



Original research article

Resistance in rejecting solid fuels: Beyond availability and adoption in the structural dominations of cooking practices in rural India

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ABSTRACT

Solid fuels are the primary cooking fuels in a wide range of developing countries, a situation that is projected to remain for the coming few decades. In the energy poverty scholarship, it is a well-argued concept that social systems influence people's energy choices. Influenced by theories of Practice, this study explores the role that social structure plays in the perpetuation of the use of solid cooking fuels, with a particular focus on rural India. We employ a qualitative approach of inquiry for data collection in three villages in Chittoor district in the state of Andhra Pradesh. The results presented in this paper are based on in-depth household interviews and focus group discussions. The findings suggest that cooking with solid fuels is intertwined with structural elements, such as established traditions, traditional income generating practices, gender norms, and a sense of belonging. These factors profoundly dominate households' decisions to continue using solid fuels despite the availability and the adoption of modern alternatives. The paper argues that interventions targeted at reducing the use of solid fuels may fail if they: 1) focus only on supplying modern fuels; 2) do not consider contextual social barriers; and 3) are implemented as standalone projects.

1. Introduction

The use of solid fuels, such as firewood, crop residue, animal dung, and charcoal for cooking is the predominant practice in many developing countries in Africa and Asia [1]. According to the International Energy Agency (IEA), 40% of the world's population cooks with solid fuels, and despite global and national commitments to reduce the reliance on solid cooking fuels, the share of solid fuel users is unlikely to decrease significantly any time soon [1]. The IEA [1] projects that 2.3 billion people will have no access to clean cooking fuels in 2030 without significant policy reform and substantial energy investments.

Numerous studies have already documented that cooking with solid fuels has multifaceted detrimental effects on human [2–4], social [5] and environmental health [6], and hence they strongly argue for a complete cooking fuel transition towards modern and clean alternatives [7–9], such as electricity, liquid petroleum gas (LPG), and natural gas. Although the availability of modern energy carriers is a prerequisite for their adoption and sustained use for cooking [10,11], various studies

have demonstrated that solid fuel users may not switch to modern cooking fuels and technology even though the latter is available [12–14]. Furthermore, evidence from past studies also suggests that although solid fuel users introduce modern fuels in their kitchen, they may not completely abandon their old fuels [15,16]. Therefore, there is a need to understand what holds people back from entirely abandoning solid fuels, so that better policies and mechanisms can be devised for a successful cooking fuel transition.

The focus of this paper is India where 780 million people primarily cook with solid fuels [1]. The share of solid fuel users is extraordinarily high in rural areas: 87% of rural families are solid fuel users as opposed to only 13% of urban households. Table 1 compares the number of households relying on various cooking fuels in rural and urban India in 2001 and 2011. During the decade, the number of households relying on solid cooking fuels rose by more than 16%¹ in the country. In rural areas, only 11 million new families adopted LPG, where as an additional 19 million solid fuel users were recorded in between 2001 and 2011. At the current diffusion rate of modern fuels, the IEA [1] projects

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¹ This increment may be partly because of the decadal population growth of India. According to Census of 2011, the total population of India grew by 182 million between 2001 and 2011.

Table 1
Households relying on various cooking fuels in India in 2001 and 2011 (in million).
Source: [17,18].

Cooking fuels	2001		2011	
	Rural	Urban	Rural	Urban
Solid fuels (firewood, crop residue, animal dung, coal, lignite, and charcoal)	126	16.9	145.3	20.6
LPG	7.8	25.7	19.1	51.3
Kerosene	2.2	10.3	1.2	6
Others	2.3	0.8	2.2	1

that 580 million people in India will remain without access to clean cooking fuels in 2030.

The Government of India (GoI) in its draft National Energy Policy (NEP), released in 2017, clearly acknowledges the adverse effects of cooking with solid fuels and aims to decrease the dependency on them through the implementation of several schemes that promote LPG [19]. For instance, the NEP underscores the continuation of Pradhan Mantri Ujjwala Yojana² (PMUY), launched by the GoI in 2016. Under this scheme, the GoI provides financial subsidies to low-income families to acquire LPG, recognising LPG as an important alternative to solid cooking fuels. In light of its persisting reliance on solid cooking fuels and the commitment to universalise access to clean cooking fuels, India, particularly rural areas where the dependency on solid cooking fuels is high, makes a suitable case for our study to explore the factors behind the perpetual use of solid fuels for cooking.

There are three important contributions that this paper makes. First, we argue against energy-access literature that emphasises a supply-driven approach and claims that increasing access to modern fuels is the important strategy for substituting solid cooking fuels. We align our arguments with scholars, such as Shove and Walker [20], Stern [21], Warde [22], and Malakar et al. [23], who argue that energy services interact with social systems and then mutually influence each other. To be specific, we investigate how social systems influence people's choices of cooking fuels. This paper demonstrates that cooking is not just preparing meals; it is an outcome of interplays between social, cultural, and material arrangements [24,25]. Furthermore, our study advances the work of Wang and Bailis [26], Jagadish and Dwivedi [27], Herington et al. [28], and Akintan et al. [29] who have investigated cooking fuel transitions from a wider social and cultural lens.

Second, we offer a 'practice' perspective to understand the resistance against giving up solid fuels and argue that to enable a successful cooking fuel transition towards cleaner and efficient fuels and stoves, it is necessary to discern the social context within which social practices take place [30]. Concerning this, we employ Anthony Giddens' theory of structuration [31,32] because it helps explaining how social practices are produced, reproduced, and transformed. In their theoretical paper, Malakar et al. [23], using Giddens' theory, have conceptualised possible reasons for the perpetuation of solid cooking fuels in developing countries. In this paper, we take forward their conceptualisation and apply it to generate empirical evidence.

Third, this study generates some policy insights that can be helpful in two important ways: 1) to design new and update existing policies; and 2) to implement existing schemes, such as PMUY, that aim to enable the widespread substitution of solid fuels by modern alternatives.

The remainder of the paper is organised as follows: Section 2 elaborates the theoretical underpinnings, explaining key arguments of Giddens' theory of structuration regarding how practices are produced and reproduced in society. This section also informs how inertia is formed around solid fuel-based cooking practices theorised by Malakar

et al. [23]. Methods adopted and other arrangements made for data collection are detailed in Section 3. A brief background of the research sites is presented in Section 4. In Section 5, we discuss the results of the study, elaborating the influences of social systems in cooking with solid fuels. The paper strengthens its findings in Section 6. Finally, it concludes with policy lessons from the study in Section 7.

2. Theoretical framework

The renowned 'energy ladder' model, developed by Hosier and Dowd [33], suggesting a linear correlation between the uptake of modern energy sources and income, has been challenged by numerous studies [34–36]. The cost of modern fuels is undoubtedly a factor preventing their adoption, but several other factors such as social, cultural, and infrastructural exist that impede the transition [16,26]. What we would like to emphasise here is that cooking with solid fuels is not an activity that occurs in a silo [24]. In fact, it is entangled with many other activities that people perform in their day-to-day life [30]. It is a practice [37] that is "reproduced through recurrent performance" [38, p. 35] along with social norms, beliefs, and values. Therefore, to understand the resistance towards changing cooking fuels, we need to unpack cooking practices from a bundle of activities that people perform everyday [39]. While most of the existing cooking fuel transition literature is more concerned towards finding the impediments to the adoption of modern cooking fuels, the centrality of this research lies in investigating why the impediments perpetuate over time and in relation to contextual changes. To do so, we essentially have to discern how practices are produced, reproduced, and transformed over time and space.

Theoretically, this paper is influenced by theories of Practice, which offer a gateway to understanding change and perpetuation of practices in all aspects of social life [32,38,40,41]. Theories of Practice put practices ahead of practitioners [42] and deconstruct the interaction between agency and structure that comes into play to make social affairs happen the way they happen. As such, "... the theories of practice emphasise processes like habituation, routine, practical consciousness, tacit knowledge, tradition, and so forth" [43, p. 140]. This theoretical lens helps not only to describe people's actions but also to identify meaning in reproducing or transforming their actions. In this paper, as suggested by theories of Practice, the unit of analysis is cooking practices, and we seek to discern their recursive production, innovation, and meanings behind pursuing certain cooking practices over others. More specifically, we draw on Giddens' theory of structuration to explore structural influences that hold people back from completely giving up their solid cooking fuels.

Giddens' structuration theory offers an understanding of the context within which social practices occur, perpetuate, and change. Central to his theory is the interaction between human agency and social structure. Human agency, according to his theory, is "the capability people have to do things" [32, p. 9] and "to make things happen" [44, p. 341]. Social structure refers to "the properties which make it possible for discernibly similar social practices to exist across varying spans of time and space" [32, p. 17]. It has virtual existence and acts as a repository of knowledge acquired by social actors [45].

Another important argument Giddens' theory makes is the existence of the duality of structure, i.e. social structure both enables and constrains human agency. Social structure enables new thoughts and actions through 'discursive consciousness' as well as engenders the repetition of existing practices as a result of 'practical consciousness'. Discursive consciousness reflects the abilities of actors to engage in the reflexive monitoring of prevailing social conventions and reasoning their actions [46]. Practical consciousness is a tacit knowledge of social affairs for which agents may fail to articulate the flow of conducts [44]. Giddens writes, "Practical consciousness involves recall to which the agent has access in the *durée* of action without being able to express what he or she thereby knows" [32, p. 49], where *durée* is a continuous

² For more information, visit the website of Pradhan Mantri Ujjwala Yojana (PMUY), <http://www.pmuujwalayojana.com/>.

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