

**ENERGY CONSUMPTION DIFFERENTIALS OF ACROSS
ZONES IN INDIA: A CASE EVIDENCE OF NSSO 61ST
ROUND DATA**

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Abstract:

Energy has played an important role in all aspects of daily sustenance of human beings as well as economy as a whole. It might be met by the users from the environment in the form of either renewable or non-renewable energy resources. In the subsistence economy, firewood and charcoal, dung and agricultural wastes meet the entire demand for cooking and heating. Although the energy used by households in rural India is changing, traditional fuels such as firewood and chips, dung cake are still playing the main sources of household cooking energy. In The present paper aims that to examine various types of energy consumption differentials in cooking and lighting purpose across zone in India by household type and to estimate the extent of households depends on firewood as a primary source of energy for their household needs in India.

Key words: Consumption differentials, energy, household types, primary source, and livelihood sustenance

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Introduction

Energy is an important source of human activity. Energy is an essential input of all productive economic activity, the process of economic development inevitably demands increasing higher levels of energy consumption. The most important single factor which can act as a constraint on economic growth of a country is the availability of energy. More than 60 percent of Indian households depends on traditional sources of energy for meeting their cooking and heating needs, but in modern day's households using LPG for cooking purposes and electricity for lighting purpose in our country. Energy may be converted into any form in modern days by the advancement of science and technology. Although the energy used by households in rural India is changing, traditional fuels such as firewood and chips, dung cake are still playing the main sources of household cooking energy. In rural areas of the country, the households used mainly three primary sources of energy for cooking such as firewood and chips, dung cake and LPG.

Amulya Kumar et.al (1999) makes it clarity that only about 50 percent of the Indian energy consumption is met by commercial energy sources, the remaining 50 percent from non-commercial sources like firewood, dung cakes and agricultural wastes. The composition of non-commercial sources are roughly about 65 percent firewood, 15 percent dung cake and 2 percent agricultural wastes. Energy is an indispensable component of material prosperity and a source of many of the largest impacts of human beings on their environment. Rural population obtains 90 percent of cooking energy from biofuels such as fuel wood, crop residues and animal dung. At the time of short supply or too expensive, people suffer from lack of direct energy services particularly cooking, heating, and lighting.

A majority of India's rural population still uses firewood for cooking purposes. With the loss of forests, there is a shortage of firewood. Agricultural labourers who constitute a predominant group among the rural poor, do not have access to agricultural waste. Hence 20 percent of their labour time is spent roaming in search of firewood. The income of the other rural households is so low that they cannot buy firewood. Hence they too have to waste time collecting fuelwood or animal waste (**Patel.V.J, 1985**).

The present paper aims that to examine various types of energy consumption differentials in cooking and lighting purpose across zone in India by household type and to estimate the extent of households depends on firewood as a primary source of energy for their household needs in India.

Evidences from earlier studies

Review of the earlier studies is presented in this section in detail for understanding the energy consumption pattern of local population in general and different sections of the society in particular.

Chandra Kanta Sharma (1991) studies found that rapid population growth and lack of supply of indigenous energy resources in Nepal has caused the extensive use of traditional energy resources which is resulting in the environmental degradation. Traditional energy sources like fuel wood and agricultural residues supply about 95 percent of total energy demand in Nepal. Fuel wood is currently being consumed at rates higher than the sustainable yield of the forests causing forest encroachment and local environmental degradation. Another study by **John Briscoe (1979)** implies that energy availability and patterns of energy use in the context of a single village in rural Bangladesh. Fuel for cooking food is by far the largest component of energy use in rural areas of the Indian subcontinent; data on specific fuels used by different classes in the village are analyzed in light of the social and economic organization. The average dry-dung production is estimated to be 1.2 kilograms per animal per day. Seventy-one percent of the dung is used for fertilizer and 23 percent for fuel.

Holdren (1991) studies indicate that the energy problem today combines these syndromes: much of the world's population has too little energy to meet basic human needs; the monetary costs of energy are rising nearly everywhere; the environmental impacts of energy supply are growing and already dominant contributors to local, regional, and global environmental problems and the social-political risks of energy supply are growing too. The growth of world population in this period was responsible for 52 percent of the energy growth, while growth in per capita energy use was responsible for 48 percent. In the late 1980s, population growth still accounted for a third of energy growth both in the United states and worldwide.

Material and Methods

The multistage random sampling has been used. Specifically, the stratified random sampling technique is used for selection of households in the purpose of energy consumption. The NSSO 61st round data (July 2004-June 2005) on energy sources on Indian households for cooking and lighting in India has been used by the researcher of this research to carry out zone wise analysis of the data. The National Sample Survey Organization (NSSO) conducts socioeconomic surveys covering various subjects on a regular basis. The survey covered all the States and Union Territories in the country. The data were collected from a sample of 79298 rural and 45356 urban households spread over 7999 villages and 4602 urban blocks respectively.

A zone wise classification of different States and Union Territories based on geographical locations (Bhatt 1997) was made with a view to get a comprehensive picture of the states of energy uses for both cooking and lighting purposes in India. This classification facilitates to understand the spatial variation in uses of energy sources by the rural and urban households in India. Statistical package for social sciences (SPSS) was used for analytical purpose and simple statistical tools such percentage and averages are used to find out the differentials in the usage of the primary energy sources among the household types and rural and urban areas of India for cooking and lighting purpose by zone wise.

Discussion

Energy has played an important role in all aspects of daily sustenance of human beings as well as economy as a whole. It might be met by the users from the environment in the form of either renewable or non-renewable energy resources. In the subsistence economy, firewood and charcoal, dung and agricultural wastes meet the entire demand for cooking and heating. Depletion of fuel wood has been already a cause of severe hardship in many areas.

In table (1) explains that selected sources of energy are used by the Indian rural households for cooking across zones in India by household types. In rural areas, the use of firewood and chips was the highest for 'agricultural labour' households and also very common among the households classified as other labour and self employed in agriculture and the use of LPG for cooking was the highest for 'others' households. The use of firewood and chips and LPG is much greater extent in comparison to dung cake and kerosene. The use of electricity for their cooking was very low.

Table: 1 Indian rural household by the primary source of energy used for cooking for each household type.

Zones	Household type	Number of HHs per 1000 HHs					
		Firewood and chips	LPG	Dunk cake	Kerosene	Electricity	No Arrangement
Southern	Self employed in Non-Agriculture	615	283	0	96	0	3
	Agricultural labour	876	88	0	35	0	1
	Other labour	758	152	0	62	0	28
	Self employed in agriculture	802	178	0	11	0	1
	Others	435	382	0	56	1	124
Northern	Self employed in Non-Agriculture	433	353	91	120	0	0
	Agricultural labour	702	159	107	0	4	0
	Other labour	583	217	96	97	0	2
	Self employed in agriculture	504	182	295	10	0	0
	Others	335	466	60	96	2	36
Central	Self employed in Non-Agriculture	761	126	88	13	0	0
	Agricultural labour	878	4	109	0	0	0
	Other labour	867	33	77	11	0	1
	Self employed in agriculture	849	46	92	1	0	0
	Others	572	244	56	33	0	66
Western	Self employed in Non-Agriculture	424	396	1	48	0	115
	Agricultural labour	873	75	1	31	0	1
	Other labour	703	129	0	63	0	51
	Self employed in agriculture	679	259	7	14	1	0
	Others	196	296	0	133	1	367
Eastern	Self employed in Non-Agriculture	709	103	58	4	0	0
	Agricultural labour	834	8	70	1	0	2
	Other labour	773	45	78	2	0	3
	Self employed in agriculture	814	18	98	0	1	1
	Others	562	219	33	5	1	47
Northeastern	Self employed in Non-Agriculture	596	372	0	24	0	3
	Agricultural labour	890	104	0	0	0	0
	Other labour	766	188	0	18	0	19
	Self employed in agriculture	899	92	1	2	0	1
	Others	496	450	0	15	4	9
India	Self employed in Non-Agriculture	677	152	90	16	0	3
	Agricultural labour	843	14	76	9	0	1
	Other labour	792	67	71	26	0	8
	Self employed in agriculture	779	61	121	3	0	1
	Others	504	260	48	33	1	103

Source: Computed from NSSO data

At the national level, the percentage of households using firewood and chips were the highest (84.3 percent) for agricultural labour households and the lowest (50.4 percent) for 'others' households among the different household types in rural India. The use of LPG for cooking was more (26 percent) in 'others' household and lower (1.4 percent) in agricultural labour households. The overall percentage of households using dung cake, kerosene and no arrangement was less than 13 percent and electricity was less than 1 percent.

The use of firewood and chips was highest (79.9 percent) for self employed in agriculture and lowest (11.4 percent) for agricultural labour. The use of kerosene is very low (0.3 percent) for self employed in agriculture followed by other labour categories and the overall percentage of LPG and dung cake are low level.

In northeastern zone self employed in agricultural households using firewood and chips was the highest (89.9 percent) followed by the other zone agricultural labour and lowest (19.6 percent) for western zone 'others' households for the same. In the northern zone 'others' households using LPG were highest (46.6 percent) and very low (0.4 percent) for the central zone agricultural labour. Western zone has registered the highest proportion of households in the category of others have no such type cooking arrangement which was accounted about 36.7 percent.

Evidences supported that **Collins (1999)** that traditionally, in the industrialized world energy was derived from renewable sources, mainly wood for heating and cooking, then later from both wind and water for motive power; the early stages of the industrial revolution were fuelled by wood, charcoal and water power.

In urban areas, the use of firewood and chips was highest for casual labour for cooking and the use of LPG was highest by regular wage/salary earning households for cooking purposes (table 2). The use of dung cake and kerosene is also common for casual labour. All the households in urban areas of India using electricity were very low. In urban areas the regular wage/salary earning households using LPG was very high (68.8 percent) and the use of dung cake is very low (less than 3 percent) for all categories of households.

Table:2 Indian urban households by the primary source of energy used for cooking for each household type.

Zones	Household type	Number of HHs per 1000 HHs					
		Firewood and chips	LPG	Dunk cake	Kerosene	Electricity	No arrangement
Southern	Self employed	285	596	0	96	1	15
	Regular wage/salary earning	156	680	0	105	1	58
	Casual labour	511	160	0	269	0	57
	Others	178	513	0	75	0	234
Northern	Self employed	151	710	17	106	8	7
	Regular wage/salary earning	74	784	12	90	4	29
	Casual labour	296	196	48	443	6	11
	Others	43	678	8	45	0	222
Central	Self employed	36	530	36	36	1	1
	Regular wage/salary earning	174	722	14	44	2	6
	Casual labour	674	183	49	50	0	0
	Others	171	606	24	25	3	162
Western	Self employed	80	794	2	102	0	4
	Regular wage/salary earning	58	719	1	108	0	100
	Casual labour	526	232	2	136	0	88
	Others	89	474	0	67	0	113
Eastern	Self employed	256	469	32	63	8	22
	Regular wage/salary earning	119	681	10	37	12	34
	Casual labour	493	120	52	68	0	28
	Others	207	506	10	38	8	165
Northeastern	Self employed	223	691	4	43	2	13
	Regular wage/salary earning	83	812	0	43	4	32
	Casual labour	426	334	1	170	0	30
	Others	229	456	0	131	20	143
India	Self employed	244	580	26	87	2	13
	Regular wage/salary earning	114	688	7	113	3	43
	Casual labour	575	142	29	155	1	28
	Others	118	556	12	52	2	237

Source: Computed from NSSO data

At the national level, the percentage of the households using firewood and chip were the highest (57.5 percent) by casual labour and lowest (11.4 percent) by regular wage/salary earning

households for their daily cooking practices. The use of LPG was the highest (68.8 percent) belongs to regular wage/salary earning households and lowest (14.2 percent) belongs to casual labour.

In western zone, casual labour is used firewood and chips were highest (52.6 percent) and lowest (4.3 percent) by northern zone in the category of 'others' households. In northeastern zone, regular wage/salary earning households has been using LPG was highest (81.2 percent) and lowest (12 percent) by eastern zone in the case of casual labour households. The use of kerosene for cooking was also common (44.3 percent) among the casual labour households.

In total, the use of energy for cooking was differing from households to households and zone to zone. In the case of firewood and chips, agricultural labour households registered the highest percentage of 84.3 percent but in urban areas it was highest in casual labour households which accounted about 57.5 percent across the zone in India. It means that in the rural areas most of the agricultural labourers households have fully and primarily dependent on free energy resources provided by common property resources due to low economic and poor purchasing power with low income earning opportunities.

But in urban areas, the casual labour has registered highest users of the LPG, which means that there is a lack of free energy resources available in their close proximity and degraded condition of common property resources in the urban areas in the name of the urbanization process. In the case of electricity others category registered highest users of 26 percent in the rural areas and the same was in urban areas was around 69 percent in the category of regular/wage salary earning households. In the case of electricity consumption both in rural and urban areas the well off people very particularly the salaried household is alone depends for cooking purposes.

At the national level, the percentage of households using electricity for lighting was the highest (71.8 percent) by the 'others' households and lowest (47.6 percent) by the 'agricultural labour'. The use of kerosene for lighting was the highest (51.7 percent) has belonged to 'agricultural labour' and lowest (27.2 percent) has belonged to 'others' households.

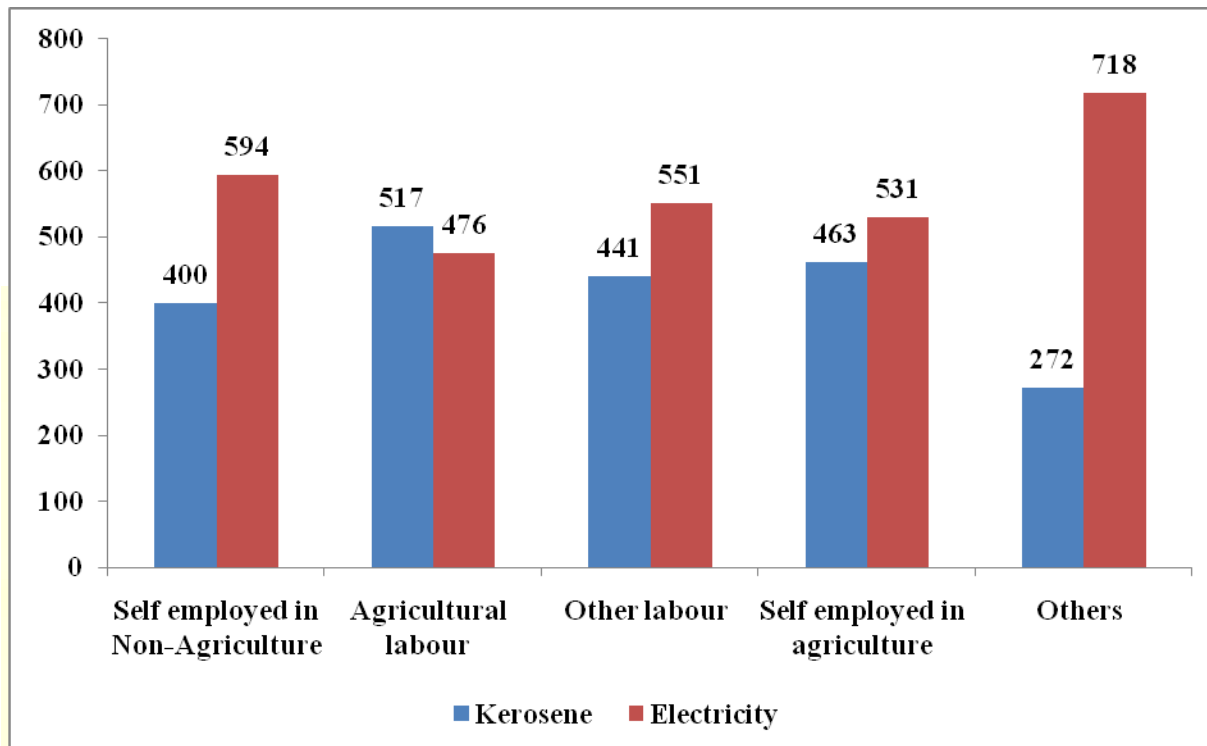
Table: 3 Indian rural households by the primary source of energy used for lighting for each household type.

Zones	Household type	Number of HHs per 1000 HHs	
		Kerosene	Electricity
Southern	Self employed in Non-Agriculture	58	941
	Agricultural labour	208	789
	Other labour	137	862
	Self employed in agriculture	91	908
	Others	88	911
Northern	Self employed in Non-Agriculture	81	911
	Agricultural labour	144	844
	Other labour	141	843
	Self employed in agriculture	92	906
	Others	47	947
Central	Self employed in Non-Agriculture	365	623
	Agricultural labour	490	502
	Other labour	460	535
	Self employed in agriculture	443	541
	Others	282	687
Western	Self employed in Non-Agriculture	60	939
	Agricultural labour	225	773
	Other labour	170	829
	Self employed in agriculture	90	910
	Others	41	955
Eastern	Self employed in Non-Agriculture	563	412
	Agricultural labour	789	163
	Other labour	691	291
	Self employed in agriculture	645	308
	Others	416	562
Northeastern	Self employed in Non-Agriculture	131	858
	Agricultural labour	394	596
	Other labour	206	781
	Self employed in agriculture	193	802
	Others	60	935
India	Self employed in Non-Agriculture	400	594
	Agricultural labour	517	476
	Other labour	441	551
	Self employed in agriculture	463	531
	Others	272	718

Source: Computed from NSSO data

In rural areas, 'others' households using electricity was high (71.8 percent) and using kerosene was very low (27.2 percent) compared to other categories of households.

Figure: 1 Energy sources of Indian rural households for Lighting (per 1000 HHs)



Source: Computed from NSSO data

In urban areas, the households using kerosene for lighting was the highest by ‘casual labour’ households and using electricity for lighting was the highest by ‘regular wage/salary earning’ households. In urban India, the use of kerosene was very low by the households for lighting purposes while compared with electricity (table 4).

In India, the percentage of households using electricity for lighting was highest (96.6 percent) here belongs to regular wage/salary earning households and lowest (76.4 percent) were belongs to casual labour households. The use of kerosene for lighting was the highest (47.2 percent) were belongs to casual labour and the lowest (. 5 percent) has belonged to ‘other’ households.

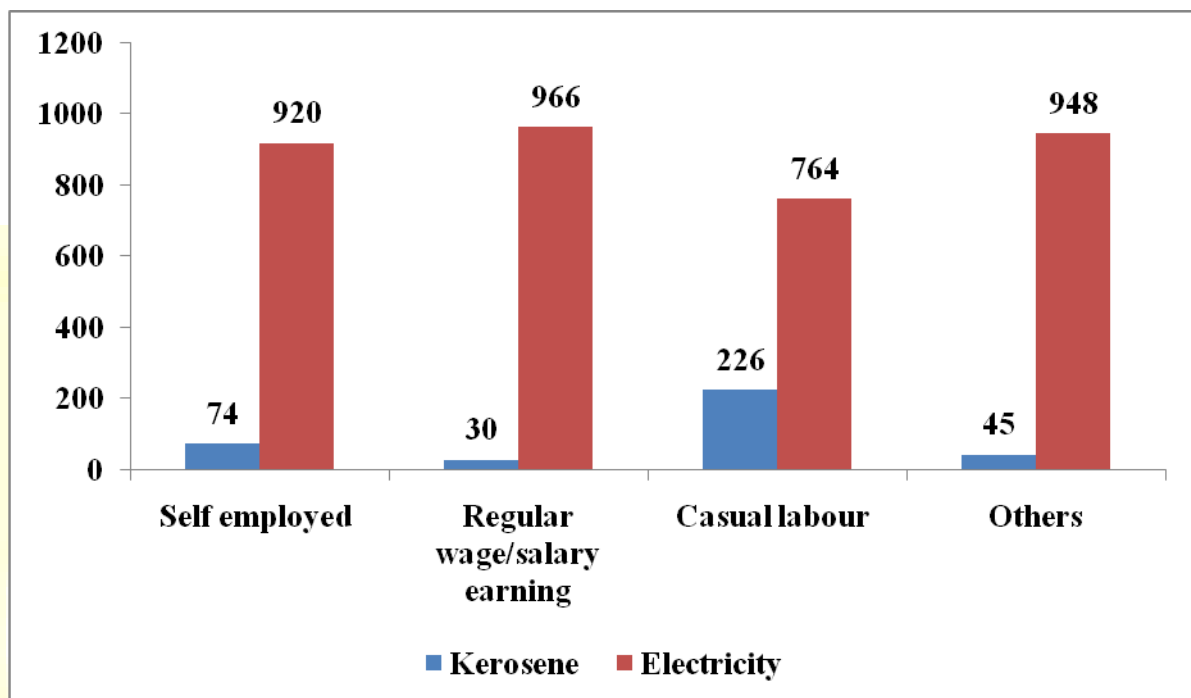
Table:4 Indian urban households by the primary source of energy used for lighting for each household type.

Zones	Household type	Number of HHs per 1000 HHs	
		Kerosene	Electricity
Southern	Self employed	22	977
	Regular wage/salary earning	16	983
	Casual labour	111	887
	Others	13	984
Northern	Self employed	37	951
	Regular wage/salary earning	14	982
	Casual labour	119	854
	Others	5	971
Central	Self employed	78	916
	Regular wage/salary earning	33	966
	Casual labour	229	765
	Others	57	936
Western	Self employed	16	981
	Regular wage/salary earning	17	978
	Casual labour	67	918
	Others	16	734
Eastern	Self employed	155	842
	Regular wage/salary earning	70	929
	Casual labour	472	525
	Others	60	929
Northeastern	Self employed	34	964
	Regular wage/salary earning	5	986
	Casual labour	98	901
	Others	18	982
India	Self employed	74	920
	Regular wage/salary earning	30	966
	Casual labour	226	764
	Others	45	948

Source: Computed from NSSO data

In regular wage/salary earning households using electricity was highest (96.6 percent) and using kerosene was very low (3 percent) compared to other categories of labour for lighting purpose. In northern and northeastern zone 'others' and 'regular wage/salary earning' households using kerosene was relatively low (0.5 percent) for lighting purpose and 47.2 percent of the households in the eastern zone in the case of casual labour households using kerosene was highest in comparing all other zones using for lighting purposes.

Figure : 2 Energy sources of Indian urban households for Lighting (per 1000 HHs)



Source: Computed from NSSO data

The zone wise analysis further indicates that the northeastern, southern, northern zone registered the most users of the electricity which was accounted about more than 98 percent for lighting purposes and eastern zone registered the lowest user of electricity for lighting purpose which was accounted about 52.5 percent.

Conclusion

Energy has played an important role in all aspects of daily sustenance of human beings as well as economy as a whole. Sudhakara Reddy and Balachandra (2002) pointed out that the two main forces that have an impact on energy demand are population growth and economic development. Other than population growth and economic development, the major factor that influences energy demand is the efficiency of energy utilization. Most of the Indian rural and urban households not only used for modern energy sources but also they still use the traditional energy sources especially firewood and chips. This result indicated that the countries met by shortage of fuelwood and diminishing forests. Improved cooking stoves, briquettes, biogas and

micro hydro have yet to make any significant impact on the national energy scene. These efforts have, however, alleviated some of the problems relating to environmental degradation including over-use of traditional sources where problems were most acute. Chandra Kanta Sharma (1991) pointed out that Careful shifts to hydropower will help not only to reduce environmental pollution, but the practice will also decrease the need to import commercial fuels, thereby saving hard-earned foreign currency for other development activities that may lead to sustained economic growth. Inevitably there will be strong socio-cultural objections to changing land use patterns in the various ways, but as emphasized at the outset, there is no known way of generating energy without environmental impact. Wage workers demonstrate a lower reliance on and consumption of wood fuel. On the other hand, they are more reliant on commercial fuels. Of the groups actively engaged in small-holder agriculture, surplus farmers have the smallest average landholding and fuel wood and paraffin consumption levels.

In total, the use of energy for cooking was differing from households to households and zone to zone. In rural areas, the use of kerosene is relatively high in the category of 'agricultural labour' and the use of electricity is relatively high in the category of 'others' households and more or less equally common among other types of rural households. In urban India, compared with electricity in households using kerosene was very low for lighting purposes. The zone wise analysis further indicates that the northeastern, southern, northern zone registered the most users of the electricity which was accounted about more than 98 percent for lighting purposes and eastern zone registered the lowest usage of electricity for lighting purpose.

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