



Going beyond incomes: Dimensions of cooking energy transitions in rural India



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ARTICLE INFO

Article history:

Received 3 October 2013

Received in revised form

17 December 2013

Accepted 18 January 2014

Available online 25 February 2014

Keywords:

Energy access

Logit model

Household choices

ABSTRACT

Most studies on household energy choices have considered income and education as suitable proxies for socio-cultural contexts, primarily because the available data on household energy is from census surveys which are mainly household consumption surveys, not focused energy surveys. Acknowledging the existing data constraints, a more focussed household energy survey was designed for rural India with the aim of better understanding determinants of current energy use patterns, energy choices, to measure the impacts of these factors, and importantly, arrive at key policy insights. This paper revisits the definition of access to include for reliability and quality going beyond conventional understanding. It also relooks at the role of gender in household energy choices. Having established that apart from income, socio-cultural factors may have a greater role in determining household energy choices, the model results indicate electricity access would have a positive impact on cooking energy choices only after meeting a minimum threshold requirement. As women move towards more formal employment, the odds of choosing cleaner fuels increase significantly. Thus, while macro-policies may provide important guidelines and the necessary framework, implementation strategies need to be designed at the local level through a participatory approach making energy an integral part of the development paradigm.

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1. Introduction

The relationship between energy and poverty has featured in many recent publications of various researchers and international agencies affirm that energy must be made a crucial part of all development and poverty alleviation projects and programmes [1–8]. As part of the Millennium Development Goals, the UN Commission for Sustainable Development 9th Session held in 2002 also explicitly acknowledged that access to sustainable energy services is an essential element of sustainable development. Thus, the importance of energy in development policy cannot be undermined and it is critical to understand the factors that drive household energy consumption patterns so as to facilitate appropriate policy design and implementation.

Future energy transitions will be driven by the demands of development combined with the constraints posed by climate

change and energy supplies. Over the years, the understanding gained suggests that the provision of energy services is not dependent on any one fuel or technology rather it is replete with innovation in the face of scarcity or other limitations. This innovation has been due to energy technologies that can offer extremely substantial improvements in the quantity or quality of energy services provided. Also an economy-wide energy resource transition of moving up on the energy ladder would require a number of small transitions at micro level which will be the drivers of change and enablers of development [9,10].

Moreover the energy need and demand in developing countries are completely different from the developed countries. The developing countries face two crucial challenges – first, is the widespread inefficient production and use of traditional energy sources which pose economic, environmental and health threats. The second is uneven distribution and use of modern energy sources which relate to the issue of equity and quality of life. Therefore, designing energy systems for developing countries presents a great challenge: designing from scratch a system that is both environmentally and economically viable and that enables social and economic development for the populations [11–13].

In India, around two-thirds of the population live in rural areas and are predominantly dependent on the primary sector for their

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¹ Views expressed in the paper are personal and do not necessarily reflect the views of The Energy and Resources Institute (TERI).

livelihoods [14]. Most rural households live on subsistence levels, enough only to meet their basic requirements. The most basic and critical requirement is that of food, after which come shelter and clothing among others. To meet these basic needs, access to energy of some form is essential. Furthermore, a large part of rural households in the country are still heavily dependent on traditional biomass based fuels for cooking energy needs. Biomass fuels account for almost 80% of total household energy consumption in rural India [15–18].

Table 1 presents an overview of energy consumption patterns in rural India over time and across different income groups [19–21].

It can be easily inferred from Table 1 that, biomass fuel use is prevalent across all income groups and remained virtually unchanged between 1993–94 and 1999–2000, with more than 90 percent of rural households using wood, dung, or both. During 1999–2000 to 2009–10, there has been an increase in firewood consumption by households followed by a slight decline after 2004–05. The overall consumption of firewood actually went up in the past decade by about 7.5 percent and close to 60 percent of all rural households were using cash-free wood in 1999–2000. In contrast, the use of kerosene as the primary cooking fuel was essentially non-existent among rural households in 1999–2000; this applies across all income groups with the exception of the richest 10 percent. In the case of electricity, there was an increase in electricity consumption by almost 25–30% overall in the last decade; while for LPG, though there was a marginal change in consumption over time, it has remained more or less constant. Studies also suggest that the effectiveness of fiscal instruments, such as changing relative fuel prices or increasing income relative to fuel prices, in promoting a switch from traditional biomass to petroleum fuels in rural areas would have serious limitations [22].

Drawing on the insights from similar studies as presented in this paper carried out in South-east Asia, Africa and South America, it is observed that different factors drive household energy choices in different regions and the same variable in two cases have differential impacts [23–29]. Thus it becomes essential to understand energy transitions and facilitate developing energy policies for the poor and promoting new energy markets that will improve their household budgets [30,31]. In many studies, the key challenge has been availability of exhaustive data on household

energy consumption and choices, the availability of which would enable a more in-depth analysis of various factors and then, fitting the appropriate model to analyse household energy choices [27,32–34].

With the above background, this paper modestly attempts to examine and understand the issues of energy access from the perspective of rural households based on a survey and analysis carried out for state of Madhya Pradesh in India.

2. Rethinking energy access

Ensuring equity and access are critical. It is not just sufficient that a fuel is available but it is equally important that there exists a minimum level of physical infrastructure to ensure easy availability to a household when the requirement arises. It is also important to facilitate a shift to cleaner fuels such that the overall benefits of energy access are greater in terms of additional health and livelihood benefits.

Apart from household income being one of the main factors in determining energy choices, the energy expenditure of households may differ due to various other factors such as availability of fuel which impacts prices, the purpose for which the fuel is to be used which is defined by certain social and cultural customs that people follow and so on. These factors play a significant role in household energy choices and differ from region to region.

Electricity access can influence a household's fuel choice significantly. Throughout the world, but mostly in developing countries, there are regions where electricity supply is insufficient or non-existent. Various authors affirm that this lack of access to electricity is a key factor in perpetuating poverty around the world and compromises the socio-economic progress of those places. Thus, improving energy access is a priority since 1.3 billion people around the world still lack access to electricity, 84% of them living in rural areas [11,29,35–37].

The presence of reliable and good quality supply of electricity allows a household to take up other activities even after sunset, thus prolonging the number of hours available for productive work in the day. This can impact household incomes significantly resulting in changing lifestyles and thus lead to changes in household expenditure patterns and possibly fuel choices as well.

Table 1
Fuel consumption patterns in rural India between 1999–2000 to 2009–10.

	Low income	Medium income	High income
Firewood	Increase from 1999–2000 to 2004–05 (95 kg–113 kg); Decline from 2004–05 to 2009–10 (113 kg–102 kg) but overall increase in the decade	Significant increase from 1999–2000 to 2004–05 (107 kg–125 kg); lower mid-income remain same from 2004–05 to 2009–10 (~120 kg); high mid-income indicates decline from 2004–05 to 2009–10 (124 kg–115 kg)	Drastic increase from 1999–2000 to 2004–05 (112 kg–124 kg) and marginal decline in 2009–10 (~120 kg); richer have higher consumption
Electricity	Increase from 1999–2000 to 2004–05 (33 kWh–37 kWh); marginal increase from 2004–05 to 2009–10	Increase over time (40 kWh–47 kWh); low mid-income indicate greater increase in consumption (~6 kWh) than high mid-income	Increase over time (54 kWh–80 kWh); significant increase from 2004–05 to 2009–10 (61 kWh–80 kWh); for highest income group, 2004–05 and 2009–10 consumption values converge (~80 kWh)
LPG (Liquefied Petroleum Gas)	Increase from 1999–2000 to 2004–05 (6 kg to 8 kg); marginal change from 2004–05 to 2009–10	Increase in consumption by lower mid-income (7 kg to 10 kg); high mid-income constant from 2004–05 to 2009–10 (~11 kg)	No change from 2004–05 to 2009–10 (~10–11 kg)
Kerosene	Marginal decrease from 1999–2000 to 2004–05 (3.17 l to 2.83 l); constant (~2.82 l) from 2004 to -05 to 2009–10; Similar trends for market purchased kerosene	Significant decline in PDS kerosene consumption from 1999–2000 to 2004–05 (3.62 l to 3.20 l); further decline in PDS kerosene consumption from 2004–05 to 2009–10 (3.20 l–2.98 l); Similar trends for market purchased kerosene	Drastic decline in PDS kerosene consumption from 1999–2000 to 2004–05 (4.29 l to 3.35 l) and further decline from 2004–05 to 2009–10 (3.35 l–3 l); Similar trends for market purchased kerosene

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