

# Energy Access in Urban Slums: A Case of Khon Kaen, Thailand

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## 1. Background

Access to modern forms of energy to the poor people will help reducing their poverty level, improve their quality of life. Access to modern energy services such as lighting, communication needs, cooking, heating and cooling will have an important role in achieving MDGs and it will play a facilitative role for other development goals (Rockstrom *et al.*, 2005). Rockstrom *et al.* (2005) mentions that an effective energy service is a prerequisite for economic and social development as well as for the sustainable poverty reduction.

Thailand is economically more advanced and comprises the developed and largest market of the Southeast Asia region. It is ranked as 78<sup>th</sup> in the Human Development Index out of 177 countries (Human Development Report 2007). In many Southeast Asian Countries including Thailand, internal migration are being observed from rural to urban areas for better life (Hartarto, 2006). Urban cost of living is higher than rural and almost everything needs to be bought. Thus, life of a migrant can be harder than the people living at rural areas. Increasing trend of the migrants also increase the number of poor in the urban, which may lead to their low quality of life.

The number of people living in urban areas is increasing rapidly around the world. In recent decades, such rates have accelerated. In Thailand, approximate 33% of its 62 million population are living in municipal areas. The growth rate was estimated to be 2.7% in 2005 (UNDP, 2005). The urban population would reach 40% of total population by 2030 (ADB and CAI 2006). A couple of studies have been conducted in the area of energy and poverty. So far these studies mainly focused to the rural poverty. However, there are significant numbers of people with low income living in urban areas in general and slum areas of the cities in particular. Low income is associated with worse lifestyle and low consumption of energy in comparison with the rich people in the cities and it may further worsen in the urban or peri-urban areas due to the lack of access to modern forms of energy as a result of the non-availability of natural resources for energy (e. g. firewood, agriculture residual) in compare to the people living in the rural areas.

## 2. Objective of the Study

The objective of this research, focusing on urban and peri-urban areas of Thailand, is primarily to assess the current levels of access to modern forms of energy, the energy consumption patterns and the total energy related expenditures in poor urban and peri urban areas. The secondary objective is to analyze the impact of past and planned energy policies on the current energy situation in poor urban and peri-urban areas. The initial study of UPEA has also suggested to comparative study between the cities of Thailand with some specific study of Greater Bangkok. The conclusions from this study will lead to suggestions of future actions for specific research and recommends policy options as well.

### 2.1 Specific Scope of the Study

The study provides a general background of energy accessibility in poor urban areas of Thailand particularly slum areas of municipalities. According to the Thailand Municipality Act, (1953), a minimum population density of 3000 per square kilometer is considered municipality areas and until the date of 2006, there are 1,161 settlement areas are recognized as municipality in Thailand<sup>1</sup>. The initial assessment study was focused mainly in Bangkok but this study focuses on Khon Kaen and some part of Bangkok as suggested in initial assessment report. Khon Kaen is a city located towards the North of Thailand. In Bangkok and its suburbs electricity is distributed by a single utility, the Metropolitan Electricity Authority (MEA) and in the rest of the country, electricity is distributed by the Provincial Electricity Authority (PEA).



Figure 2: A glimpse of slum area in Thailand

Source: <http://www.nyu.edu/socialwork/ip/news/archives/2.jpg>

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<sup>1</sup> <http://www.thailocaladmin.go.th/upload/document/type2/2550/01/doc1169528224271.pdf>  
(citation 14 Nov 2007)

### a) Bangkok and Greater Bangkok

Bangkok is the capital city of Thailand where 32 percent of urban populations of Thailand are populated (UNDP, 2005). As of March 2005, Bangkok Metropolis has 5,641,915 populations living in 50 districts on an area covering more than 1,500 km<sup>2</sup>. The Bangkok Metropolitan Region (BMR), often referred to as Greater Bangkok, comprises of Bangkok and the five adjacent provinces of Nonthaburi, Pathum Thani, Samut Prakan, Samut Sakhon and Nakhon Pathom. The total population of Bangkok Metropolitan Region (BMR) is 9.4 millions in the year 2000 and annual growth rate is 1.62 % during 1990-2000 (Pornchokchai, 2003).

Bangkok Municipality Area (BMA) has 35 times larger population than the second largest city in the country, Chang Mai. Bangkok urban areas account for 85% of economic output with 15.2% poverty incidence rate (World Bank, 2002). Urban areas of the Thailand have been the center of attraction for local labor migration because of comparatively better facilities such as transportation, public health and other infrastructure. People from the rural areas migrate to urban areas in search of better employment opportunities and higher income and start to live surrounding highways, rivers, and rail lines, and/or proximate to industrial employment areas (World Bank, 2002). A study shows that 81% of the dwellers in Bangkok region are migrated from other regions or slums and 78% are permanently settled in the region anticipating the higher prospect of employment and better chance of rented housing availability (Guerra, 2004).

The following map shows that most of slum settlements of Bangkok are located in the core areas where main commercial activities are concentrated.

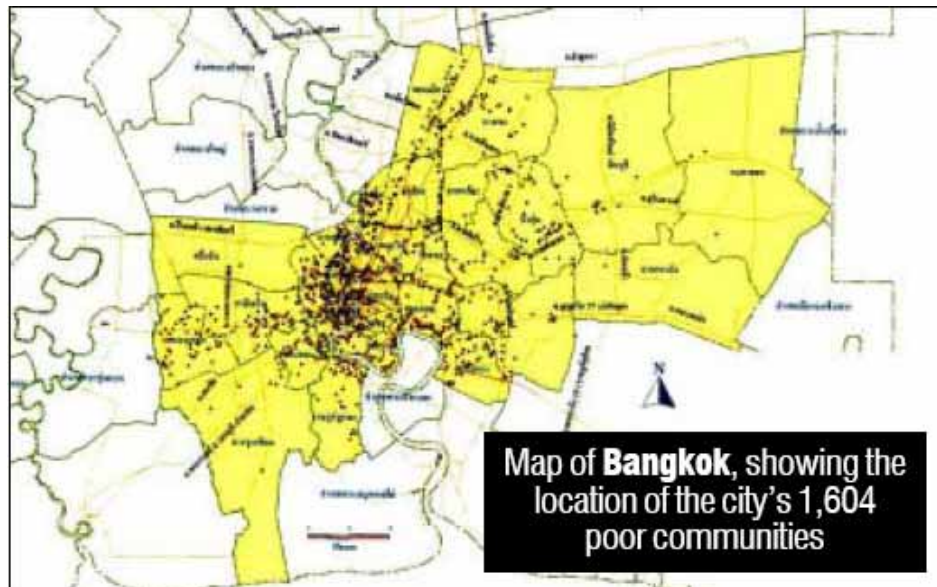


Figure 1: Slum areas in Bangkok

Source: CODI, 2005

<sup>2</sup> <http://www.bma.go.th/bmaeng/population/population.htm> (citation 14 Nov 2007)

## **b) Khon Kaen**

Khon Kaen is the commercial and political center of Northeastern Thailand and has the highest population growth of the Northeastern region<sup>3</sup>. Present population of the city is estimated around 1,726,594<sup>4</sup> in 2005. Khon Kaen is one of four cities selected for accelerated growth, and with infrastructure improvements such as the planned upgrading of Nam Pong Airport, a new highway to the Eastern Seaboard and use of container transport. Manufacturing and industry are attracted to Khon Kaen because of the advantages of the transportation network<sup>5</sup>.

### **2.3. Rationale and motivation for selection the study areas**

Most of the studies on energy and poverty in Thailand are focused in rural area. Very limited information and study is found in the energy access and poverty in non rural (urban and peri urban). In year 2005, 87.5% of the population had access to grid electricity (DEDE, 2005). 99% of the registered households<sup>6</sup> have electricity connection (AESIEAP, 2007)., Biomass accounts for 33% of the total household energy consumption in Thailand. 57.5% of the households cook with LPG while only 32.8% of the households cook with traditional biomass<sup>7</sup> (NSO, 2005b). Renewable energy had a share of 16.9% in the total primary energy supply (TPES) in year 2004 (IEA, 2004.)

Parliament Office (2002) argues that modern energy sources, such as electricity and Petroleum-based fuels generally provide only a small part of the energy use of poor people. This is mainly because they are too expensive and because it can prove difficult to achieve regular supplies to isolated rural communities. According to the Homeless International (2005) 900 million people live in slums worldwide and 570 million of them live in the Asia-Pacific region. Homeless International (2005) claims “Urban poverty is often underestimated, unrecognized and poorly understood,” and official poverty lines define significantly fewer urban dwellers in many Asian countries.

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<sup>3</sup> <http://www.khonkaen.com/english/history.asp> (citation 14 Nov 2007)

<sup>4</sup> <http://www.khonkaen.com/english/history.asp>(citation 14 Nov 2007)

<sup>5</sup> <http://www.khonkaen.com/english/history.asp>(citation 17 Nov 2007)

<sup>6</sup> 100% in municipal areas and 98.9% in non-municipal areas

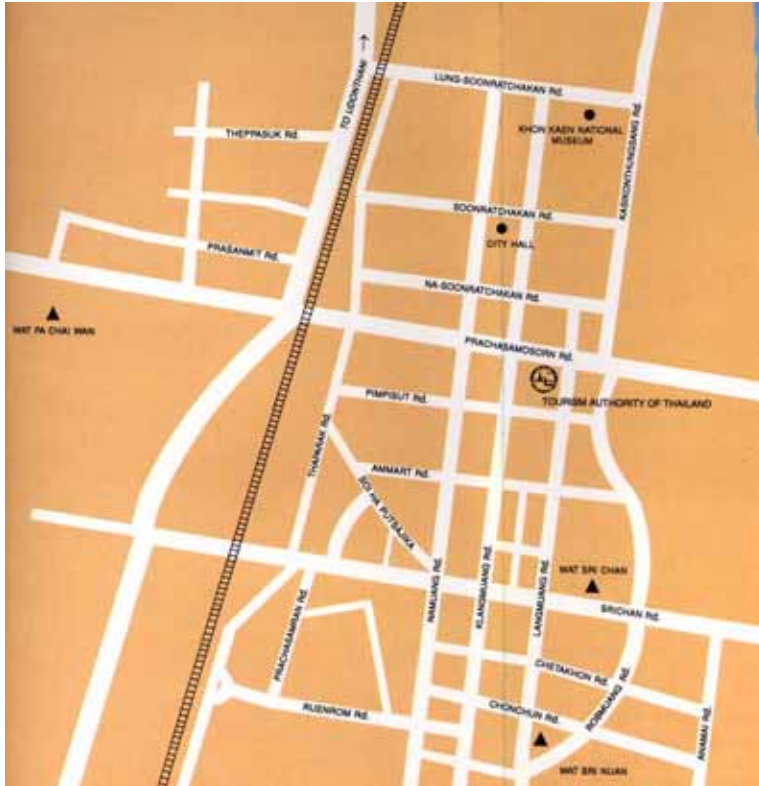
<sup>7</sup> fuelwood wood and charcoal



Thailand is highly reliant on oil as a source of energy, and it is very inefficient in its usage (UNDP, 2007). It has been considered as a weak energy security country status after the result of inflation of oil prices in 2006 (UNDP, 2007). The country has average

per-capita income of \$2490 (IEA, 2006). According to UNDP (2007), Bangkok, Bangkok vicinity, the East and South and the center are better off than rest of the region of the country.

The concentration of economic activities in the Northeast region has direct relation in regional migration from rural to urban center, which has increased the population and pressure in resources as well (NESDB, 2007). In term of income, per capita Gross Regional Productivity (GRP) showed high disparity between Bangkok and its vicinities,



**Figure 1: Map of Khon Kaen**

the highest level at 275,030 Baht/year, and Northeastern, the lowest level at 32,897 Baht/year with the differences of 8.4 times (NESDB, 2007). In a comparison, out of 76 provinces Bangkok and Khon Kean rank 6<sup>th</sup> and 39<sup>th</sup> respectively in the basis of GPP per capita<sup>8</sup>. Khon Kaen has 58,977 Baht and Bangkok has 298,043 Baht per capita income in provincial level (NESDB, 2007).

The basic hypothesis of the study were, a) poor people of the urban and peri urban areas are disadvantaged both in terms of the quantity and quality of energy services and most of the urban poor live in slum area, b) urban poor has access to liquid and gas fuels for cooking is a realistic option for urban areas but their affordability is not necessary especially modern energy, c) poor people households are using less energy than wealthier ones but spending higher share of their income.

## 2.4. Introduction and Summary of Key Findings of Scoping Phase

<sup>8</sup> NESDB 2007



The initial study identified two main policies which have an impact on energy access of the urban poor. policies on household registration and electricity pricing. A household registration is required to apply for different services, including electricity. Slum households do not always meet the requirements to get a household registration and almost 60% of the surveyed slum household did not have one. This study was based on Bangkok only. Other findings were as below:

- Data capturing the access to energy in poor urban areas in Thailand are scarce and different proxies have to be used. In particular, the detailed data found in the household energy consumption survey cannot be analysed with the data found in the household socio-economic survey.
- Although at the country level, the great majority of the poor live in rural areas, poverty in urban areas in general and in Greater Bangkok in particular remains an issue that needs to be addressed urgently.
- Almost all the poorest households in Greater Bangkok have access to electricity and more than 85% of surveyed slum households used LPG for cooking. The choice of fuels used to cook at home depends on the type of food and the availability of ready to eat food from street vendors in the area.
- The issue of households being connected to the electricity grid, through their neighbours has not been studied in detail before. The observations, based on a limited field survey, presented in this report show that a non negligible share of slum households (approximately 32%) get their electricity connections through their neighbors and none steal electricity from the grid. Poor households, which connect electricity through their neighbors, pay more than 100% of the normal electricity tariff.
- Few income generating activities take place in Bangkok slums directly. This does not seem to be due to the lack of availability of modern forms of energy but rather to the lack of market or a lack of entrepreneurs in the slums. Small workshops, convenience store and food stalls are the main income activities undertaken by the slum dwellers inside the slums. Electricity seems to be the most used energy sources for these activities. Few slum dwellers are involved in taxi activities with their cars and motorbikes.
- The electricity tariff has increased at a high rate over the last decade. Rise of income of the poor was much lower, especially during 1998-2002. Especially increased electricity tariff affects the poor people legally connected to the electricity grids. Most of the poor interviewed during this study said they had to decrease their electricity consumption due to increase in the electricity price but this could not be confirmed due to lack of hard data.

### **3. Methodology**

This analysis in the study is primarily based on the secondary data and a limited sample survey (involving 100 hundred households) is carried out in the slum areas of Khon Kaen—a city in the Northeast Thailand (hereafter referred to as “Field Survey, 2007”)--to collect primary data in order to supplant the information gap in the secondary data. This analysis mainly focuses on different forms of energy (electricity, LPG, Gasoline and biomass) and their usage for lighting, cooking, transportation etc. in urban and peri urban areas of Thailand. Slum areas of two cities having different demographic dimensions are selected for the limited sample survey. They are i) Khon Kaen and ii) Bangkok. Also, the situation of energy access of the poor and energy demand in the slum areas in these two cities have been compared.

#### Data Collection

Secondary information were collected from government reports, especially from agencies such as National Statistical Office (NSO) and National Economic and Social Development Board (NESDB). These two organisations are responsible for collecting data and reporting the socio-economic status of the country. Documents consulted include several issues of the Statistical Yearbook, Census, Household Socio-Economic Survey and Household Energy Consumption Survey. Other sources of data include Metropolitan Electricity Authority (MEA) and Provincial Electricity Authority (PEA) annual reports, previous studies on slums in Thailand and literature from organizations working in slums, such as Community Organizations Development Institute (CODI).

To complement the information gathered in the literature, a limited sample survey was carried out in the slums of Bangkok during January-February 2007. Another limited sample survey was conducted in the urban and peri urban areas of Khon Kean in the first week of October 2007. The survey was organized as follows: a questionnaire, including questions on socio-economic status, housing status, electricity access and demand, cooking fuel demand, transport fuel demand and other energy sources demand, was prepared.

## 4. Poverty and slum situation in Thailand

### 4.1 Slum situation

According to NESDB (1998), 43 percent of the population lives in the urban area in Thailand and it will reach to 50 percent by the year 2015. Regional income disparity is significant in Thailand as the mean household income in Bangkok is about 3.4 times higher than the national average and it is eight times more than the poorest provinces in the northeast (Vorratnchaiphan and Villeneuve, 2006). They also argue that geographic structure of slum areas is changing rapidly with the decrease of slum areas in the urban core and the rapid rise of new slums in the urban fringe areas, typically near the industrial areas in the north and east of Bangkok and around the edges of major secondary cities.

Thai urban planning tends to perform very poorly and has had almost no effect on shaping Thai urban form and land use due to the lack of policy coordination and synchronization in central and provincial level. As a result, Thai cities are built up self organization without any planned way (Vorratnchaiphan and Villeneuve, 2006). In Bangkok and its surroundings, urban development has generated many slums. They increased from 50 in 1968 to 1,020 in 1985 (Pornchokchai, 1985).

Table 1: Summary of slum communities in Thailand (2000)

Urban Centers	Slums	Households	Population	Share of total household <sup>1</sup> (%)	Share of total population (%)
Bangkok	796	196,354	1,099,575	8.4	17.3
Nonthaburi	60	6,994	34,970	-	4
Pathum Thani	93	17,099	85,495	-	13
Samut Prakan	207	41,456	207,280	-	21
<b>Total Greater Bangkok</b>	<b>1,156</b>	<b>261,903</b>	<b>1,427,320</b>	<b>8.5</b>	<b>14.2</b>
Samut Sakhon	62	8,838	44,190	-	10
Nakhon Pathom	30	3,038	15,190	-	2
<b>Total BMR</b>	<b>1,248</b>	<b>273,779</b>	<b>1,486,700</b>	<b>-</b>	<b>16</b>
Other Cities	341	62,673	277,172	-	1
<b>Thailand Total</b>	<b>1,589</b>	<b>336,452</b>	<b>1,763,872</b>	<b>2.1</b>	<b>2.9</b>

Source: Pornchokchai (2003) and <sup>1</sup> figures in this column are calculated using data in NSO (2000).

The urban poor are a heterogeneous group and most of them are migrated from villages for looking job opportunities and better quality of life. There are differences in term of income, education, awareness, and interests of coming there and needs for life (Savant-Mohit, 2004). World Bank (2002) reports that most of slums areas of Thailand are upgraded and people who live in the slum areas are somewhat settled and are secured physically. In general, slum dwellers have secure housing tenure, but many do not have

secure land tenure. The National Housing Authority estimates that about two thirds of slum households in Bangkok and its vicinity have an income over 9,000 Baht per month and therefore may have capacity to find housing solutions outside slum areas<sup>9</sup>.

## 4.2. Poverty and Energy Profiles in urban and peri urban Thailand

Thailand is classified as belonging to the lower middle income group by the World Bank<sup>10</sup> which means it is no longer a strictly agricultural economy and its 90 percent GDP comes from the manufacturing and the services sectors (NESDB, 2005). In Thailand, absolute poverty is defined as the population with a monthly average income below the poverty line defined by National Economic and Social Development Board (NESDB). In 2006, the national poverty line at the country level was set at Baht 1,386/capita/month. Based on this definition, 9.55% of the total population was considered as poor in 2006 (NESDB, 2007).

At the country level, about 86.1% of the poor reside in non-municipal areas while the rest live in municipal areas. In municipal areas, the poverty line was set at Baht 1,661/capita/month to reflect the higher cost of living. In these areas, 677,900 people (i.e. 3.62% of the total municipal population) were living with an income lower than the poverty line (NESDB, 2007) (Table 2).

Table 2: Population under the poverty line

		Poverty line (Baht/per month/capita)	Percent of population under the poverty line	Population under the poverty line in thousand
Bangkok	Total	2,020	0.51	28.7
Khon Kean	Total	1,293	14.99	234.7
Northeast	Urban	1,365	8.61	319.4
	Rural	1,215	18.46	3,301.1
	Total	<b>1,240</b>	<b>16.77</b>	<b>3,620.4</b>
Thailand	Urban	1,661	3.62	677.9
	Rural	<b>1,386</b>	<b>9.55</b>	<b>6,056.7</b>
	Total	<b>1,271</b>	<b>12.04</b>	<b>5,378.7</b>

Source: NESDB, 2007

NESDB also uses the notion of relative poverty to reflect further on the extent of poverty in municipal areas. People living with less than 50% of the median income are considered as living in relative poverty. Using this definition, 18.7% of the total population or 12.069 million people were living in relative poverty in 2004. The percentage of people living in relative poverty in municipal areas (19.9%, 3.999 million people) was higher than in non-municipal areas (14.5%, 6.194 million people).

<sup>9</sup> [http://www.undp.or.th/focusarea/environment/\(citation 15 Nov 2007\)](http://www.undp.or.th/focusarea/environment/(citation%2015%20Nov%202007))

<sup>10</sup> [www.worldbank.org/data/countrydata/countrydata.html](http://www.worldbank.org/data/countrydata/countrydata.html).

Another issue of concern in municipal areas is the widening gap between the rich and the poor. In 2004, in these areas, the 40% poorest had a share of only 3.6% of the total income, whereas the share of the richest quintile of the population was 72%. In 2000, the 40% poorest households had an income share of 2.6% and the richest quintile had a share of 75.4% of the total income. In six years, economic growth has not reached the poor in a way that leads to noticeable reduction of inequalities. As a comparison, in 2004, 40% of the poorest people in non-municipal areas had a share of 21.8% of the total income where as the richest quintile's share was 37.1% (NESDB, 2006).

## 5. Energy situation in Khon Kaen

### 5.1. Energy Access in Slum Area

#### 5.2.1 Electricity

Electrification in municipal areas in Thailand is very high which is also the case in slums areas. A limited sample survey conducted under this study also shows that most of the households have access to electricity. Out of the 100 households interviewed during the field survey in Khon Kaen show that all of them have access to electricity and 48 percent of them are having access to electricity for more than 10 years. The survey shows that 100 percent of households have electricity in Khon Kean. Electricity is being used for lighting, heating, entertainment and communication etc (Table 3). It shows more than 90% of the households possess televisions, refrigerators (89%), electric iron and rice cookers whereas one fourth of the households possess air conditioning units. More than half of the households have washing machine.

Table 3: Use of electrical appliances in slum communities in Khon Kaen

Type of appliances	Households in percent using appliances
Television	98
Refrigerator	89
Washing machine	59
Air-conditioning unit	25
Electric water heater	26
Rice cooker	97
Fans	100
Electric Iron	98

Source: Field Survey, 2007

All of the surveyed households are found connected to the PEA grid. In Khon Kaen, average monthly electricity expenditures in slum areas is found as 697 Baht and the poor households who are considered under the poverty line are found to spend 362 Baht per month.

#### 5.2.2. Energy Use for Cooking

In Thailand, several types of fuels have been used for cooking in households sector e.g. LPG for the preparation of main dishes, electricity for preparing rice (rice cooker) or boiling water (electric kettle), charcoal and wood to grill food etc. The survey under this study shows that poor households also use several types of fuels for cooking (Table 4). LPG is the dominating fuel for cooking at household of Thailand followed by electricity and charcoal.



In Khon Kaen, LPG is the major fuel type used for cooking followed by electricity (Table 4). Interestingly, even in Khon Kaen, no household was found to rely only on biomass for cooking. The main reason quoted to explain the use of LPG and electricity for cooking was that both sources were readily available and the supply was reliable.

Table 4: Cooking fuels used by the 100 surveyed households in Khon Kaen

Type of Fuel	Main cooking fuel of households: percentage of surveyed households	Percentage of the households using the fuel for cooking
LPG	76	86
Electricity	13	57
Charcoal	9	59
Wood	1	25
No cooking done at home	1	-

Source: Field Survey, 2007

### 5.2.3. Energy and Private Transportation

Out of the 100 households interviewed during the field survey, 78 households owned a car, 40 possessed a motorbike and 6 had both car and motorbike (Table 5). All the cars and motorbikes owned by the households in the survey were based on gasoline and diesel. The relatively high ownership of cars and motorbikes indicate that most of the slum dwellers work out of the slums and use the vehicles to go to work. Some slum dwellers use their car or motorbike to transport passengers for money.

Table 5: Vehicle ownership for Private Transportation in Khon Kaen

Types of vehicle	Percentage of total households having vehicle ownership	Average number of vehicle types available per household
Motorcycle	62	1.12
Car	25	0.78
Pick- up (mini truck)	22	0.22
Van	13	0.13
Other mini truck	2	0.20

Source: Field Survey, 2007.

### 5.3. Energy for other Services

The field survey in Khon Kaen shows that most of the energy needs in slum households are met by electricity which is used for lighting, entertainment (TV, radio etc), convenience (cooling, water heating), and cooking rice; LPG which is used for cooking main dishes, and Gasoline and diesel which are used in vehicle transportation. Use of renewable energy is not found significant in the slum areas of the Khon Kaen. So, the

following chapter will mainly focus on electricity, LPG, gasoline and diesel use by the people in the slums of Khon Kaen.

## 5.4 Energy Demand and Energy Expenditure Patterns in slum areas in Khon Kaen

### 5.4.1 Electricity

Table 5 shows gives an indication of the use of electric appliances in slum area of Khon Kaen. As can be seen from the Table, 98 percent of the households have a TV, 100 percent households have a fan, 98 percent have a radio, 97 percent have an electric stove and 25 percent have an air condition.

Table 6: .Use of electrical appliances in slum communities in Khon Kaen

Type of appliances	% of households with the ownership of appliances	Type of appliances	% of households with the ownership of appliances
Air Conditioner	25	Light Bulb	19
Compact Fluorescent	33	Microwave oven	31
Computer	41	Radio	98
Electrical pot	76	Refrigerator	89
Electrical Stove	97	Toaster	4
Fan	100	TV	98
Fluorescent	99	Video/VCD/DVD Player	80
Gas Stove	28	Washing Machine	59
Iron	98	Water boiler	26

Source: Field Survey, 2007

Table 7 shows that the average monthly electricity expenditure of the households in the survey is 697 Baht which is nearly 13 percent of their total income. The table also shows that the average monthly electricity expenditure of the households under the poverty line is less than the corresponding figure of all the households. However, the households under the poverty line are found to spend higher percentage of their income on electricity.

Table 7: Electricity expenditures in slum area of Khon Kaen, Baht

Items	Surveyed households	Surveyed households with income below poverty line
Average Monthly Electricity Expenditure of Households (Baht)	697.55	362.72
Share in the total income (%)	12.82	15.69

Source: Field Survey, 2007

Summary of the perception of slum households on electricity tariff is given in Table 8. It is interesting to note that the households in the survey have no difficulty to pay the electricity charges. However, 61 percent of the households feel that the electricity price is expensive and 85% of them feel that the tariff is increasing. 96% of the households say that the electricity is reliable in Khon Kaen Slum area.

Table 8: Perceptions on electricity tariff, reliability of supply and difficulties to pay among surveyed households in percentage

Electricity Tariff				Reliability of supply		Difficulties to pay
Expensive	Cheap	Increasing	Decreasing	Reliable	Not Reliable	
61	39	85	15	96	4	0

Source: Field survey, 2007.

#### 5.4.2 Energy for Cooking

The wholesale price of LPG is fixed by the government but the retail price is deregulated. The wholesale price is fixed at Baht 12.46 per kg in Thailand. Monthly expenditure for cooking fuels in slum areas of Khon Kaen is given in Table 9. On the average, households under the poverty line spend substantially less on cooking fuels than the average of all households under the survey but its share in the total income is slightly higher than the average of the households. One of the special feature of Thailand is that prepared and ready to eat food is easily available everywhere, including slums. Thus, it is possible that only a part of the food is cooked at home and the rest is bought from food vendors. The difference between cooking expenses noticed during the study could, therefore, be possibly explained by the different habits of households, in terms of cooking food or buying it from outside.

Table 9: Expenditures for cooking fuels in slums in Khon Kaen

Items	Field Survey	
	Surveyed Households	Surveyed Households with income below poverty line
Average Monthly Expenditure for cooking(Baht)	390	206.67
Share in the total income (%)	4.08	5.19

Source: Field Survey, 2007.

#### 5.4.3 Energy for Private Transportation

Table 10 shows the average monthly expenditure for private transportation in slum areas of Khon Kaen. Most of the households under the survey are having either a car or motorcycle. As poor households in the slum do not own a vehicle, the share of expenditures for fuel for private transportation in the total monthly income is lower for the poor than for the non-poor. The level of ownership of cars and motorbikes tend to be lower in poor household than in non-poor households. The expenditure of poor households is different from what was observed for electricity and cooking fuel expenditures.

Table 10: Expenditures on fuels for private transportation in slum areas of Khon Kaen

	Field Survey	
	Surveyed Households	Surveyed Households with income below poverty line
Average Monthly Transportation Expenditure (Baht)	1,067	305.00
Share in the total income (%)	9.3	7.7

Source: Field Survey, 2007.

### 5.5. Household Energy Cost in Slum Areas of Khon Kaen

Average slum households and poor households spend almost similar percentage of their income but poor households spend more share of their income than average households in cooking (Figure 2). Similarly, poor households spend less share of their income in transportation. The average monthly expenditure of the surveyed slum households in energy is 25.2 percent of total income while the corresponding figure in the case of households below poverty line is 28.58 percent.

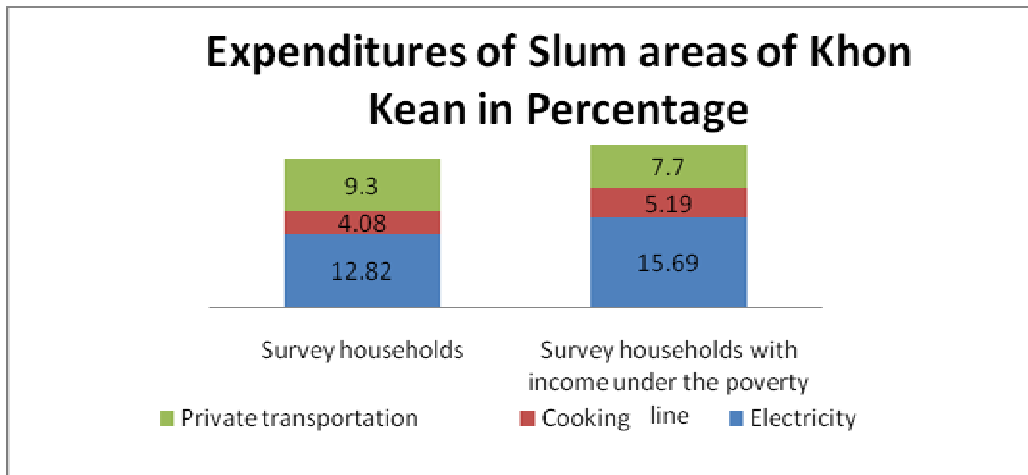
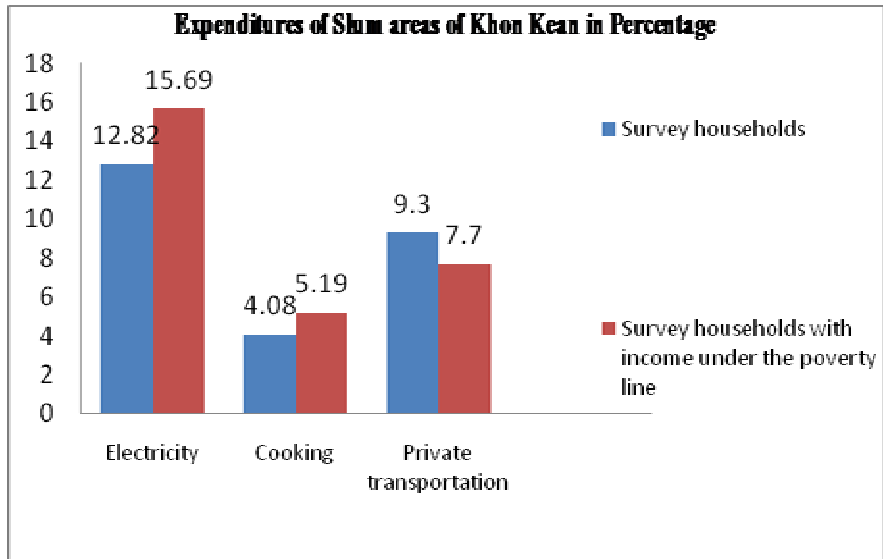


Figure 2: Share of energy related expenditures in slum areas of Khon Kean, %

Source: Field Survey, 2007.

### 5.6. Productive Usage of Energy

22 percent of the households in the survey in Khon Kaen reported that they also used electricity for income generating activities that included running workshops, refrigerators for small stores and food stalls. Some households also had rented rooms in their house and the electricity bill also included the cost of electricity consumed by the tenant.

Some households were running small restaurants at their homes and used different fuels like LPG, electricity (to cook rice) and charcoal (to grill meat and fish). Similarly, 18 percent of the households have been using their cars or motorcycles as a taxi.

## 6. Comparative Analysis of Energy Use by Slum Households in Bangkok and Khon Kaen

Slum dwellers have secure housing tenure, but many of them do not have secure land tenure. The National Housing Authority estimates that about two thirds of slum households in Bangkok and its vicinity have an income over 9,000 Baht per month and therefore may have capacity to find housing solutions outside slum areas<sup>11</sup>. Many households in slum areas of poor provinces like the Northeast may be living in a poorer environment than that in Bangkok, as many households in the Northeast still use wood and charcoal fuel because these fuels are more accessible and affordable than other sources of energy (UNDP/Thailand, 2004). Figure 3 shows that a significant large percentage of slum dwellers in the Central and Northern Thailand are reported to have fear of eviction and resettlement due to the high opportunity cost of leaving their urban slums.

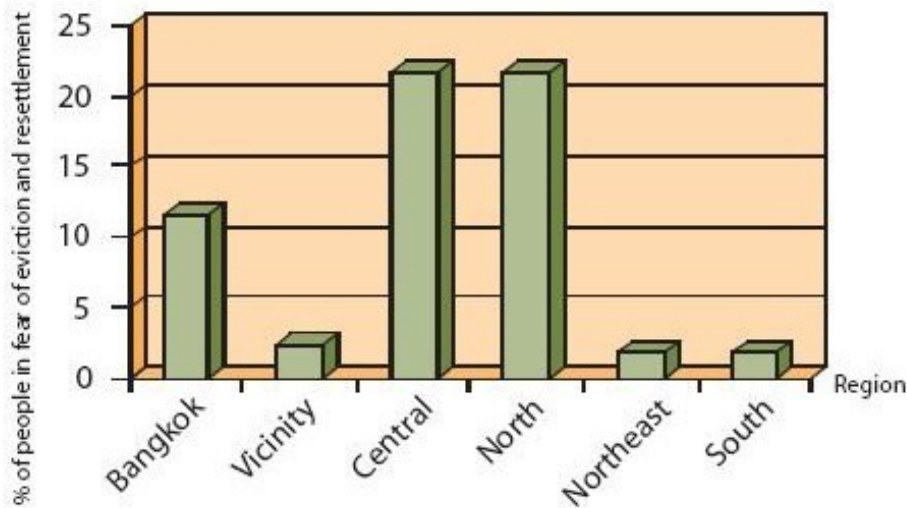


Figure 3: Slum Dweller attitudes to eviction and resettlement

### 6.1. Energy Access in Slum Area of Bangkok and Khon Kaen

#### 6.1.1. Electricity

The field survey of this study shows that most of the households have access to electricity in slum areas of Thailand (Pornchokchai, 2003). The survey under this study also shows that 100% households in the slum areas of Bangkok and Khon Kaen have access to electricity. Interestingly, 100% households under the survey in Khon Kaen are connected to electricity supply from Provincial Electricity Authority (PEA) grid. In Bangkok only 68 percent household connected to the Municipal Electricity Authority (MEA) grid and rest 32% households are connected through neighbors (Martin et al., 2007).

<sup>11</sup> [www.undp.org/energyandenvironment/sustainabledifference/PDFs/Asia/Thailand.pdf](http://www.undp.org/energyandenvironment/sustainabledifference/PDFs/Asia/Thailand.pdf)



The survey out of the 100 households slum areas in Khon Kaen shows that 56 percent of them are having access to electricity for more than 10 years. Similarly, in Bangkok also, 54 households are also connected to electricity supply for last 10 years (Martin et al., 2007).

In Khon Kaen, average monthly household electricity expenditure in slum areas is found to be 697 Baht while the poor households below the poverty line spend 362 Baht per month. These figures are comparatively less than the average month electricity expenditures in slum areas in Bangkok where the corresponding figure is 856 Baht and 728 Baht per household respectively.

### **6.1.2 Energy for Cooking in Bangkok and Khon Kaen**

In Thailand, several types of fuels are used for cooking by households e.g. LPG for preparing the main dish, electricity for preparing rice (rice cooker) and boiling water (electric kettle), charcoal and wood to grill food etc. The poor community in the urban and peri urban areas also use several types of fuels for cooking (Table 11). LPG is the most popular fuel for cooking followed by the electricity and charcoal.

Table 11: Percentage of households using fuels for cooking in slum areas of Khon Kaen and Bangkok

<b>Types of Fuel</b>	<b>Khon Kaen</b>	<b>Bangkok</b>
LPG	86	87
Electricity	57	54
Charcoal	59	34
Wood	25	6
No cooking done at home	1	0

Source: Field Survey 2007

In both of the slum areas under this study, LPG is the main cooking fuel followed by electricity, charcoal and wood. The sample survey under this study shows that charcoal and wood are used specially for grilling meat. Interestingly, only a small number of households were found to use wood for cooking.

### **6.1.3 Vehicle Ownership**

The ownership of vehicles by households in the slums of both cities is shown in Table 12. As can be seen, Khon Kean slum households have on average slightly smaller car ownership than the households in Bangkok slums while the motorcycle ownership is almost the same in both of the areas (Table 12).

Table 12: Vehicle Ownership per Household

<b>Vehicle type</b>	<b>Khon Kaen<sup>a</sup></b>	<b>Bangkok<sup>b</sup></b>
Motorbike	1.12	1.1
Car	0.78	1

<sup>a</sup> Field Survey, 2007

<sup>b</sup> For households reporting ownership of the item in 2002

The difference in car ownership between the cities is possibly due to their respective location or the kind of professional activities undertaken by the households. In both of the urban areas, it is found that the car and motorcycle are also being used as a taxi .

## 6.2. Energy Demand Patterns and Energy Expenses in slum areas in Bangkok Khon Kaen

### 6.2.1. Electricity

Table 13 shows some similarity in the ownership of electrical appliances in Bangkok and Khon Kaen. As can be seen, in the slums of both urban areas, there are high ownerships of televisions, fans, refrigerators and rice cookers (Table 13).

Table 13: Household ownership of electrical appliances in slum communities in Bangkok and Khon Kaen (%)

Appliance type	Bangkok- 2002 Survey <sup>1</sup>	Bangkok- 2007 Survey <sup>2</sup>	Khon Kaen- 2007 Survey <sup>3</sup>
Television	100	100	98
Refrigerator	96	99	89
Washing machine	65	N.A.	59
Air-conditioning unit	15	N.A.	25
Electric water heater	12	N.A.	26
Rice cooker	N.A.	90	97
Fans	N.A.	90	100

**Source:** <sup>1</sup>Pornchokchai (2003), <sup>2</sup> Martin et al., 2007 <sup>3</sup> and Field Survey, 2007

The limited household survey under this study shows that most of the households in slum areas have access to electricity. The households below the poverty line are spending higher percentage of their income on electricity than the average slum households (Table 14) (Martin et. al, 2007). Table 15 also shows the perception of slum households on electricity tariff. It is important to highlight the fact that several households in slums in Bangkok report difficulty to pay for their monthly electricity bill.

Table 14: Electricity expenditures in slum area of Khon Kaen

Items	Khon Kaen <sup>1</sup>		Bangkok <sup>2</sup>	
	Surveyed households	Surveyed households with income below poverty line	Surveyed households	Surveyed households with income below poverty line
Average Monthly Electricity Expenditure of Households (Baht)	697	363	856	728
Share in the total income (%)	12.82	15.69	7.1	11.5

Source: <sup>1</sup>Field Survey, 2007. <sup>2</sup>Martin et al., 2007

Less number of the surveyed households in Khon Kaen feel the electricity price to be expensive comparing with Bangkok. In Bangkok 77% of the households have expressed the electricity bill as expensive as compared to 61% in Khon Kaen (Table 15).

Table 15: Perceptions on electricity tariff, reliability of supply and difficulties to pay among surveyed households (% of households) in Bangkok and Khon Kaen

	Electricity Tariff					Reliability of supply			Difficulty to pay
	Expensive	Cheap	No Opinion	Increasing	Decreasing	Reliable	Not Reliable	No Opinion	
Bangkok	77	22	1	100	0	73	21	6	22
Khon kaen	61	39	-	85	15	96	4	-	0

Source: <sup>1</sup>Martin et al., 2007. <sup>2</sup>Field Survey, 2007

## 6.4. Cost of Energy in the Residential Sector in Slum Areas of Khon Kaen and Bangkok

Table 16 shows that share of slum household energy expenditure in total income in Khon Kaen is quite higher than that in Bangkok. The average total monthly energy expenditure amounted to 25.93% of the average income of the surveyed households in Khon Kaen and 16.5% in Bangkok. In the case of slum households below the poverty line, the share of energy expenditure in the total income was found to be even higher in both cities, i.e., 28.85% in Khon Kaen and 18.5% in Bangkok.

Table 16: Total energy expenditures versus income in surveyed households in Khon Kaen and Bangkok

	Share of energy expenditure in total income (%)	Share of energy expenditure in total income for the poor (%)
Khon Kaen <sup>1</sup>	25.93	28.85
Bangkok <sup>2</sup>	16.50	18.50

Source: <sup>1</sup>Field Survey, 2007. <sup>2</sup>Martin et al., 2007

#### 6.4.1 Comparison of Energy for Cooking

Slum households in Khon Kaen households spend higher share of their income on cooking fuel than their Bangkok counterparts. The slum households below the poverty line are found to spend less money than the average slum households (Table 17). However, the poorer households spend higher percentage of their income on cooking energy than the average slum households in both cities.

Table 17: Expenditures for cooking fuels in slum in Khon Kaen and Bangkok

Particulars	Khon Kean <sup>1</sup>		Bangkok <sup>2</sup>	
	Surveyed Households	Surveyed Households with income below poverty line	Surveyed Households	Surveyed Households with income below poverty line
Average Monthly Expenditure for cooking(Baht)	390.00	206.67	163.0	156.0
Share in the total income (%)	4.08	5.19	1.4	2.5

Source: <sup>1</sup>Field Survey, 2007. <sup>2</sup>Martin et al., 2007.

#### 6.4.2 Energy for Private Transportation

The share of private transportation related energy expenditure is higher in Khon Kaen than in Bangkok (Table 18). In the case, the households below the poverty line, in both Khon Kaen and Bangkok, spend, on the average, smaller percentage of their income on private transport related energy than the average slum households.

Table 18: Expenditure on fuels for private transportation in slum areas of Khon Kaen

Particulars	Khon Kaen <sup>1</sup>		Bangkok <sup>2</sup>	
	Surveyed Households	Surveyed Households with income below poverty line	Surveyed Households	Surveyed Households with income below poverty line
Average Monthly Transportation Expenditure (Baht)	1,067	305	980	290
Share in the total income (%)	9.3	7.7	8.1	4.5

Source: <sup>1</sup>Field Survey, 2007, <sup>2</sup>Martin et al., 2007

## 6.5 Household Energy Cost in Slum Areas of Khon Kaen and Bangkok

Table 19 shows that share of energy expenditure in total household income in Khon Kaen is quite higher than in Bangkok. The average total monthly energy expenditure amounted to 25.93% and 16.5% of the average income of the households under the study in Khon Kaen and Bangkok respectively. Similarly, the total share of energy expenditure in the total income for households below the poverty line was found to be even higher (28.85%) in Khon Kaen than in Bangkok (18.5%) which is mainly due to the high price paid for electricity.

Table 19: Total energy expenditures versus income in surveyed households in Khon Kaen and Bangkok

Areas	Share of energy expenditure in total income (%)	Share of energy expenditure in total income of the poor (%)
Khon Kaen <sup>1</sup>	25.93	28.85
Bangkok <sup>2</sup>	16.5	18.50

Source: <sup>1</sup>Field Survey, 2007. <sup>2</sup>Martin et al., 2007

A study shows that in Bangkok, the fraction of disposable income spent on fuel and electricity was 3.63% and 4.36% respectively for an average household, while the corresponding figure in the case of the poorest 20% was in the range of 5.05% - 5.76% (UN, 2007).

World Bank (2002) uses the benchmarks to measure affordability (in per cent of total household income/expenditure) to be 10-15% of income and similarly, WHO (2004) has set the benchmarks of 10%. On these basis, average households in urban slums both in Khon Kaen and Bangkok may be considered to the affordability.

## **7. Review of Existing Policies related to Slums and Energy Access**

In this chapter, we discuss some policies that are related to energy access and supportive of slum dwellers' quality of life.

### **7.1. Electricity Pricing Policy**

As we discussed in previous chapters, urban slum dwellers are vulnerable to pricing of electricity as their main energy expenditure is related with electricity. The Metropolitan Electricity Authority (MEA) provides reduced tariff for households consuming up to an average of 150 kWh per month over a period of three months; otherwise the households would face the normal tariff. This scheme is available only to those people who have a house registration. A study shows that electricity tariff has increased at a higher rate than average income for both poor and non-poor (Martin et al., 2007).

### **7.2. House Registration Policies**

House registration policy was introduced in 1956 in Thailand. At present, house registration document is necessary to get all types of government services for e.g., citizenship, access healthcare, banking services and electricity connection.

According to the Savant-Mohit (2004), urban poor in Thailand often negotiate with land owners for permission to settle on their land on a temporary basis for building temporary dwellings rather than occupying a plot of land illegally. They pay a nominal rent in verbal understanding to the land owners; sometimes middlemen get the land from the owners and rent it to the poor people. Yap (1992) mentioned that in some places, slum dwellers rent the land/house from a landowner and sublet it to another family (Savant-Mohit, 2004). This practice may lead to the higher level of electricity expenses in some slum houses as they have to get electricity connection from the neighbors and have to pay high tariff.

### **7.3. Infrastructure in slum areas**

The Thai government has been implementing several programmes for slum upgrading, e.g. re-blocking, reconstruction, land-sharing and relocation in slum areas (Guerra, 2004). Similarly, the government has encouraged private investors to provide low-cost housing for the targeted dwellers currently living in some squatter slums on the land owned by temples or by the Crown Property Bureau (Guerra, 2004).

### **7.4. Factors behind better energy access in urban slums in Thailand**

As discussed in chapters 4, 5 and 6, slum areas in urban Thailand have higher access to energy particularly electricity and cooking fuels, although they have to spend relatively high percentage of their income on energy. Compared to rural dwellers, urban slum dwellers have better access to modern energy. In the following sections, we discuss the factors behind better access to energy in urban slums.



#### ***7.4.1 Electricity access***

The majority of the households in Thailand is already electrified or has access to electricity. The high level of electrification is a result of the Thai government's successful rural electrification program (UN, 2007).

In the slum areas of Thailand, some dwellers do not have house registration nor they have direct connection to electricity supply from grid. To solve this problem in around 1995, the Thai government began to issue temporary registration numbers or "quasi household IDs" (Cook et al., 2005) to those households who do not have permanent registration number. These quasi household registrations allow their owners to apply for a legal electricity connection with the relevant utility besides other benefits provided by these quasi households IDs. However, in terms of electricity connection, the initial deposit for the electric meter is higher for the temporary registered households than for the fully registered households (Shrestha et al., 2007). This policy substantially reduced the number of illegal electricity connections (connection through a neighbor) in Thailand (Cook et al., 2005).

#### ***7.4.2 Comparatively better income level***

Living in slum areas does not necessarily imply that all slum dwellers are poor. Similarly, not all the poor are necessarily living in slum areas.

A study shows that 26% of slum dwellers had a monthly income of approximately Baht 2000 to 3000. Similarly, 47.5% of the slum households have permanent occupation; 15.73% have a short-term, daily, or seasonal job, and 34.06% have other occupations. Most of the slum people (48.9%) were farmers before coming to the Bangkok slum and very few of the urban poor were professional or technical workers (Guerra, 2004). However, the Bangkok poor earned more from wage and salaries than their counterparts elsewhere (Guerra, 2004).

#### ***7.4.3 Use of energy in income generation activities***

Some slum dwellers are found using energy for productive activities and earn income. Some are running small restaurants at their home while some are using their private vehicles e.g. motorcycles or cars as a taxi. The limited household survey conducted under this study shows a higher number of motorcycle ownership in the slums.

## 8. Conclusions

This study is focussed on urban poor's access to energy in Khon Kaen. The main conclusions of this study are as follows:

- High access to electricity: In Khon Kaen, almost all slum households have access to electricity supplied by PEA. But, in Bangkok, sixty eight percent have direct connection to MEA grid and 32 % through their neighbours.
- LPG for cooking in most of the households of slums: More than 80% of surveyed slum households used LPG for cooking and other fuels are also used for cooking.
- Ownership of motorcycles and cars in the slum areas is found to be relatively high. This is partly because slum dwellers use them also as taxi.
- Although the households below the poverty line in slum areas are spending less than the average slum households in absolute terms, but the energy expenditure share of the poor in the total income is higher.
- Slum dwellers in Khon Kaen spend less on energy for cooking, electricity and transportation compared to those living in Bangkok slums. But their energy expenditure share in total income is higher than that in Bangkok.
- Some slum households in Bangkok are getting electricity supply through their neighbors unlike the surveyed households in Khon Kaen, all of whom have directly connected to the PEA grid.
- It was originally assumed that the poor people in urban and peri urban areas are disadvantaged both in terms of the quantity and quality of energy services. But, the present study shows that most of the urban poor have access to modern energy.

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## Annexes

### Annex 1: Population Statistics Thailand

**Table 13.2: Population Statistics, Thailand<sup>1</sup>**

<b>Total area (km<sup>2</sup>)</b>	513,225
<b>Total population (million)</b>	
1980*	46.7
1995	59.4
2000	62.4
2003	63.9
2015*	66.3
<b>Population Density (persons/km<sup>2</sup>)</b>	
1995	116
2000	122
2003	123
<b>Population annual change (%)</b>	
1995	1.2
2000	1
2001–2015*	0.6
<b>Urban population as percentage of total population</b>	
1990	32.7
2000	38.1
2006	40
2006**	43
2015**	50
<b>Urban population % annual growth rate 1990–2003</b>	5.3
<b>Population (%) below the national poverty line (2002)</b>	
Total	9.8
Urban	4.0
Rural	12.6

km<sup>2</sup> = square kilometers.

Unless otherwise noted, the source is *Key Indicators 2004*. Manila: Asian Development Bank.

\* Source: *2003 World Development Indicators*. Washington, DC: World Bank.

\*\* Source: PSUT Project. *The Future of Thai Urbanization: New Drivers, New Patterns*.

## Annex 2: MEA new users: Connection Rate

Service charge for new user in case of Low Voltage system on overhead grid.

Electrical Size (Ampere)	Elec. Meter		New user service charge (Baht)						Total
	Ampere	Phase number	Elec. Check Charge	Elec. Connecting Charge	Transformer	Electrical Device Construction	Services charge	security money	
Less than 10	5	1	100	480	-	1,500	2,080	300	2,380
11 - 30	15	1	250	1,000	300	3,000	4,550	2,000	6,550
31 - 75	30	1	400	1,750	1,500	6,000	9,650	4,000	13,650
76 - 100	50	1	550	2,500	3,150	9,000	15,200	8,000	23,200
Less than 30	15	3	750	3,700	1,350	6,000	11,800	6,000	17,800
31 - 75	30	3	1,200	8,600	5,100	12,000	26,900	12,000	38,900
76 - 100	50	3	1,650	9,000	15,000	16,000	41,650	24,000	65,650
101 - 200	200	3	2,950	9,300	34,800	30,000	77,050	48,000	125,050
201 - 400	400	3	5,650	9,600	74,100	42,300	131,650	96,000	227,650

Source [http://www.mea.or.th/menu2\\_2\\_41.htm](http://www.mea.or.th/menu2_2_41.htm) (19.02.2007)



Annex 3: MEA electricity tariff for residential customers

Electricity Consumption	Year					
	1991-1997		1997-2000		2000-Present	
	Service Charge	Unit Price	Service Charge	Unit Price	Service Charge	Unit Price
Unit	Baht/Month	Baht / Unit	Baht/Month	Baht / Unit	Baht/Month	Baht / Unit
1 - 5	89	0	85.21	0	40.9	1.8047
6 - 15		0		0		1.8047
16 - 25		0		0		1.8047
26 - 35		0		0		1.8047
36 - 100		1.14		1.1236		2.1800
101 - 150		1.14		1.1236		2.2734
151 - 400		2.22		2.1329		2.7781
>= 401		2.53		2.4226		2.9780

Annex 4: MEA electricity tariff for residential customers (reduced tariff)

Electricity Consumption	Year					
	1991-1997		1997-2000		2000-Present	
	Service Charge	Unit Price	Service Charge	Unit Price	Service Charge	Unit Price
Unit	Baht/Month	Baht / Unit	Baht/Month	Baht / Unit	Baht/Month	Baht / Unit
1 - 5	5	0	4.96	0	8.19	0
6 - 15		0.7		0.7124		1.3576
16 - 25		0.9		0.8993		1.5445
26 - 35		1.17		1.1516		1.7968
36 - 100		1.58		1.5348		2.1800
101 - 150		1.68		1.6282		2.2734
151 - 400		2.22		2.1329		2.7781
>= 401		2.53		2.4226		2.9780

Annex 5: Wholesale price of LPG

Date	Wholesale price of LPG without Value Added Tax (Baht/kg)
15-Nov-01	9.7532
1-Mar-02	9.6532
30-Oct-02	10.5878
5-Dec-03	11.5223
7-May-04	12.4569