

# Just Energy Transition in Nepal

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## 1. Introduction

Owing to the unprecedented rate at which the global temperature is rising and climate impacts are unfolding across sectors and scales (IPCC, 2023; UNEP, 2023), the global community is in a race against time to curb greenhouse gas (GHG) emissions, limit global temperature rise, and avert climate change-induced loss and damages. Over the past few years, climate change impacts have become more severe and are impeding efforts to achieve the United Nations' Sustainable Development Goals (SDGs). In response, by signing the landmark Paris Agreement, almost all countries around the world have pledged to restrict “the increase in the global average temperature to well

below 2°C above pre-industrial levels and pursue efforts to limit it to 1.5°C above pre-industrial levels.”

The Intergovernmental Panel on Climate Change (IPCC), in all its assessment reports, has emphasized that unsustainable energy consumption is one of the largest sources of anthropogenic GHG emissions. This implies that the global energy transition to low-carbon energy resources is necessary to accelerate mitigation actions and to achieve the global temperature goals set by the Paris Agreement. Expectedly, the transition towards renewable energy and/or energy efficiency are featured as key domestic mitigation measures in

the enhanced Nationally Determined Contributions (NDCs) of all the countries<sup>1</sup> recorded in the NDC registry as of September 2022 (UNFCCC, 2022). The fact that renewables accounted for just 17.7 percent of the total final energy consumption in 2019 (IEA, IRENA, UNSD, World Bank, WHO, 2022) suggests that global commitments have not yet translated into a massive transformation in the energy sector to reverse the course of climate change. But the need is pressing.

In addition to being central to achieving climate mitigation goals, energy transition is also at the heart of the efforts to achieve SDG 7 (universal access to affordable and clean energy), especially for countries where a lack of access to clean cooking and reliable power supply remains serious development concerns. According to the Tracking SDG 7 report (IEA, IRENA, UNSD, World Bank, WHO, 2022), globally, 733 million people did not have access to electricity and 2.4 billion people lacked access to clean cooking in 2020. Nearly all energy poor populations rely heavily on solid biomass, animal wastes, charcoal, coal, or other unsustainable fuels, for basic energy services such as cooking, food processing, heating, etc., and that has implications for their socio-economic development and the environment. For many developing economies, a lack of access to clean energy remains one of the key barriers to achieving many other, if not all, SDGs, including SDG 1 (end poverty), SDG 3 (good health and well-being), SDG 5 (gender equality), SDG 8 (decent work and economic growth) and SDG 11 (sustainable cities and communities). However, clean energy generation per se is not the ends and may not automatically reduce pre-existing inequalities. But to achieve the net-zero targets and energy transition goals, it is crucial to take deliberate actions to ensure that the energy transition is just and equitable for all.

In Nepal, traditional fuel (mostly firewood) accounted for 64.17 percent of the total energy consumed in 2022. Commercial energy sources (coal, petrol, diesel, LPG, etc.) at 28.35% are the second largest contributor to the national energy mix (WECS, 2023).

Of all the end-use sectors, the residential sector is the largest energy-consuming sector (60.59%) in Nepal, followed by the industrial (22.17%) and transportation (10.49%) sectors. While firewood is a dominant energy source in the residential and commercial sectors, commercial fuels (mainly diesel, coal, and petrol) are the most common energy sources in the rest of the energy-consuming sectors of the country. The 2021 Population and Housing Census revealed that almost 3.6 million households in Nepal use unclean biomass as their primary cooking fuel and over 0.48 million households remain deprived of access to electricity.

This paper aims to examine the global discourse surrounding just energy transition and the state of energy transition in Nepal, and attempts to position the concept of just energy transition in Nepal's development context. The paper will focus on distributional and procedural considerations of policies, plans and efforts directly aimed at facilitating the adoption of clean and low-carbon energy systems/technologies. We acknowledge that holistic planning (considering socioeconomic and environmental impacts of all energy products throughout their life cycles) is critical for energy transition to be truly inclusive, equitable and transparent. However, for the purpose of this paper, we limit our discussion to energy transition across end-use sectors of Nepal, particularly residential sector (with focus on clean cooking and electricity services) which is the largest energy-consuming sector and largest source of GHGs in the country (GoN, 2021).

1 **Note:** United Nations Environment Programme. 2023. Emissions Gap Report 2023: Broken Record – Temperatures hit new highs, yet world fails to cut emissions (again). Nairobi. <https://doi.org/10.59117/20.500.11822/43922>."

## 2. Energy transition in Nepal

The national energy targets stated in various policy documents and energy plans suggest that Nepal's energy transition vision is to move away from traditional biomass and imported fossil fuels-based energy sources to a mix of cleaner and renewable sources, such as hydropower, owing to their climate change mitigation potentials. The sectoral

policies on renewable energy, such as the National Renewable Energy Framework 2017 and Renewable Energy Subsidy Policy 2022, encourage the uptake of renewable energy systems for various energy services. Likewise, Grid Connected Alternative Electrical Energy Development Procedure 2021 paves a way for integrating solar power into the central grid.

**Table 1: An overview of Nepal's energy transition targets set to be achieved before or by 2030**

Priorities	Baseline	Targets	References
<i>Power Generation</i>	1400 MW (ref. yr. 2021)	Increase the generation of clean energy to 15000 MW	2 <sup>nd</sup> NDC; SDG 7
<i>Share of renewables (supply and demand)</i>	<1% (NEA, 2022) (ref. yr. 2021)	5-10% of energy generated will be from renewables – mini and micro-hydro power, solar, wind and bio-energy	2 <sup>nd</sup> NDC
	6.6% (WECS, 2022) (ref. yr. 2021)	<ul style="list-style-type: none"> <li>By 2030, 15% of the total energy demand is supplied from clean energy sources</li> </ul>	2 <sup>nd</sup> NDC
<i>Cooking</i>	0.5% (CBS, 2022) (ref. yr. 2021)  74.7% (ref. yr. 2015) 18% (ref. yr. 2015)	<ul style="list-style-type: none"> <li>By 2030, ensure 25% of households use electric stoves as their primary mode of cooking</li> <li>By 2025, install 500,000 improved cookstoves, specifically in rural areas</li> <li>By 2025, install an additional 200,000 household biogas plants and 500 large scale biogas plants (institutional/ industrial/ municipal/ community)</li> <li>Limit the proportion of households using firewood for cooking to 30%</li> <li>Limit the proportion of households using LPG for cooking to 39%</li> </ul>	2 <sup>nd</sup> NDC  SDG 7
<i>Electric vehicles</i>		<ul style="list-style-type: none"> <li>90% of all private passenger vehicle sales (including two-wheelers) will be electric by 2030</li> <li>60% of all four-wheeler public passenger vehicle sales will be electric by 2030 (excluding electric rickshaws and electric tempos)</li> <li>200 km of electric rail network to support public commuting and mass transportation of goods will be developed by 2030</li> </ul>	2 <sup>nd</sup> NDC
<i>Electricity access</i>	74% (NPC, 2020) (ref. yr. 2015)	Proportion of population with access to electricity will reach 99% by 2030	SEforAll; SDG 7
	80 kWh (ref. yr. 2015)	Electricity consumption per capita to reach 1500 kWh by 2028-2030	MoEWRI White Paper 2018; SDG 7
<i>Energy efficiency</i>	0.84% per year (ref. yr. 2000-2015) (MoEWRI, 2019)	To achieve average energy efficiency improvement rate of 1.68% per year by 2030	NEES 2019

Further, Nepal has set out a net-zero vision of minimizing GHG emissions and sustainably achieving net-zero emissions by 2045. The national energy targets underscore the Nepal government’s strong interest in: i) generation of hydropower; ii) increase in the share of renewable energy in the national energy mix; iii) energy access; and iv) improvement in energy efficiency. Cross-sectoral policies and plans, such as National Climate Change Policy (2019) and National Adaptation Plan (2022), also emphasize that, in addition to the foregoing benefits, a transition to renewable and low-carbon technologies are important for Nepal from the climate change adaptation perspective. Nepal’s energy transition targets are essentially driven by its interest in energy self-sufficiency, energy security, reduction in trade deficit and universal access to sustainable, reliable, affordable, modern, and clean energy (MoEWRI, 2019). Since Nepal does not have any fossil fuel reserves of its own and as fossil fuel imports are one of the key contributors

to Nepal’s growing trade deficit, replacing fossil fuels with increased use of indigenous hydropower and renewable energy sources is widely viewed as important not just for climate change mitigation but also for energy security for the country. However, for developing countries like Nepal, achieving net-zero emission targets and just energy transition will largely depend on climate investments and international and multilateral finance.

### 3. Defining a just energy transition

Historically, energy transitions have occurred “by one resource starting with a small share and growing to a large share of the energy mix” (Carley & Konisky, 2020). This is most likely how the modern energy transition will unfold, but what will make it distinct from past transformations are: i) the pace at which it is required to occur; ii) greater variations in transition pathways across regions; and iii) the coupled and ramified impacts the former two inevitably have on different segments and aspects of the society. This

**Table 2: Different dimensions of energy justice framework - adapted from Sovacool et al.’s energy justice framework**

Principle	Description
<b>Availability</b>	Everyone deserves sufficient amount of high-quality (clean and modern) energy services to fulfill bare minimum human development needs.
<b>Affordability</b>	Everyone should be able to access provision of energy services, regardless of their socio-economic status.
<b>Due Process</b>	Energy production and use must not involve any form of human rights violation.
<b>Transparency and Accountability</b>	Everyone, especially those that the energy interventions are intended to benefit, must have access to high-quality information, decision-making processes, and grievance redressal and feedback mechanisms.
<b>Sustainability</b>	Energy systems must be able to support socio-economic functions of society in a sustainable manner.
<b>Intragenerational Equity</b>	Everyone must have a fair chance at benefitting from the energy services.
<b>Intergenerational Equity</b>	Present use of energy resources should not affect the future generations’ ability to live a good life.
<b>Responsibility</b>	Every nation is responsible for protecting the natural environment and minimizing damage to the natural systems.

essentially highlights the fact that modern energy transition is a complex, multidimensional and multidirectional phenomenon, and that its pursuit demands context-specific approaches to address the inclusivity and distributional concerns.

The concept of ‘just transition’ is believed to have been first used in the context of environmental justice in the 1980s to protect the US’s workers affected by the closure of industries that could not meet new environmental standards (Newell & Mulvaney, 2013). In recent years, ‘just transition’ is increasingly being used to represent a nexus between energy transition and energy justice, and to imply a transition away from fossil fuels-based energy consumption to low-carbon energy systems in a way that is acceptable, sustainable and equitable for all. Energy justice is closely related to climate justice and environmental justice, and is generally framed around the common justice principles: i) distributional justice, ii) procedural justice, and iii) recognition justice (Wang & Lo, 2021). Sovacool *et al.* presents an energy justice framework based on the principles of sustainable energy (see Table 2) which may be perceived as having a greater decision-making<sup>2</sup> and practical influence in operationalizing the notion of just transition and energy justice (Sovacool, Heffron, McCauley, & Goldthau, 2016). In the following section, we will use an adaptation of this framework to examine the energy justice issues in Nepal.

Over the past decade, most of the literature on just transition and energy justice seem to draw on justice issues primarily based in the Global North (such as green jobs, ethical consumptions, etc.)<sup>3</sup> (Jenkins, et al., 2021), and is often centered around benefits and burdens associated with a decline in fossil fuels (Newell & Mulvaney, 2013; Wang & Lo, 2021). More recent works on just transition,

however, seem to encompass topics that extend beyond the ones directly related to a fossil-fuel based economy, and is inclusive of issues related to energy availability and affordability, energy poverty accountability, transparency, and sustainability (Monuz Cabré & Vega-Araújo, 2022; Sovacool et.al., 2016). Similarly, the UAE Consensus that came out of the recent COP28 emphasizes the need for a just transition, and for the first time in COP history, the body set up the new Loss and Damage Fund and the just transition work programme. These are major milestones that have been set to protect those who are increasingly being impacted by climate change and global energy transitions. Although just energy transition has been described in a variety of ways, a general understanding is that it is an ever-changing idea at the crux of which lies a notion of fair and equitable distribution of costs and benefits that come along with clean, renewable energy. Some emerging literature argues that, in order to advance just transition, governments and other stakeholders, such as civil societies and private actors, must work together to allow equitable opportunity for all to participate in energy decision-making processes (i.e., procedural justice), and to provide sufficient energy services and transition benefits to all populations, especially those most marginalized or affected (i.e., distributional justice) (IPCC, 2023).

Many argue that ensuring universal access to affordable, modern and sustainable energy services for the fulfillment of basic needs is the first imperative of a just energy transition (Jenkins, et al., 2021; Hirsch, Matthess, & Fünfgelt, 2017 (eds)). Indeed, studies have shown a strong link between access to electricity services and improvement in income, primary and secondary education, poverty reduction, gender equality and people’s health

<sup>2</sup> **Note:** The framework defines decision-making as an act of making decisions or choices around energy conversion and use by anyone including but not limited to policymakers and regulators.

<sup>3</sup> **Note:** Global North is a term widely used to refer to developed/industrialized economies, many located in North America and Europe.

and well-being (UNDP, 2018; Khandkar, Barnes, Samad, & Koo, 2022). Conversely, a lack of access to modern energy and heavy reliance on traditional fuels have been linked, by numerous studies, to various detrimental health, environmental, socio-economic and gender impacts. These multipronged consequences of poor access to energy do not only interfere with the development processes and well-being of those directly affected by them, but also have a reverberating impact on entire communities and future generations' ability to absorb climate shocks, raising questions about both intragenerational and intergenerational equity.

#### 4. Just energy transition in the Nepalese context

Since Nepal has never been a fossil fuel-based economy and it never had major fossil fuel industries, transitioning to a low-carbon energy system for Nepal is expected to be less disruptive (to its socio-economic landscape) than it might be for countries with economies and energy systems heavily dependent on fossil fuels. Unsurprisingly, much of the energy transformation in Nepal is envisioned at the energy-use end. Nepal's policies recognize energy as crucial for fulfilling basic services, achieving economic development, reducing poverty, and protecting fundamental right of the people to live in a clean environment, such as Article 30 of the Constitution of Nepal 2015 which protects people's right to a clean environment and Article 51.g.(3) which calls for ensuring "... reliable supply of energy in an affordable and easy manner, and make proper use of energy, for the fulfillment of the basic needs of citizens, by generating and developing renewable energy."

In this section, we will examine Nepal's energy access situation using the energy justice framework developed by Sovacool *et al.* 2016, and discuss different energy justice concerns mainly surrounding electricity service and clean cooking. It must be noted that the energy justice issues

discussed in this paper are not exhaustive, and are meant to inspire more comprehensive studies and discussions around just energy transition in the country.

#### Justice in energy service provisions

The 15th Periodic Plan for FY 2019-2024 set a target of achieving 100% electrification by the fiscal year 2023-2024. In 2023, 92.52 % of the population in the country had access to electricity. The progress that Nepal has made gives the impression that this target can be achieved in the near future. However, Nepal's target of achieving universal access to electricity is confronted with a number of economic, technical, sociocultural, environmental and political hurdles. How we overcome these hurdles and get electricity to the most rural and poor populations is perhaps the most important question from the distributive and procedural justice standpoint.

Similarly, in the clean cooking sector, energy transition has been envisioned in two ways: i) reducing consumption of biomass through use of efficient biomass-based technologies, and ii) replacing biomass through introduction of new fuel sources. Below, we examine whether the electricity and clean cooking provisions in Nepal address different dimensions of energy justice and if they do, to what extent do they do so.

#### Distributional consequences of energy provisions – Availability and affordability

##### Electricity services

In terms of power connections, Nepal has made significant progress over the past decade. Between 2011-2021, households using electricity as a primary means for light increased from just about 67% to 92%, and households using kerosene decreased from 18% to 0.6% over the same period (CBS, 2011;



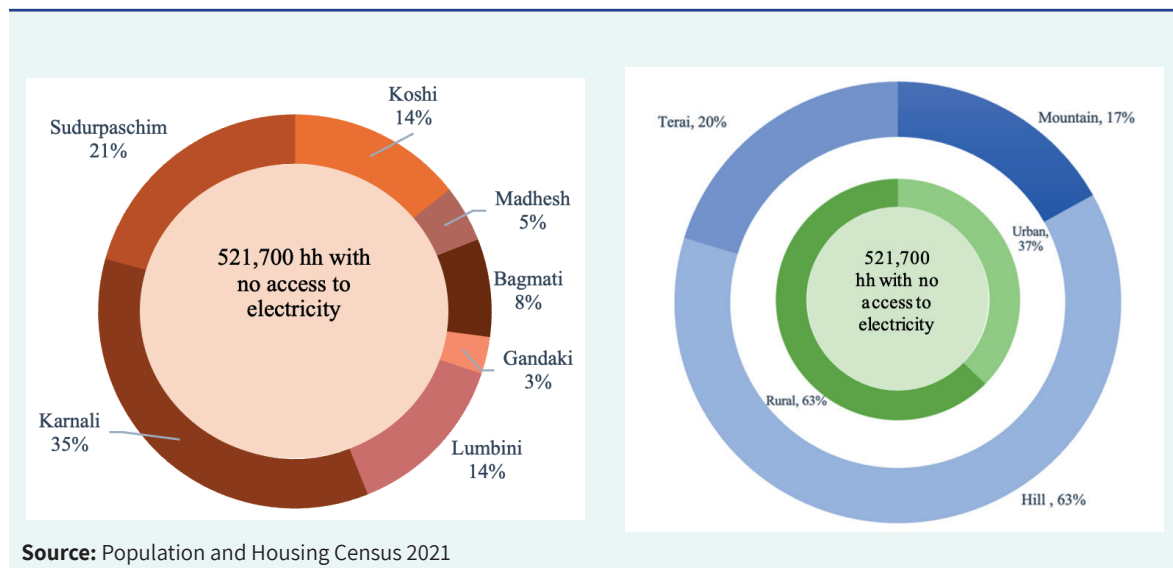
CBS, 2022). To power kitchens, households using traditional biomass as a primary fuel for cooking decreased from 64% to almost 54% from 2011 to 2021. However, in order to examine if this energy transition could address distributional concerns, it is crucial that we look beyond these numbers and focus on households that have somehow been left behind in the drive to achieve energy transition.

The Population and Housing Census 2021 reveals that Sudurpaschim and Karnali provinces combined have more than half of Nepal's total households without electricity (see Figure 1-left), i.e., 292,328 out of 521,700 households, despite them having just 14% of the country's population. This shows a stark regional disparity in electricity access in Nepal. Further, out of the total households without electricity, 37% is from urban areas while 63% is based in rural areas (see Figure 1-right). This is particularly interesting because a lack of access to

electricity is often perceived as remote population's issue, and urban population unable to access grid connections remains sidelined by much of national energy projects and policies (Republica, 2018). But in fact, much of the electrification-related projects and government subsidies focus primarily on energy supply in off-grid rural areas, whereas urban areas are usually the focus of grid-upgradation projects.

In Nepal, electricity services are delivered basically in two ways: i) central grid networks (largely based on hydropower) commissioned and managed by Nepal Electricity Authority (NEA) through its distribution centres across the country; and ii) decentralized systems (powered by either small/mini/micro hydro, solar or solar-wind hybrid systems) operating in off-grid areas under various local ownership and business models. In 471 areas across 43 districts, local community-based entities usually known as

**Figure 1: Households with no access to electricity**



Community Rural Electrification Entities (CREEs) manage the local distribution networks under the NEA's Community Rural Electrification Program (CREP). Under a programme, the Nepal Government provides free electricity to domestic consumers with grid connection of 5-Ampere meter capacity, consuming less than 20 kWh per month. According

to the NEA, about 2.1 million domestic consumers benefited from this scheme in the fiscal year 2022-2023. This facility is available to consumers in CREE areas as well. The total electricity consumed by such beneficiaries, including the consumption of other general consumers, are captured on single meters installed on the distribution system of the

CREE areas. Accordingly, the CREEs pay a total electricity bill to NEA which includes payment for total of 20 kWh free electricity also. However, the CREEs are not reimbursed the amount equivalent to the free electricity consumed by the small consumers. Clearly, the government’s (and NEA’s) burden has been shifted to the CREEs, a community organization. This is an injustice to the CREEs who are serving about 513,984 households (NEA, 2023) where NEA’s direct operation is said to be unfeasible.

The government also provides subsidies on renewable energy systems for both off-grid rural areas and urban areas with irregular electricity supply. It also provides subsidies on selected electrification projects for single mothers, earthquake victims, socio-economically backward households, and endangered indigenous ethnic and marginalized groups. As such, they are generally intended to enable deprived populations mainly from off-grid areas to access bare minimum electricity services but does not address the energy injustice occurring within grid-connected areas. Low-income families in urban areas, especially those residing in rented properties and informal settlements (who are often at the bottom of the pyramid populations) either pay more than the market price for informal and often low-quality electricity connections (generally extended from neighbors with formal connections) or remain deprived of electricity access. There is a need for comprehensive studies to better understand factors influencing people’s decision to (or not to) get power connections or power system upgradations in different socio-cultural and political contexts, so that such information can be fed into the design of context-specific interventions as we seek to achieve the 100% electrification target.

The 2017 Nepal Multi-Tier Framework for Measuring Energy Access, a nationwide household survey,

revealed that although a high level of electricity access has been achieved, only a small fraction (i.e., 17%) of households enjoyed full access with a stable power supply, few voltage fluctuations, and minimum interruptions (Pinto, Yoo, Portale, & Rysankova, 2019). The survey revealed a stark difference in electricity consumption among grid-connected households in rural and urban areas – i.e., 37.4 kWh/month versus 67.5kWh/month respectively (NEA, 2023). The survey also showed that households dependent on mini-grids (largely based in rural areas) for electricity access are more likely to be at lower tiers as opposed to the grid-connected households – “about 38% of mini-grid consumers were in Tier 1, compared to just 1.4 percent of grid-connected households” (Khandkar et al., 2022). This raises concerns about equity across the consumer base receiving electricity services from different sources. Evidence suggests that reliability and quality of electricity is a strong determinant of a household’s decisions to purchase electrical appliances that provide energy services that get translated into improvements in levels of education, income and productivity (Khandkar et al., 2022). Although it can be assumed that there have been improvements made in grid electrification post this survey, progress tracking is generally done in terms of technology deployed and power connectivity, so it is uncertain how much progress have been made towards level of electricity services.

Government subsidies (MoEWRI, 2022) and/or development programmes<sup>4</sup> supported by various agencies have played a crucial role in materializing much of the rural electrification projects in Nepal. In most cases, communities have also made significant investments (mainly in the form of labor, time, land, and cash, in some cases, often taking loan burden) (Butchers, et al., 2020) to set up decentralized systems in off-grid areas, as opposed

4 **Note:** Programmes such as National Renewable Energy Programme (UKAID-supported); Renewable Energy for Rural Livelihood (supported by UNDP and ADB); South Asia Sub-regional Economic Cooperation (ADB-supported) are some examples of country-level programmes that have been supporting rural electrification efforts in the country.



to grid-connected areas managed by the NEA where consumers just have to pay for power connection to their homes. Nevertheless, a study conducted in 2020 (involving 24 micro hydro sites) showed that consumers from these sites pay more for electricity compared to grid consumers (considering basic rates in both cases) (Butchers, et al., 2020). This differential treatment of rural and urban consumers by the State and the regulatory frameworks – the cost burden and low-quality electricity despite the greater investments by rural populations – is an injustice that needs to be addressed to ensure that everyone gets a fair chance to benefit from energy transition.

### Clean cooking services

The Nepal government has implemented a number of programmes in the past to promote improved cookstoves and biogas stoves for their environmental and health benefits. The Rural

Energy Policy 2006 (Article 4.6) emphasizes on raising awareness and implementing activities for the promotion of efficient biomass stoves. Subsequent Renewable Energy Subsidy policies, however, have not provisioned subsidies or any other kind of support to promote the use of mud chimney stoves, despite it being generally affordable to the rural households. The Government provides a subsidy on metallic cookstoves (for populations living in the mountainous districts), rocket cookstoves or metallic gasifier (for rural and semi-urban populations) and biogas stoves (with households with cattle). The policy also has special provisions for single mothers, earthquake victims, and endangered indigenous ethnic groups. But the biogas technology is an expensive technology and is generally not affordable for poor households, despite the subsidy. Rural poor generally have limited access to clean cooking options: electric cooking is generally unavailable due to market inefficiencies for rural areas; biogas stove and LPG



Photo Credit: PEEDA

stove are expensive; biomass portable stoves are generally not available in the market, and even if they are, they are expensive. As a result, many rural low-income households have no other choice but to rely on traditional cookstoves. Burning solid fuels using traditional inefficient cookstoves releases high levels of toxic gases and particulate matters that have been linked to a number of health issues, especially among women and children. Further, having to collect fuelwood, and cook on inefficient stoves leave women with limited opportunities to participate in remunerative and community development activities, attend training, and engage in self-care and personal growth.

LPG is the most common fuel among households, considered as clean energy sources for cooking, however it has to be imported and is one of the largest contributors to Nepal's trade deficit. Thus, the government intends to limit its use and promote electric cooking instead. So far, no specific policy (such as renewable energy subsidy policy) has been formulated to promote electric cooking in the country. There are several country-level projects and programmes supported by various organizations that are promoting electric cookstoves in different parts of the country, covering both rural as well as urban areas. However, a lack of reliable and good quality power supply, and a lack/underdeveloped supply chain system of electric cooking products and services keep many households from benefiting from this modern energy cooking solution.

## Sustainability of energy systems

Given the sparsely populated landscapes, limited cash flows, and relatively low purchasing capacity, the private sector has little incentive to take their services to remote areas (Bhattarai, Somanathan, & Nepal, 2018). As a result, in most rural electrification projects, private sector engagement is generally very limited, and a majority of these projects are generally managed by community-based organizations. It is assumed that local

participation in rural electrification, under CREP and community-managed decentralized energy systems, allows for local participation, sense of ownership and empowerment, and enables low-income communities to share costs and hence afford energy systems. Nonetheless, a lack of technical capacity to repair, poor management skills, minimal revenue (generally due to lower electricity demand) (Butchers, Williamson, & Booker, 2021), inadequate user awareness and after-sales services, and overall poor management and maintenance of the system are some of the most common challenges that local institutions are confronted with in ensuring the sustainability of rural electrification and/or community-managed power distribution systems. Similarly, a lack of market system and repair and maintenance services have been a challenge for wider adoption and sustained use of clean cooking systems, mainly in rural areas. In the past, various programmes, such as Energy Sector Assistance Programme, National Rural and Renewable Energy Programme and other NGO-supported projects, would train local men and women to develop them as stove technicians and deploy them to construct stoves in rural households. Such an approach had caused the mud chimney stove to gain massive popularity. The Nepal government has also before been very successful in promoting biogas stove technology using local technicians. However, since factory-made portable biomass rocket stoves hit the Nepali market, the popularity of the chimneys fell, and the policy did not have provisions to support local technicians. Further, many stove projects in recent times have been promoting commercial stove designs which lack provisions and support to develop in the local market and adjust to the value chain that could facilitate consistent supply of stove products and after-sales services. A lack of local value chain and after-sales services in rural areas, therefore, remain the greatest impediments in achieving wider adoption and sustained use of decentralized energy systems and clean cookstoves.

Despite the quality and potential of technological interventions, the absence of necessary arrangements for continued operation, maintenance, and financing – which could generally be addressed through a viable business model – can hinder the sustainable operation of energy systems (Chaurey, Krithika, Palit, Rakesh, & Sovacool, 2012). A sustainable business model coupled with an inclusive, participatory and needs-based approach to designing and implementing energy interventions can provide greater value to their end users in the long run, rather than products that wear out over time and become a liability<sup>4</sup>. Furthermore, past experience suggests that tying up energy projects with a more integrated rural development program, productive use of energy and income generation, and building local capacity to repair and maintain energy interventions are key to ensuring continued operation and delivering sustainable social impact (Zomers, 2003; Sovacool, 2013).

Rural economy in Nepal, as elsewhere, is generally characterized by inconsistent cash flows, high perceived risk, poor digital and road connectivity, and local entrepreneurs with limited business skills. In such challenging resource-deficit settings, market and business development support play a crucial role for last mile retailers and suppliers to be involved in energy products and services. This component is an important entry point to also build capacity of women and vulnerable and socially excluded groups (through entrepreneurship and leadership trainings, skills development trainings, financial and digital literacy trainings, etc.) to enable them to infiltrate into value chain systems within rural communities.

As far as mini-grids are concerned, usually they operate at smaller scales and are generally perceived as temporary solutions. However, emerging technological innovations (such as cost

competitive technologies and storage systems, smart grids, etc.), viable business models and partnerships present opportunities to upgrade and improve the level of electricity generated from decentralized systems, make them comparable with the grid electricity, and more dependable for the bottom of the pyramid populations, particularly those based in far-flung areas.

## Gender equality and social inclusion, and intergenerational equity

The Paris Agreement states that Parties should “... respect, promote and consider their obligations on human rights, the right to a clean, healthy and sustainable environment, the right to health, the rights of Indigenous Peoples, local communities, migrants, children, persons with disabilities and people in vulnerable situations and the right to development, as well as gender equality, empowerment of women and intergenerational equity” while taking climate actions. The Constitution also recognizes the State’s responsibility to make special provisions for the protection, empowerment, and development of its citizens, including socially or culturally backward women and vulnerable and marginalized groups. Yet, there remains a huge gender gap in energy sector employment and energy access. Women are severely underrepresented in the energy sector. For instance, just 12.6% out of a total of 8,884 employees and 6.2% of 5,664 technical staff at Nepal Electricity Authority are women (WePOWER, 2022). The participation of women in the energy value chain is also very low. In order to ensure that economic opportunities created by energy transition benefit all in an equitable manner, there is a need for initiatives to promote women and marginalized groups, and to build their capacity to enable them to tap into such opportunities. It must be acknowledged that women and marginalized

<sup>4</sup> **Note:** Programmes such as National Renewable Energy Programme (UKAID-supported); Renewable Energy for Rural Livelihood (supported by UNDP and ADB); South Asia Sub-regional Economic Cooperation (ADB-supported) are some examples of country-level programmes that have been supporting rural electrification efforts in the country.





Photo Credit: Women Light the World

groups are not just energy users, but they can also become employees, social change agents, and participants in the energy value chain, decision makers and important stakeholders in energy project planning and implementation.

In the clean cooking sector, the work force, mainly women, were trained only as stove technicians by programmes like ESAP and NRREP, and could not be re-employed as supply chain actors after the advent of factory-made portable efficient stoves. In fact, no policy envisioned this possibility. As a result, the women technicians were removed from the clean cooking value chain system when there was a transition of clean cooking projects from fixed-type improved cookstoves to portable cookstoves.

It should be noted that there are a number of emerging policies, provisions and projects designed to enable women and historically deprived groups to access electricity and energy services. However, evidence suggests that a lack of access

to information and application processes, limited resources/assets and poor social networks prevent women and marginalized groups from accessing and benefitting from government subsidies (Kaphle, Uprety, Shrestha, Pandey, & Mukherji, 2022; Butchers, et al., 2020), energy projects and energy-related job opportunities (WePOWER, 2022). Many energy policies and projects are increasingly acknowledging GESI considerations, such as National Renewable Energy Framework, Renewable Energy Subsidy Policy 2022 and the Second NDCs. However, a majority of policies still treat women and marginalized groups as passive beneficiaries and their focus seems to be more on increasing representation of women and marginalized groups. What renders such efforts less effective is inadequate focus at addressing barriers that keep these already marginalized groups from using such opportunities to their benefit (Buchy & Shakya, 2023). More targeted interventions to address barriers for women and minority groups to participate in energy projects and energy workforce

in a meaningful way is crucial to ensure that energy transition support economic development of all in an equitable manner.

In addition, in order for energy transition to be just and equitable for all, intragenerational equity is imperative, but just as crucial is intergenerational equity. As such, it is crucial to ensure that any energy infrastructures, technologies, and projects do not have adverse social impacts, affect the ecological resilience, and compromise the ability of future generations to have green, productive, and sustainable livelihoods.

### **Due process, accountability and transparency**

The Constitution of Nepal 2015 has provisioned alternative energy, which is often used interchangeably with rural or renewable energy in Nepal, as exclusive power of the local government. This new arrangement is expected to enable local stakeholders to better influence energy plans and policies and access policy feedback mechanisms. Nonetheless, many local governments have limited prior experience, expertise, and funds to develop and implement energy plans and policies. In the past, much of the renewable energy plans and policies used to be developed and implemented in a top-down manner. Even today, local governments have little budget, and formulation, implementation and monitoring of major renewable energy plans and policies continue to be led by the federal government through the Alternative Energy Promotion Centre (AEPC). As such, there remains much work to build the institutional capacity of local governments, to enable them to leverage the power vested upon them by the Constitution and to effectively design, plan and implement inclusive energy policies and plans.

Furthermore, with accelerated grid extension efforts of the government, many decentralized systems have become redundant or even unwanted in cases where operational challenges exist. While it is important that communities receive reliable and stable power supply of greater capacity, newly installed decentralized systems becoming redundant within a

short span of time is perceived by many as a waste of communities' contributions, public funds and social capital, and a consequence of a lack of a long-term planning, comprehensive study, coordination, transparency and accountability on the part of project proponents and government agencies.

Usually, progress made in energy access is often reported in terms of economics and technologies deployed. While these may be easier metrics to measure and report, experience suggests that this is not adequate to capture learnings and best practices, understand the developmental impacts of energy interventions, and to design impactful and just energy interventions. There is a need for a more holistic consideration of a range of factors – technological, economic, socio-political, socio-cultural, social inclusion and gender dimensions – in designing assessment frameworks for energy interventions.

### **5. Moving just energy transition forward**

An energy transition, in order for it to be just and sustainable, must be planned and implemented in the context of sustainable development, gender equality, social inclusion and poverty eradication, and be grounded in the development needs and aspirations of the societies within which they occur (IPCC, 2023; NPC, 2020). And in order to achieve the above, there is the need for a platform to allow for multi-stakeholder consultation and engagement leading to a collective vision and goals for and a pursuit of just energy transition.

- Achieving universal access to affordable, modern and sustainable energy while also simultaneously cutting emissions from energy use is the focus of the discussion around just energy transition in Nepal. While Nepal has made significant progress over the past decade in terms of energy access, the fact that almost 3.6 million households still rely on traditional fuels for cooking and over 0.48 million households remain without electricity suggests that Nepal needs to accelerate efforts in energy

transition. For Nepal, energy transition is not just about achieving climate mitigation targets but also about achieving SDG 7 and other development goals, including poverty eradication, gender equality, and good health and well-being.

- Households without access to clean and modern energy are dispersed across all provinces, urban-rural areas, and grid-connected and off-grid areas in Nepal. This suggests that a one-size-fits-all approach will not address all energy injustice issues. A comprehensive mix of evidence-based policies is needed to address energy injustice issues of different demographics, in different contexts and at different stages of energy project development and implementation.
- Power connection is crucial, but improvements in level of service for all consumers (grid-connected as well as others) is a critical next step to enable them to convert electricity access to energy services (such as heating, cooling, mobility, communication, etc.). At present, there is a severe disparity in the level of electricity service and energy cost within and between off-grid and on-grid areas. A majority of renewable energy policies focus exclusively on reducing the up-front cost of energy technologies for deprived groups based in off-grid areas. Energy policies and projects should also address the energy injustice (created by the differences in the energy cost and level of energy services) that different consumer groups are experiencing, and the challenges faced by rural communities and community-based institutions in operating energy systems in a sustainable manner. Research funding, climate financing and development funds will be crucial to closing the viability and technical gaps that affect the sustainable operation and management of community-scale energy systems.
- A sustainable business model that integrates energy interventions with integrated rural

development, productive use of energy, income generation, and women empowerment programs is more likely to generate sustainable social impacts. Furthermore, productive use of energy also can be an important entry point to build the capacity of women and other vulnerable and socially excluded groups (through entrepreneurship and leadership trainings, skills and capacity development trainings, financial and digital literacy trainings, etc.), enabling them to get integrated into energy-based value chain systems. Government agencies and development partners can support this in a variety of ways, including but not limited to technical assistance, capacity building and business development support, de-risking or risk-sharing measures, supply and demand-side subsidies, result-based financing, etc.

- While a free market, regulated for quality and fair prices, can provide need-based energy services to a mainly urban population, it fails to serve the rural and semi-urban areas as business incentives are less in such areas for the private sector. It is therefore the government has a critical role in making energy transition just through fiscal tools and interventions such as mass awareness and capacity building.
- Women and other vulnerable and marginalized groups face numerous barriers (such as a lack of information, poor social network, limited assets/resources, financing opportunities, etc.) to access energy provisions, government subsidies, planning and decision-making mechanisms, and economic opportunities (including green jobs) created by energy transitions. Interventions and policies to address such barriers are crucial to ensuring that energy transition contributes to social inclusion and gender equality.
- The Constitution of Nepal 2015 envisions local governments to have exclusive power to make policies and plans related to alternative energy. This means, local governments and



stakeholders are best positioned to address community-specific energy issues and needs and GESI concerns. However, in order for local governments to take on this role, they need to be empowered through institutional capacity strengthening support and adequate funds.

- One of the energy transition goals of Nepal is to gradually increase the renewable energy shares in the national energy mix. Given that the demand for renewable energy-based decentralized systems is higher in rural and off-grid areas, the government should create an enabling environment by promoting high quality designs, technological innovations, regulatory frameworks, and financing opportunities to enable decentralized systems in rural areas to be easily integrated into the national grid when the area gets connected to the national grid. In addition to contributing to renewable energy shares, this will also address any sustainability concerns and encourage investments in decentralized systems.
- Since energy has been recognized by the country's Constitution as an essential service, it is reasonable to assume that a right-based approach is pursued to achieve universal access to clean, modern, and affordable energy. This entails not only universal access but also a condition wherein the energy could be utilized in productive economic activities. It is also important that policies address unemployment and social capital (e.g., local institutions) issues through skill development, knowledge-transfer and technical support programmes when shift in technology or working modality become inevitable due to technological advancement or advent of new technologies.
- Lastly, in order to encourage orientation towards energy services that match 'in quality to end uses rather than technological deployment' (Sovacool, 2013) and social impacts of energy interventions, a range of factors (including technological, economic, socio-political, socio-cultural, social

inclusion and gender dimensions) must be considered in designing and evaluating energy policies and interventions.

## 6. Energy justice framework for Nepal

The energy justice framework presented by Sovacool *et al.* based on the eight broad principles of sustainable energy, is applicable to understanding energy transition justice in Nepal. This examination is based on four out of the eight broad principles, namely, i) availability, ii) affordability, iii) transparency and accountability, and iv) GESI and intergenerational equity, would provide us with a broad understanding of energy transition justice in Nepal. These principles are based upon the beneficiary perspectives, that is, we look at whether the people as beneficiaries have benefitted from or fallen victim to the policy interventions.

In Nepal's case, as we have noted in the main discussion, the energy transition toward cleaner energy sources have engaged a large number of community institutions. Such community institutions are our social capital, which has been painfully accumulated over a long period of time. Any examination of the energy transition should also look at the consequences of policy interventions on such community institutions and other energy value chain actors and their sustainability. This we should consider as an added principle to Sovacool *et al.*'s framework in the case of Nepal. Importantly, assessing any energy interventions or designing an energy transition pathway must take into account energy justice considerations and their potential and ex-post impacts on different domains of socio-ecological systems they function within to ensure that the energy transition contributes to maximizing social impacts and benefits all in a sustainable and equitable manner. As such, while the scope of this paper has been limited to the end-use of energy within residential sectors, the framework discussed in this paper may be developed into a decision-making tool and have a practical influence in creating a vision for a just energy transition and in operationalizing the notion of just transition and energy justice.

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