

Energy Profile and Environmental Consequence of Families in Specific Urban Area of SURI Municipality (Ward No – 02) Birbhum, West Bengal, India

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ABSTRACT

Globally buildings are responsible approximately 40% of the total world annual energy consumption. Most of this energy is for the provision of lighting, heating, and cooling and airconditioning. Increasing awareness of the environmental impact of Co₂ and NO_x emissions and CFC triggered renewed interest in environmentally friendly cooling, and heating technologies.

One way of reducing building energy consumption is to design building, which is more economical in their use of energy for heating, lighting, cooling, ventilations and hot water supply. Passive measure, particularly natural or hybrid ventilation rather than air conditioning can dramatically reduced primary energy consumption. However exploitation of renewable energy in buildings and agricultural greenhouses can also significantly contribute towards reducing dependency on fossil fuel. This paper investigate the range of socio economic aspects that influence energy utilization pattern and Co₂ emission in the study area also factors have been analyzed by principle component analysis to find factors affecting energy efficiency. The energy consumption pattern is studied and energy efficiency is estimated in terms of Specific Energy Consumption. Further energy consumption potential is estimate. The environmental impact in term of Co₂ emission is estimated and also wide ranges of energy saving options are identified. The factors influencing the energy efficiency and energy consumption in the study area is also studied. This article discusses the potential for search integrated systems in the stationary and portable power market in response to the critical need for a cleaner energy technology. Anticipated patterns of future energy use and consequent environmental impacts acid precipitation, Ozone depletion and the Green house effect or Global warming] are comprehensively discussed in this paper. Throughout the theme several issues relating to renewable energies environment and sustainable development are examined from both current and future perspectives.

Keywords: Energy, Energy efficiency, Specific energy consumption, Sustainable development

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I. INTRODUCTION

Degradation of the natural environment has become the subject of increasingly intense research over recent decades. This is just as true in the social sciences as in the natural, biological and physical sciences. The social sciences have been particularly concerned with the consequences of social organization and social actions on levels of environment degradation. Human consumption of natural resources is generally identified as the key link between human behavior and degradation of the natural environment (Stern et al. 1997). Though social research has primarily focused on the total volume of human consumption, classical sociology points toward the importance of transitions in the nature of consumption as a fundamental change in the way people relate to their environment (Foster 1999). In this study we investigate a key transition in the total environmental footprint of human consumption (York, Rosa and Dietz 2003), the transition away from biomass fuel towards more highly processes alternative energy source. Firewood gathered from forested commons is an important source of domestic energy in rural areas of many poor countries (Cecelski, Dunkerley and Ramsay 1979; Heltberg, Arndt and Sekher 2000). It has been estimated that more than 2.4 billion people really directly on

traditional biomass fuels for their cooking and heating, and in poor countries biomass use represents over half of residential energy consumption (International Energy Agency 2005). Demands for fuel wood by subsistence agriculture households may be the leading cause of world deforestation (Amacher, Hyde and Joshee 1993; Amacher, Hyde and Kanel 1996). According to recent data, the global rate of deforestation continues to be alarmingly high - about 13 million hectares per year (Food and Agriculture Organization of the United Nations 2005). In recent decades deforestation has come to be perceived as a global problem, because of the perception that the earth's resources are reaching the limits for supporting the world's population and economic systems (Schmink 1994). Deforestation has created a situation of fuel wood scarcity to the point that an impending "fuel wood crisis" looms in many settings (Deweese 1989; Heltberg et al. 2000).

In addition to the scarcity of fuelwood as a crisis, deforestation has numerous other harmful consequences such as loss of biodiversity and soil erosion (Heltberg et al. 2000; Palloni 1994). Also, because women are the main gatherers of fuel wood, the depletion of forests forces women to spend more time looking for wood to gather and search farther from their homes, lengthening their working day (Agarwal 1994). Finally deforestation exacerbates conditions that could produce global warming, such as the release of carbon dioxide into the atmosphere (Heltberg et al. 2000; Palloni 1994). Therefore the transition from fuelwood to alternative sources of energy is a key transition in how humans effect the environment. Substitution of fuelwood with alternative fuels can reduce pressure on Natural forests. This is because alternative sources of rural domestic energy (such as crop residues, animal dung, wood from trees on the farm, biogas, kerosene, sun and wind power) do not cause forest degradation (Heltberg et al. 2000)

METHODOLOGY

Detailed review of the literature followed by identification of research gaps and subsequent discussion with experts in the field of energy management facilitated the preparation of questionnaire for the study. The primary data required for the study is gathered through canvassing structured questionnaire, administered personally. Basically a survey must serve to functions: it should translate research objectives into particular questions the respondent can answer, and it should encourage the respondent to help with the survey and to provide the information correctly. The questionnaire covered different aspects of household energy consumptions, energy consuming appliances and the attitude and behaviour of individual towards energy, etc. Nevertheless, the questionnaire has sections covering following aspects:

- General Information of the Facility
- Demography and Economic Background
- Different Types of Energy Consuming Devices Used
- Variables that Influence Energy Efficiency and Energy Consumption

A survey is conducted in various facilities in different locations of Suri city in Birbhum District. Socio- Economic and energy data as collected from randomly selected samples. A sample of 50 household and buildings like hut, brick house, market, hotels, shop etc is chosen for the pilot study. The questions specific to energy in the survey on primary source of energy for lighting, cooling and cooking etc. The other information required for achieving the stated objectives includes; annual energy requirements [for lighting and cooking etc] Co₂ emission factors and environmental factors. The data for estimating these parameters has been obtained from catalogues, journal papers and equipment manufactures.

SCENARIO IN INDIA

India is one of the countries where the present level of energy consumption, by world standards, is very low. The estimated annual energy consumption in India is about 330 Million Tones Oil Equivalent (MTOE) for the year 2004. Accordingly, the per capita consumption of Energy is about 305 Kilogram Oil Equivalent (KGOE). As compared to this, the energy consumption in some of the countries is of the order of over 4050 for Japan, over 4275 for South Korea, about 1200 China, about 7850 for USA, about 4670 for OECD countries and the world average is about 1690.

In so far as electricity consumption is concerned, India has reached a level of about 600-kilowatt hour (kwh) per head per year. The comparable figures for Japan are about 7,800, for South Korea about 7,000, for China about 1380, for USA about 13,000, for OECD countries about 8050 and world average are about 2430. Thus, both in terms of per capita energy consumption and in terms of per capita electricity consumption, India is far behind many countries, and as a matter of fact, behind even the world average. Therefore, to improve the standards of living of Indian people and to let them enjoy the benefit of economic development, it is imperative that both energy consumption and electricity consumption level is enhanced. India is targeting a growth rate of 9-10%, having already reached a level of almost 8%. To sustain the double-digit growth rate for next 10-15 years, it would be essential that the level of energy availability and consumption, and electricity consumption in particular, is enhanced substantially.

Electric energy occupies the top grade in the energy hierarchy. It finds innumerable uses in home, industry, agriculture and in transport. The facts that electricity can be transported practically instantaneously, is almost pollution free at the consumer level and its use can be controlled very easily, make it very attractive as compared to other forms of energy. The per capita consumption in any country is an index of the standard of living of the people in that country. Electric energy demand has been rapidly increasing in India since 1947. The increase was very sharp in the seventies. This is attributed to greater industrialization and large scale use of electric energy for agricultural purpose. However, the per capita consumption in India is ridiculously low as compared to that in developed countries. Table shows the installed capacity and per capita consumption in India.

Table : 1.1-Electric Energy Growth In India

YEAR	Installed Capacity	Per-capita consumption(kwh)
1950	1.71	15.6
1961	4.65	37.9
1969	12.96	77.9
1979	26.68	130.9
1990	63.63	238.0
1997	85.79	334.3
2005	118.426	612.5

Energy demand :

The energy demand is likely to increase at the rate of about 7.5% in the future. Table gives the future energy demand in different sectors. The total energy requirements at the bus bars will be about 20% higher than given in table 3 because of the losses in transmission and distribution system. It is seen that the maximum increase in demand is likely to occur in residential sector. This is due to increase in population, greater need for housing and rural electrification. The demand for agriculture is likely to reach saturation.

Table: 1.2-Forecast of electrical energy demand (kwh)

Year	Industrial	Residential	Agriculture	Commercial	Other	Total
2007-08	264	216	86	36.7	42.3	645
2011-12	396	346	117	55	61	975
2016	534	469	159	74	82	1318

Energy is an essential basic need for not only human being, but also for national economic and social development, However, Production of energy is found to exhibit both local and global environmental impacts, if not appropriate technology and management.

Emissions Profile

In 2005 India ranked fifth on the World

Resources Institute's country ranking of total GHG emissions. However, contributors such as population growth and a modernization of lifestyle mean that India's rank is climbing. Some sources now put India as third on the list of the world's top emitters.

Electrically and heat generation are the most significant sources of CO2 emissions, as illustrated in the graph below, with major proportion also coming from the manufacturing and construction sectors.

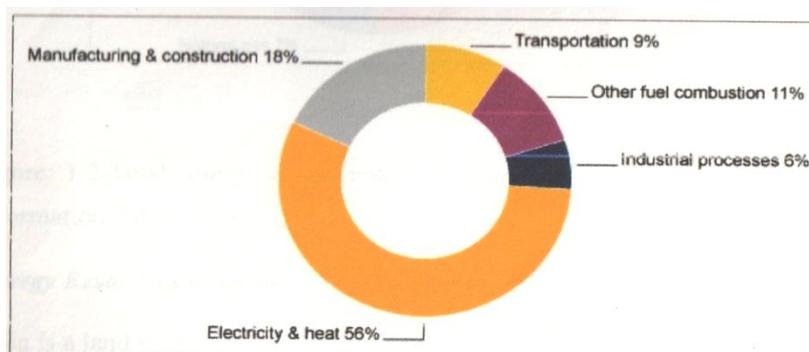


Figure : 11-CO2 Emissions by Sectors in 2008(excludes land us change). Source : World Resorces Institute, Clim,ate Analysis Indicators Tools <https://cait.wri.org/>

Energy Profile

Fossil fuel such as oil and coal dominate India's primary energy usage. With the discovery of new gas deposits, it is expected that India's use of natural gas will grow in the coming years. Combustible renewable and waste constitute almost one quarter of energy use, including traditional biomass sources such as wood and animal waste. Other sources of renewable energy include wind, solar and hydroelectricity.

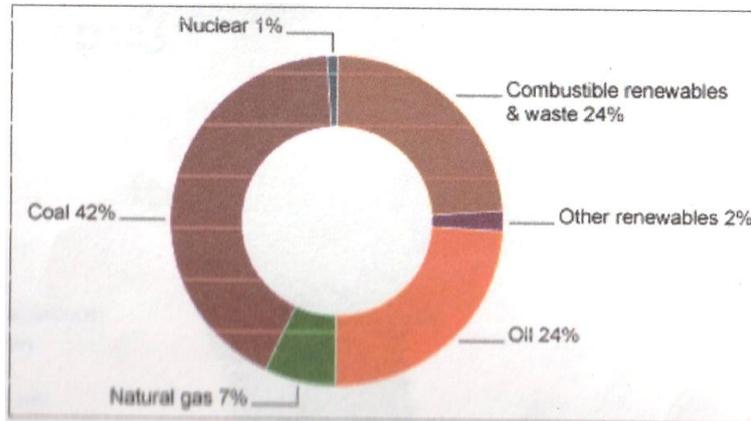
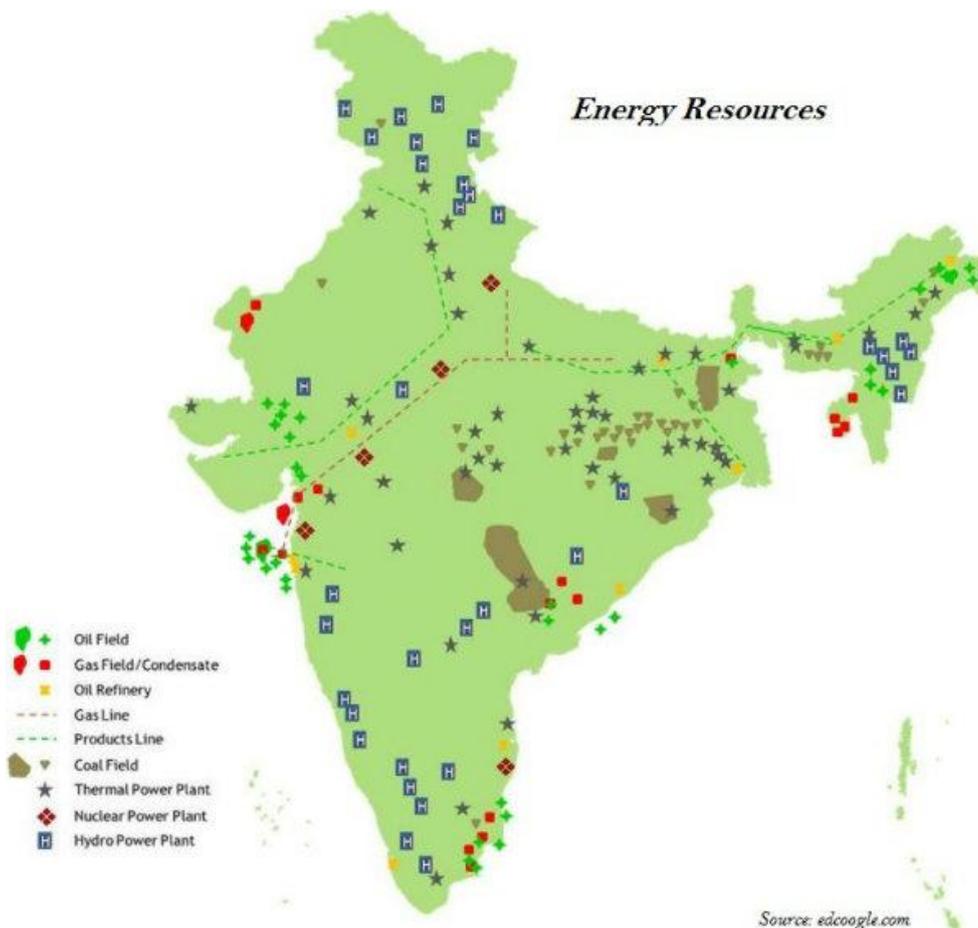


Figure : 1.2- Total Energy Consumption by type in 2008. Source : US Energy Information Administration.

Energy Resources in India

India is a land with vast natural resources. It has plethora of cal mines, water bodies, areas with strong winds and places rich in minerals. These enable the country to generate its own energy. India is capable of meeting 90% of its own energy needs. This is possible due to the availability of various renewable and non-renewable energy resources.



The map shows the Energy production in India

Non-renewable energy resources

- **Coal :**

Coal constitutes the most dominant constituent of the energy sector. In the year 2005-06, the coal production was over 370 million tones. Power Sector consumes almost 80% of coal that is produced. India has large coal reserves of the order of 200 Billion Tones, most of these are high ash content coal in the calorific valuable range of 3000 kilo calorie per kilogram to 4,500 kilo calorie per kilogram and ash content in the range of 30-45%. Using the high ash coal for the power sector is a major challenge, from the point of view of achieving high level of efficiency of consumption, and more particularly, from the point of view of achieving high level of efficiency of consumption and more particularly, for the point of view of environmental management due to fly ash emissions.

- **Petrol :**

Oil constitutes over 35 % of the primary energy consumption in India. It is expected that this would rise both in terms of absolute amount and proportion. The demand projection is placed at about 200 million metric tones by the end of the 11th Five Year plan i.e. by 2011-12 and over 250 million metric tones by 2024-25. The present level of demand is about 120 million metric tone by 2024-25. The present level of demand is about 120 million metric tone of oil equivalent. At present the upstream regulation is by the Director General of Hydro Carbons. They concentrate on the technical aspects and pricing is not under their domain. However, under the NELP Contract, the private sector would need to have the price approved by the Government and to that extent, Director General, Hydrocarbons would have a role.

- **Natural Gas :**

Natural gas constitutes about 9% in the India's energy profile, as compared to about 25% world average. About 45% of natural gas is consumed by power sector and about 40% by the fertilizer sector. The balance 15% goes for various other consumption. At present about 65 million cubic meters of gas per day is being consumed and it has the potential for increase.

Renewable energy resources in India

- **Bio-fuels-** Bio-diesel is one of the major requirements in the world. India has abundant bio-mass to utilize. Its biomass reserves have not been properly harnessed. The Indian Government is making efforts to exploit the biomass reserves of the country.

- **Hydroelectric power** - India has a large number of water bodies in the form of river and oceans. The availability of these water resources makes it easy to generate hydroelectricity. At present the country has a capability of producing hydro energy of about 15 million MW.

- **Combustible wastes-** India is converting its combustible wastes into powerful energy resources.

- **Wind Power** - India is developing its wind energy plants. With windmills installed in as many as 13 states, India produces electric energy of about 45,000 MW.

- **Solar energy-** India is steadily using solar power to replace electrical energy. But there is still much room for improvement. The cost of solar equipments is still high in the country.

- **Nuclear energy-** India is trying to generate nuclear power for civil use. The recent Indo-US nuclear pact has been a step in that direction. India is trying to develop an annual 20 GW of nuclear power generation capability by 2020. It occupies the ninth place in the number of countries having active nuclear power reactors.

SIGNIFICANCE OF THE STUDY

Access to modern energy is one of the most basic requirements for development. In rural and urban areas of India, there are a large number of people who do not have access to LPG and depend on traditional biomass such as wood, crop, and dung for cooking. In addition, energy has numerous and complex links with poverty reduction. Therefore, it is important to estimate the impacts of energy access improvement on socio-economic situation in these areas quantitatively. This study focuses on socio-economic and environmental impacts of energy utilization methods adapted by the rural, semi-urban or urban household. We tried to analyze the links between energy, income, and health hazard. We examine the impact of community context on households' use of fuels other than wood for cooking. Our theoretical framework emphasizes the importance of local community contextual characteristics as determinates of the transition from use of fuel wood to use of alternative fuels. We use longitudinal multilevel data on household fuel wood to use of alternative fuels. We use longitudinal multilevel data on household fuel choice and community context from the West Bengal to provide empirical estimates of our study. The results of this investigation reveal that increased exposure to nonfamily organizations in the local community increases the use of alternative fuels. These findings should motivate greater in co-operation of social changes and sociological ideas into research on environmental consumption.

II. REVIEW OF RELATED LITERATURE

➤ Electricity Consumption and Economic Growth

At the international level it is well established that there is a high correlation between energy consumption and economic growth, although the direction of causality is unclear. Countries with high levels of income also used high levels of energy. For instance, for each person in the United States energy consumption is 10 times the amount that is used in India. Energy consumption also increases with economic growth as well. For India economic growth has been quite high in recent years. This trend has been mirrored within the energy sector, and this is especially true for electricity consumption. Between 2000 and 2007 India's economy grew nearly 77 percent and this was matched by a 60 percent increase in electricity consumption (Figure 2.1).

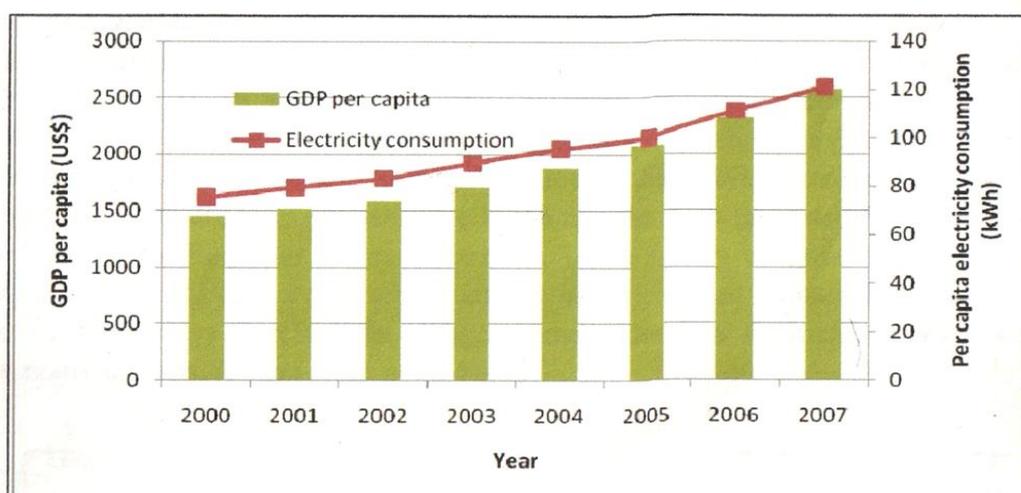


Figure 2.1 : -Trends in economic growth and electricity consumption in India

➤ Energy is required for every aspect of our daily life. At present, commercial energy consumption makes up about 65% of the total energy consumed in India. This includes coal with the largest share of 55%, followed by oil at 31%, natural gas at 11% and hydro energy at 3%. Non-commercial energy sources consisting of firewood, cow dung and agriculture wastes account for over 30% of the total energy consumption. The critical feature of India's energy sector and linkages to economy is the import dependence on crude and petroleum products. Import bill is likely to grow to more than 100% in the near future because of population explosion and improved living standard in the country. Being a tropical country India has unlimited potential for producing renewable energy sources. These sources of energy can play an important role in the sustainable development by providing basic energy needs of rural and remote areas. (Sweta Sing, et al, 2010)

➤ Energy is important both for economic development, but it also plays a major role in improving conditions at the household level. The benefits of modern energy both for improved economic growth and for improving for achieving the Millennium Development Goals (MDGs) (World Bank 1996). Although energy is not on of the MDGs, the MDG summit consider it essential for achieving most of the goals. It is generally recognized that energy issues must be dealt with in order to alleviate poverty in the developing world (DFID 2002; Sachs 2005).

➤ A survey of energy consumption pattern has been carried out in different sector domestic, agricultural, transport, rural industries and miscellaneous uses in a cluster of 3 villages, district Ballia, Uttar Pradesh India during 2008. The study investigated the current energy status, choice of energy options and potential of renewable energy systems for creating sustainable livelihoods in rural areas. Data on energy inputs and outputs were collected and analyzed for the cooking devices, lighting, cooking fuels and their consumption, energy consumption in other household devices such as electric fan, coal, electric iron, TV, etc from 100% household survey. The study reveals that commercial fuel includes petrol, diesel, kerosene and electricity. Kerosene for which the supply is 3lit/card holder per month is amounting to 57.6 kl/year through the public distribution system. Diesel, petrol and LPG are scarcely available in the cluster. Two hamlets of Beswan village and two hamlets of Baijalpur are un-electrified. There is very irregular supply of electricity, average 4 hours/day. Poles which supply electricity are damaged during stormy and strong windy days therefore the villages come under dark for many days and sometimes for many months. (Sweta sing, et al, 2010)

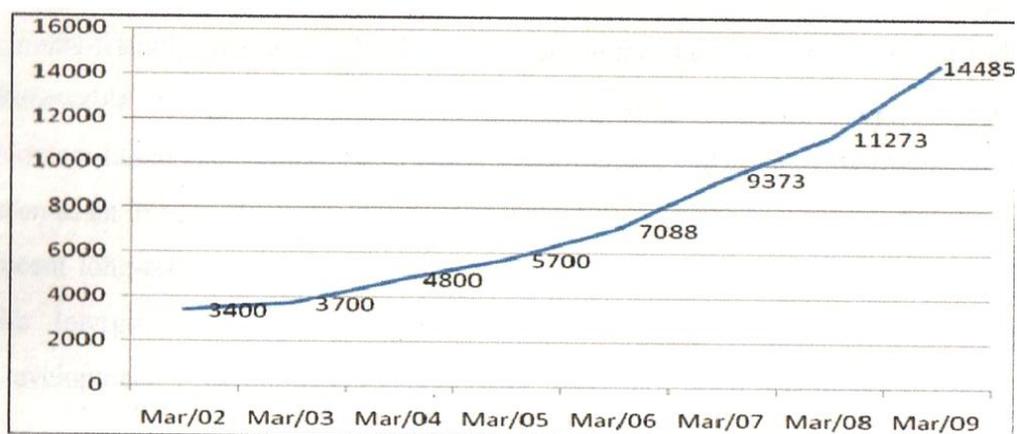


Figure : 2.2 - Growth in the electricity generation(MW) capacity from renewable during 2002-2009.

➤ Degradation of the natural environment has become the subject of increasingly intense research over recent decades. This is just as true in the social sciences as in the natural, biological and physical sciences. The social sciences have been particularly concerned with the consequences of social organization and social actions on levels of environmental degradation. Human consumption of natural resources is generally identified as the key link between human behaviour and degradation of the natural environment (Stern et al. 1997).

➤ The core set of energy indicators, now called Energy Indicators for Sustainable Development (ESID), has been designed to provide information on current energy related trends in a format that aids decision making at the national level in order to help countries assess effective energy policies for action on sustainable development. The indicators can help to guide the implementation of actions urged at the WSSD, namely, (I) to integrate energy into socioeconomic programmes, (II) to combine more renewable energy, energy efficiency and advanced energy technologies to meet the growing need for energy services, (III) to increase the share of renewable energy options, (iv) to reduce the flaring and venting of gas, (v) to establish domestic programmes on energy efficiency, (vi) to improve the function and transparency of information in energy markets, (vii) to reduce market distortions and (viii) to assist developing countries in their domestic efforts to provide energy services to all sectors of their populations. The indicators should make it easier to see which programmes are necessary for sustainable development. This should identify what energy statistics need to be collected as well as the necessary scope of regional and national databases. (Energy indicators For sustainable development : Guidelines and Methodologies)

➤ With the recent negotiations surrounding the Kyoto Protocol and the growing awareness of the limits of traditional approaches to energy, the urgent need to develop more climate-friendly energy technologies is becoming keenly appreciated worldwide. Renewable energy technologies are receiving heightened attention, and modern biomass-based energy--the use of wood, crop residues and dung as fuel--is increasingly seen as an important component of the transition to a low-carbon energy future. Several recent long-range sustainable energy studies, including the 2nd Assessment Report of the Intergovernmental Panel on climate change (IPCC), the United Nations Development Programme Energy After Rio and Shell Petroleum's Energy for development, have all suggested that large-scale modern biomass might contribute to global energy supplies in the next century to a degree comparable to the use of fossil fuels today. (Barnes, Douglas F.; Floor, Willem)

III. AIMS & OBJECTIVES

- To analyze the energy use scenario of our area of interest.
- To understand the rate of fossil fuel consumption of the area.
- To realize sources of pollution of the area.
- To study the socio economic condition of the population\
- To investigate the health hazard of the local people.
- To study energy consumption in terms of electricity use
- To spread awareness among local people about the pollution free renewable energy sources for sustainable development.

IV. STUDY AREA

The study has been done in the Suri Municipality area, Birbhum West Bengal.

The Exact Location is :

Ward No.-2, (Samannya Pally, Anandapur, Postal Quater, Rabindra Pally)

Block-Suri-I
P.O-Suri, District-Birbhum, Pin-731101 West Bengal.



Fig: 4.1-Map of India

West Bengal at a Glance



Fig: 4.2-Map of West Bengal

District Map :

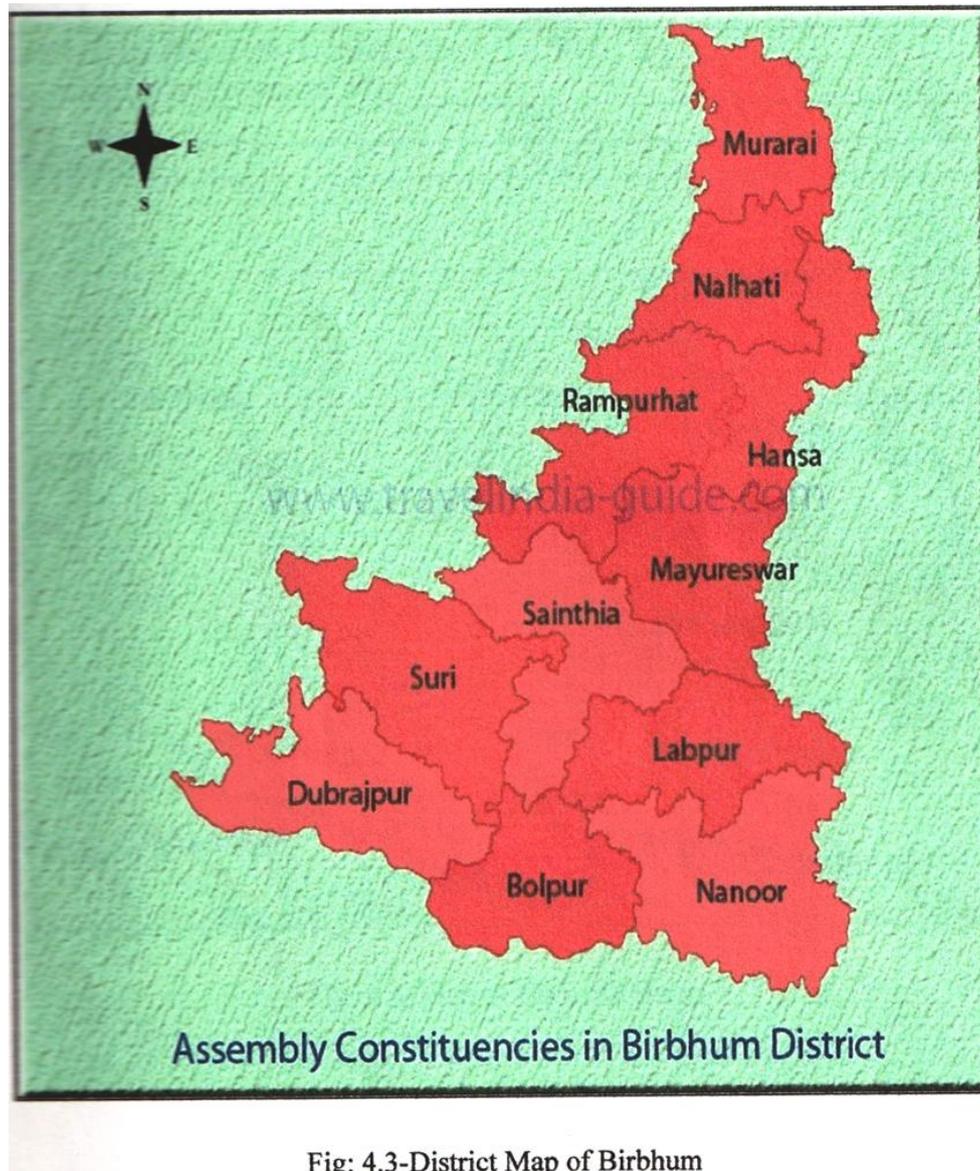


Fig: 4.3-District Map of Birbhum

Fig: 4.3 -District Map of Birbhum

Study Area Profile

1	Proposed project area	Suri Municipality
2	District	Birbhum
3	Total population of the Municipality according to the Census of 2011	67812
4	Total male	34599
5	Total female	33213



Fig: 4.4-Map of Suri, Birbhum

Fig: 4.4-Map of Suri, Birbhum



❖ **Study Group**

The study has been done over 60 families residing in the study area. The families were chosen randomly. A total of 354 people have been considered in this particular study.

❖ **Analysis of collected Data**

1. Primary Data, obtained directly from question answer part of the questionnaire were primarily analyzed generate secondary data.
2. Secondary Data, obtained after grouping, regrouping and analysis of primary data were further analyzed statically. Pictorial presentation of the data in the form of Pie Chart and Bar Diagram has been given to consolidate the analysis method.

V. RESULT & DISCUSSION

The survey was done over 60 families and 354 people. From the primary data obtained in the questionnaire survey we calculated secondary data like literacy rate, percentage of people suffering from respiratory diseases etc.

❖ **Table : 5.1-Population Analysis**

Number of Families	60
Numebr of people	354
Number of Male	195
Number of Female	159

Percentage of male (55%) ; Percentage of female (45%)

❖ **Table: 5.2- Type of Family**

Percentage of Nuclear Family	Parentage of Joint Family	Total Family Surveyed
80	20	60

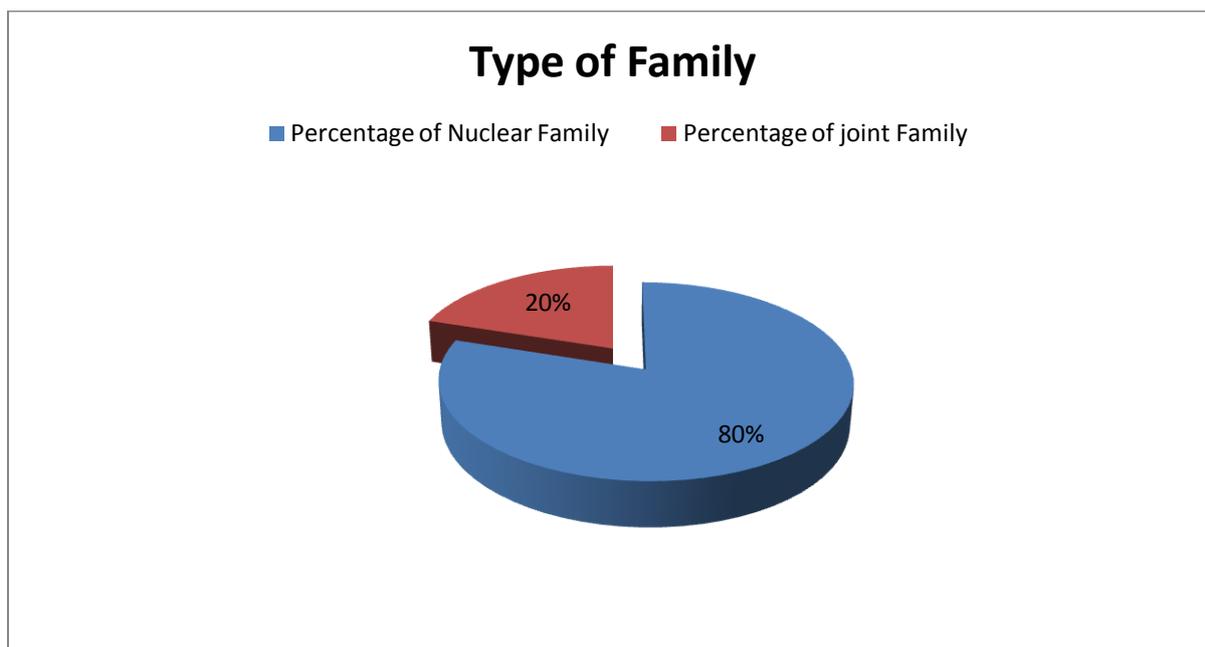


Fig: 5.1-Type of Family

❖ **Table : 5.3-Literacy Rate**

	Literate	Illiterate	Literacy Rate
Male	190	5	97%
Female	129	30	81%
Total	319	35	90%

It is evident from the table that literacy percentage was quite good which around 90% Literacy rate was distinctly different between male (97%) and the female(81%).

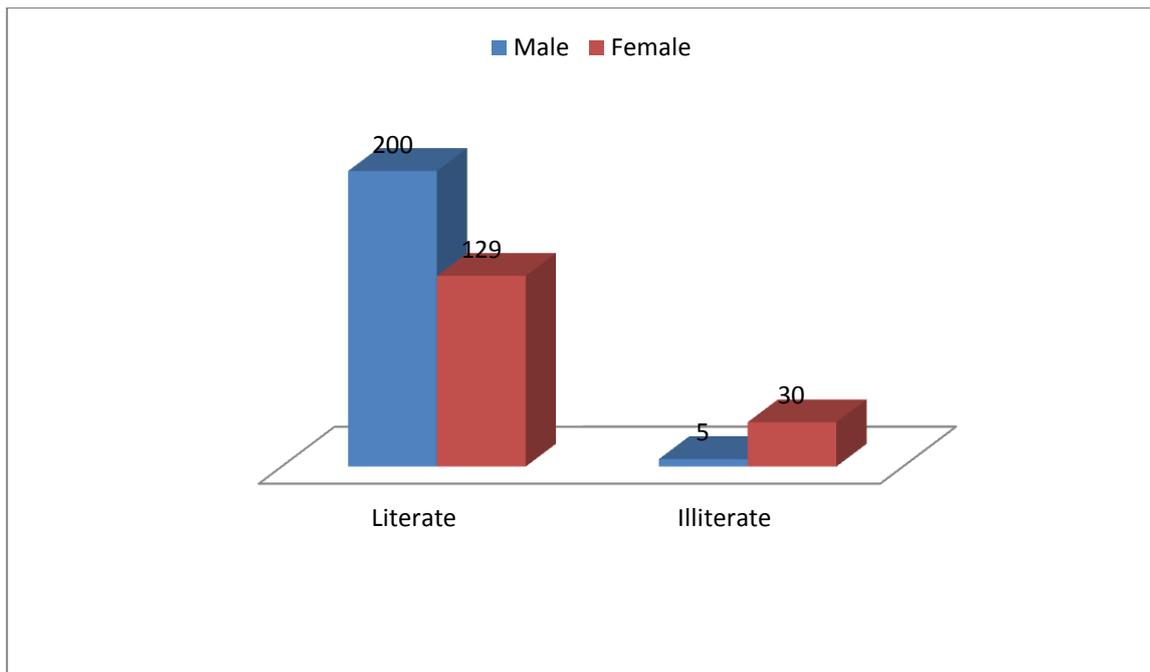


Fig: 5.2 -Literacy Rate

Educational Status : Most of the literate people, especially in the female group discontinued their education after X or XII. Most of people completed their graduation or post-graduation level of education.Hoe ever, significant fractions of population have never gone to a High School.

Table-5.4-Educational Status

Education Level	Percentage of People	Total family surveyed
Post graduation	15	60
Graduation	25	
Higher Secondary	30	
Secondary	15	
Below class X	10	
Below Class V	5	

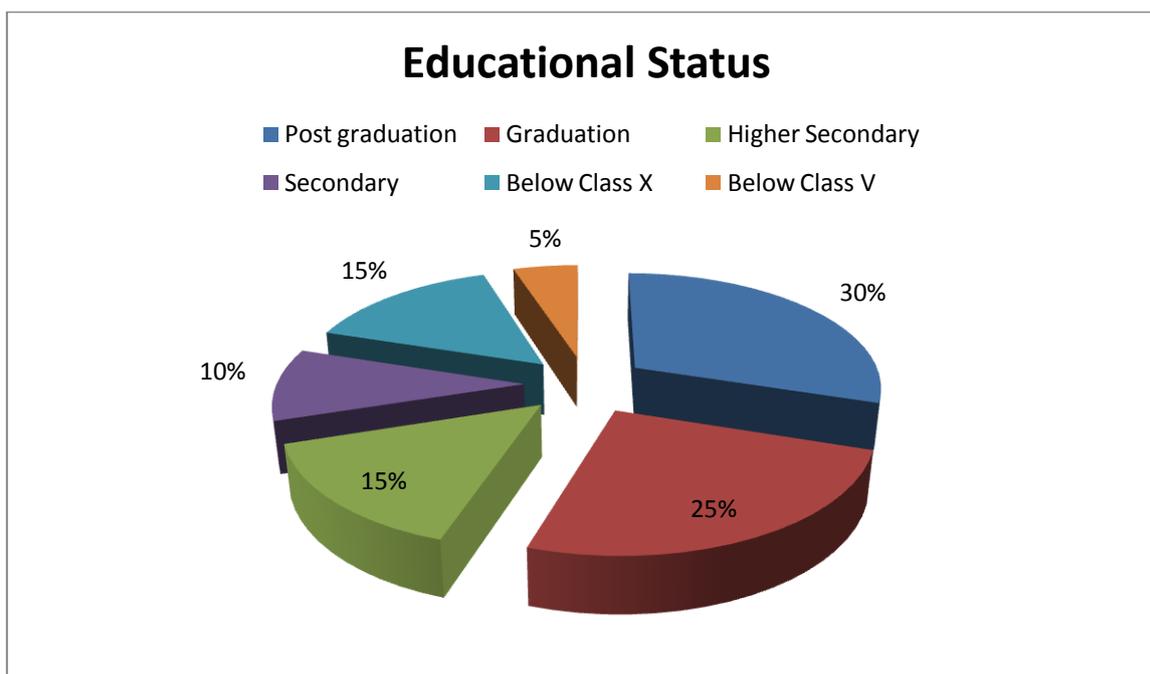


Fig : 5.3-Educational Status

❖ **Age-Group Analysis**

we have divided the whole population in 5 age-groups.

1. Group A contains children below 10 years of age,
2. Group B contains teenagers from 10-18 year of age,
3. Group C contains young people from 18-35 years of age,
4. Group D has people of age group 35-55 years and
5. Group E contains senior people above 55 years of age.

Table : 5.5-Demographical distribution of people in those age groups is shown below

	A(<10)	B(10-18)	C (18-35)	D(35-55)	E(>55)
Male	34	42	50	52	39
Female	21	28	28	33	27
Total	55	70	78	85	66

This distribution can be shown in a pie chart as :

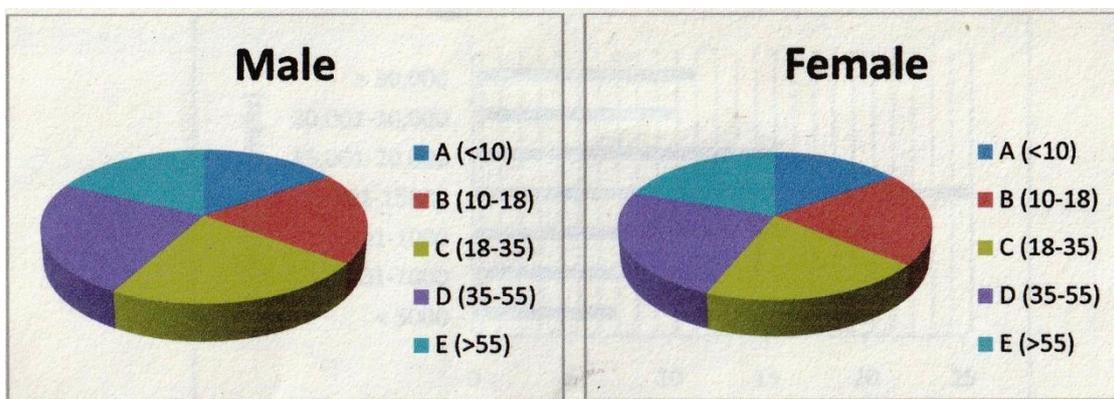


Fig : 5.4 -Age group distribution in Male

Fig: 5.5-Age group distribution in female

❖ **Socio Economic Profile**

The families in our study have mostly two earning members with a very little exception. The average income of the families in our study area is around Rs. 10,000 per month. Most of the families reported their earning in between 7000-15000 rupees per month. The distribution is presented in the following table.

Table: 5.6-Monthly income

Monthly Income (Rupees)	Percentage of families
<5000	7
50001-7000	12
7001-10000	20
10001-15000	25
15001-20000	15
20001-30,000	10
>30,000	11

The data can be analyzed and presented in the following way. The diagram clearly shows that the distribution of the earning groups :

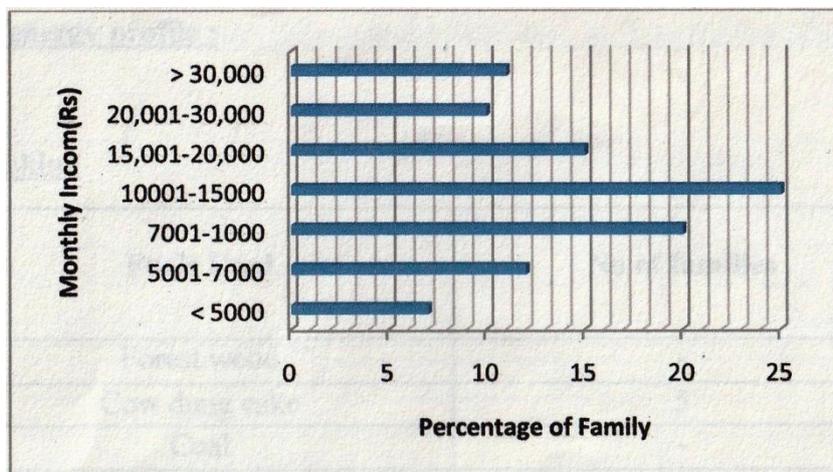


Fig : 5.6-Monthly Income

❖ **Occupation/ Source of Income:**

Source of Income	Percentage of families
Contract Labour	8
Agriculture	15
Business	25
Service	35
Teaching	12
Lawyer / others	5

The distribution of source of income is presented in the following diagram :

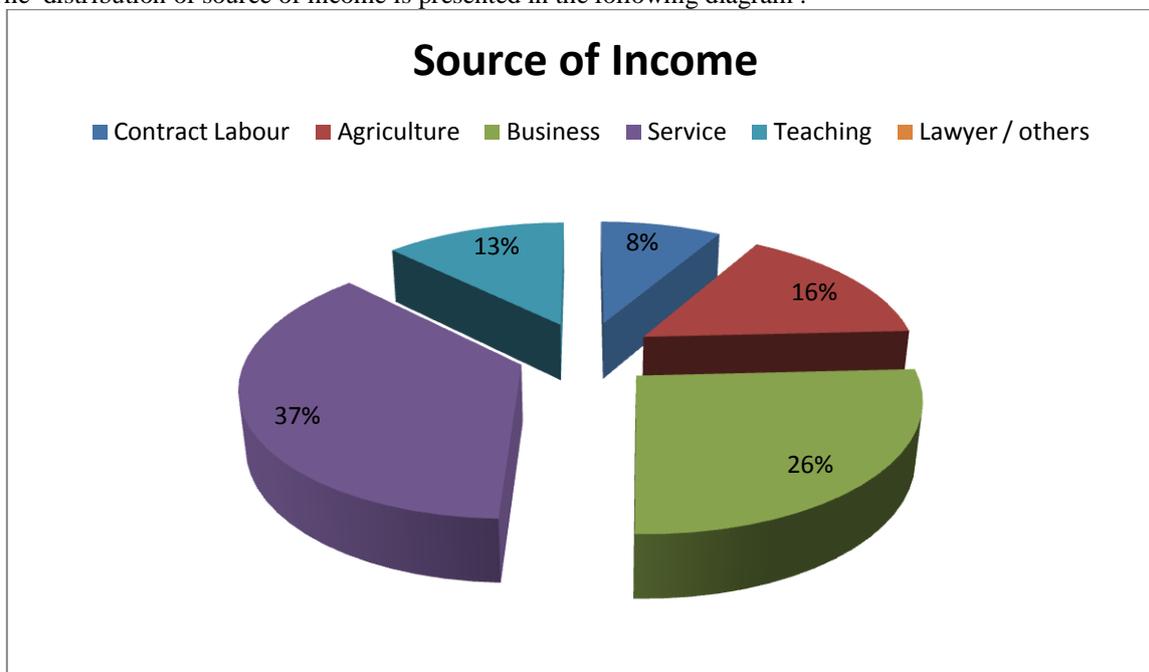


Fig : 5.7-Source of Income

❖ **Domestic energy profile :**

❖ **Table : 5.8-Cooking**

Fuel Used	No of families
Forest wood	-
Cow Dung Cake	5
Coal	-
Kerosene	12

LPG	43
Rice	-
Bio-gas	-
Any other specific	-

The families are mostly dependent on LPG and kerosene for cooking purposes. However use of cow dung cake is an old and common practice in many household irrespective of the other fuels and it is used in a number of families as a fuel. The distribution of the is presented in the following diagram.

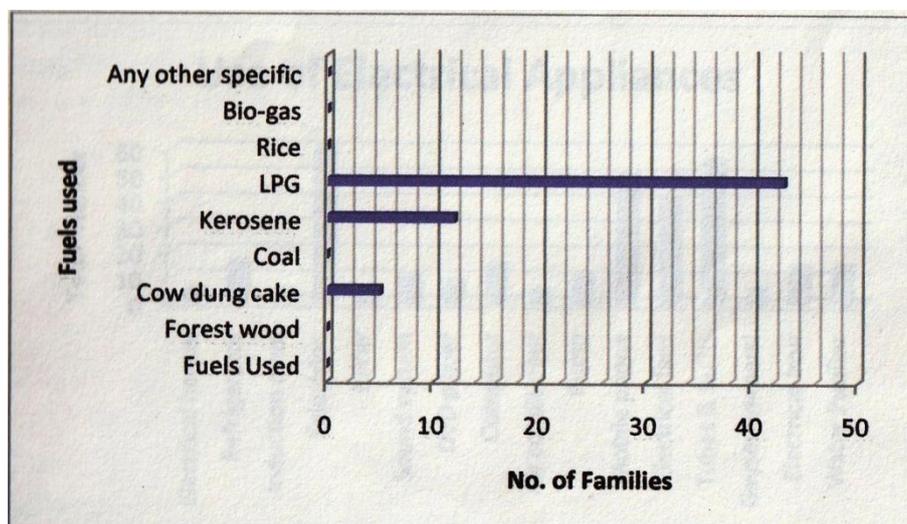
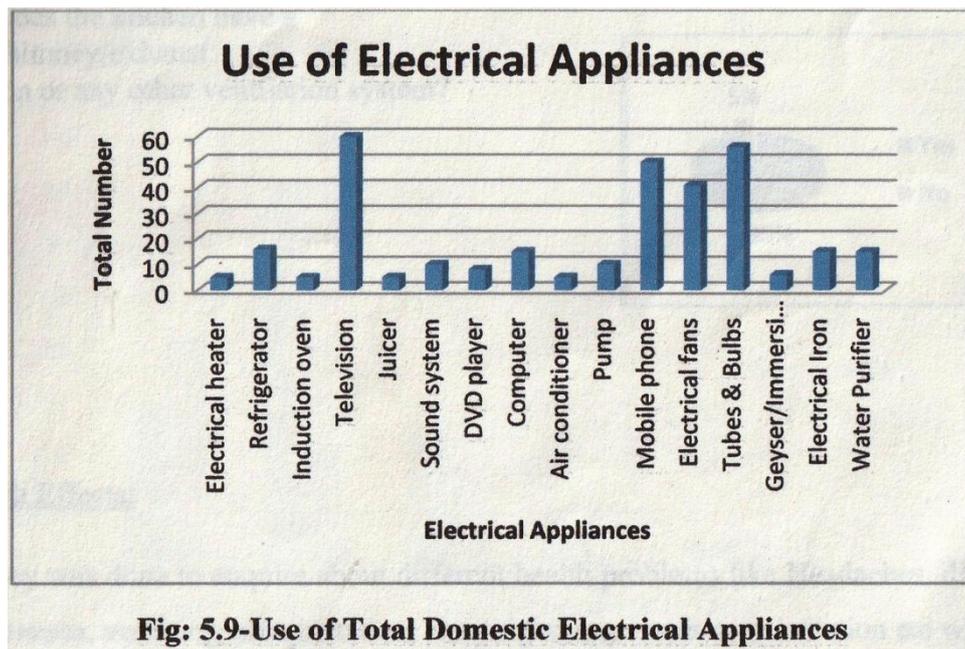


Fig: 5.8-Fuel Use for Cooking

Table:5.9-Use Of Total Domestic Electrical Appliances In The Survey Area

Name of appliances	Total Number
Electrical heater	5
Refrigerator	16
Induction Oven	5
Television	60
Juicer	5
Sound system	10
DVD player	8
Computer	15
Air conditioner	5
Pump	10
Mobile phone	50
Electrical fans	41
Tubes & Bulbs	56
Geyser/ Immersion heater	6
Electrical Iron	15
Water Purifier	15

Irrespective of the economic condition, the use of Television and mobile phone was predominant within the study group. Electric fan, refrigerator, electric light were also common which contributed to the electricity consumption profile of these families, Electric heater, Juicer and AC were used occasionally.



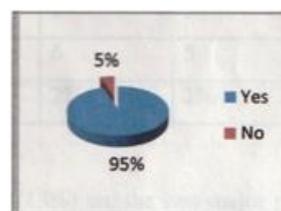
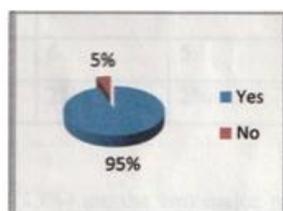
Use of automobiles :

In our study group, very few families were found to possess automobiles. Scooter and motorbikes are the automobile vehicles which were reported and personal Car was also reported in a significance number. The use of fuel in this particular area was not so high as the use of personal vehicles is not a common practice with some significant number of exception.

There are no people which cut down trees to collect fire woods.

❖ **Few important Closed Questions :**

✓ Is it an open kitchen ?



✓ Does the kitchen have a chimney /exhaust fan or any other ventilation system ?

❖ **Health Effects :**

The survey was done to enquire about different health problems like Headaches, dizziness, fatigue, nausea, vomiting, skin irritating, chest tightness, respiratory irritation etc. which are quite commonly caused by indoor air pollution.

However, the surveyed people have reported mainly about three problems which are predominant in their families.

1. Head ache
2. Skin irritation
3. Eye irritation

The number of people suffering from these problems has been presented in the following table :

Table : 5.10 People Having Health Problems

	Headache	Skin Irritation	Eye Irritation	Short of Breath	Chest Tightness
Male	15	36	15	5	2
Female	21	11	9	1	3
Total	36	47	23	6	5
(%)	10%	13%	6%	2%	2%

It is very clear that headache (10%) and skin irritation (13%) are the two major problems followed by the eye irritation (6%) and others. Interestingly significant number of people has not been reported to suffer from any of the health hazards.

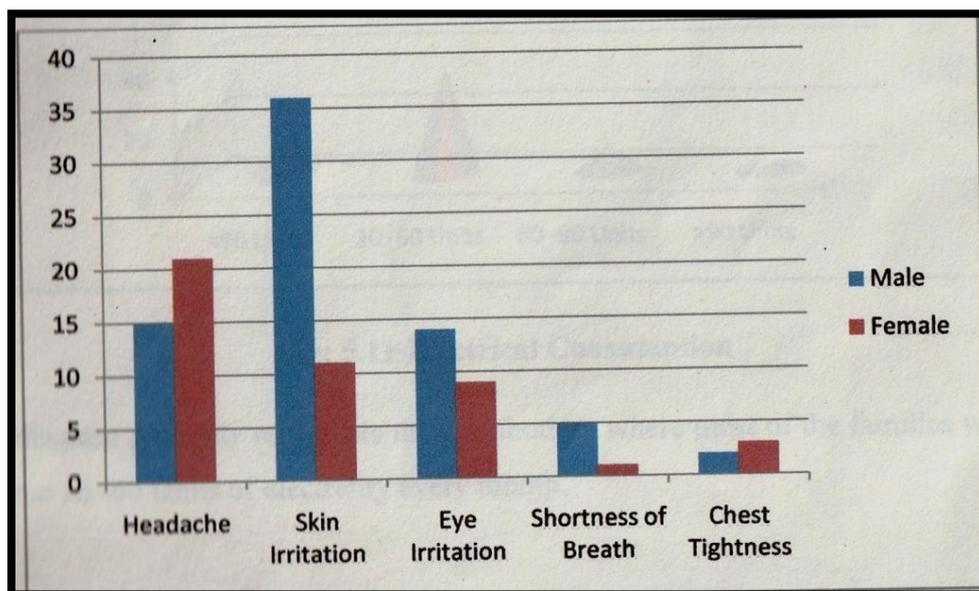


Fig : 5.10-People Having Health Problems

The diagram shows Skin irritation is prevalent in the male population and the female group mostly suffers from headache. This indicated that the female group are the major victims of indoor air pollution which is more likely to cause a headache than a skin irritation.

❖ **Electrical consumption:**

❖ The consumption of electricity was found to be moderate among the study group due to less use of electronics goods and gadgets. The families have been divided in to four groups in terms of electricity consumption.

Table : 5.11-Electrical Consumption

Monthly Electric consumption	No of Families
< 30 Units	12
30-60 Units	36
60-90 Units	9
>90 Units	3
	60 (total)

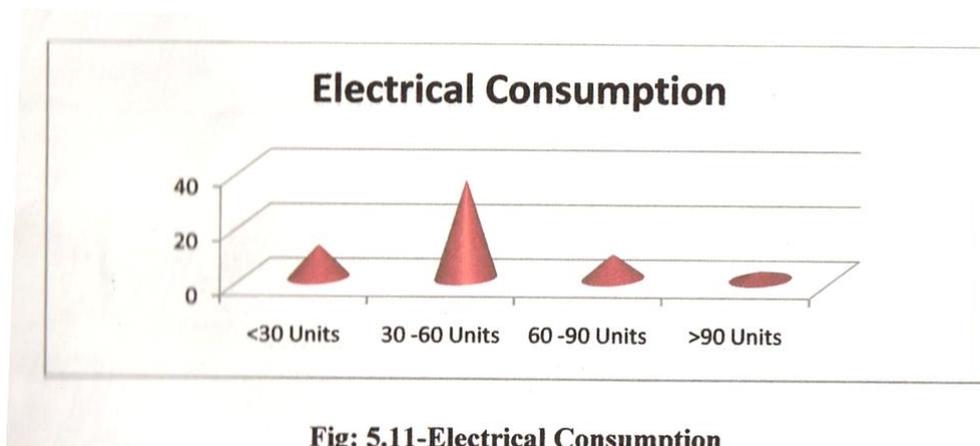


Fig: 5.11-Electrical Consumption

The bar diagram precisely represents the distribution, where most of the families were found to consume 30-60 Units of electricity every month.

❖ **Use of clean Energy**

The people in our study area are quite unaware about the potential of clean energy. For instance none of the three villages has a single Bio-gas plant within their premises. There is no single report of the use solar energy for household purpose.

VI. CONCLUSION

The findings of this study suggest that the provision of high quality energy services is quiet good to urban areas. The socio economic condition of the people is moderate and most of the people are literate. However, one would expect energy poverty would be commensurate with income poverty. This pattern is confirmed for urban India but it is not the case for rural areas. This means that despite national energy programs to help bring better energy services to people in urban areas, a significant gap in services still persists.

Besides providing electricity, improving biomass use and its efficiency is essential for reducing energy poverty. Improving efficiency of fuel wood use for cooking is extremely important. An initiative has recently been launched to reach the majority of biomass energy users via a program that aims to both reduce CO₂ emissions and improve rural health (Indian Institute of Technology Delhi and The Energy and Resources Institute, New Delhi,2010). It is expected that this initiative would improve the efficiency of biomass use in India.

On the other hand, improving access to modern fuels such as bio-gas for cooking and other purposes would help reduce energy poverty. However, the sale of LPG in India, for example , is very widespread in urban areas and all LPG sold through the government has a large subsidy component in the price. Although urban people receive significant energy support from the Government of India, our findings would tend to confirm that there is still a long way to go ensure that the some urban people can take advantage of the many benefits of modern energy and the services that they provide to consumers.

Finally, spreading the awareness among the people regarding the use of renewable energy is extermely important. According to first-if-its-kind survey conducted by Mercom Capital Group titled ' India Renewable Energy Awareness Survey,' only 56% of Indian consumers have heard of ' renewable energy' or 'clean energy', and only 27% of consumers have heard of ' energy efficiency', Although awareness was low, 71% of Indian consumers surveyd are willing to pay higher rates for electricity from renewable energy sources. Especially, there is a great need for education of people regarding the problems of fossil fuel and raising awareness of the uses of solar power technologies in particular.

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B) APPENDIX

Relevant supporting materials are obtained from :

- 1) Suri Municipality office.
- 2) Photographs of a few interviews during survey work.

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