormous foreign contributions as part of the peace agreement) to create the rural electrification plan, the government pays US\$650 for each residential connection. To earn this subsidy, the connection must be made to a private residence and the dwelling must be more than 200 m from the existing network (Lewington and Zilli, 2002). These two base criteria, however, create areas in the country that may never be 'illuminated' for two main reasons: (1) Union Fenosa's two subsidiaries, Distribuidora Eléctrica de Occidente and Distribuidora Eléctrica de Oriente, make only about 7% profit on each connection. In turn, this means that the companies will not make connections too far from the 200 m zone because costs increase with every meter.

(2) Many households within the 200 m zone are left without electricity because there is no subsidy for those connections—residents in this zone must often pay a hefty refundable deposit to secure a connection. Because there is no relationship between wealth and distance from the distribution network, many people living within the 200 m zone cannot afford the steep deposits (Lewington and Zilli, 2002).

4.2 Sources of energy to meet the plans: past, present, and future

Guatemala's ambitious electrification of urban and rural areas requires increased generation and distribution of energy to meet the expected increased demand for electrical energy. In 1991 Guatemala depended on energy from public hydroelectric (principally, the 300 MW Chixoy dam) and thermal plants (gas turbines and vapor). The opening of the electrical-energy production and distribution market in the mid-1990s resulted in radical shifts in who produces energy and the sources used to generate power for the people (table 3). In 2000 two thirds of electrical energy came from

Table 3. Changes in Guatemala's electricity generation and consumption by source and ownership, 1991–2000. Future expansion is also indicated (source: EIA, 2002; MEM, 2001).

	National interconnected generation system, power demand	Share of installed capacity (%), and indicators of ownership (%)			Consumption by sector (%) ^a		
		hydroelectric state (private)	thermal state (private)	geothermal state (private)	R	C	I
1991	495	65 100 (0)	35 100 (0)	0 0	33	23	32
2000	1049	33.1 91 (9)	64.8 10 (90)	1.7 21 (79)	36	25	27
2004 plan	1414	186 MW online by 2003	more floating power plants?	no projects online	na	na	na
2010 plan	1967	1000 MW enabled with private funds?	natural gas from Mexico (6 million m ³ per day)	1000 MW potential, private funds	na	na	na

^a R = residential, C = commercial, I = industrial.

privately owned thermal plants (powered by bunker—which is primarily a fuel oil for ships, coal, gas, and diesel). Hydroelectric plants still contribute significant amounts (35%), and still remain largely state owned and operated (table 3). Geothermal plants provide negligible amounts of power to the national interconnected generating system.

The government estimates that by 2010 an extra 900 MW of installed capacity will meet future demands. A large portion of this demand will be satisfied, the government hopes, by small hydroelectric projects (<40 MW) that could add 186 MW to the system by 2003, and large hydroelectric projects (>100 MW) that could add over 1000 MW to the system (MEM, 2001). Yet, large hydroelectric projects appear unlikely given the poor investment climate in Guatemala and public opinion—local as well as international—against large hydroelectric projects (see, for example, Maza, 2001). More likely, Guatemala will witness the installation of large, privately owned thermal plants like the first Central American 120 MW coal-fired plant put into operation in 1999 by Teco Power Services. Another viable option, especially for generating companies who want to assume less investment risk, are large floating power plants (FPPs) like the 124 MW Esperanza (Hope) barge anchored in Guatemala's main Pacific port.

13
Prensa Libre - Guatemala, martes 6 de agosto de 2002

**GRACIAS A PQP LAS
CANDELAS SON UNA ESPECIE
EN PELIGRO DE EXTINCIÓN**

Puerto Quetzal Power es el primer generador privado de energía
eléctrica en Guatemala. Nos enorgullece ser aliados del desarrollo
del país, produciendo energía eléctrica confiable y segura.

Transformamos energía, transformamos vidas

PQP
Puerto Quetzal Power

Figure 2. A full-page newspaper advertisement in the country's leading daily, *Prensa Libre* (6 August 2002, page 13). The title reads “thanks to PQP candles are a species in danger of extinction.” The subtext tells us “Puerto Quetzal Power is the first private generator of electric energy in Guatemala. We are proud to be associated with the development of the country, producing safe and reliable energy.” A small slogan at the bottom of the page reads “we transform energy, we transform lives.”

Esperanza, the largest diesel-powered FPP ever built in the United States, is owned by Puerto Quetzal Power (which is, in turn, owned by Enron and Centrans Energy Services), and complements two existing 550 MW FPPs in the same port. Incredibly, these moveable power sources produced 15% of the power consumed in Guatemala in 2000 (Clevenger, 2000) and contribute to the transformation of rural energy consumption (figure 2).

4.3 Expanding the distribution network

The provision of power to almost 300 000 new rural users in the period 2000 to 2004 requires massive funding and extension of the national electricity-distribution network. Funding comes from governmental agencies (the National Peace Fund, the Social Investment Fund, local municipalities) and nongovernmental entities and *paises amigos* (friendly countries). With US\$333 600 000, MEM will contract out construction of 1283 km of 69 kV lines; 6700 km of distribution lines of 7.6, 13.2, 19.9, and 34.5 kV; 11 350 km of residential distribution lines; and 28 substations with a 235 MVA capacity (figure 3).

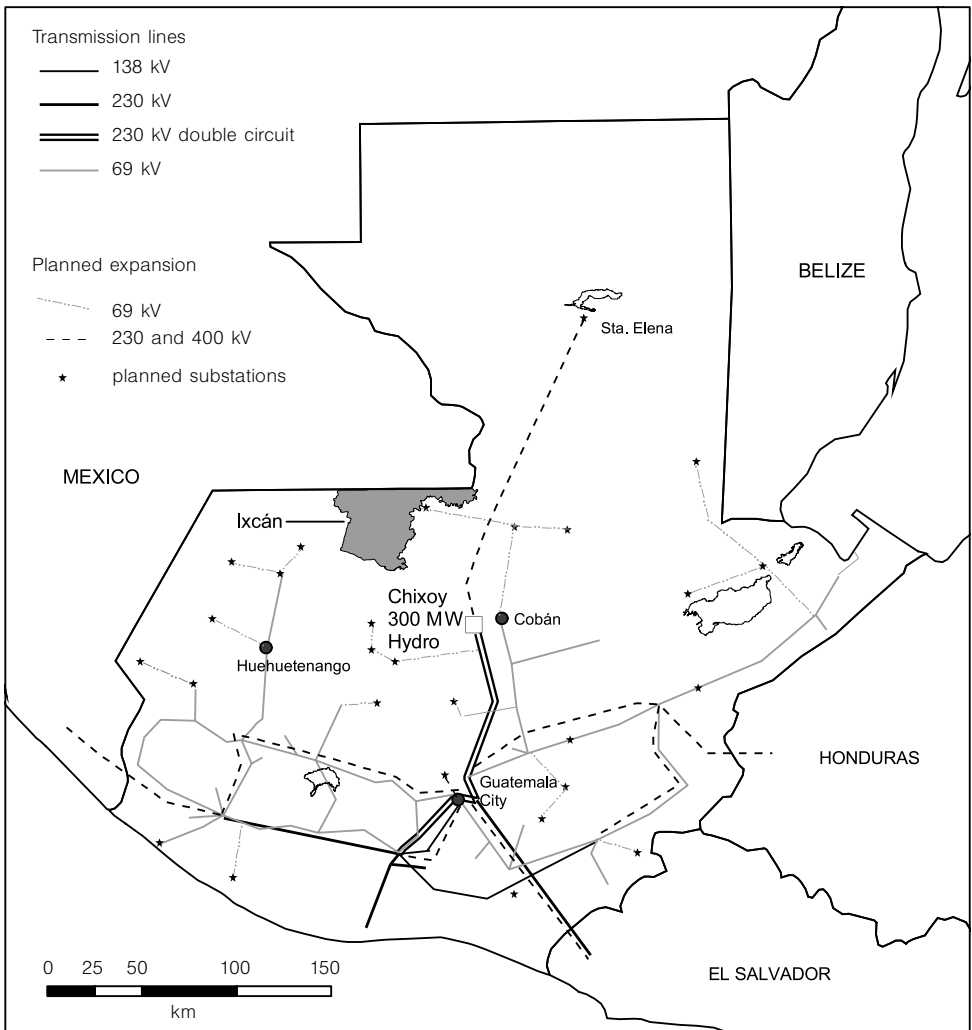


Figure 3. Guatemala's existing electricity transport system and planned lines and substations for the period 2000–08 (source: MEM, 2001).

5 Local rural energy realities: Ixcán, Guatemala

Official rhetoric seen in government documents, posters, and signposts suggests to users that the provision of electricity to rural households is an integral dimension of development (for example, figure 2). Indeed, by introducing electricity to *los lugares mas recónditos de nuestro país* (to the most remote corners of our country), MEM sees that it is accomplishing the development directives set out in the 1996 peace accords (MEM, 2001, page 1) and fulfilling the ministry's vision of "aiding the economic, social, and environmental development of the country", and mission of "facilitating and guiding the development of the energy and mining sectors towards satisfying current and future markets, and also promoting the optimal use of renewable energies to conserve the natural environment" (MEM, 2001, page 1, author's translation). Nobody can deny the steaming progress of Guatemala's rural electrification plan in providing a basic need—in the eyes of more developed nations and centralized government agencies. But what do rural residents think about electrification of their communities, and do they see themselves as any more economically, socially, and environmentally developed? What do Ixcán residents think about the US\$1.7 billion plan to generate, transport, and distribute energy and development?

Although not meant as an outright critique of centralized energy plans, the results from this research in rural Guatemala suggest that a single bulb hanging from a cable in the middle of a one-room house is not, in the minds of locals, a significant step away from current living conditions. In fact, more Guatemalans live in poverty today than was the case ten and twenty years ago (Jonas, 2000; Naciones Unidas, 2000). In this section of the paper I present the perspectives of Ixcán residents regarding their progress, or lack thereof, and their views on rural electrification.

Ixcán residents fret over water in the dry season and spend hours hauling water from central wells or nearby streams. Ixcán men, women, and children cut and carry firewood from distant land parcels. Half of Ixcán's residents cannot read or write (Salud Pública, 1999). Ixcán residents suffer repeated bouts of malaria and diarrhea. Ixcán women spend the better part of each day preparing and cooking *tortillas* (flat maize cakes) and beans over open fires (figure 4, see over). The majority of Ixcán residents cook on open fires or on improved wood-burning stoves and light their homes with candles and homemade kerosene or diesel lamps (old jam jars and a rag—somewhat akin to a Molotov cocktail). Ixcán people want potable water. This repetitious list is not uncommon in Guatemala. I entered the world of Ixcán residents to understand their view of the slippery word and constructed concept of *development* better (Escobar, 1995).

Survey results confirmed the insights I gained from living in Ixcán and the information provided by in-depth interviews. Some sections of the survey asked residents about their living conditions and, given options, what change they would prefer. Most residents ranked potable water as their primary need (table 4). Improvement in schooling and the

Table 4. Results from a survey question that asked Ixcán residents to state the project they perceive as the most important way to improve their livelihoods ($n = 158$).

Community	Most important project			
	water	schooling	electricity	roads
San Lucas ($n = 82$)	74	3	3	2
Kaibil Balám ($n = 46$)	35	6	4	1
Paraíso de Adán ($n = 30$)	23	3	4	0
Total (%)	83.5	7.6	6.3	2.5



Figure 4. Ixcán resident cooking tortillas on an open fire. The clay *comal* (griddle) sits on leaf springs from the suspension of an old truck. A family of seven uses three *tareas* in one week (most people use the word *tarea* to indicate the amount of wood a man can carry on his back; when referring to firewood, residents are careful to mention if they are referring to a human load or mule load).

introduction of *luz* (literally light, but meaning electricity) came a distant second. A few household heads saw the construction of access roads to areas of intensive maize cultivation as a wise investment—many farmers now pay a high fee to owners of rugged four-wheel drive pick-up trucks to bring harvested maize from distant fields in the dry season; the tracks become impassable with the onset of rains.

Residents of these three Ixcán communities admit that they would like electricity in their homes, but they stress that lighting (because, they joke, that is all they would use electricity for) is not an immediate need. Residents told me that they have waited so long for small improvements in their lives, that waiting ten to fifteen years more for the luxury of light at night is no major concern.

5.1 Why rural residents do not want electricity—at least not yet

When I asked people why they did not want electricity, most people took me for a fool, but still took the time to point out:

“Look around—you see that we cannot even afford to eat meat, in the rainy season we live in the mud like pigs, it’s not worth selling our maize, and we do not even have potable water. How could we even afford to pay for light? Anyway, we would only use it for a few hours at night because we cannot buy *aparatos* [appliances] to make use of the electricity—we don’t have enough money” (resident of Paraíso de Adán, July 2001).

Ixcán residents do not have enough spare cash to pay US \$4 for 30 kWh to 40 kWh a month—the average consumption of users connected under the rural electrification program. This price includes a government subsidy for users who consume less than 300 kWh per month, and a fixed US \$0.9 service charge. Some people in San Lucas, Kaibil Balám, and Paraíso de Adán can, however, buy appliances and pay for the electricity to feed radios, compact disc players, and community cell telephones—these people are successful migrants to the United States and Canada. At least 10% of males between the ages of 15 and 55 years from these communities currently work outside of Guatemala and regularly remit earnings to home communities. For their families the lack of electricity is not a problem—they simply invest US \$200 to \$300 in solar panels and 12 V batteries. Even these residents do not see a need, yet anyway, for the increased power from mainline electricity.

5.2 Wood energy in the rain forest

Ixcán families rely on firewood for cooking. Space heating is not an issue in this hot and humid region of Guatemala. Almost all of the families in the three study communities own and use improved wood-burning stoves. The stoves were built after 1996 as part of the postwar development program for areas of Guatemala heavily impacted by the internal conflict. The agencies responsible for the funding and construction of the stoves are not connected to the MEM. Improved stoves supposedly consume less firewood and also reduce smoke inhalation [smoke inhalation causes the majority of upper respiratory tract diseases in Ixcán and rural Guatemala in general (Salud Pública, 1999)].

Although Ixcán residents express gratitude for the stoves and the reduction of smoke in their houses, they stress that firewood is increasingly scarce; and, although the stoves use less firewood, they do not remedy firewood shortages. Results from one section of the survey that probed residents about firewood use produced various surprises: (1) 21% of households purchase wood on regular basis; and (2) a full 87% of respondents said they can no longer find woods that *arde* (burn well and hot). Rather, they now burn whatever is available. Rosalia, a resident of San Lucas, aptly expresses current firewood issues in her community:

“Look, when we first came here good firewood was all over the place. This was especially so because we were making the first clearings for our houses and maize fields. Then we just picked it anywhere without concern about where it came from. Now we have to make special trips to our parcels to collect firewood, so we have less time to do all that we need to do in the house. Yes, we still have wood, but it is not good wood. Good firewood is harder to find. Also, the people who own cardamom dryers are taking all the big and good trees down to dry cardamom. You have even seen me here burning the cobs of the maize after we take off the grains. Even though we have *estufas mejoradas* [improved wood-burning stoves] we still use wood and that still means we have to collect the wood. Just because we have electricity does not mean that we all of a sudden stop using wood.”

Why, then, in a rainforest region that receives from 2800 to 5000 mm of rain a year (see figure 1), do farmer families experience firewood shortages? Residents provided several answers. First, many farmers live up to two hours' walk from their land parcels and therefore cannot make frequent trips to look for firewood. Owners of distant parcels often buy wood from people with parcels closer to the village center or, in the case of Kaibil Balám, farmers who cannot meet their firewood needs seek permission from the village agrarian committee to collect firewood from the forest reserve surrounding the village center. Second, and especially in San Lucas and Paraíso de Adán, residents say that the conversion of rainforest, shade-grown crops such as coffee and cardamom, and/or changing plots of maize cultivation to permanent cattle pasture reduces the availability of desirable firewood. Third, during the 1980s the army forced scattered farm families to live in a designated village center whereby soldiers could maintain better control over the population. To increase visibility, the military cleared all trees in the village centers. Also, during the years of intense conflict (1981 to 1986) villagers avoided farming their parcels of land for fear of running into army or guerrilla patrols. Restricted access to land parcels led to intensive use of nearby parcels and communally owned lands for firewood and the cultivation of basic crops. Octavio from San Lucas explains how the military restricted access to land parcels and how land near the center of communities was stripped of useful firewood:

"In 1981 we came here to the center where we are now. But that was how we abandoned our place of work, our *milpa*, our maize—everything stayed in our parcels. Then the troops came by. Doing 'clean up' they said. And the military commanders at the time only gave us two days to gather all our goods, maize, and beans and to get into the center where we live now. Everything else stayed back in the parcels. So then the troops passed by burning our old houses in the parcels—burning them with all of the maize and beans we were growing. They burnt our houses where we had maize and beans and all of the things that we needed to live out there, like dishes, grinding stones, mechanical grinders....

All of us gathered here to live in the center. We could not go out to our parcels because if you went you never returned. Some families went out to their fields, and because they disobeyed the orders of the authorities, they were 'lifted' by the troops never to be seen again. There were five young men from here from San Lucas that they 'took'. A neighbor who was on patrol at the time told me that the troops killed those five men at the same time as all the other people from Santo Thomas." Octavio then explained how community members continued to plant subsistence crops and struggle for survival during the conflict:

"We organized and we all went out to nearby fields together. While some of us planted, the rest of us kept guard. Look, here there was security because we provided it. Also, because we could not work so much in our parcels we had to go to the *Zona* [military base at Playa Grande] for food and they rationed us. They gave us two pounds of sugar, two of beans, and two of salt for the week. How then, I ask you, was that supposed to last a week. And, it is not as though they gave it to us—we had to buy the rations. But they did not let us buy the amount we wanted. If you bought *una arroba* [twenty pounds], then you did not return home—they grabbed you and took you away. The army said that the food was not for you, but to take it to the guerrillas. So then, many people died because they bought too much food."

During this time of conflict the land nearest to the community center was heavily used and remains devoid of large trees even today. Access to desirable firewood continues to be an issue in Ixcán because residents take few actions to ameliorate shortages. Ixcán residents react to shortages in a fashion similar to that in many parts

of the world (for example, see Brouwer et al, 1997): they use less fuel; switch to lower quality woods; lengthen collection time; or employ more household labor to secure firewood. In the last few years, however, in the face of wood shortages and absence of development programs that target wood as renewable fuel, several San Lucas residents mentioned that they are thinking of reserving parts of their land parcels expressly for firewood production and for the production of fenceposts to enclose cattle pastures. For example, Antonio, a *parcelario* (parcel owner) in San Lucas, stood on the edge of his forested parcel (which is an hour's walk from the community center) and explained:

"First let me tell you that, and I know this sounds strange, but if the war had not hit us so hard here all this that you see around you would be gone. All the forest would already be cattle pasture—the war slowed the whole process down. I plan to save my parcel because, you watch, all those people who are just cutting down their trees and making pasture are going to be begging for firewood and wood for fence posts. That way I secure a bit of a future for my children. They [land buyers] came down from the highlands and offered me 100 000 Quetzales for my land [US \$13 000 for a 30 ha parcel]. I refused because I know it is good land and the wood is worth a fortune."

Ixcán residents receive little help from the outside—governmental or nongovernmental organizations—regarding firewood management. Some San Lucas residents with migrant money followed the agroforestry examples of an international NGO, the Community Housing Foundation (CHF), and planted part of their parcels with hardwoods such as mahogany. Planting hardwood, however, does not provide firewood. CHF, the only environmental NGO in the area, does not offer expertise or advice on growing wood for firewood, and their agroforestry program reaches only about 5% of Ixcán families (interview with Jorge Albizúrez, Agroforestry Division and Environmental Education, Community Housing Foundation, 12 January 2000; interview with Randy Lyness, Senior Program Officer, Community Housing Foundation, 18 May 2002). The local military base, as part of its civil affairs division, also runs a tree nursery and plants trees in previously occupied communities (Girón, 2000).

Residents state that the lack of forestry programs and NGO presence in San Lucas and Paraíso de Adán, is because they are not indigenous communities and did not become refugees during the war. Lucia lamented that,

"after the war the NGOs gave all of their attention to the return refugee communities. We do not receive any help because the government and the NGOs say that we did not suffer that much during the conflict. But suffer we did, just in a different way under the command of the military. We deserve help and aid just like the communities that fled. We constantly put in petitions for help, but nothing ever comes of it. Well, we will see what happens. Because, as you can see we need water, better roads, and more teachers, but we do not have the money for those luxuries."

Clearly, then, as the Ixcán case study demonstrates, rural residents recognize the benefits of electricity. They also realize, however, that they are in no position to pay for electricity services or the appliances served by electricity. Rural residents clearly vocalized the need for other types of rural development in the near future—electricity remains a distant desire.

6 Discussion: is electrification beneficial to rural Guatemalans?

Regardless of rural realities, Guatemala's electrification plan proceeds. Guatemala's MEM sees the rural electrification as part of Plan Puebla–Panama, where power can be shared between countries depending on demand. The broad net of transmission lines, the director of the energy division of MEM told me, facilitates the ideas behind the proposed sharing of power when needed. Although rural electrification may fit into

larger government agreements about a continuous electricity grid stretching the length of the Central American peninsula, now is the time to ask if rural electrification makes a difference to the people it purports to serve. Although rural electrification and Plan Puebla–Panama are certainly laudable, evidence from the ground level suggests that development monies could be better spent on water projects, education, and forestry projects for firewood. The lack of attention to Guatemala’s most widely used fuel, firewood, is not unique to Ixcán. Firewood, even though it is the most important energy source for most rural folk, is not “sufficiently incorporated into the policies and strategies of national development” (Elías et al, 1997, page 117). Indeed, even though Guatemala’s MEM promises to search for renewable energy sources to meet future demand, it all but ignores firewood: all energies and funding currently focus on the rural electrification plan. The attention paid to commercial forms of energy and the lack of attention to “energy for survival” (Soussan, 1988, pages 55–56) is not uncommon in less developed countries. Moreover, providing electricity to rural users from centralized power plants that burn diesel or coal is hardly beneficial to the environment. Planners must keep in mind that electricity must be generated *somewhere*, and the benefits of generation must be fully considered even if, as is the case in China, the switch from firewood to electricity may save endangered habitats (An et al, 2002). Only if Guatemala chases funding for hydroelectric, geothermal, and solar power can the ministry start to accomplish its mission of “promoting the optimal use of renewable energies to conserve the natural environment” (MEM, 2001, page 1).

Most rural Guatemalans are part of the 30% to 40% of the world’s population (mainly in less developed countries) who already employ a form of renewable energy—biomass. And, because alternative forms of renewable energy are not going to reach the rural poor any time soon, it is vital to examine this resource with sustainable use in mind (Hosier et al, 1992; O’Keefe, 1996). Rural energy planning in the Third World can be most efficient if it strengthens—*not replaces*—local integrated production systems (Mahiri and Howorth, 2001). Energy budgets from the developing world continue to reflect a heavy reliance on biomass (Carroll et al, 1982; O’Keefe, 1996), yet few studies capture local variations in the use of biomass fuels such as firewood, and even fewer government and NGO programs incorporate survival fuels into their development programs.

Although not denying rural folk the right to a few hours of electric light at night, it is crucial to question if development funds could be better spent, especially if, as O’Keefe (1996, page 208) states, “rural electrification has rarely offered regional development, industrialization, or employment.” In Guatemala large subsidies enable provision of electricity to many rural users and also helps rural users pay for services. Under the current contract, electricity-distribution companies complain that providing electricity to rural users is not profitable because the low consumption by households (30 kWh to 40 kWh per month) does not cover the cost of distribution (Lewington and Zilli, 2002). Will rural users be able to afford electricity when the subsidies disappear?

The substitution of electricity for firewood will not occur overnight, especially if rural users see few economic reasons for switching (An et al, 2002). The provision of electricity to rural Guatemalan homes does not mean that families will change their current, biomass-reliant, energy-consumption patterns because, quite simply, rural electrification does not equate to electric stoves and appliances. Rather, electrification is synonymous with a single light bulb hanging in a house where wood-burning stoves boil water from local streams.

The introduction of electricity and improved wood-burning stoves does not attack the more basic problem of wood use and lack of agroforestry incentives. Taking a somewhat more cynical, but perhaps realistic, stance, one could state that the energy

landscapes of power lines, pylons, and improved stoves, although at first instilling a sense of progress and incorporation of national development into larger plans like Plan Puebla–Panama, do not reflect desires on the ground in rural areas. This rural electrification program, like many centrally planned development programs over the last fifty years, exemplifies the disconnectedness between centralized planning and distant realities. Power lines and transformers reflect government planning. Tree seedlings struggling on the other side of the hill, if implemented, could reflect a local reality that is sustainable.

The discussion on research results in the larger framework of rural development is important. It is equally important, if not more so, to express the significance of the research in terms that are meaningful to the livelihoods of the people who live in rural areas and who feel the impact of development policies. Therefore, I close this report with the words of a Kaibil Balám resident who aptly stressed the importance of wood in her life:

“wood is important in our lives because it provides so many services, for example, we can say that it used to eat because we use it to cook our food, if there is not a tree we cannot cook our food.”

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