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Justice and politics in energy access for education, livelihoods and health: How socio-cultural processes mediate the winners and losers

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ABSTRACT

The rhetoric on development benefits of energy access often focuses on education, livelihoods and health. Using case studies of two energy access projects in India, this paper demonstrates that these claims, while true in part, are neither simple nor straightforward. It argues that pre-existing socio-cultural processes mediate the development outcomes of energy access projects. In particular, the roles of gender, socio-economic positions and the local economy are vital in understanding the links between education, livelihoods, health and energy.

This paper is important for two reasons. First, working with culture as a mediator, it provides nuanced insights into relationships between energy access and three key development goals. Second, by presenting this analysis, the paper identifies a need for further research on the relationships between socio-cultural processes, development and energy access and, how by keeping these processes in mind, the benefits of energy access could be extended to less privileged social groups. This paper is based on a nine-month long ethnographic research in five villages in India's Bihar state. Home tours, interviews, participant observations and group discussions were used to collect the data.

1. Introduction

A substantial body of literature argues that "access to modern energy services is fundamental to human development" ([1]:7). Energy access extends working hours, reduces wastage of time and bodily energy, fosters livelihoods, improves education and raises human development indicators [2–6]. Modern energy also supports information flows, entertainment, better health services and indoor air quality [7,8]. Much of the academic and policy literature on energy access gives importance to three specific development outcomes: education, livelihoods and health [6,9,10].

Kanagawa and Nakata [5] find a positive correlation between per capita electricity consumption and education. Electric lighting creates conditions conducive to studying by reducing indoor pollution and health hazards caused by kerosene lamps [11]. Modern energy saves time spent on fuel collection thereby freeing time to study and enabling people, especially women, who work during the day to study in the evenings [3,12]. Reddy and Nathan [13] explain that access to clean energy could positively impact women's education, health and livelihoods. Thus, access to modern energy contributes to improved education and gender equality [14].

The positive impact on education has long-term implications for livelihoods and poverty alleviation [4]. Electricity improves livelihoods by powering irrigation pumps for farmers and rural industries [15,16]. Electric lights extend working hours and raise incomes [2,17]. By reducing indoor pollution, modern energy also improves health [18]. It reduces vulnerability to wood and kerosene fires, hazards which affect women more [19]. Health services also improve through the use of modern equipment and sterilisation techniques [20].

This rhetoric on education, livelihoods and health is the starting point for this paper. Using insights from two energy access projects, it demonstrates that, while true up to an extent, these development benefits of energy access do not materialise in a straightforward and uncomplicated way. Many of the claims discussed in the earlier paragraphs are simplistic. For example, "socio-political conditions" like political clout, community collaborations, social norms and access to schools mediate the uptake of solar home systems and therefore the benefits of modern energy in Sri Lanka ([21]:2587–88). Energy experiences are also gendered [22,23]. These social, cultural, political and economic conditions have received less attention in the

literature; instead, studies focus disproportionately on technical and financial aspects of energy access projects ([24]:2). Watson et al. ([24]:62) call for further work on understanding the "interaction between technical and cultural" aspects of energy access.

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By studying the socio-cultural processes in particular contexts, we can understand the ways in which the benefits of energy access materialise in people's everyday lives [25,26]. A focus on socio-cultural process provides a more nuanced understanding of the positive and negative impacts of energy access projects. Keeping this in mind, this paper investigates the socio-cultural processes that tailor the impacts of these projects in particular contexts. It argues that these processes mediate the development outcomes of energy projects. In particular, the roles of gender, socio-economic positions (caste) and the local economy are vital in understanding the links between education, livelihoods, health and energy. The paper makes three arguments related to these links. First, providing electric lights for studying helps mainly those who place a high value on education. Second, providing electric lights benefits boys and men more than girls and women. Third, providing lights allows businesses to save money, but does not result in business expansion, due to other market limitations.

Section 2 clarifies why the paper focuses on particular aspects and geographies. Section 3 explains the methodology for this research. Sections 4–6 provide empirical evidence for the arguments made in the paper. Finally, Section 7 presents concluding remarks and recommendations for future research.

2. Focusing on education, health and livelihoods through electric lights in rural areas

This section explains why this paper focuses on three particular development outcomes, electric lights and rural areas.

2.1. Three development outcomes

As explained, much of the rhetoric around energy and development focuses on education, livelihoods and health [1,27]. The two case studies for this paper also emphasise these outcomes. One case study, Husk Power Systems (HPS) provides "reliable and affordable electricity to improve" people's "health, education and livelihoods" (HPS Brochure). The other case study, Lighting a Billion Lives (LaBL) "provides illumination that advances education, health, and livelihood activities" (LaBL Brochure). Therefore, this paper tracks how these development outcomes are made practical and operationalised into everyday contexts, and in doing so are reworked, disrupted and contested.

2.2. Electric lights

Energy access efforts weigh disproportionately in favour of electricity. The World Bank's Global Tracking Frameworks reports that globally 85.3% of people have access to electricity but only 57.4% have access to clean cooking ([28]:2). Clean cooking and heating have been widely overlooked by energy access policies ([28]:50). International Energy Agency's projections show that electricity access will stay ahead of clean cooking in the future [28]. Within electricity access efforts, lighting initiatives take the lead. A survey by Energy Access Practitioner Network found that at least 102 of their 120 respondents were involved in lighting initiatives [29]. Only 69 were involved in clean cookstoves. This is further evidenced by the large number of initiatives focused on lighting – Lighting Africa, Lighting Asia, Solar Electric Light Fund, Global Off Grid Lighting Association, d.light Solar, to name a few. The two case studies for this paper also prioritise lighting. In addition, ESMAP's ([30]:7) multi-tier matrix considers "lighting and mobile phone charging" as first essential services. Consequently, this paper focuses on electric lights and what gets left out when there is an unequal focus on lights.

2.3. Rural areas

Energy access is a bigger problem in rural areas [31,32]. There is a 20 percentage point gap in electricity access and 60 percentage points gap in clean cooking between urban and rural areas [28]. In India, about 45% rural households lack electricity access compared to only about 7% urban households [33]. This has resulted in an increased focus on rural electrification [34] with a subsequent expansion of the number of projects aiming to improve energy access in rural areas. Thus, this paper focuses on rural areas.

3. Methods

Research for this paper was conducted in five villages in India's Bihar state, the state with the smallest percentage of people with electricity access [33]. For a comparative and "cross-technology investigation", two sustainable energy case studies and two baseline energy systems are considered ([35]:2).

The first case study, Lighting a Billion Lives (LaBL),[1] aims to provide lighting to a billion people. LaBL has projects in 2222 villages impacting more than 100,000 households [36]. As part of its business model, LaBL selects and works with a local entrepreneur in the target village and sets up a solar lantern charging station with 50 or 60 lanterns in their house.[2] Villagers rent solar lanterns on a daily or monthly basis. LaBL was present in two research villages.

The second case study, Husk Power Systems (HPS),[3] sets up biomass gasification-based micro-grids in villages and supplies electricity for a monthly rental. Its 84 plants impact 200,000 people in more than 300 villages [37]. The company's own team manages and maintains the micro-grids. HPS was working in one research village and had previously worked in another. Both projects assess lighting needs and kerosene expenditures to identify target villages.

The baselines include one village connected to India's central grid and a second village that is neither part of the case study projects nor connected to the central grid. In the second village, kerosene oil and a diesel generator micro-grid are sources of light. Kerosene does not directly produce electricity but provides lighting, a key electricity service. It competes with other electricity systems.

A nine-month long ethnographic study was conducted during 2012–13 during which three to six weeks were spent in each of the five villages. During this time accommodation was found in or near the villages. Since light was a key theme, most fieldwork was conducted after sunset. The villages had various combinations of energy systems and light sources, adding diesel generators, solar home systems, solar street lights and candle lights to the baseline and case studies. These were used in different combinations depending on the space, time and context. Socially, the village populations mostly consisted of Hindus with a sizable Muslim population in one. Within the Hindu villages several combinations of castes were present. Table 1 outlines the social makeup and light sources in the villages.

Mythology and history have created a hierarchy of castes in India. *Dalits* have the lowest position among the Hindu caste groups. *Dalits* are not only socially distinguished but are also spatially separated from the other castes. Their habitations are generally on the fringes, often separated from the village. Mostly landless, *dalits* are also the poorest of the poor.

A multi-methods approach was chosen to ensure the research was as comprehensive as possible [38]. In total 60 home tours and family interviews, 10 group discussions and 24 elite interviews were conducted. Participant observations data was recorded in 580 diary pages and more than 1200 photographs and videos. Family interviews were conducted with male and female members together. In some cases only male or female members were present. In total 34 higher caste and 26 lower caste families were interviewed and homes visited. Two higher

[1] http://labl.teriin.org/.

[2] LaBL also uses micro-grids and solar home systems. This paper is limited to its solar lantern programme.

[3] http://www.huskpowersystems.com/.