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# ENERGY CONSERVATION IN HOUSEHOLDS IN URBAN AREAS IN INDIA

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***Abstract— India, as a country is very rich in terms of natural resources however as citizens, we have not respected this fact and have been continuously exploiting nature's gift to mankind. Further as the population is ever increasing, the load on the consumption of resources is unprecedented. This has led to the depletion of natural resources such as coal, oil, gas etc., apart from the pollution it causes. It is time that we shift from use of these conventional resources to more effective new ways of energy generation. We should develop and encourage usage of renewable resources such as wind and solar in households to conserve energy in place of the mentioned nonrenewable energy sources. This paper deals with the most effective ways in which the households in India can conserve energy thus reducing effect on environment and depletion of limited resources.***

**Key words: Energy Consumption, Resources, India, Renewable Resources and Environment.**

## I. INTRODUCTION

This study explores the valuable writings on options for energy efficiency in India and obstructions to their assumptions. The topic reflects the importance of energy both in the development of the Indian economy and in India's growing emissions of green house gases (especially carbon dioxide). As India grows so will the Indian industries and its every increasing population. Electricity demand is increasing and so is the emission of greenhouse gases. Energy efficiency (i.e. reductions in energy per unit of output) are often suggested as a means of reducing carbon emissions. Improvements in energy efficiency will pay for themselves through reductions in fuel costs and would, therefore, be desirable even if climate change were not a concern.

This study also observes published works on energy efficiency opportunities and its drawbacks in India, as a guide for further research in the area. This paper focuses on the following questions:

1. What savings will be obtained by using energy efficient alternatives?

2. Why are these technologies being—or not being—adopted?

3. What policies can be and have been implemented, and how have they performed?

### ENERGY USAGE IN INDIA

Energy is one of the most important resources for the economic development of the country. In the case of developing country like India, the energy sector becomes of prime and critical importance with the view of increasing energy requirements needing more investment. Conservation of energy is a very critical topic at this point of time in the world. Energy conservation refers to reducing energy usage by using less of an energy service.

Most of the literature concentrates on solutions to the first two questions. Many studies calculate energy per unit of output in various sectors (e.g.: heat input per kWh or specific energy consumed per unit of output for various industrial processes) and compare these with levels attained in other countries or with "best practice". Attaining the best practice may not be economically efficient in India, with respect to current prices and interest rates. It is therefore important to ask what would be the cost as well as the energy savings from adopting more energy-efficient technologies.

Several studies that try to understand household energy use patterns in developing countries can be found in the literatures. However, those that try to quantify patterns in household energy transitions and the basic causal elements, or factors affecting fuel choice decisions using disaggregate household data are more limited. Studies on household fuel choices for developing countries

Proof from empirical studies on the patterns of household energy use in India includes WB, 1999; WB, 2002; Alam et al., 1998. Viswanathan and Kavi Kumar, (2005) analyze fuel consumption patterns across rural and urban households in India by examining data on the share of expenditures for different fuels. However, prior empirical research using a discrete choice framework for households in India is limited to

Only two studies. The first of these studies is Reddy, (1995) that looks at energy carrier choices for a sample of households residing in the city of Bangalore. He employs a series of binomial logit models to determine the choice between each pair of energy carriers, to explain the shifts in and the pattern of consumption of different fuels used for cooking and water heating. Results of the study confirm the hypothesis that households ascend an energy ladder and the choice is largely determined by income. However, factors such as family size and occupation of the head of the household are also seen to play a role in fuel selection.

Given the limited area and country specific empirical evidence that is available on this topic, this research aims to extend the knowledge in this field. First, we explore choices only in urban households, as we believe an analysis of choice of household fuels within rural areas would require additional information on closeness of source of biomass or time required for collection. Secondly, the analysis focuses on cooking fuels, which consists the largest part of household energy needs in India, and are very different from the energy needs for either lighting or powering appliances. Finally, they assumed that there is a natural order of progression in terms of the choice of fuels based on their efficiency, ease of handling, and hygiene.

These changes in daily life promote changes in patterns of environmental consumption such that individuals are more likely to consume things, which they themselves did not yield. Marx describes this change as a metabolic gap – the creation of a gap between natural resources and the people consuming the resources, causing humans to interact ever more indirectly with the natural resources they consume (Foster 1999; Marx [1867] 1976). Axinn, Barber and Biddlecom (2007) describe this change as a shift from direct to indirect consumption of environmental resources.

1.Total Installed Capacity:

| Sector | MW | %age |
|---|---|---|
| State Sector | 94,153 | 37.1 |
| Central Sector | 68,993 | 27.2 |
| Private Sector | 90,903 | 35.8 |
| Total | 2,54,049 | |

Total usage per sector

| Fuel | MW | %age |
|---|---|---|
| Total Thermal | | |
| Coal | 1,52,971 | 60.2 |
| Gas | 22,608 | 8.9 |
| Oil | 1,200 | 0.5 |
| Hydro (Renewable) | 40,799 | 16.1 |
| Nuclear | 4,700 | 1.9 |
| RES** (MNRE) | 31,692 | 12.5 |
| Total | 2,54,049 | |

Total Energy usage per resource

## II. HOW CAN ENERGY BE SAVED?

### *Cooling*

Switching your ceiling fan to turn in a counter-clockwise direction in the summer and in the winter, run it at low speed, but clockwise. Close your exterior doors and windows tightly when the AC is on else load on ac will increase, also turn off kitchen and bath exhaust fans. Change or clean your AC's air filters at least once a month to keep your system running at high performance and you're a/c should have 5 star rating to be most energy efficient. Also set your thermostat fan switch to "auto" to save energy because leaving it in the "on" position keeps air running constantly. Block the sun from overheating your home by using shades, blinds and drapesand for outside use awnings, trees and shrubs. Insulating the walls with injected foam insulation to help you save energy by keeping hot outside air from seeping through porous block walls . Opening interior doors helps cool air flow freely throughout the home.

### *Heating*

Carpeting or rugs add to comfort and heat retention, especially if there is little or no floor insulation. Setting the thermostat to 68-70 degrees during the day in the winter, and 65-68 degrees at night keeps the home comfortable and save on heating costs. Close the flue in the fireplace and install glass doors to keep in the warm air. Heating the home with the sun's help. Leave window shades or blinds open during the daytime. And consider using solar heat to supplement your normal heating source

### *Lighting*

Replace standard bulbs with CFLs. Compact fluorescent light bulbs are more energy-efficient than regular bulbs, while giving off the same amount of light use the appropriate CFL bulb for your light fixture as they come in various sizes and types for different lighting needs.Use motion-detector lights for indoor and outdoor lighting as they're convenient and efficient. Selecting light-colored or opaque lamp shades in the corners so that they reflect light from two walls. The total energy consumption with conventional fluorescent tubes

(40W) is 837kW.Upgrading to LED's (Havells Endura Linear(20W); Lumen Output:1750lum) decreases the total energy consumption per month to 375kW.Thus, makes a Energy Saving of 55%.

*Appliances*

Use microwaves and toaster ovens to cook or warm leftovers rather than using a conventional oven. Prefer using refrigerators which are five star rated and set the temperature between 30 and 42°F also use a power-save switch if you have one do periodic cleaning and check if the insulation are intact. Keeping the freezer full uses lesser energy than an empty one and for maximum saving put gallons of water. Separate wash loads into light and heavy fabrics for the shortest drying times. Or better yet – air-dry your lightest fabrics.Wash full loads of clothes when possible. When smaller loads are necessary, use less water. Using copper-bottomed pots and pans helps in efficient cooking Use tight-fitting covers on pots and pans when cooking on the stove to shorten cooking time. Match your pot size to the burner on your stove. Heat is lost when small pots are used on large burners.

*Water heating*

Always wash with cold water because laundry detergent works just as well, and saves 40 cents per load. Check hot water pipes for leaks, which can drain your energy savings. Install a solar water heater to save energy and money by using solar power. Reduce water heater temperature setting from 140 degrees to 120 degrees it will save money while keeping water hot enough for showers and cleaning dishes.

*Electronics*

Plug electronics into a power strip, then turn the strip off when not in use to save in energy costs. Set the computer to sleep or hibernate mode instead of using a screen saver so it uses less electricity during periods of inactivity. Unplug battery chargers when the batteries are fully charged or the chargers are not in use because many chargers draw power continuously, even when the device is not plugged into the charger.

*Windows*

Install high-performance windows, screens and films to protect upholstery, wood and artwork from UV rays while saving energy. Using east-west facing windows so that there is natural circulation of wind and air and thus requirement for fans and air conditioners would decrease, sun rises from the east and sets in the west so thus there will be natural light and requirement for tubelights and bulbs decrase during the day. If the household is a bungalow then skylight can be used.

*Roofing*

Reduce the strain on AC by applying reflective coating. This will help you save by decreasing the amount of heat coming into the home. Reflective roofs not only reduce heat buildup, they also prevent the expansion and contraction that degrade roofs.

Energy saving is a very important aspect in the world. A developing country like India, needs to maintain its resources for the furture generations to come. Without the adequate utilisation of resources, progress of the country would get hampered.

*SOLAR ENERGY AS AN ALTERNATIVE IN INDIAN URBAN HOUSEHOLDS*: Using solar electricity is also another way especially in countries like India where there is ample sunlight for approximately 300 days a year and 7hrs a day on an average. The estimated potential of power generation through Solar PV is about 20 MW per sq km in India, while the installed capacity is only 110 MW. It is useful for providing grid quality and reliable power. Solar PV can find applications both in industries, households, and for municipal operations such as street lighting. Solar roof top panels with a capacity of generating 1,250 kilowatt (kw) are functional at 15 places in Surat city this if installed in 1000s of buildings across metropolitans and tier 2 cities can generate enough energy to meet some amount of urban demand in India. "The Solar City aims at minimum 10% reduction in projected demand of conventional energy at the end of five years, through a combination of enhancing sup- ply from renewable energy sources in the city and energy efficiency measures."[Blessymol Thomas, energeTica India].

Case: A household having a montly electricity bill of Rs 2542 and an open rooftop area of 108.53 sq.ft. A solar PV system, if decided to use by the household would cost System cost Rs 1.4 lacs 2.System size 1KWP 3.No of modules 4 (250 Wp) each 5.2 (inverter type).

The solar power generated would be 128 units and the share of electricity sufficed by using solar power would be 32%. Thus a CO2 emission saving would be 1000kg and monthly savings would be Rs 794.

BIOMASS: Biomass is used as the primary cooking fuel in 58.68 % of the household. LPG is the most widely cooking fuel used by 64.6% of households, followed by biomass 19% and kerosene 6.4%.Of all the households in India, 74% have access to electricity, 94% of the urban. In India, households are not completely depends on one type of energy for their daily cooking and lighting purpose. If we see the urban area, most of the households are using LPG for their cooking and electricity for lighting.

## III. What is the future expectation?

In future, it is expected in India, that there would be further ways which would be discovered in which we can save more energy. Hybrid cars are also going to be the cars dominating the automobile industry. India is expected to move further in energy saving techniques in the coming years. As of now, they have started to use the equipments which are rated the maximum (i.e. 5) by the Energy Savings Guide. Later, its expected to see an increase in the usage of solar powered equipments at homes with the installation of solar panels.

## IV. Conclusion

We can summarise by saying:

Energy Saved= Energy Produced

Thus by using such simple and easy to adopt techniques we can save energy for the current and future generations. Energy saving is not just a onetime activity by requires continous monitoring and training till it becomes imbibed in our habit. Many today in India face the problem of power cuts and if urban people just waste energy the load shedding will increase. Thus as responsible citizens we should be conscious of our energy footprints and promote the "bijli bachao" andolan.

It can be expected, that many other ways would be discovered to be able to prevent energy wastage as resources are the vital parts of our lives. Greater use of more energy-efficient technologies in India would in many but not all cases pay for themselves in the form of energy savings. This prompts the following questions:

(1) What influences some firms and households to adopt more energy-efficient technologies?

(2) Is this rate of adoption efficient?

With answers to these questions, one could help design policies to improve the economic efficiency of energy use and examine opportunities to further improve energy efficiency as a measure for reducing global CO2 emissions and also reduce the energy usage, which would prevent the extinction of resources for the future generation.

## V. References

[1] Soma Bhattacharya and Maureen L. Cropper- Options for Energy Efficiency in India and Barriers to Their Adoption April 2010 RFF DP 10-20J.
[2] Mehdi Farsi, Massimo Filippini, Shonali Pachauri: FUEL CHOICES IN URBAN INDIAN HOUSEHOLDS, December 2006
[3] Mathew P. Davies: Non conventional energy development in India, November 1998
Link: http://www.cs.columbia.edu/~mdavies/energy/ncei.pdf
[4] MNES. Renewable Energy: Opportunities and Guidelines for Investors. New Delhi: MNES,
2013-2014
[5] Ministry of Non-Conventional Energy Sources. 2013-2014 Annual Report. New Delhi: MNES,
2014.
[6] Central Statistics Office National Statistical Organization Ministry of Statistics and Programme Implementation, Energy statistics 2013
[7] Central Statistics Office National Statistical Organization Ministry of Statistics and Programme Implementation, Energy statistics 2014
[8] Natarajan, I. (1985) Domestic fuel survey with special reference to kerosene, Volume I, National Council for Applied Economic Research New Delhi
[9] Reddy, A. K. N. and B. S. Reddy (1994), 'Substitution of energy carriers for cooking in Bangalore', Energy - The International Journal 19(5): 561-572.

[10] Reddy, B.S. (1995), 'A multilogit model for fuel shifts in the domestic sector', Energy 20(9): 929-936.
[11] Reddy, B.S. (2003), 'Overcoming the energy efficiency gap in India's household sector', Energy Policy 31(11): 1117-1127.
[12] Manzoor Alam, Jayant Sathaye, Doug Barnes: Urban household energy use in India: efficiency and policy implications, LBNL-43942
[13] Bhatia, R (1988) Energy pricing and household energy consumption in India. The Energy Journal. 9, 71—105.
[14] Energy scenario, Bureau of Energy Efficiency, Pg:1-35