# Household Energy Transition in Metropolitan and Rural Nepal

*Analysing Meaningful Energy Transition through the Energy Cultures Framework*

*Dianne Kok*

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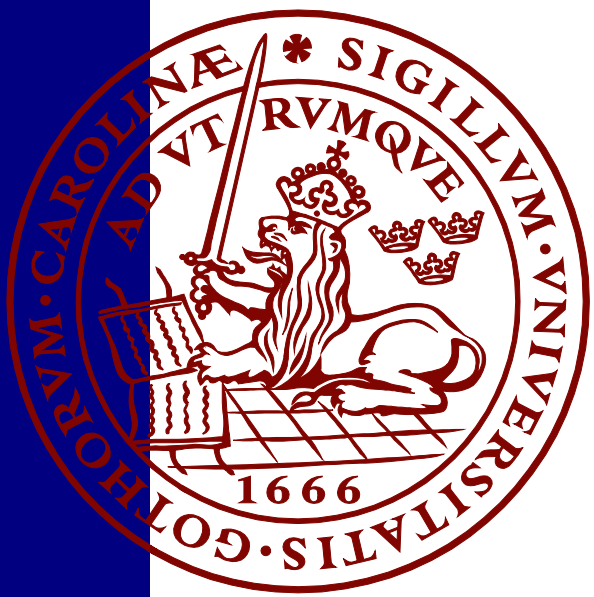
A thesis submitted in partial fulfillment of the requirements of Lund University International Master's Programme in Environmental Studies and Sustainability Science (30hp/credits)

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## Analysing Meaningful Energy Transition through the Energy Cultures Framework

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Submitted May 12th, 2024
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# Abstract

Nepal has made major progress in expanding its national electricity grid, creating the potential for a double transition as increased access benefits the energy-poor and sets the infrastructural ground for transition to renewables. Many households, however, continue to rely on traditional and transition fuels such as firewood and gas. This problem is both social and environmental, as without the 'meaningful' adoption of modern fuels, development supports neither socioeconomic progress nor the sustainability of the energy system. Informed by qualitative semi-structured interviews in Nepal, this thesis applies the Energy Cultures Framework to model the materiality, motivators, and activities of household energy consumption. It finds that although many households are satisfied with the convenience of gas and electricity, major barriers to modern energy use such as income, knowledge, habits, and unreliable supply remain. Future change is mostly motivated by the desire for a convenient and healthy life and requires locally informed policy.



Keywords: *energy justice, sustainable development, sustainability cultures, materiality, practice, meaning*


Word count: 11595

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I am also grateful to Sara and Juan for their excellent supervision, encouraging me to consider all aspects of my research alongside 'deeper' reflections on my time in Nepal. This thesis has been a learning process of purpose, ethics, epistemology, and whether or not to conduct ethnography. Making my first steps as a field researcher definitely helped me figure some things out. I trace my interest in energy back to Mgr. Hedvika Koďousková's course on Energy and Society that I followed during my exchange at Masaryk University, and I am thankful for her support and suggestions on theory and analysis.

Although the direction our lives and academic careers take is impossible to predict - from the Netherlands to Czechia, Sweden, and now a short period in Nepal - it sometimes only takes a Himalayan jeep ride to realise you are somewhat on the right path. Thank you, Sanjay, Lena, Ray, Zach, Mélissa, Unni, Sameer, Daisy, Guy, Julian, Paoline, Jackie, Ellen, Jacob, Steffie, and others I met along the way for encouraging me to find my own. I will blame the Kathmandu dinners for any rogue decisions I make from now on.

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# 1. Introduction

*"On close examination, the human mind, the human heart, and the human environment are inseparably linked together. We must recognise we have brought about a climate emergency in order to generate the understanding and higher purpose we need now. On this basis, we can create a viable future - sustainable, lasting, peaceful co-existence."*

*- Dalai Lama XIV (Stanley et al., 2009)*

## 1.1 Energy Development and Climate Change

Reliant on global networks of distribution and supply, energy is at once one of the most personal areas of development. The energy sources we use and have access to affect nearly every move we make, from the food we prepare in our homes to the lit-up spaces where we gather with our families (Melin et al., 2021). Energy poverty, a situation in which a household is unable to obtain sufficient energy services, can detrimentally affect well-being and quality of life (Pellicer-Sifres et al., 2021). Energy is therefore an essential element of development. The United Nations Sustainable Development Goals (particularly SDG 7) specifically address the need for action towards affordable, reliable, sustainable, and modern energy for all (Frigo et al., 2021).

Simultaneously, reducing emissions related to energy production and consumption is a necessary step in both national and global climate action (Van Bommel & Höffken, 2023). Emission reduction requires a transition from greenhouse gas-emitting fossil fuels to green and renewable energy alternatives. Globally, household energy consumption makes up a substantial share of energy-related carbon emissions (Druckman & Jackson, 2016). Energy transition therefore strongly connects social and environmental priorities, grounding the direction of sustainable energy development in this same interlinked context.

## 1.2 Double Energy Transitions in Nepal

In Nepal, a low-income and developing country in South Asia, energy transition would particularly contribute to social and environmental aims. While Nepal has made substantial efforts to develop domestic hydropower, its energy mix is still dominated by traditional and fossil fuels such as firewood and gas (Aryal et al., 2023; Lohani et al., 2022). Reliant on these fuel types, per capita energy consumption in Nepal is the lowest in South Asia (Ha & Kumar, 2021; Sharma et al., 2024). Still, savings could be made in the domestic sector which is currently responsible for the largest share of energy consumption in Nepal (Sharma et al., 2024).

Nepal has already made substantial strides in improving nationwide electrification, with over 94% of households having access to electricity in 2023 (WECS, 2023). With the expansion of the national grid and continued hydropower investment, widespread electrification is a clear policy goal. However, connection to the national grid is not enough by itself. Despite grid expansion, the transition from traditional livelihoods to modern habits is still ongoing (Acharya & Marhold, 2019; Pokharel & Rijal, 2020). Many differences in energy access and justice persist (Damgaard et al., 2017). Although some differences are unavoidable given Nepal's mountainous geography, others are connected to injustices in the energy system such as the affordability of clean energy alternatives and the local environmental impact of hydropower dams (Islar et al., 2017).

Assessing the Nepalese energy system through a socioeconomic lens, energy consumption should increase to increase household capacities and standards of life. However, considering households' (potential) contribution to greenhouse gas emissions, development should also focus on low-carbon possibilities (Khosla et al., 2019). Besides environmental benefits, a shift to renewables would also relieve Nepal's dependency on Indian gas and improve trade balance and energy security (Aryal et al., 2023; Islar et al., 2017; Underwood et al., 2020). Multiple energy developments should occur at once, aiming both for a transition towards renewables and increasing energy access overall (Islar et al., 2017; Van Bommel & Höffken, 2023).

This thesis will define energy transition as meaning a *sustainable* energy transition that improves household access to electricity, preferably from renewable sources. In a development context, this transition may occur through the adoption of transitional fuels such as LPG, but should eventually and essentially be directed to renewable fuels such as hydropower, wind, and solar.

### 1.3 Just and Meaningful Transition

The challenge of energy transition in Nepal is therefore to sustainably expand energy access. Increased consumption is necessary to improve individual well-being, but requires consideration of global environmental welfare (Wood & Roelich, 2019). A locally and globally just transition should aim to increase household consumption of renewables to promote low-carbon solutions alongside socioeconomic development (Pierce et al., 2010). Supporting low-carbon solutions through suitable technology, policy, and social norms is necessary to position renewable energy sources into the energy mix as affordable, reliable, and easily accessible energy alternatives.

Although the global South has historically contributed little to the atmospheric carbon now necessitating climate action, renewable alternatives will still bring local environmental, economic, and health benefits. Moreover, while Nepali people are among the least significant contributors to climate change, they already face the consequences of changing weather patterns and melting

glaciers in the Himalaya (Islar et al., 2017). In this context, we should not expect or force Nepalese households to adopt renewables out of urgency for climate action, but rather encourage energy development as a way to improve local livelihoods and increase socio-economic conditions and capabilities, also in light of changing climatic conditions (Pokharel & Rijal, 2021).

Energy choices may depend on factors such as availability, affordability, and accessibility. Fuel selection can also stem from sociocultural motivations such as the intended end-use and perceived reliability of the fuel source (Acharya & Marhold, 2019; WECS, 2022b). In Nepal, a period of scheduled power-cuts ('load shedding') long prevented users from confidently adopting energy cooking technologies (Wang et al., 2022). In evaluating a 'meaningful' energy transition, we should therefore assess both the kind of energy sources that are available to households as well as the choices households make based on this given material context.

### 1.3 Thesis Aims and Research Questions

Applying the Energy Cultures Framework (ECF) developed by Stephenson et al. (2010) to qualitative interview data, I will discuss the sociocultural drivers and barriers related to household energy transition in Nepal. The energy landscape in Nepal is developing, but how can we ensure that the achieved energy development leads to 'meaningful' access? And to what extent is this development sustainable? In doing so, I highlight the importance of a social lens to just energy transition. I will apply the ECF to illustrate socio-material organisations of household energy use and the resulting drivers and barriers to transition. The questions the thesis will discuss are the following:

1. How do households perceive the ongoing energy transitions and their contribution to meaningful energy access in Nepal?
    - How do households perceive recent energy development and its impact on household energy access?
    - What evaluation do households make concerning the desirability of energy sources from practical, economic, health, and environmental perspectives?
2. What drivers and barriers exist around meaningful household energy transition in Nepal?

By answering the above questions, I will apply and test the Energy Cultures Framework to fit the context of household energy consumption in Nepal. This thesis so contributes to country-specific knowledge on household energy practices and the related drivers and barriers to sustainable transition. I also position socially informed energy policy and energy development as multi-advantageous for sustainability and human well-being. The thesis contributes to sustainability

science through its assessment and application of an interdisciplinary framework developed for the modelling of sustainable energy development, as well as by expanding knowledge on energy transition in the specific context of Nepal. Although the energy cultures presented are case-specific, they may also be relevant in comparison with drivers and barriers to transition elsewhere.

### 1.4 Thesis Outline

In Chapter 2, I discuss 'meaningful' energy consumption through the lens of energy justice. Building on this, in Chapter 3, I present the Energy Cultures Framework as a theoretical model for the assessment of sustainable energy practices. In Chapter 4, I then present my methodological approach consisting of qualitative semi-structured interviews in Kathmandu and the Kaski district. I thereafter present the results, analysis, and discussion of my interviews in Chapters 5 and 6. Finally, Chapter 7 concludes my thesis and directs further steps for research on energy transition in Nepal.

## 2. Towards Meaningful Energy Access

In this chapter, I will present household energy consumption as a key indicator of energy justice along with recent energy development in Nepal. I will so discuss how to approach and assess 'meaningful' household energy access in the context of Nepal.

### 2.1 Energy Justice and Development

Any discussion of energy development should first recognise the concept of energy justice. Energy justice brings ethics into energy by viewing energy production and consumption as practices greatly influenced by social values and moral evaluation (Sovacool & Dworkin, 2015). Building on environmental justice, Sovacool & Dworkin define energy justice as "a global energy system that fairly disseminates both the benefits and costs of energy services and one that has representative and impartial energy decision-making" (Sovacool & Dworkin, 2015, p.436).

On an individual level, this may relate to (inequalities in) availability, affordability, and access to decision-making processes (Lacey-Barnacle et al., 2020; Sovacool & Dworkin, 2015). On a collective level, energy justice acknowledges the moral implications of energy production and consumption habits, such as negative externalities and trade-offs within and between generations which are often related to environmental pollution and emissions (Sovacool & Dworkin, 2015). Energy justice is often discussed along its three core tenets: procedural, distributional, and recognition justice (Lacey-Barnacle et al., 2020).

Lacey-Barnacle et al. (2020) critically argue that most of the literature and case studies on environmental justice focus on developed country contexts, despite developing countries' rising demand for energy services and the need for low-carbon solutions also in growing economies. The right balance of development for both the alleviation of (energy) poverty and carbon emissions is even more important in a developing country context (Winkler, 2020). While constituting two of the "foremost challenges of the 21st century", a just transition should therefore aim to address both environmental and social concerns and leave no one behind (Winkler, 2020, p.2).

While energy policy in Nepal has until recently focused on developing decentralised and renewable energy systems in hard-to-reach areas, the current focus is the expansion and improvement of the national grid, the development of domestic renewables such as solar, wind, and hydropower, and their incorporation into the electricity mix (Bhattarai et al., 2023; Lohani et al., 2022; WECS, 2013a; WECS, 2013b). As shown by Figure 1, consumer fuel consumption has still far from transitioned from firewood to electricity (WECS, 2022a), and biomass (firewood) and gas remain primary fuels (Lohani et al., 2022). A just energy transition in Nepal should increase consumers'

access to reliable, affordable, and modern energy fuels and will likely require a multi-step process (WECS, 2013a; Willand et al., 2021). Non-renewable modern fuels such as gas can function here as a transitional fuels towards renewable energy (Gürsan & de Gooyert, 2021)

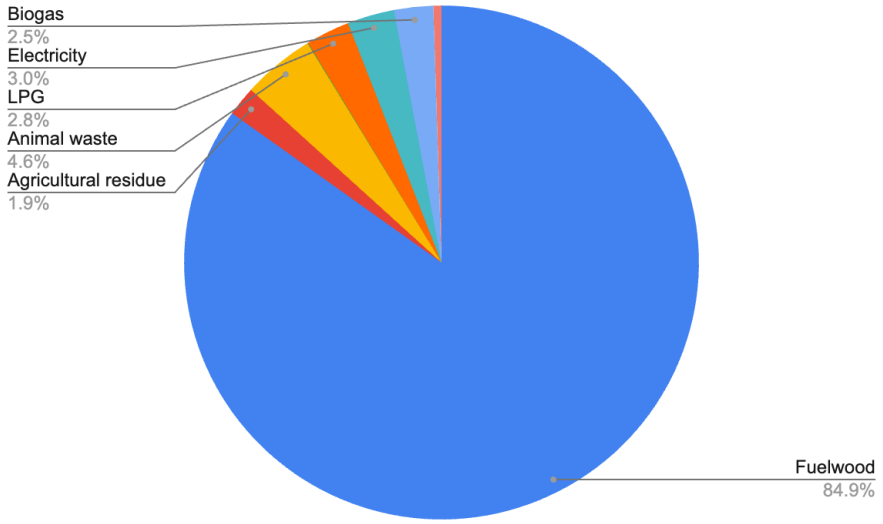



**Figure 1.** Residential Energy Consumption by Fuel Type for the Year 2021
*Note. The total share of solar (pink segment) is 0.5%. Sourced from WECS (2022a, p.55).*

## 2.2 Meaningful Energy Access

Based on the notions of capabilities and functionings, the Capabilities Approach (CA) focuses on the needs households can meet through the available energy services and to what extent they can realise meaningful lives (Schlosberg, 2012; Willand et al., 2021). Capabilities make up the range of opportunities allowing people to achieve a good life, leaving it up to the individual to define what a 'good life' means for them (Pham, 2017). In situations of energy poverty or vulnerability, households cannot access affordable or reliable energy services and therefore have limited capability regarding their health and well-being (Willand et al., 2021).

In their discussion of energy justice, Sovacool & Dworkin (2014) also argue that good societies should present their populations with a set of opportunities or substantial freedoms and the choice to exercise these or not. Aligning with the CA, just energy development should primarily aim to improve the range of capabilities users are free to apply, acknowledging individual agency (Damgaard et al., 2017). A capabilities approach to energy does not focus only on what technologies people have, but rather on what they can do with them (Melin et al., 2021; Pellicer-Sifres et al., 2021). Following this discussion of energy justice and the capabilities approach, it is important to look at energy choices, their consequences for individual capabilities, as well as their alignment with community interests (Melin et al., 2021).

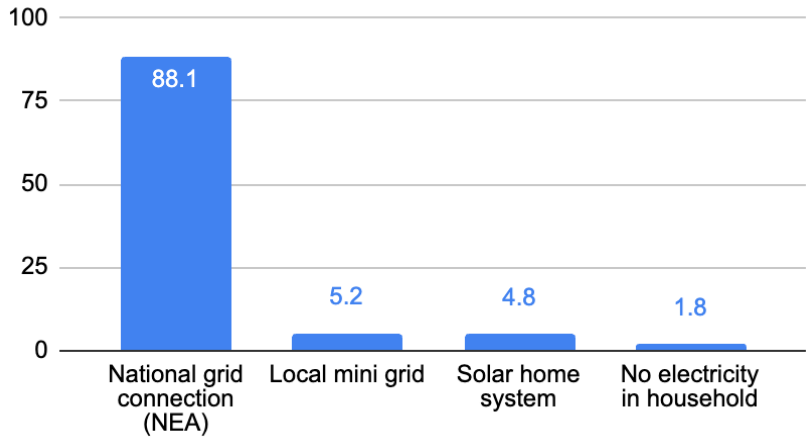



**Figure 2.** Percentage Share of Electricity Sources in Nepal for the Year 2023
*Note. Own table using data from "Household Energy Consumption and Energy Transition in Nepal 2023" (Sharma et al., 2024, p.28). NEA refers to the "Nepal Electricity Authority," responsible for managing the national grid.*

**Table 1.** Development of Cooking Fuel Usage Trend from Now to Present

| | 30 years back | 20 years back | 10 years back | 5 years back | Present time |
|---|---|---|---|---|---|
| Fuelwood | 97.9 | 95.5 | 87.5 | 78.0 | 67.4 |
| Agricultural residue | 29.8 | 28.5 | 24.4 | 21.5 | 17.3 |
| Cow-dung cake | 19.2 | 19.2 | 15.2 | 12.9 | 10.9 |
| Coal | 0.0 | 0.0 | 0.2 | 0.3 | 0.1 |
| Kerosene | 4.4 | 6.8 | 1.2 | 0.4 | 0.0 |
| LPG gas | 0.6 | 5.4 | 28.1 | 51.0 | 64.1 |
| Electricity | 0.3 | 0.6 | 3.0 | 5.3 | 8.4 |
| Solar | 0.0 | 0.0 | 0.0 | 0.1 | 0.6 |
| Biogas | 0.4 | 0.7 | 2.3 | 2.6 | 2.4 |

*Note. Sourced from Sharma et al. (2024, p.64). The present year refers to 2023. 1300 households were sampled.*

As shown by Figure 2, in Nepal, the national electricity grid has expanded to reach almost all households (Sharma et al., 2024). However, both urban and rural households also continue to rely on traditional fuels such as firewood for various household energy uses (Sharma et al., 2024). Table 1

illustrates the continued use of firewood and agricultural residue for cooking, even in the present time. This raises questions about restrained capabilities despite increased material access. While expanding access addresses the distributional aspect of energy justice, procedural injustices and inaccessibility may still affect household access (Melin et al., 2021). Meaningful energy access thus goes beyond mere connection and supply (Bhatia & Angelou, 2015).

### 2.3 Household Energy Consumption

Studies on household energy consumption patterns are extensive, assessing and modelling anything from fuel selection to technology preferences. While there are many 'lifestyle' approaches, some scholars suggest that fuel selection does not always have to be rational (Stephenson et al., 2010). While household consumption is influenced by personal values, it is also constrained by unpersonal technologies and materialities beyond individuals' agency. Household energy use is then not defined by rationally premeditated lifestyle choices but rather driven by larger structures of energy provision and consumption and technology (Gram-Hanssen, 2014).

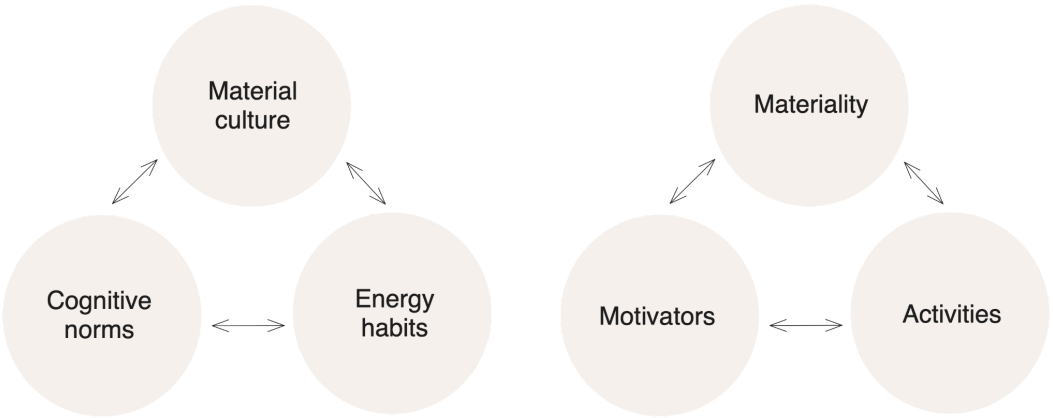
Gram-Hanssen (2014) proposes practice theory as a holistic approach that includes both habits and structures. Energy consumption is affected by individual preferences, but also part of collective practices (Gram-Hanssen, 2014). Material inputs and affordability, availability, and accessibility are important, but should always be linked to the final energy use (Grabher et al., 2023). Practice theory allows for the measurement of 'meaningful' energy access, as it approaches the direct demand of energy through energy services (Pachauri & Sprengh, 2004). While energy units alone do not tell us much about their application, practice refers to socially meaningful variables such as a cooked meal, heated room, or light to read (Pachauri & Sprengh, 2004). Similar to the capabilities approach, practice theory therefore studies what people are able to do as a result of increased household electrification, rather than mere developments in materiality (Pelz & Urpelainen, 2020).

## 3. The Energy Cultures Framework

Centred in the same holistic assessment of both material and social culture, the Energy Cultures Framework (ECF) was particularly influenced by practice theory (Stephenson et al., 2015). This chapter will present the ECF as suitable for the analysis of household energy behaviour in Nepal.

### 3.1 Theoretical Framework

The ECF framework defines energy behaviour as consisting of three distinct yet interactive elements: cognitive norms, energy practices and material culture (Figure 3). The framework characterises certain 'energy cultures' in which users apply the same energy behaviour as a result of the specific organisation of these three elements. Energy behaviour is "embedded within the physical and social contexts of everyday life", and seen as both repetitive and heterogenous actions (Stephenson et al., 2015, p.117). In order for the framework to be more generally applicable, in later renditions, the terminology has been adapted to 'motivators', 'activities', and 'materiality' (Figure 3, Stephenson et al., 2023). I will continue with this updated version.




**Figures 3 and 4.** Two Renditions of the Energy Cultures Framework
*Note. Own graphic using Stephenson et al. (2010, p.6124) (left) and Stephenson (2023, p.76) (right).*

The ECF strongly emphasises the consumptive side of energy transition, arguing that user practice forms as a result of the available material technologies and fuels, while also being informed by social attitudes towards the material elements of the energy landscape (Stephenson et al., 2010). The ECF here applies an actor-network frame, arguing that "The material world and its objects create a network of dynamic interactions which drive both stability and change" (Stephenson et al., 2010,

p.6121). Although reliant on habit and “persistent patterns of thought, perception, and action”, energy cultures are not fixed (Stephenson et al., 2010, p.6123).

Materiality, motivators, and activities are always connected, and in turn affected by a wide “contextual soup” of factors, including values, beliefs, knowledge, technology, economic factors, regulation, and incentives (Stephenson et al., 2010, p.6123). The ECF proposes that a transition to sustainable energy behaviour requires a disbalance or change in one of the three elements, inspiring a shift in the related two. How this occurs exactly depends on the specific organisation of the culture.

The driving purpose of the ECF is thereby to assess transition from specific energy habits to new (sustainable) practices, beliefs, and technologies. The framework helps question situations in which energy habits do not follow predictable patterns. As the authors discuss, adoption rates of energy-efficient technology and practices often “lag far behind those that cost-benefit analyses would suggest reflect rational economic choices” (Stephenson et al., 2010, p.6120). The framework aims to indicate the cause of such ‘irrational’ responses.

Lin and Kaewkhunok (2021) also argue that energy cultures need to be defined in a particular context, for instance along political, gender, and economic demographics. These internal and external contexts define the development of energy cultures and impact potential energy transition. Related to this, the ECF also pays attention to external influences on energy cultures, such as government regulation and subsidies. Given their externality to the system, these variables lay beyond the agency of the energy culture (Figure 5) (Stephenson, 2023). Still, their workings may affect the internal energy culture both positively and negatively, for change or against it (Stephenson, 2023).

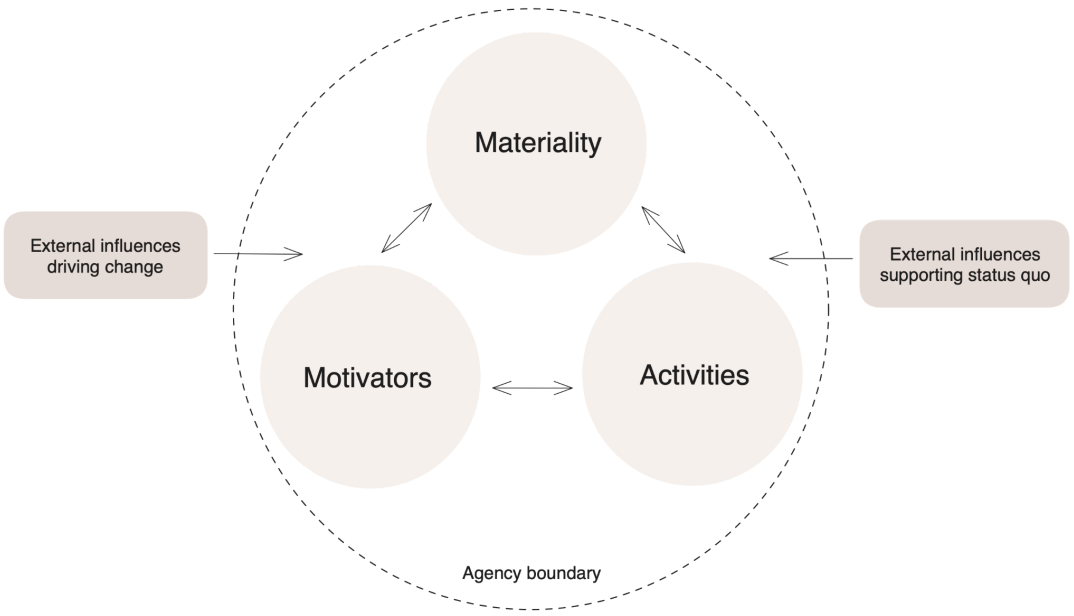



**Figure 5.** Expanded Version of the Energy Cultures Framework
*Note. Own graphic using Stephenson (2023, p.88).*

### 3.2 Operationalisation

The ECF is relevant because it sets the scene for change. While it is more commonly applied to developed economies in which energy use needs to be brought down, there are also examples of its successful use in developed country contexts where the ECF explains the difficulty of (rural) energy transition through a social lens (Klaniecki et al., 2020). Applying the ECF in a context of development, the framework can help frame the kind of transition that is already going on, what aspirations people have for future development, how these aspirations are shaped by existing norms and values, and to what extent a green transition fits into this. I am only aware of one previous study applying the ECF to energy transition in Nepal, namely one focusing on gendered energy transitions in Kathmandu (Shrestha et al., 2019). Applications of the ECF are often based on qualitative primary data (Klaniecki et al., 2020; Shrestha et al., 2019), which is how I came to develop my method presented in the following chapter.

Considering the countless possible iterations of energy culture, this thesis will discuss the varying elements that construct distinct energy cultures in Nepal. Energy cultures can exist on different scales (i.e. family, business, industry, or national levels). I will follow a similar structure to Klaniecki et al.'s (2020) discussion of energy cultures in Romania, presenting the different elements of energy cultures on a national level (Stephenson et al., 2015). I will propose three possible cultures related to their primary fuel use as a material determinant, as well as a visual model of cooking practices. The next chapter will go into the applied methodology for modelling the energy cultures in Kathmandu and the Kaski district.

# 4. Methodology

## 4.1 Applying the Framework

As set out in the previous chapter, I will apply the ECF as a theoretical framework to sustainable energy development in Nepal. Diverging from its usual focus on energy-saving practices, I will use the framework's elements to discuss drivers and barriers to sustainable energy development. Focusing on households, I will apply a method of semi-structured interviews to evaluate different energy 'cultures' in Kathmandu and the Kaski district.

Qualitative semi-structured interviews are a common approach for inductive theory testing (Bryman, 2016). Compared to self-reported survey data, interviews offer a more thorough perspective (Pierce et al., 2010), enabling this thesis to expand meaningfully upon recently collected quantitative data on household energy consumption (Sharma et al., 2024). Following the logic of human interaction, interview methods allow research participants to speak directly about the world around them, using their own words (Knott et al., 2022).

Qualitative interview approaches are necessary to collect the "finely grained and detailed information" necessary for the evaluation of socio-cultural influences on household decision-making (Crosbie, 2006, p.740). As argued also by Galvin (2015), it is the qualitative data on beliefs, attitudes, practices and skills that display the meaning given to energy systems by consumers, as it is not "the temperature of the room that is important, but the meaning the interviewee ascribes to the feeling of warmth or cold" (p.4).

Applying a semi-structured qualitative interview approach, this thesis assumes the methodological positioning of social-constructionist, interpretative knowledge production. All data is naturally situated within a strong social context, shaped by the individuals interviewed, the translator helping conduct them, and the researcher herself interpreting them.

The interviews are meant to offer authentic, credible, and transferable insights into energy cultures in Nepal. While the interactive setting of the interviews allows for more flexibility compared to surveys, in the case of this thesis, it is still constrained by linguistic and cultural barriers and levels of translation. The semi-structured approach therefore does not necessarily lead to fully in-depth interviews, although many insights can still be drawn from it. This limitation should be considered in the analysis of the collected data. The following section will further detail the selection of the interview sample.

## 4.2 Interview Sample

I conducted fifteen interviews in total, seven in Kathmandu and eight in two municipalities around Pokhara (Bamdi and Chapakot) (Figure 6, Table 2). All households were part of the 2023 Interdisciplinary Analysts survey on household energy transition and were approached for a follow-up interview for this thesis. To differentiate between distinct 'energy cultures', it is important to include a variety of household and livelihood contexts in the interview sample. Besides urban-rural differences, there are also variances within the urban and rural contexts. All interviewees are therefore referenced in the results section by their ward number but remain otherwise anonymous. While the sample of this thesis is much smaller than the 2023 survey, its qualitative method may nevertheless contribute to "careful and critical examinations of routine and taken-for-granted interactions with products and systems in terms of energy consumption and sustainability" (Pierce et al., 2010).

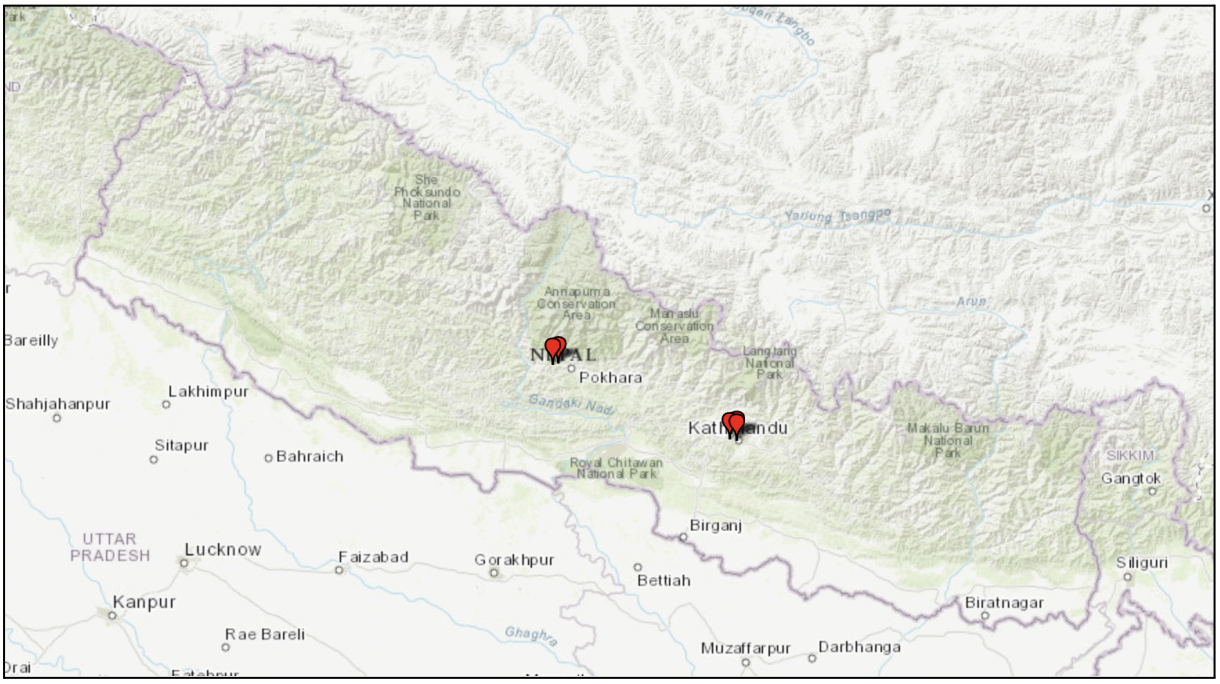



**Figure 6.** Sample Locations
*Note. Map indicating the location of all interview samples. All maps hereafter have been generated by the author using GPSVisualizer.com and an ArcGIS Online base map (ArcGIS relief/topo).*

**Table 2.** Overview of Interviews

| *Date* | *Municipality* | *Ward* | *Amount of interviews* | *Gender distribution (f/m)* |
|---|---|---|---|---|
| 18/02/2024 | Kathmandu Metropolitan City | 27 | 3 | 1/2 |
| 19/02/2024 | Kathmandu Metropolitan City | 12 | 2 | 2/0 |
| 22/02/2024 | Nagarjun Urban Municipality | 7 | 2 | 1/1 |
| 27/02/2024 | Pokhara Metropolitan City | 23, Chapakot | 3 | 0/3 |
| 28/02/2024 | Pokhara Metropolitan City | 23, Chapakot | 3 | 3/0 |
| 29/02/2024 | Pokhara Metropolitan City | 23, Bamdi | 2 | 1/1 |

*Note. In total, eight women and seven men were interviewed. The average age of interview participants is ~43 years old.*

### *4.2.1 Urban sample*

The urban sample includes seven interviews spread over three wards (Figure 7). The sampled ward 27 and 12 are both located in the centre of Kathmandu. This area is characterised by a high population and building coverage (Figures 8-9). The three interviewed households in ward 27 also ran businesses in the area. Ward 12 has similar business activity and is distinguishable from ward 27 by its many courtyards. Ward 7 of Nagarjun Urban Municipality lies further from central Kathmandu. The houses are more spread out and residents still partially rely on agriculture, managing agricultural land either directly around their house or elsewhere (Figure 10). Ward 7 is more difficult to reach and thus seems more remote compared to the inner-city wards.

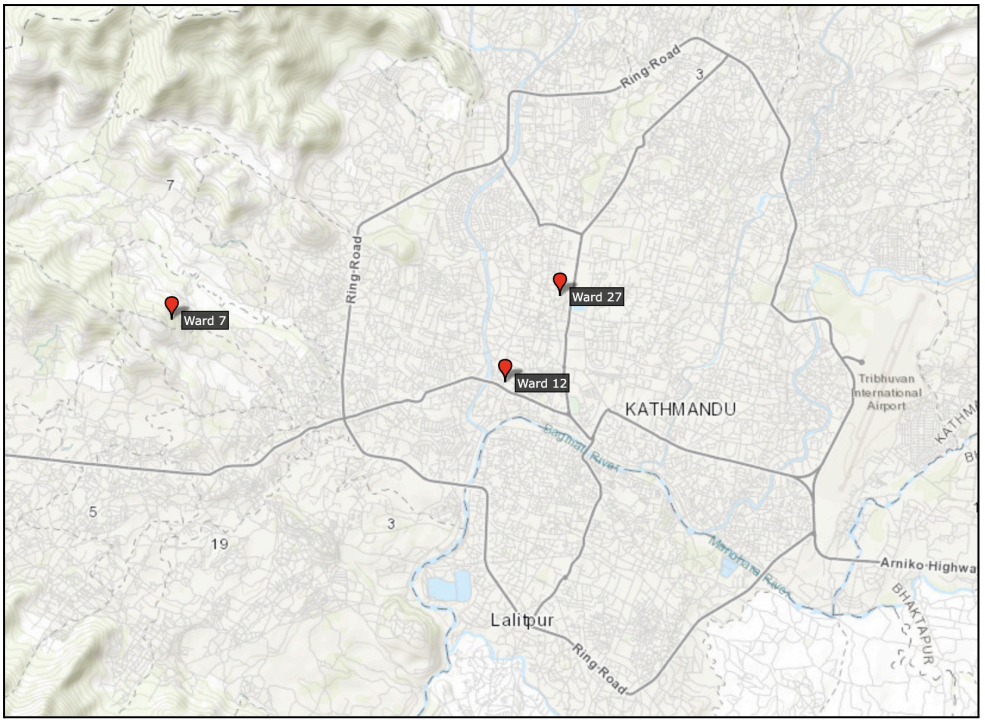



**Figure 7.** Urban Sample
*Note. Ward 12 and 27 fall under Kathmandu Metropolitan City, while ward 7 falls under Nagarjun Urban Municipality.*


**Figure 8.** Illustration of Ward 12
*Note. Photos by author, March 19th, 2024.*

**Figure 9.** Illustration of Ward 27
*Note. Photos by author, March 19th, 2024.*

**Figure 10.** Illustration of Ward 7
*Note. Photos by author, February 22nd, 2024.*

### *4.2.2 Rural sample*

The rural sample includes eight interviews in the Chapakot and Bamdi municipalities. Both are small villages located around an hour from Pokhara by car (Figure 7). Chapakot can only be reached by jeep, making the village much more remote than Bamdi, which is easily reached by car or motorbike. Bamdi is positioned along an asphalted road and is made up of a few streets, some small shops, and a local school (Figure 12). Chapakot lies on a hill and its houses are only connected by stone paths (Figure 13). Residents in Chapakot largely sustain themselves through agriculture. The two villages illustrate life away from the urban or metropolitan centres at different extents. Households in both villages have adopted modern lifestyles but also use some traditional practices relating to agriculture or food production. Bamdi and Chapakot are or were until recently constrained by road access and remoteness and have benefited from changes in infrastructure to some extent, yet still require further development.

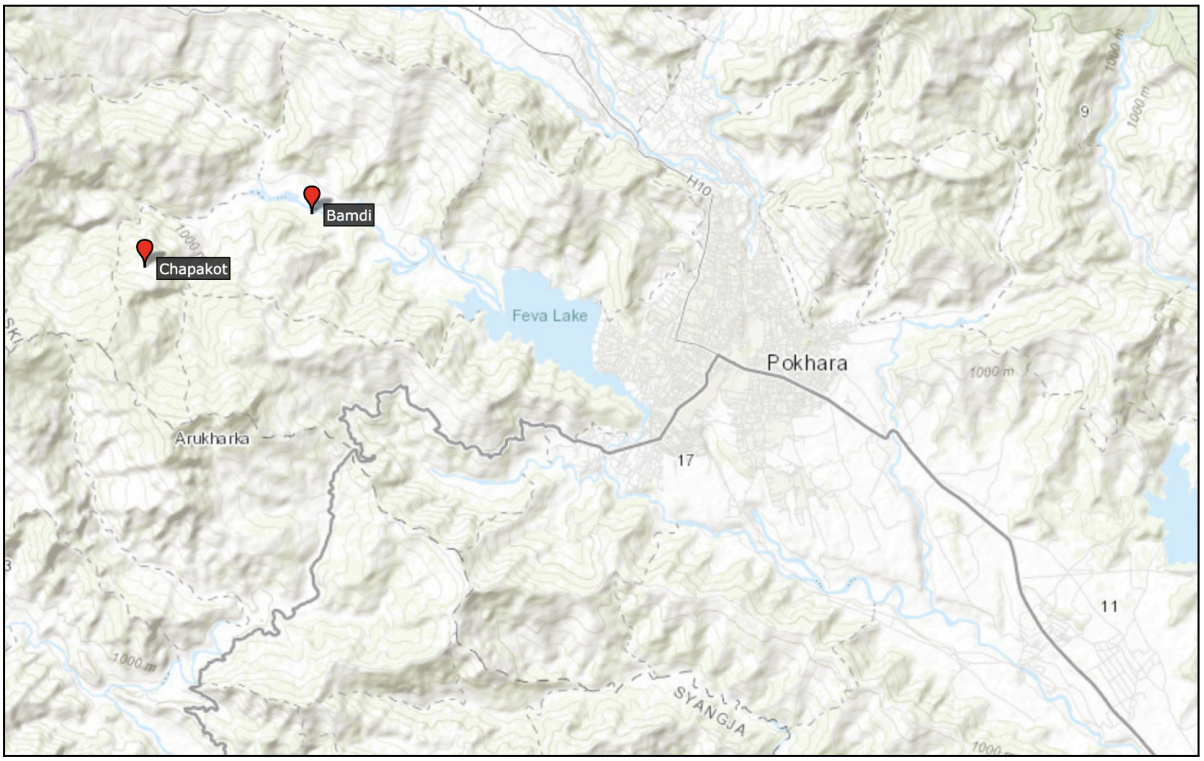



**Figure 11.** Rural Sample
*Note. Both Chapakot and Bamdi fall under the Pokhara Metropolitan City area (ward 23).*

**Figure 12.** Illustration of Bamdi
*Note. Photos by author, February 29th, 2024.*

**Figure 13.** Illustration of Chapakot
*Note. Photos by author, February 28th, 2024.*

### 4.3 Interview Method

All interviews have been conducted in Nepali with the help of a local research assistant. The interviews largely followed the interview guide provided in Appendix A. Some follow-up questions were asked by the translator to probe the interviewees to answer more comprehensively, as well as by the researcher to ask for further clarifications. Consent was obtained verbally, both in the initial phone inquiry for the follow-up and when visiting the interviewees in their neighbourhoods. Interviews were documented using pen and paper. All field notes were archived digitally and coded for recurring themes and patterns. These themes were then discussed along the ECF and are presented in Chapter 5. The findings have been anonymised and since any citations are based on live translation, they are cited from notes and not direct quotations (Boehnke et al., 2023).

All interviews were discussed with the research assistant to triangulate the data and its translation. This is an important step to check the accuracy of the translated and interpreted data (Temple & Young, 2004). Prolonged collaboration and engagement with the IDA research team also contributed to the research findings (Wallin & Ahlström, 2006). Moreover, while the interviewees' responses were translated directly during the fieldwork process, the translator logically had to make changes in her transmission of the answers from the interviewee to the researcher, occasionally shortening their answers or looking for comparable words to describe what they had explained in Nepali. The translator thereby held a key role in the knowledge production process (Temple & Young, 2004). At the same time, her presence helped bridge cultural and linguistic divides between the researcher and the interviewees.

### 4.4 Complementing the Interview Data

In addition to the interviews, this thesis is also informed by continuous observation of Nepali energy practices during six weeks of fieldwork (February 12th - March 26th, 2024). Being present in my research area for a prolonged period, I was able to discuss and experience some of the realities of 'daily life' in Kathmandu and Kaski. During this time, I also attended an energy stakeholder meeting at the IDA office (March 18th) and discussed my research with local experts. I continuously reflected on my observations and presence and kept note of this in a fieldwork notebook. Since fieldwork places the researcher "actually [in the field] and caught up in the currents of everyday life", observation is practically unavoidable (Ingold, 2014, p.386). Still, as argued by Ingold (2014), describing qualitative "encounters, fieldwork, methods and knowledge as ethnographic [would be] positively misleading" (385). Considering the requirements and limitations of ethnographic research (Ingold, 2014; Seim, 2021), I consider my observational data as complementary to my interviews rather than an applied method by itself.

The photos of the sample sites included above (Figures 8-10 and 12-13) further complement the textual interview data. Photography provides meaningful visual representations yet is not exempt from discussions on objectivity (Pink, 2007; Wright, 2024). While portraying a particular situation without manipulation, photography still exists within a frame of representation that is affected both by the researcher's selection of the material as well as the viewer's interpretation of the photograph (Pink, 2007; Schwartz, 1989). I selected the photographs above to give insight into the material reality of the interview sample, yet also recognise that they only offer a limited perspective into these places (Wright, 2024). While I consider some of my fieldwork observations (i.e. placement of houses and apparent material realities) in Chapter 5, the photographs above serve only as a contextualisation and starting point for the qualitative interview data.

### 4.5 Positionality, Bias, and Limitations

Finally, research on development, especially when applying fieldwork methods, requires strong reflections on positionality and bias. Cronin-Furman & Lake (2018) reflect on the ethics of collecting data abroad, including the physical presence of "white women carrying notebooks" (p.609). Researchers make specific choices regarding their fieldwork practices, such as clothing, note-taking, and taking photographs (Laube, 2020). They participate in the social situations that surround their data collection but also shape these situations by their choices made in advance (Laube, 2020). Development research especially requires an understanding of the (mutual) expectations of the research, for participants and the researchers themselves. Cooperation with local organisations may address some of these ethical concerns, for instance by offering a more local perspective, but do not take them away (Cronin-Furman & Lake, 2018).

The Kathmandu-based research institute Interdisciplinary Analysts (IDA) functioned as a host organisation and facilitated a large part of my fieldwork. IDA was a crucial entryway into the local energy cultures, not only thanks to their prior study on household energy use but also by assisting with the practicalities of my interviews. Before the start of my fieldwork, we discussed how interview participants might reflect on my position as a foreign researcher. Given the language barrier with the interviewees, we decided the translator should present both me and my research to the interview participants, and while doing so, position herself as having an equally important role in the study. This local connection was important to give credibility and legitimacy to my otherwise foreign presence in the field.

The interviews went smoothly and all interviewees seemed at ease in discussing their personal contexts, addressing both the translator and me directly. While the local connection did help in facilitating the interviews, I remained the researcher carrying a notebook and was aware of my

physical presence in the spaces where I carried out my research. I also reflected and asked questions continuously about the cultural (energy) practices mentioned in the interviews and in conversation with my translator (i.e. fodder preparation methods and types of stoves and lamps).

Moreover, although the interviewees expanded in great detail on their energy practices, the pauses for translation and cultural knowledge gaps prevented the interviews from reaching an in-depth conversation style. In most cases, I only diverged from the interview guide to ask clarifying questions about energy habits or to point out material things in our surroundings. The translator would ask more nudging questions to encourage the interviewees to elaborate on their answers.

My outside position may have also created a bias in the interviewees' answers. The explicit and implicit power relations in the social context of the interviews may have urged them to comment on aspects they felt would suit the premise of my study, instead of those they find most relevant themselves (Hammett et al., 2014). This responsive agency of the interviewees may also influence their self-reported satisfaction with energy development. Because research is "never value free or unbiased" (Hammett et al., 2014, p.48), my study should therefore be viewed in correspondence with existing and future (local) research on household energy behaviour in Nepal.

# 5. Results and Analysis

This chapter will present the research findings from qualitative interviews and observations in Kathmandu and Kaski. I reflect on the three elements of the ECF and present three 'primary fuel' cultures. I touch upon cooking cultures in particular, as cooking remains a major and energy-intensive household energy practice in Nepal (Malla, 2022).

## 5.1 Evaluating Development

To answer the first research question regarding households' reflections on energy transition, interviewees were asked to compare their current energy use to previous years and their attitudes towards its development. The following subsections will discuss households' responses along the three elements of the ECF.

### *5.1.1 Materiality*

Related to materiality, households were asked to reflect on the *availability, reliability,* and *affordability* of their energy sources. These variables reflect the material conditions determining household fuel selection (Acharya & Marhold, 2019; Pokharel & Rijal, 2021). The interviewees' evaluation of their material culture also indicates development over time. Concerning *availability*, most interviewees mentioned positive developments over the last decade. If not before, all interviewed households are now connected to the national grid. Both urban and rural respondents mention recent adaptations to their energy habits, like purchasing a fridge or induction cooking system (H2, Urban W27; H6, Urban W7). Most households still heavily rely on gas (see also Table 5).

Electricity seems to have become the standard for lighting. This indicates improved *reliability* of national grid electricity following a long period of load shedding. Load shedding refers to scheduled power outages that are meant to take pressure off electricity grids, a common practice in Nepal up until early 2017 (Timilsina & Steinbuks, 2021). Both urban and rural interviewees agree that they have access to a mostly continuous energy supply, with power cuts lasting at most 30 minutes (H14, Rural (Bamdi)). Both the urban and rural samples are connected to the national grid but have different experiences of access. Residents in Chapakot all mentioned issues with continued supply during rainy weather, as well as insufficient voltages for certain appliances (H8, Rural (Chapakot); H9, Rural (Chapakot); H10, Rural (Chapakot)). The rural interviewees also commented on the difficulty and expense of transporting gas cylinders up to the village (H10, Rural (Chapakot); H12, Rural (Chapakot); H14, Rural (Bamdi)).

Moreover, interviewees remain critical of the *affordability* of modern energy sources. Firewood is still considered an affordable fuel as it is often taken from households' own agricultural land or shared community forests (H6, Urban W7; H8, Rural (Chapakot); H12, Rural (Chapakot); H14, Rural (Bamdi)). This is usually the case for biofuels which are collected and not bought (Masera et al., 2000). The most costly element of firewood is then the labour required for the processing of the wood, yet many households are able to manage these tasks on their own and therefore do not make high expenses to obtain it (H6, Urban W7). One of the interviewees in Chapakot also explains that since the village is becoming emptier, *"there is more than enough firewood to go around"* (H8, Rural (Chapakot)).

Interviewees' opinions on the cost of gas vary greatly. While never seen as a cheap fuel, gas is generally considered to be affordable. A smaller group refers to it as an 'expensive necessity', because *"Food has to be cooked anyway [so] the price is less important"* (H4, Urban W12). One of two rural households that still use firewood for cooking commented on their desire to use gas (due to its convenience), yet the high investment in a gas cooking system prevented them from doing so (H8, Rural (Chapakot)). The other household commented on the inconvenience of transporting gas cylinders so high up the hill from the village road (H12, Rural (Chapakot)).

The same differences in distributional justice exist in the urban sample. Because of different income levels, two neighbouring households in Ward 7 make completely different evaluations of their energy consumption, despite their immediate proximity. The interviewee from a lower-income household struggles to imagine what she could use further energy for, as this is currently unaffordable and unrealistic, whereas the higher-income household can access all the energy services they desire.

Expanding on distribution and access, most interviewees say the price of grid electricity has come down and is now affordable. Still, both investments in and the use of electric appliances are seen as costly (H4, Urban W12; H8, Rural (Chapakot)). Many generally seem to be reluctant to use more electricity. The households mention paying only the minimum subscription cost and making efforts to keep their electricity bills low (H4, Urban Ward 12; H8, Rural (Chapakot); H10, Rural (Chapakot)). One household used to use an electric kettle, but switched back to boiling water with firewood and storing bottles with boiled water in the sun to save costs (H8, Rural (Chapakot)). One urban household had just started using induction and is not sure yet how this choice will affect their energy bill (H6, Urban W7). Should the cost become too high, households imagine switching back to gas. Still, despite limited access due to income constraints, *"It is better to have some electricity than none at all"* (H8, Rural (Chapakot)).

Besides fuel cost, multiple interviewees emphasised strongly how income in general influences all energy choices made. Commenting on affordability, interviewees argue that *"Now you*

*can get anything if you can afford it"* (H10, Rural (Chapakot)), but also that *"The use of energy and appliances gets more expensive each day"* (H7, Urban W7). For those that can afford it, electricity is *"irreplaceable"*, even if it comes with a higher price tag (H2, Urban W27). The same argument is made for gas. Business owners in both the urban and rural sample reflect on their income as highly fluctuating. A rural homestay owner expects most of his energy investments to be made up for by his income from tourism (H9, Rural (Chapakot)), while a woman running a café in Kathmandu changes her monthly energy decisions (purchasing gas) based on the cafés turnover (H1, Urban W27).

### *5.1.2 Activities*

The main development mentioned over the last 10 years is the abandonment of firewood for cooking (in urban areas) and the adoption of more electric technologies. When asked about their energy uses now, all households mention a variety of fuels that they use for different purposes. Most use gas for cooking and electricity for lighting, and firewood for agricultural purposes. The use of firewood for domestic cooking purposes has declined strongly with the introduction of gas. All households using gas commented that it is a 'cleaner' and more convenient fuel to use compared to firewood. *"Using an open fire, dishes were difficult to clean because the ashes would get stuck to the bottom, the home used to get much messier due to the smoke and ashes of the fire. Things have gotten better since switching to gas and electricity"* (H1, Urban W27).

Two rural households previously operated some of their electric appliances (i.e. rechargeable lights and mobile charge) on domestic solar panels, but have stopped using these now that the national grid is more economically advantageous and long power cuts have become rare (H10, Rural (Chapakot); H14, Rural (Bamdi)). Two other rural households still maintain a solar panel for lighting and are happy to have this as a separate option to the national grid (H9, Rural (Chapakot); H11, Rural (Chapakot)). Solar does not seem to be as common in the urban sample, as none of the interviewed urban households make use of private solar systems, with the exception of one solar water heating system (H7, Urban W7).

Given the changing needs in developing economies, (modern) multi-purpose fuels need to be used alongside traditional limited-purpose fuel types for certain purposes. Since "You can't run WiFi on firewood" (Dipak Gyawali, personal communication, 2023), even the most rural households are forced to use some form of electricity alongside more traditional fuels. Grid and solar electricity offer many applications (heating, lighting, charging), yet at the same time, certain energy habits can only be carried out using more traditional methods. As put by one interviewee: it would be possible to sustain life without gas, but *"Without firewood, life becomes pretty hard"* (H14, Rural (Bamdi)).

While electricity may not be able to meet all energy needs, energy use has increased due to the use of electric appliances. Still, despite the increased availability and reliability of electricity,

households have not switched to electricity as a primary fuel (as presented in Table 1). While households can adopt new fuels, they do not necessarily shift from one fuel type to the next. Several households give the example of their stoves: while some are happy to try new technologies like induction, they do not get rid of old ones. Instead, they mention the convenience of being able to cook multiple things at the same time (H1, Urban W27; H6, Urban W7; H9, Rural (Chapakot)). Gas and induction can be used side by side.

This result is in line with the 'fuel stacking' approach. In contrast to the 'fuel ladder' approach in which households linearly 'move up' towards more developed energy sources once their socioeconomic conditions allow, the 'fuel stacking' approach captures households preference for multiple fuels at once (Acharya & Marhold, 2019; Masera et al., 2000; Yadav et al., 2021). The fuel stacking approach recognises that fuel selection does not rely exclusively on income but also other preferences. Masera et al. (2000) discuss economic considerations, as well as material factors (technical preferences of fuel types), cultural preferences, and health impacts. In their model, even the most traditional (and pollutant) fuels remain in use and fuel wood is rarely abandoned completely. This multi-fuel strategy "helps households maximise fuel security and at the same time receive the advantages of different fuels" (Masera et al., 2000, p.2085).

### *5.1.3 Motivators*

Regarding motivating factors or "how people think" about their energy uses (Stephenson, 2023, p.75), the questions in section three of the interview guide (Appendix A) relate to habits and satisfaction. Most interviewees seem to be satisfied with their energy access, even if their access and use were still constrained or limited (H6, Urban W7; H7, Urban W7; H8, Rural (Chapakot)). Various interviewees also commented on having gotten used to a lifestyle with limited energy use (H11, Rural (Chapakot); H12, Rural (Chapakot)). Households with access to information technologies were more aware of the economic and health benefits of modern fuels (H3, Urban W27; H8, Rural (Chapakot)). The internet has made all kinds of information available, including information on induction (H3, Urban W27; H8, Rural (Chapakot)). In the rural sample, one interviewee was unaware of electric cooking technologies, despite using grid electricity for other purposes (H13, Rural (Chapakot)).

While some interviewees expressed clear awareness of the economic, health, and environmental benefits of using electricity for lighting, cooking, and other purposes, the majority mentioned ease and convenience as the most important factors affecting their fuel selection. Understandably so, as modern technologies made available by energy transition have impacted interviewees' daily routines tremendously. They no longer have to get up at night to wait in line at the water collection point (H5, Urban W12) and can work later hours instead of only by sunlight (H6, Urban W7).

Interviewees especially show a high satisfaction with gas for cooking and electricity for lighting (*"Now there is light everywhere"*, H13, Rural (Chapakot)). Life has become *"easier"* because of gas and electricity, providing facilities for heating, cooking, more productive hours, and study time for children. Interviewees comment on gas being much easier to use than firewood, as pots get less dirty, heat is easier to manage, and it is possible to do multiple tasks at the same time (*"You simply lower the flame"*) (H6, Urban W7; H11, Rural (Chapakot)). Two interviewees see gas as the easy option when they feel *"rushed or lazy"* (H10, Rural (Chapakot); H11, Rural (Chapakot)). With gas, the male members of the family are also able to cook (H14, Rural (Bamdi); H15, Rural (Bamdi)).

A middle-aged female café owner explains that her day-to-day routine has become simpler, both at home and at work (H1, Urban W27). She is able to work faster by using multiple stoves and especially using electric methods, as she can leave her cooking unattended while she goes out to do other things. For her, convenience is a prime motivator to adopt new technologies, and despite the investments that they require, she is happy to *"pay the price for a more convenient life".* Another interviewee agrees: preparing dal bhat (a standard meal consisting of rice and lentils) has become much easier now she is able to use gas and induction simultaneously (H6, Urban W7).

### 5.2 Evaluating and Envisioning Future Development

As part of section four of the interview guide (Appendix A), the households were asked to rank the following priorities as reasons to adopt new energy technologies: ease and convenience, better for health, cheaper, and better for the environment. Figure 14 shows the distribution of the first place prioritisations made of these four motivators. Here the benefit of convenience also comes out on top. Health is often mentioned in relation to firewood, as its use contributes negatively to indoor and outdoor air pollution (dirt, smell, and smoke). One young mother explains she is more comfortable using gas, as she believes firewood directly harms her baby's health (H4, Urban W12). Sometimes health is mentioned counterintuitively: *"You need to be strong in order to collect firewood"* (H15, Rural (Bamdi)).

The interviewees ranking environment as a priority mainly mention pollution in the household and urban contexts, as well as the sustainable management of community forests. Only one interviewee actively acknowledged larger environmental damage caused by the use of firewood: *"We have used a lot of firewood and have caused a lot of disadvantages to the environment"* (H14, Rural (Bamdi)). Another interviewee in Bamdi, however, tellingly argued that using firewood is not a *"moral choice"* and instead the simple result of economic motivations (H13, Rural (Chapakot)).

The benefit of 'cheaper' was never selected as a first priority. Households do not connect modern technology to economic savings and several interviewees even laughed at the suggested

benefit of economic gain. Commenting mainly on cooking, many interviewees feel that there could be benefits to using electric kitchen appliances, but that doing so would lead to an unaffordable energy bill. Income constraints feel so limiting that three interviewees even say they do not start thinking about what they could possibly wish to use more energy for, as there is no point in *"dreaming about the impossible"* (H6, Urban W7). In addition to this, many interviewees reflect on 'cheap' as the relative share of their income, rather than the price per unit of fuel. If households already feel their income is constrained now, they do not expect to be able to use more energy later on, even if the price per unit decreases: *"I am already unable to upgrade my energy use now, let aside from in the future"* (H8, Rural (Chapakot)).

When asked directly about renewables, households evaluate them positively. Still, solar is little used in the samples, either because of income constraints or because of a lack of necessity. As mentioned, several households previously used private solar panels, but let them fall out of use due to expensive maintenance and decreased national grid prices. Not using fossil fuels does not seem to considered as a reason to transition to renewables fuels by itself (H1, Urban W27), but households might consider other local environmental benefits such as smog (H2, Urban W27; H3, Urban W27; H11, Rural (Chapakot)) and forest management (H14, Rural (Bamdi)).

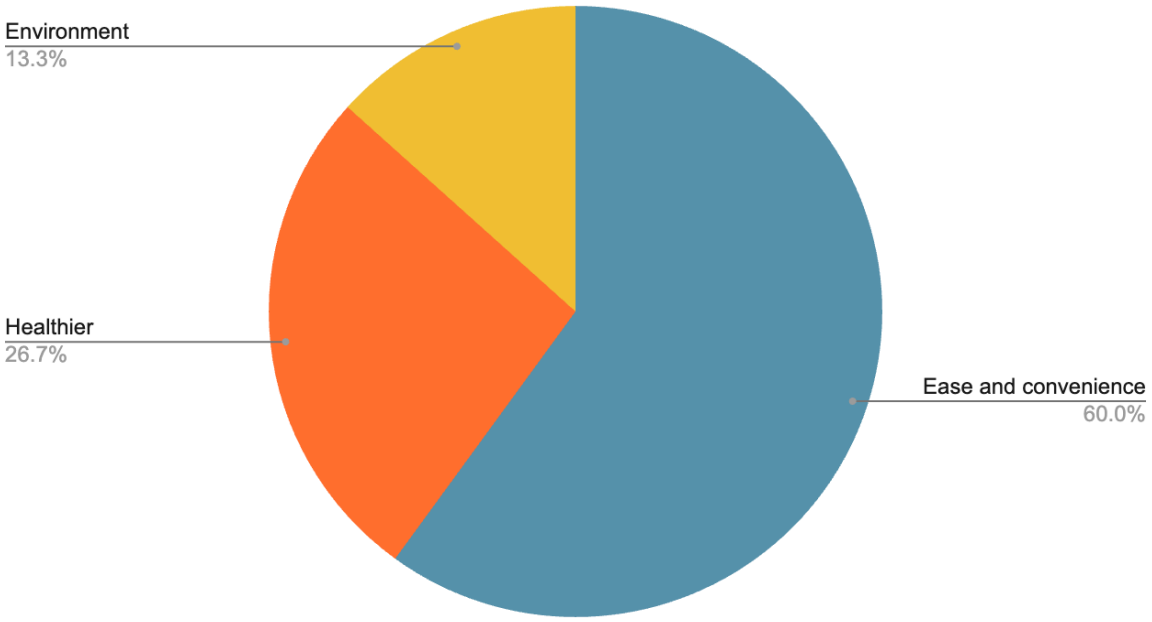



**Figure 14.** First Place Prioritisation of Reasons to Adopt New Energy Technologies
*Note. Ease and convenience was mentioned by nine interviewees; health by four; mention of environment by two. Economic advantages were never mentioned as first priority.*

### 5.3 Desires, Wants, and Needs?

Interviewees in both the urban and rural samples mentioned quite recent changes to their energy habits. Two urban interviewees bought a fridge only during the last year (H2, Urban W27; H4, Urban W12), and in the rural sample, a household had recently purchased a solar water heater (H9, Rural (Chapakot)). When asked about their motivation for these upgrades, all three interviewees expressed a desire for increased convenience, as well as having the financial space to make the necessary investment. This relates to the priorities expressed in Figure 14: energy adaptations are motivated by a desire for their benefits, not because of potential economic savings. One urban interviewee also reflected on the differences in social attitudes to energy now and in the past. Previously, people would use energy because of necessity, now they require more because of their *"wants and desires",* such as convenience (H7, Urban W7).

Another urban interviewee explained that her household currently does not use a WiFi system because mobile data packages are cheaper and meet their needs, but that they would be willing to make the investment if required to maintain a certain lifestyle in the future (H5, Urban W12). In this sense, there are also generational differences. Children who are studying need lighting to work on homework as a basic capability, but may later require computers and internet (H2, Urban W27). For the first interviewee, it seems unavoidable that her household will use and pay more for energy services as her children grow up.

When asked about their willingness to pay, most mention their already limited income. Still, some discuss that they would be willing to invest in modern fuels or technologies in exchange for quantifiable or otherwise obvious benefits, such as increased income of their businesses. Others feel they have little power in the face of the market: *"If electricity becomes more expensive I will not have a choice but to pay for it anyway"* (H11, Rural (Chapakot)). And similarly: *"I would not be willing to pay more unless there is no other option"* (H7, Urban W7).

An urban interviewee reflected on the role of the government: the household has had to arrange many things by themselves before, so she does not expect the government to intervene in her household energy system now either: *"Solar would be great, but I do not count on the government to provide it"* (H6, Urban W7). Another urban interviewee explained that air pollution is certainly a problem, but since Kathmandu is already covered in smog, it might be too late to impose regulations on it now (H7, Urban W7).

Despite the general trend of increased energy access, occasional shocks force households to (temporarily) revert back to old habits. One interviewee discusses that she had to make use of less or less-preferred appliances because of fuel shortages during the COVID lockdown (H1, Urban W27). Now she is able to make use of her fridge and oven again. Similar shocks occurred following the 2015

earthquake and Indian trade blockade (Underwood et al., 2020). These instances illustrate on a large scale how energy habits are not always determined by choice, but are also imposed by the larger socioeconomic context outside of the household's control.

Table 3 displays the different drivers and barriers that can be distilled from the fifteen total interviews. Following the reflections above, households largely respond to the developing energy systems around them to the extent that they are *economically* able to. Cheap energy is not a priority, but based on the share of income the household can devote to energy, the household seeks to use convenient and healthy energy sources. When the income is too limited, the household accepts the current lifestyle and fuel types connected to it. 'Cheap' also has a negative connotation, and interviewees would rather have something good than something affordable, but of poor and unreliable quality. *"Unreliable energy has no economic benefit: a cheaper but quickly broken appliance is a poor investment"* (H1, Urban W27). Reliability and applicability thus seem more meaningful in driving energy transition.

**Table 3.** Drivers and Barriers to Household Energy Transition

| Drivers | Barriers |
|---|---|
| *Materiality*<br>- Increased availability of appliances<br>- Adaptive response to power cuts<br>*Activities*<br>- Increased convenience<br>- Economic savings or other 'benefits'<br>*Motivators*<br>- Examples from people in the neighbourhood and community conversations<br>- Information from the internet | *Materiality*<br>- Income constraints (initial investment and operation costs)<br>- Environment (space, road access)<br>*Activities*<br>- Preference or need for traditional methods<br>*Motivators*<br>- Satisfaction with current energy use and appliances (lack of need)<br>- Lack of awareness |

Both in urban and rural contexts, a prominent driver of transition is community. Seeing the benefits and comforts of electrification in their direct surroundings, households get inspired to start using electric appliances such as heating systems and induction cooking (H2, Urban W27; H4, Urban W12). This can motivate development in close neighbourhood environments and encourage residents to increase their domestic energy consumption, even if this will cost them more. Information technologies (such as WiFi) are also an important part of electrification which contributes to a positive feedback loop: through the internet, households are educated about further benefits of modern technology like induction (H3, Urban W27; H8, Rural (Chapakot)).

In the rural sample, households also mentioned needing community approval and agreement on large investments such as solar panels (H10, Rural (Chapakot)). When asked about their future vision, many also mentioned developments that would benefit the community overall rather than

just their household individually (H10, Rural (Chapakot); H15, Rural (Bamdi)). In urban contexts, electrification can also occur on a community level, for instance through solar street lighting as was installed in ward 27.

### 5.4 Applying the Energy Cultures Framework

As the diversity of examples in the previous section illustrates, there are countless iterations of energy culture(s) in Nepal. Since the ECF is at both a model of behaviour and a theory of transition (Stephenson, 2023), it should at once demonstrate current energy cultures and simultaneously question which components need to shift to realise future transition. Table 4 presents three energy cultures based on a primary energy source for cooking. Households may move between them and overlap may exist between certain elements of the cultures. These cultures are not meant to reflect stages of transition from fuel to fuel, but should rather illustrate the diversity of experiences.

The first culture encompasses mainly rural households that still make use of firewood for their basic energy needs. Of the interviewed households, 8 households still make use of firewood for the preparation of food for human consumption (see also Table 5). Traditional methods are used for the preparation of animal fodder (usually in a large pot on an outdoor stove). The households are primarily reliant on firewood due to its availability and perceived affordability. The households also make use of gas and grid electricity, but in a limited fashion (i.e. only mobile charge but no other applications). The households are conscious of the fact that their energy consumption lies below average and that they might benefit from other sources but do not consider such developments to fit into their spending patterns.

The second culture covers both the rural and urban households that have transitioned away from using firewood, but still use more gas than electricity. Gas is used for cooking and (water) heating and is supplemented by electricity for lighting and charging mobile devices. Fuel selection in this culture is still motivated based on affordability, but because of the increased household income, users have more flexibility in their choices and therefore prefer convenient fuels. Gas is seen as a convenient cooking option and is perceived as cheaper than electric alternatives. Households in this culture would like to use more energy services but feel constrained by their budget.

With sufficient income, the third culture faces the least amount of material constraints, giving households access to both modern energy technologies and the income to afford them. Households use electricity for cooking, lighting, and heating, and may even have adopted renewable alternatives such as solar water heaters. Since income is not a constraint, the household uses a range of electric appliances to increase their convenience (i.e. kitchen appliances, washing machines, water pumps).

Households are able to comfortably meet their needs, but further improvements and transition towards renewable electricity are still ongoing.

**Table 4.** Three Proposed Energy Cultures

| | Materiality | Activities | Motivators |
|---|---|---|---|
| 1 | Firewood is still a common energy source, some gas and grid electricity. Low income | Traditional livelihoods and limited electricity application | Aware of limited energy use, but no desire for further use due to income constraints |
| 2 | Primarily gas, some electricity. Increased income | Increased income, but still acting on affordability. Efforts to reduce electricity costs | Desire for more use, but income constraints |
| 3 | Primarily electricity, possibly renewables. Sufficient income | More electric appliances, energy use based on convenience | Can meet most needs, shift to electricity and renewables still ongoing |

## 5.5 Cooking Culture

As a final illustration of the ECF applied to the context of Nepal, Figure 15 maps the various elements of cooking culture already brought forward in the previous sections. Based on the distribution of primary cooking modes in Table 5, Figure 15 captures the majority cooking culture which is centred around gas. Nepali cooking culture has mostly moved away from firewood, but the majority of interview households are still hesitant to transition (fully) to electric cooking. Cooking behaviour especially reflects the cultural nature of energy use since it is so infused with social norms and preferences such as taste (Jürisoo et al, 2019).

Old habits die hard, and so, even when technology becomes available, there are reasons to use firewood (and gas). One interviewee explains: *"Even though new technologies make life easier and we like to use them, we still love to use firewood in one way or another"* (Household 15, Rural (Bamdi)). Based on the interviewees' evaluation of past development, previous shifts in cooking habits were inspired by changing materialities, as well as changing motivators (i.e. social examples and the need for convenience). The majority of cooking transitions have occurred in urban areas (Bharadwaj et al., 2022). Rural cooking transition policy could be informed by the barriers and drivers discussed in this chapter.

**Table 5.** Overview of Interviewees' Cooking Habits

| *Primary mode of cooking* | *Household no.* | *Total* |
|---|---|---|
| Firewood | 6, 9, 11, 12, 13 (fodder), 8, 9, 10, 11, 12, 13, 14, 15 (food) | 5, 8 |
| Gas | 3, 4, 5, 6, 7, 9, 10, 11, 14 | 9 |
| Induction | 1, 2, 7 | 3 |
| Electric appliances | 1, 3, 4, 6, 7, 10, 14, 15 | 8 |

*Note. Numbers refer to interview order.*

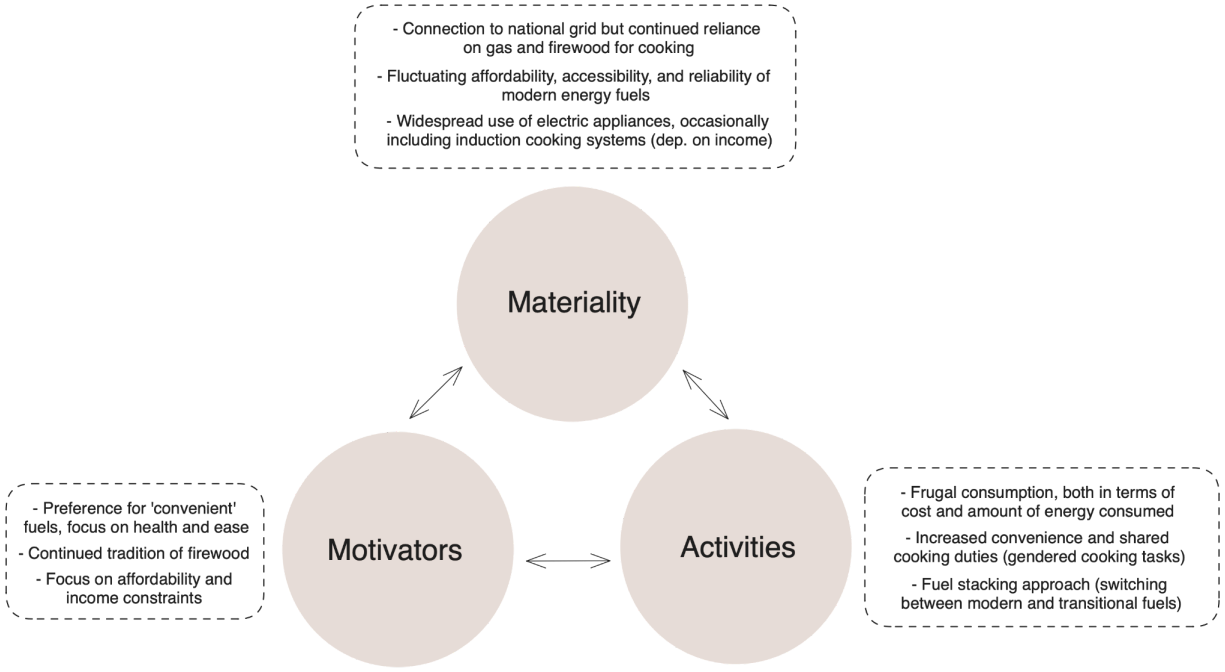



**Figure 15.** Elements of Cooking Energy Culture in Nepal
*Note. Own graphic based on Stephenson (2023).*

## 6. Discussion

To evaluate just energy transition, we must assess what is going on, how things ought to be, and what solutions are necessary to get to that point, and who is involved in making these decisions (Figure 16; Sovacool & Dworkin, 2014). These elements have been presented in the previous chapters: Chapter 2 set out the basics of energy justice and its assessment in the context of households, and Chapters 3 and 4 applied the ECF to qualitative fieldwork in Nepal. Finally, Chapter 5 presented different experiences of energy development and household aspirations regarding energy transition in the study sample. Grounded in these justice aims, in this chapter I will return to a final discussion of rural and urban drivers and barriers to sustainable energy transition.

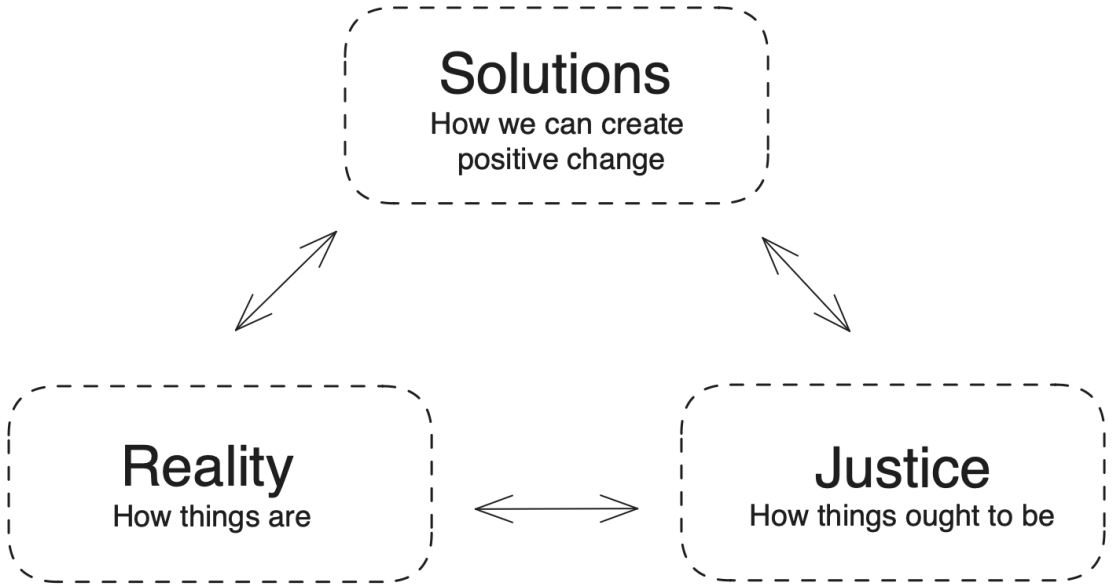



**Figure 16.** Components of Energy Justice
*Note. Own graphic using Sovacool & Dworkin (2014, p.19)*

Sovacool and Dworkin (2014) argue that the application of justice in practice is more relevant than in theorising. One of its applications is the linking of individual wishes to the desires of the collective and society as a whole. In this sense, “it serves to resolve disputes in ways that extend beyond mere individual preferences" (p.10). Following Chapter 5, the ECF structures an initial or preliminary inquiry into energy consumption and requires further in-depth follow-ups to the drivers and barriers it identifies (Klaniecki et al., 2020). Considering these contextualised perspectives, energy development in Nepal should aim to alleviate the barriers related to all three ECF elements.

## 6.1 Drivers and Barriers

As financial constraints are mentioned in both urban and rural samples to varying extents, one of the main *material* barriers is not availability, but access as a result of household income. As the example of the two neighbours showed, despite being in close proximity to the other households in the village and having access to national grid electricity, differences in income determine entire energy habits and the distributional justice of (modern) energy access.

Both rural and urban cases show that adding to infrastructure alone is not enough to spur a just and green transition. While the expansion of the national grid has been 'meaningful' to some extent because it has brought electricity to households that were previously entirely deprived of it, issues with rural road access and power lines show the necessity of further infrastructural improvements. Materiality goes beyond providing grid lines and other transmission technologies: electricity also has to be applicable and reliable.

Besides practical material barriers, some energy *activities* require traditional or transition fuels. Rural users will likely never fully phase out firewood due to their need to prepare fodder. The move from traditional and transition fuels should therefore consider traditional lifestyles and behaviours and the related constraints for transition. Households using less desirable or developed energy fuels should not be framed as lacking knowledge of alternatives as they are often already aware of the drawbacks of these energy sources (Jenkins et al., 2015).

Instead, policy should acknowledge the contextualised needs that require them to continue using fuels such as firewood, and address these barriers instead of (non-existing) knowledge gaps. Still, there is still room to decrease fossil fuel dependencies and shift energy use to electricity, like electric cooking and water heating. Recognising local priorities is an important part of procedural and recognition justice (Jenkins et al., 2015).

Besides these traditional habits, households seem generally open to trying modern technologies. If presented with clear economic or health *motivators*, urban and rural interviewees are both willing to replace gas with electricity. Households need to have a clear reason to change but do not necessarily have to be aware of (all) motivators to shift their energy use. One barrier here is the counter-developmental idea that 'how it has always been done' must suffice also now. In the current conditions, many interviewees seemed to accept their situation and energy conditions, no matter whether these would be objectively adequate or desirable.

## 6.2 Limitations, Agency, and the System

This connects to one of the limitations of the collected qualitative data, as through its multiple processes of linguistic and cultural translation, a certain sense of urgency may have gotten lost.

Despite efforts to explicitly acknowledge positionality and bias, it is unavoidable that my presence in the field has affected interviewees responses to some extent. Conducting interviews (at times, extremely) with energy-poor households, I was surprised by the respondents' evaluations of energy access. Their relatively positive evaluation of objectively poor energy access may be explained by my entry into their homes and lives as a foreign researcher, but also as a guest.

Alternatively, the relative acceptance of energy poverty might relate to the interviewees' cultural background in deterministic religion, karmic beliefs, and remnants of caste hierarchy (Karnic & Suri, 1995). This may also explain the strong focus on community, as households hold onto the collective distribution of "who deserves what" rather than prioritising individual gain (Duong et al., 2024). These are "subjectivities" in the context of Nepal that are not captured by my interview method (Nightingale, 2011).

Moreover, although government subsidies and responsibility were brought up by some interviewees, I have not extensively addressed external factors to household behaviour. Still, I want to restate that sustainable and just transformation should occur on all levels of the energy system, and policy should encompass much more than individual habits. Energy transition is so tied up in the economic development it simultaneously supports and even if preferences shift, income remains a major constraint and the unaffordability of clean fuels should be addressed (Pokharel & Rijal, 2021).

National policy should therefore aim to both improve household agency specifically, while supporting economic advancement and infrastructural development generally. Policy should account for urban and rural needs and adapt its approach to fit both contexts into national priorities. This includes extensive research on household perspectives, also in light of increased climate impacts (Ensor et al., 2019).

On a national level, adopting modern fuels is necessary to improve energy security (WECS, 2013b). Although households perceive gas positively, importing makes Nepal vulnerable to regional political shifts with India and fluctuations in price on the international market (Herington & Malakar, 2016; Underwood et al, 2020). Besides security, Nepal is facing the task of incorporating more renewables into its energy mix to achieve its international environmental targets, as transitioning away from fossil fuels is more needed than ever (Poudyal et al., 2019; Lohani et al., 2022).

An important balance to strike here is between human development and climate change mitigation, reiterating the developing country context of Nepal (Wood & Roelich, 2019). Reflecting also on my fieldwork and my personal observations of (some of) the lived realities of energy poverty in Nepal, a realistic transition should address access first and sustainability second. Although sustainable energy development can lead to double social and environmental benefits, a just transition should primarily focus on mobilising energy to improve the daily lives of the energy poor.

## 7. Conclusion

This thesis set out to map and evaluate household energy transition in Nepal, applying the perspectives of both energy justice and sustainable development. Informed by qualitative interview data, household perspectives regarding materiality, activities, and motivators were evaluated through the Energy Cultures Framework. Understanding the organisation of these three elements is essential to explore both present and future household behaviours, the evaluations that are made in their fuel selection, and the opportunities for change.

In the case of sustainable development generally and energy systems more specifically, human and environment needs are inseparably connected. Balancing human needs and achieving environmental targets is especially important in the context of low-income countries where energy poverty is a pressing issue affecting household capabilities. Although development of renewables may contribute to a 'double transition' of both social and environmental gains, a meaningful energy transition should largely be informed by household wants and needs.

Building on the Capabilities Approach and practice theory, the Energy Cultures Framework offers a useful theoretical lens into household energy choices and drivers and barriers for transition. The framework has mainly been applied in a developed country context, yet is also relevant to the case of Nepal, as it offers a clear framework to assess pathways to sustainable development.

The fifteen semi-structured interviews conducted with households in Kathmandu and Kaski reflect a relatively positive evaluation of recent energy developments in Nepal, as at least transitional fuels and grid electricity have become available to the majority of households. Gas and grid expansion have made daily life easier and healthier, a benefit households would also appreciate and prioritise in future energy development. Households apply multiple fuels at once, motivated by economic savings or traditional habits and needs.

While households reflected positively on their current levels of access, the objectively low energy use of households signals that the current development has not yet proven 'meaningful' for all. With little economic room, fuel selection is still constrained by income and many households remain in energy poverty or at the risk of falling into it.

Although some energy applications perpetuate the use of traditional or transitional fuels such as firewood and gas, there is potential for sustainability gains especially in cooking habits. Households are at least willing to do so, should improved fuels be affordable and their benefits clear. My findings further signify the need for contextually informed policy that recognises drivers and barriers specific to both metropolitan and rural contexts.

In a metropolitan context, transition is well underway, but transitional fuels such as gas are still widely used alongside electricity. Fuel selection can change monthly based on income, yet interviewees often accept the (high) cost for fuels they view as essential. Households are aware of the benefits of modern fuels, either thanks to the internet or examples from their neighbours.

Such community examples are even more relevant in rural areas where not all households are familiar with the benefits of electronic technologies. Despite use of the expanded national grid and interest in electric technologies, rural households face greater income constraints and also retain some traditional habits. Rural households also face more challenges with availability and accessibility, as it is difficult to transport gas up the mountain roads and power lines get damaged during storms.

Interviewees reflected on 'making do' and being satisfied with the limited energy sources at their disposal. This response shows the practical resilience of the Nepali people, yet also points to a barrier for further development. If households do not allow themselves to dream, how can policy meet their needs and wishes? The response may have also been affected by my positionality both as researcher and outsider in Nepal. Further research would therefore benefit from an even more local lens and in-depth presentation of household perspectives.

To conclude, the meaningfulness of energy development depends entirely on the participation and reflection of the wants, needs, and desires of those who it concerns in the first place. Through this thesis, I have tried to present and give voice to exactly this group. I hereby hope to have illustrated the interconnectedness of mind, heart, and environment for sustainability, and how these links are in turn reflected in the constellations of materiality, activities, and motivators informing the diverse energy cultures of Kaski and Kathmandu.

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# Appendix A

**Interview guide**

1. Energy use
    a. Can you tell me about the ways you use energy in your home (heating, cooking, cooling, lighting, electric devices/appliances)?
    b. Is it affordable? Is it renewable?
2. Energy development
    a. Has the source of energy you use changed over the last ten years? Do you feel you use more or less energy and appliances now?
3. Attitude previous development
    a. Are you satisfied with the energy services you have access to now?
    b. Do you think this energy source is reliable and affordable? Is the energy source appropriate for what you need energy for in your home? Does this affect whether you use the energy source?
    c. What are some things you can do around the home or neighbourhood now that you have more energy?
    d. Can you tell me about the process of getting new energy fuels? Why did you start using them?
4. Priorities future development
    a. How would you say your daily routine has changed due to energy development?
    b. In what ways do these new fuels benefit you?
    c. If you had to rank the following benefits, how would you rank them?
        i. Cheaper, easier, better for health, better for the environment
    d. Is there anything you would still like to use energy for but cannot yet?
    e. If you were able to receive reliable energy in the future, would you be willing to pay more for it than you currently pay for your energy?
    f. Should your energy access be updated in the future, what would you like development to prioritise? *For example: cheaper energy, more reliable energy, more healthy energy systems?*