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Citation: BROWN, E., CLOKE, J. and CAMPBELL, B., 2016. Communities of energy. *Economic Anthropology*, 3(1), pp. 133-144.

Additional Information:

- This is the peer reviewed version of the following article: BROWN, E., CLOKE, J. and CAMPBELL, B., 2016. Communities of energy. *Economic Anthropology*, 3(1), pp. 133-144, which has been published in final form at <http://dx.doi.org/10.1002/sea2.12050>. This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for Self-Archiving.

Metadata Record: <https://dspace.lboro.ac.uk/2134/20311>

Version: Accepted for publication

Publisher: © Wiley for the Society of Economic Anthropology

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Please cite the published version.

Communities of Energy

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Abstract:

The call for social science to engage with energy infrastructures and users to enable low carbon transitions that benefit the poor in the global south is welcome, but its urgency risks epistemic distortion. The theme of ‘community’ in the social studies of energy needs critical reflection, disambiguation, and interrogation with empirical case studies. This article explores dimensions of assumed homogeneity at local scales. In attending to similarities and difference in comparisons between case studies in Nicaragua and Nepal, the authors propose that a framework for understanding communities of interest and practice can be identified in selective resistance to and appropriation of energy technologies that highlights positions of marginality and common purpose in emerging social energy systems.

Keywords: community, renewables, development, Nicaragua, Nepal

Introduction: Seeing Communities in Low Carbon Energy Development

Policy concerns about the ‘energy trilemma’ of energy security, climate change and energy poverty (cf. Goldthau, 2012; Scott, 2012; Gunningham, 2013, Bradshaw 2013) have given rise to a spate of energy development initiatives such as Sustainable Energy For All (SE4ALL)¹. This wave of energy interventions is becoming a propellant across the global south for highly technocratic social constructions of communities and households, visualizing these as mere ciphers for ‘modern electricity services’ rather than as active agents located in social energy systems. These two-dimensional representations serve as templates through which *a priori* donor-driven goals are disseminated. They are vehicles for rolling-out available renewable energy technologies (RETs), and for overwriting development by the theme of access to modern energy services. The United Nations General Secretary declared:

One out of every five people on Earth lives without access to electricity and the opportunities it provides for working, learning, or operating a business. Twice as many ... use wood, coal, charcoal, or animal waste to cook their meals and heat their homes, exposing themselves and their families to smoke and fumes that damage their

¹ See Our Vision, Sustainable Energy For All, <http://www.se4all.org/our-vision/>

health and kill nearly 2 million people a year. Without access to energy, it is not possible to achieve the Millennium Development Goals.²

While important, the facts and figures concerning global energy poverty and the health effects of burning biomass are not our focus. Our analysis questions the functionalist constructions of “community” and “household,” which are being depicted as ideal scales at which energy project initiatives should be directed. There is a tendency to assume a number of things: that communities (and households) have clearly delineated boundaries; that they provide a nurturing or cohesive focus for energy provision; that they are spatially and locationally specific; and that they operate according to predictable norms of energy consumption constructed to flesh out the ideal of a linear, evolutionary ‘energy ladder’ up which communities and households progress. We suggest, instead, that because households and communities have become spatially and relationally more fluid, more flexible and indistinct with globalization, this sharp delineation, if it were ever true, has become far more blurred. Communities need conceptual re-energizing.

In respect of the new energy era, households and communities are being re-written as “apparatuses of knowledge” (Foucault, 1977: 106). These are technocratic apparatuses that give pre-eminence to the territorial, rather than the relational, dimensions of such designations (Gusfield 1975) to suit the potential of available

² Ban Ki-moon, Secretary-General of the United Nations November 2011, Sustainable Energy for All Vision Statement, http://www.se4all.org/wp-content/uploads/2013/09/SG_Sustainable_Energy_for_All_vision_final_clean.pdf

technologies. In some low-income contexts (Bangladesh, for example), the household has been depicted as the critical arena for intervention through the emblematic functionality of the Solar Home System (SHS). In other contexts community energy is promoted, with the form or scale of community often being dictated by the mini-, micro- and nano-grids that, in claiming to fit a particular scale of community, end up defining it. Walker and Devine-Wright (2008) have already pointed out the sociological emptiness of simple locality and labeling of projects as ‘community energy’, when processes of community engagement can actually be quite minimal.

Networking communities for research

Responding to growing curiosity about low carbon energy technologies globally, the work of the Low Carbon Energy for Development Network (supported by the UK Department of Energy and Climate Change and Department for International Development) has, since 2012, put social scientists firmly ‘in the mix’ for understanding sustainable energy solutions for the poor in the global south. The authors have coordinated the LCEDN and helped to bring together academics from a variety of British universities, along with NGOs, government, and private sector collaborations. In principle international funders encourage knowledge exchange among researchers and practitioners to make low carbon alternatives available for the poor of the developing world. In practice, however, a technocratic bias and the allure of a technical ‘silver bullet’, whether economic, fiscal or scientific, continues to distract governments, multi-lateral and supranational institutions alike.

Research into diverse socio-technical, transdisciplinary approaches by the LCEDN involves creating in turn a transdisciplinary academic-practitioner community that extends out to civil society through relevant NGOs working on energy projects in the global south, connects with commercial firms researching and building new technologies, addresses the policy community at various levels of governance, and engages relevant actors in the international donor community. The LCEDN is drawn from a ‘community of interest’, anticipating an emergent ‘community of practice’ for research into pro-poor renewable energy.

Achieving sustainable energy in the developing world requires decentralized systems, suited for place, and resilient to severe climatic phenomena accompanying anthropogenic global warming (Skea 2014). An additional friction is that while several Renewable Energy Technologies (RETs), particularly solar, are being vaunted as potentially ‘game-changing’ technologies, from the World Bank downwards, their deployment risks being structured by a dominant ‘socio-technical imaginary’ (Jasanoff 2009; 2010) subject to the market diktat of the global neoliberal meta-narrative. This imaginary has at its core a technocratic approach to energy access whereby perceptions of the beneficial effects (poverty alleviation and improvements in quality of life) of energy provision through a range of technologies has simply been assumed, with little empirical back-up.

The scale at which the rollout of these game-changing technologies is set is mostly determined by technological choice, with ‘community’ being reverse-engineered as whatever technical *dispositif* (Foucault, 1977) is most appropriate. We argue for

analysing the dynamics and scales of how communities are to be understood; their available energy options and livelihood resilience patterns, their features of socio-cultural difference, and the ways in which they conform to or challenge the goals and behavioral pre-suppositions of donors. Kenya and Bangladesh are experiencing intense roll-out of solar and PV technologies, but:

Solar advocates commonly make claims about the environmental, rural productivity, and poverty alleviation benefits of solar electrification (e.g. Kaufmann, et al., 2000; Ybema, et al., 2000; Martinot, et al., 2002). Some critics challenge these claims contending that the environmental benefits of solar electrification in rural developing country contexts are minimal, productive uses are few and far between, and that in the absence of large subsidies solar sales are primarily to the rural elite rather than the rural poor. [Jacobsen 2004:1]

A review of literature on off-grid energy systems and their effects, productive and non-productive uses of energy and the role of infrastructure in development, including solar/PV RETs tempers the meta-narrative that energy provision is in and of itself a major tool for alleviating poverty (Gyawali 2003, Ockwell and Mallet 2012, Byrne et al 2012, Agarwal 2008). A substantial part of our approach is to question the extent to which technocratic determinations of ‘appropriate scale’ form part of the problematic itself.

The LCEDN and the projects associated with it, for example, are concerned with local solutions for communities at *niche* level. Though little studied in their

potential to form a knowledge resource for particular social and market contexts, niche scale phenomena are both widespread and very diverse as settings for low carbon applications. An influential and policy-friendly ‘multi-level perspective’ (e.g. Geels and Shot 2007) model suggests that this kind of socio-technical innovation can scale up to make transitions at the level of socio-technical *regimes* possible. It is at the *regime* level that political economic interests and regulatory systems contrive technological ‘lock-in’ of particular forms of energy use and practice, which are then resistant to change due to economies of scale, habit, and infrastructural capitalization. Socio-technical *regimes* are to some extent buffered from, yet still responsive to, changes at both *niche* and *landscape* levels of their ecology. Case studies of the normative goals of planners for scaling-up niche innovations in RETs are needed to compare experimental infrastructures and their potential for mass adoption.

Looking beyond technological primacy in many renewable energy projects, our aim is to track the implementation of strategies from such abstract models into the realm of lived realities, attending to the socio-technical imaginaries that accompany them. Low carbon pathways can thereby be opened up to different configurations of human-energy relationships than the distinctly techno-modernist norm of ‘grid-user interface’. We can learn how to re-view ‘energy’ from off-grid positions. Energy sustainability in this framing questions how households and communities configure their lifeworlds in terms of energy needs as conventionally conceived (e.g. lighting and powering devices), or through other ontologies of livelihood and power relations (Lohmann and Hildyard 2013).

Political Economy of Communities

The idea of community is, then, one of the central motifs of much work on low carbon energy in the global south. In this and the next section we reflect briefly on the history of the term in social science and its changing usefulness in development paradigms. Perspectives on underdevelopment in studies of political economy have often cast ‘communities’ as pockets of traditional culture and livelihood. Closer examination has frequently revealed dependency on migrant wage economies, where non-market logics and topographies of wealth and poverty have reproduced human labour power for the benefit of commercial and national elites. De Janvry’s (1975) use of ‘functional dualism’ to explain how highly marginalized subsistence agricultural sectors contributed to the evolution of commercial agriculture in rural Latin America is a classic example. Ferguson’s (1991) analysis in Lesotho of communities’ persistent non-commodification in factors of village livelihoods emphasizes connection, heterogeneity and boundary-making. Campbell (1997) discusses analogous processes in Nepal’s historic trading system based on human portage of goods through the Himalayan mountain ranges. In this case many seasonal porters came from ethnically marginalized subsistence communities formed by linguistic and kinship features at odds with norms of caste hierarchy.

Understanding these external processes prevents simplistic views of community as cohesive and locally bounded. In any case, a significant ‘community turn’ was taken in the successful designs of environmental conservation and development

projects from the early 1980s.³ This worked with the pragmatism of devolved responsibilities under the broad heading of Community Based Natural Resource Management. The persuasiveness of Ostrom's work (1990) on Common Property Management systems hit a chord with various sustainable development programs, which sought to involve civil society to fulfill national and international objectives by creating accountable user groups. 'Community' became a buzzword for forestry and other natural resource projects, along with toolbox of participatory appraisal methods designed to relocate development initiative away from the state, deploy indigenous knowledge, and build grassroots involvement in implementing sustainable development agendas (Campbell 2005a). Though engagement with "communities" became more pragmatic with decentralization, attention to social capital and local 'ownership' of development goals, such projects risked making these communities vulnerable to conflict and elite capture (Brosius et al 1998, Gold 2005).

With these provisos in mind, we will now elaborate on notions of "community of interest" and "community of practice." Re-casting community within socio-technical energy systems involves understanding the roles of various latent and emergent communities of interest and practice within those systems. These are not spatially confined but situated in relation to blockages and flows of agency,

³ Richard Jenkins points out that whatever problems social scientists may have with the term, "'community' does not belong to intellectuals. It is a powerful everyday notion in terms of which people organise their lives and understand the places and settlements in which they live and the quality of their relationships." (Jenkins 2014:133).

capacity and value; above all, a social energy system cannot accurately be analyzed without considering the socio-cultural role of power within any energy production regime.

It is therefore also necessary to widen the gaze to include global energy production regimes that produce and re-produce deprivation, poverty and marginalization in terms of unequal capacities to acquire and manage decentralized RETs (Hornborg 2011). Re-written as alternative systems of energy governance rather than merely ‘renewable energy technologies,’ understanding local energy communities involves researching and understanding social energy systems through the optic of fluid and hybrid communities of energy. We begin with community of interest as a provisional term of description, noting its currency in a wide range of engineering and design literature (e.g. Fischer, below), along with the more face-to-face learning relationships that are communities of practice (Lave and Wenger 1991). In the meeting of embodied communities of practice with technology-oriented communities of interest, there are striking overlaps. Fischer writes concerning information systems:

Communities of interest (Cols) (defined by their collective concern with the resolution of a problem) bring together stakeholders from different communities of practice (CoP). Reaching a common understanding between these stakeholders is a major challenge due to the “symmetry of ignorance” caused by their respective cultures and their use of different knowledge systems. [Fischer 2001]

Some advocates (e.g. Sapkota et al 2014) see RETs as intrinsically beneficial tools for social harmony. By overlaying a communities of interest approach to social

energy systems, we argue that low carbon technologies and off-grid services do not amount, by themselves, to a recipe for addressing resource poverty and wider social marginalization of the rural poor. No technology is context-neutral. Others caution that the direction and causal mechanisms of impact and empowerment are co-constitutive and complex: “The energy problem cannot be solved without solving the poverty problem and the poverty problem cannot be solved without solving the energy problem.” (O’Brien et al, 2007: 615). Our perspective is that we need to consider different sets of questions, such as if and how decentralized low carbon energy technologies lend themselves to existing skill sets, patterns of household interaction, and community level power relations.

While the local and community are critical areas of focus within the current global promotion of clean energy, if they are used in the absence of nuanced attention to the flows and structures of power, they risk being over-simplified and reverse-engineered to fit an overly simplistic technocratic agenda. Focusing energy access and efficiency research on the individual, household or community omits the reality that “access to energy resources at the grassroots depends on ...structural factors determined well outside of communities” (Bailis, 2009:2).

In what follows we develop our re-examination of community in two different contexts. Our Nicaraguan example presents a framework for organizing the analysis of social energy systems and maps the evolving communities of interest developing around renewable energy via explorations of the asymmetrical perspectives of the stakeholders and their relative power over given technologies,

systems and projects. In the Nepalese case we build upon and illustrate this framework to discuss barriers to experimentation with renewables resulting from state projects that are themselves involved in struggles over the consequences of environmental regulation for communities of practice facing various effects of the global economy.

Re-empowering ‘community’

RETs could in the right conditions offer communities control over their own energy systems, providing new opportunities for citizen participation and income generation, whilst at the same time re-envisioning energy access as a vital component of community governance on a multi-scalar basis and across a range of meanings of community. Relabeling Renewable Energy Technology (RET) to Alternative Energy Technology (AET) would, in our view, capture this fundamental reframing of “community” development. RETs are site-specific, and can be configured at different scales and in a range of different forms and combinations that are more or less amenable to local community specification. They are not fuel-dependent (though some need batteries), so in principle they are less vulnerable to issues of affordability and security of fuel supply. It is true that RETs bring with them their own problems in terms of start-up costs, maintenance and the supply of parts, and there are important questions over relative costs and most importantly over the potential impacts upon livelihoods. But we insist that how RETs are deployed and at what scale *can* make the difference between RETs being merely ‘renewables’ and being truly ‘alternatives.’ The difference centers on

both the kind of energy systems and community that are envisaged, including the degree of self-governance inherent in the system design, rather than just the supply of energy.

If a standard social science formulation of ‘community,’ from Tönnies onward, invokes an interactive “sense of belonging together” entailing services and material reciprocities (Gold 2005:3), our approach queries assumptions of community in binaries of simple and complex, univocal and plurivocal (Watts 2000). Community risks becoming problematic in the RET imaginary, as discussed above, through an enforced elision with scale. Following Swyngedouw, community becomes a scaled place that is ‘the embodiment of social relations of empowerment and disempowerment and the arena through and in which they operate’ (1997: 167). Community is deemed a vital construct by a range of energy sector actors from supranational institutions downwards, for example: the UNDP vaguely and generally claims that “energy services can act...as an entry point to mobilize communities to take charge of their own development” by ‘aligning the project within the prevailing local governance framework’ (UNDP, 2011:12). The politics of participation within any given community need to be understood, and ‘special mechanisms are needed to bring in relatively disadvantaged groups’ (White, 1996: 7). Levels and types of participation relevant to all interest groups need to be carefully mapped. Failing to take particular groups into account in a way that recognizes meaningful difference could mean that people’s refusal to participate becomes a perfectly logical response (Novellino 2007, Campbell 2005b).

Energy provision after all is not an end in itself. Interventions into energy systems need to analyse all aspects of energy access, for instance in gendering projects in ways that apprehend the “real energy crisis” of rural women, which Makhabane (2002) suggests is their “time poverty”. This implies building in an understanding of energy as crucial to leisure, supporting the family and communal association through the optic of women; many projects alleged to be ‘gender neutral’ are rather ‘gender absent,’ since assuming access to modern energy services to be of equal benefit to men and women is in fact reproducing and exacerbating existing gendered inequalities. This is one way in which community becomes a homogenous and reifying ‘black box’ (similar to treatments of households as decision-making ‘units’) for the purposes of re-inventing it as an adjunct of technology design and implementation.

Given these provisos, we find innovative potential in exploring community as complex, self-organizing, self-imagining and conceptually productive. This can contribute to addressing energy poverty at the micro-, meso- and macro-scale within a framework of analysis that not only places the socio-cultural alongside the economic and the technological, but recognizes their interrelatedness.

Critiquing how technocracy co-opts community only takes us so far – community has to be deconstructed to be re-constructed. Multi-scalar properties of a social energy system involve a range of different communities of interest, in our experiences from Nepal and Nicaragua. These are at least as important as any

physically-situated community to be 'projectized'. Insights into this diversity were derived in the case of Nicaragua, from a set of workshops in which two of the authors were involved. These identified municipal authorities and political groupings, national and departmental authorities and political groupings, small, medium and large businesses, government and public institutions, academic and technical institutions as well as international donors and a large range of NGOs, which were all involved in social energy systems to a greater or lesser extent, and all of which would constitute communities, to a greater or lesser extent. Mapping this community of interest through the various kinds of stakeholder communities becomes a vital precursor to any local energy project. This makes visible their interactions and the degree of power each one possesses. Learning from this mapping method, the Nepalese case is then given a more expansive treatment, by another of the authors, finding localized and multi-sited alliances of local territorial and occupational groups with a variety of state actors. The communities of interest gathering round a biogas project required mapping and understanding, where varied rhetorics of community interest had already played out over decades of rumbling resource conflict. Different local actors were involved in aligning to government offices at odds with each other in producing renewable energy imaginaries suited to various local and state agendas.

Identifying and mapping these different sets of actors and the ways they possess characteristics that might put them together in communities of interest, helps locate a social energy system. Understanding these players' interactions, their arguments and alliances, is crucial to analyzing the socio-technical construction of

any energy supply in any given location, as well as distribution systems and their future outlook, at different scales of political economy.

Turning to our research examples, the different authors have been working on energy issues in both countries for a number of years, and bringing insights from these two countries derives from applying the analysis developed through the work of the LCEDN and other energy projects that the authors are engaged in, to pre-existing work and understandings.

Nicaragua Example

Two of the authors were involved in a series of renewable energy workshops in Central America (the Energy Central project) funded by the EU and intended to strengthen RET-focused networks in the region. The workshops were held in with a mixed set of participants drawn from wider civil society, local and national political interests, the international donor community as well as the commercial and academic sector. An exercise to examine perceptions of non-technical barriers brought up by the participants, allowed the researchers to discern overlapping communities of interest, self-selected by the levels, scales and types of non-technical barriers they described. Different participant groups identified both non-technical barriers that were specific to their own interests (subsidized Chinese solar panels for the commercial sector, for instance), and those that were common to all (such as the sectoral interests and generalized corruption of the two major political parties and the structures of government).

Different but frequently intermixed communities of political actors, academics, private sector actors, civil society groups comprised of indigenous NGOs of various persuasions, civil society groupings comprised of foreign NGOs and their associated bilateral, multi-lateral and supranational aid programs, interacted to describe their overlapping theatres of engagement within the Nicaraguan social energy system.

The theatres were identified as commercial, educational, legislative, fiscal and environmental. Perceptions of the most relevant non-technical barriers to RET development helped to describe those theatres, themselves cross-connected by three main themes, financial, political and innovational. Thus in the commercial theatre financial barriers included costs of initial investment to the community, municipality or business. Political barriers included subsidies and guaranteed tariffs for fossil fuel electricity generation. Innovational barriers included ways to assist poor women in becoming energy entrepreneurs for households/micro-businesses.

Looking selectively at some of the other theatres, in the educational theatre, political barriers were identified in the poor image of renewable energy given previous unsuccessful projects. Innovational barriers in the educational theatre raised lack of confidence in renewable energy, ignorance about them, and resistance to new ideas. In the legislative theatre, financial barriers consisted of inappropriate use of legislation i.e. setting up of concessions, writing contracts, and unfair subsidization. Political barriers included the self-interest of political

elites and groupings, while innovational barriers included the issue of how to focus on a strategy for alternative energy at the national level which is gendered and focused on poverty alleviation. The fiscal theatre identified how to change the national tax system to favour renewable energy. The environmental theatre involved financial barriers to focus energy policy towards rural electrification for rural poverty alleviation, the political barrier of doing so with participatory decentralization; and the innovational barrier of integrating energy with other development sectors.

Perhaps the most important thing to realise here is that however each group described itself (NGO, business, academic) they each interact in different ways in all of these theatres and they all have a role to play. Looking at the RET environment and crudely mapping it in this way moves the vision away from the technical, financial and object-community focus that has characterized the sector in many projects to date, and constructs a more integral vision of all of these actors through self-description as what they are, components in a social energy system.

Nepal example:

For the extended community case study in Nepal, a different project history led to the mapping of communities of interest. It emerged from a village-initiated dialogue, following networks into offices of NGOs and government departments in the capital, Kathmandu. Threats to the operation of a high-altitude yak cheese factory, due to concerns about the use of fuelwood for cheese-making in a national

park, sparked a conversation in March 2011 in Nepal's Rasuwa District and set off a research trail in search of renewable energy solutions.

Community mobilization is identified as a vital component of Nepal's off grid renewables programmes by Yadoo et al (2012). Community-based energy user groups in Nepal have been explicitly formulated on the back of successful resource governance among forest user groups. Community forestry is a success story in Nepal's development culture (Stevens 1997). This case study challenges the notion that the local scale is in any sense 'simple' to apprehend, but it is a locus where dialogues, discourses, livelihoods and leadership are configured and articulated in mutual contest. Communities of practice are collectivities in which persons learn and apply skills of occupational consequence and social recognition. We can identify several communities of practice in this case. Communities of interest can by contrast be seen as those whose personal, commercial and institutional attention and expressions of interest are drawn to the energy problem-focus. To organize these various actors and their interactions, a political ecology mapping framework will be applied to make visible the diverse claims of legitimate voice and public good. This emphasizes the differences that renewable energy solutions can present to struggles at the local level, concerning development pathways affecting income possibilities for a poor district of a poor country.

Yadoo, et al's (2012) account of community energy projects in Nepal indicates positive outcomes, but it is not informed by anthropological work of analysis and

comparison in disentangling energy generation success stories within accounts of RET projects. The processes whereby actions in common have resulted in light, heat and transport arriving in new forms need explanation, and so do the failures of such attempts, as chronicled since the 1980s by Gyawali (2003). The project to install a biogas plant at the yak cheese factory brought into focus the connections of livelihoods, socio-technical imaginaries and environmental governance.

The community of interest perspective brought configurations of present and future energy users into view, while ethnographic encounters with differently community members gave voice to uncertainty in long term commitments to strategies of livelihood practice. Uncertainty matters: transhumant herding and dairying in the mountains could be rejuvenated by renewable energy inputs, but lead to capital risk and poverty if succeeding generations do not share the same goals for them as persons-looking-ahead, and perhaps hold different socio-technical imaginaries.

Communities of practice in rural Nepalese livelihoods have been historically constituted through economic and ethnic marginalization with substantial recourse to forest provisioning. A historical political ecology of community reveals tensions between capacities for livelihood resilience, and alliances between local actors and diverse forms of state and market, ethnic and class interests. There is then no pure or intrinsic community, but there is always a language and disposition for collective mobilization when rhetorics of community come into play, both to secure market advantages, defend environmental entitlements, cope with

earthquakes, and participate in claims and rewards that flow from short-term and long-term cooperative practices. The socio-cultural depth of cooperative practice has yet to be recognized in the literature on low carbon energy technologies. The community mobilization factor for RETs builds upon communities of practice, which are indispensable for any village in Nepal to manage the challenges of biomass-dependent livelihoods, where in many ways cash values have been subordinate to the general social capital of institutions for reciprocal flows of barter, debts and favors between households, ethnic groups and village communities (Campbell 1994).

Away from road infrastructure and along the routes where mountain villagers have herds that move up and down hill according to seasonally available pasture, there is a strong interest in acquiring off-grid energy systems. The organization of agro-pastoral production is based on common property resources, but this has historical links to state economies of pre-modern value extraction. Campbell (20013) describes the *corvée* labor system by which royal butter-making dairy herds moved each summer into forests of Tamang-speaking villages, requiring each household to provide numerous days labor to carry equipment and construct timber shelters for the state herds of cattle. When Swiss technology for European-style cheese making was introduced in the 1950s in the Langtang valley, the state was therefore well acquainted with the territory and the viability of the project. In 1970, the state Dairy Development Corporation built another cheese factory in Rasuwa District at Chandanbari, affecting the re-organization of local herding practices into separate dairying and breeding units (*chauri* hybrids of yak and

cow) over a considerable area of five adjoining village administrative units. The Agricultural Development Bank was extending loans for acquiring livestock in the mid-1970s to boost incomes in the region, at the same time as The Department of National Parks and Wildlife Conservation set up the Langtang National park to limit the access of people and livestock to pasturelands.

Renewable energy technologies such as biogas have in recent years been introduced and supported by programs linked to biodiversity conservation to reduce fuelwood provisioning. WWF and World Bank actively funded biogas extension in bufferzone areas of national parks in the lowlands of Nepal since the early 2000s. By 2009 a quarter of a million homes had biogas units in southern Nepal (Campbell and Sallis 2013). Anecdotally, the biogas concrete dome technology has moved uphill through its own persuasive efficiency, often being adopted *en masse* by entire villages (pers comm. 2013 Krishna Adhikari of Kaski District). Barriers are met in part due to hard ecological factors of temperature differences, and in part due to other priorities affecting whether a technology is adopted. In respect to the spread uphill and the communities of interest and practice encountered there, things get complicated and barriers need to be overcome as the ecological and economic persuasiveness of a technology loses force and other public actors are called upon to facilitate uphill progress.

In the case of the Langtang National Park and the government yak cheese factory at Chandanbari, where village herds sell their milk, there is an institutionally long-articulated message by the Park that the cheese-making units must stop using

fuelwood and find alternatives. The park's primary concern is to protect forest and rare mammals and therefore, whereas in many areas of policy it shares a community of interest with local peoples, there are limits to that sharing, outside which the conservation community becomes dominant. Park officials are not inclined to accommodate livestock herds within the national park, but the park advocates adoption of renewable energy technologies to reduce livestock pressure on forest. While there are funds from the buffer zone to distribute to village community initiatives for livelihoods, eco-tourism and environmental education, biogas has not received special funds as have the lowland Protected Areas, and the institutional culture is neither geared towards active management of biodiversity in the national park, nor the positive encouragement of alternative job creation for the villagers affected by the park's enclosure of access to forest. Hence the outcome of protected area management has not been to foster alternative sustainable livelihood strategies, but rather to push even more rural Nepalis into the global labor market, such as the high carbon economy and construction industry of Qatar and elsewhere (Campbell 2014).

Campbell's research facilitated a biogas system in Langtang National Park by commissioning the primary Biogas Support Program, based in Kathmandu, to the area to bring stakeholders together and review site options for a demonstration anaerobic digester. Meetings were held in the district capital of Rasuwa, where the LNP headquarters are located, and at one of the proposed off-grid sites for a demonstration unit at Chandanbari. The stakeholder consultations revealed strong material for mapping communities of interest in energy transition and their

unequal power and agency in a given social energy system. This was evident in contested use rights over local forest areas. It came through when considering processes of socio-economic change (elderly women herders with children abroad were asking should they carry on by themselves or sell up?). It was notable in the lack of integrated policy (forests and climate change mitigation are not effectively linked with low carbon energy). Barriers of administrative competence to negotiate change came up over leadership in devolved environmental governance. Problems in extending wider opportunities for participation in RETs were identified in lack of continuity among district development officers always being from outside the district, and moreover from high caste groups, inhibiting the spread of renewables in districts where villagers are from ethnic minorities, and where there has been a frustrated movement for a decentralized federal constitution.

The experience of trekking from a meeting among district capital stakeholders up to the cheese factory site brought numerous voices to bear on the energy problem, each speaking with knowledge of likely reception by other sections of the community of interest. If the cheese factory enterprise still gives the best living in the district, it was also clear that many of the youth were not inclined to see themselves following in their parents' pastoral footsteps and preferred the prospect of an NGO job, or employment abroad. The national park finds allies among the district youth who have no interest in pursuing their parents' transhumant lifestyles. The cheese factory finds allies among the specialist and relatively well-to-do local ethnic elite whose income has been substantially enhanced by good prices for milk

over recent years. There was thus no singular community position, nor likely to be a consensus over the wisdom of investing in a renewable energy source for the cheese making.

Grassroots support to make the demonstration biodigester a success came when the herding committee deliberated over technical challenges. Bridging knowledge for the new technology and perceived adaptations of practice in daily routines were contemplated. The community of practice of *chauri* herders was active in the changes involved in the collection of necessary quantities of dung to make the demonstration unit function. Hearing of the requirement that dung for the anaerobic digester had to be kept fresh without forming a crust, they suggested gathering and covering a mound of dung with a tarpaulin close to the cheese factory.

All through the discussions, however, officials of the national park stuck by its commanding position as landowner, reflecting the historical mission of what Adams & Jeanrenaud (2008) characterize as outmoded sustainability; protecting environmental resources against livelihood needs of the poor. Newer sustainability moves beyond protected areas and attends to the structures of disadvantage that lead to the livelihood needs of the poor, being met at the cost of environmental welfare, which is where renewable energy technologies could make a difference. For this to happen, a mapping of communities of interest is needed, recognizing mutual ignorance concerning that interest, and considering what the interests and practices of those with greater influence might be, as opposed to those with less or

no influence. As with the discussion of the Nicaraguan case, this results in visualizing ‘components in a social energy system’.

Community of Interest	Langtang National Park	Dairy Development Corporation	Yak-cow-chauri Herders	Biogas Support Project
Innovational aspect	priority agenda item for climate change action	Training for maintenance and use of digester	Relocation of herding camps closer to digesters	Replicability of scarce biogas examples at altitude
Required actions	Reorganise permit system for wood collection; buffer zone support funds	Change work routine from winter wood collection	Dung collection in dairying season	Commissioning skilled & reliable construction contractors
Main barrier	The biggest dairying unit is located on national park land	Lack of funds to invest in technology trials	Tension between VDCs for locating the trial digester	Cost of site access during snows and monsoon
Impact perception	Reduce pressure on forest, successful outcome for pro-conservation local youth	Reduce conflict with national park	Livelihood security; value of biogas for other purposes	Extending biogas beyond easy diffusion in warmer climates
Sustainability factors	Compatibility of biogas with climate change mitigation	Cheaper cost of running biogas to buying wood	Long-term viability of dairying employment for community youth	Training and monitoring post-construction

VDC = village development committees (Bharku-Shyabru vs Dhunche)

Other sections of the local community of interest could be included here, but are not primary stakeholders

Skill sets appropriate for expanding renewables are evident, as is the desire to have energy with less dependence on fuelwood, but the decisive brokers in this field are stymied by local and national political uncertainties and conflict. The local capacity may be there, but the regime of livelihood conduct is constrained by state

interests in protecting forest biodiversity. There is effectively a barrier of institutional culture against a transition of the kind promoted by the authors' collaboration in LCEDN. The national parks are not locally accountable, and have soldiers to back them up. Now they are further empowered by the scientific authority of climate change risk to instruct villagers to change their ways. Another avatar of the state as patron of local livelihoods comes in the form of the Dairy Development Corporation, and accepts the need for energy transition but has no funds for experimental technical systems. In this case community alliance with external transition actors has been necessary to overcome impasse between state offices constraining community empowerment through renewables. This case study demonstrates how complex are ground level realities where RETs have the potential to make a difference, when local manifestations of regime-level institutions act out old stances over territory and influence connected to regime hierarchies. As Smith and Sterling (2010) recommend, it is pressure from political mobilization that is often required to persuade socio-technical regimes to engage in transition. This is also the point: to amplify community scale interests in holding regime actors to account for equitable energy transition benefits.

Conclusion

The authors set out to explore across their case studies how notions of communities of energy can be taken forward. Applying their newly-developing understanding of social energy systems and a far wider understanding of

communities retrospectively to previous fieldwork, they are persuaded that studies of energy transition will only be effectively understood and improved upon by using comparative methods, and moving beyond physical constructionist paradigms in energy systems. For the places and communities where social scientists contributing to the Low Carbon Energy for Development Network are at work, we consider this approach valuable, but not without difficulty in marrying applied goals with critical functions. The contribution of anthropologists and geographers alike is to open up the off-grid realities of energy in social contexts that follow different logics than simple appearances of requiring an ‘energy service’. Taking seriously communities of energy as critical vectors for low carbon transition, we are critically open that RETs do however present genuinely alternative pathways for development for many in the global south, though our two case studies highlight problems in integrating renewable energy with other development sectors, and on-the-ground power alignments of regime actors at odds with each other over socio-technical imaginaries for community development.

In the hybrid research collectives being promoted through the LCEDN, we anticipate them forming assemblages that increase “possibilities for (being in) the world” (Gibson-Graham 2011:8). The “contemporary world ... has taken the physical and mental form that it has due to the energy produced by petroleum” (Szeman 2014:7), and we are looking for different physical and mental forms through empirical studies of agents, contexts, histories, values and communities of transition. There is empirical and critical work to do in exploring the democratic potentials in materialities of energy (Mitchell 2009), and the concurrence of peak-

oil and climate change awareness (Shove 2010) which have brought a renewed and urgent criticality to socio-technical research, and what forms of governance facilitate low carbon economies.

It is in mapping the emergence of common interests in-the making and provisional collaborations in communities of energy, that the socio-technical bridging initiatives to low carbon futures are finding traction (as much among interdisciplinary collaborators as between technicians and their beneficiaries). In this terrain of explicit deliberative exchange, the diversity of participants and the provisionality of their dialogues widen out directions of travel to low carbon transitions (Leach et al 2012). In the scenario of contemporary uncertainties and imbalances of global economy, it is apparent to the authors that the active communities of resource governance emerging in relation to potentials of renewable energy systems for livelihood justice will constitute an important field for anthropologists and other social scientists to share approaches and experiences.

We have set out various ways in which uses and abuses of ‘community’ can be thought through in relation to energy, and insist that while community is often a victim of fashion, sentiment and naive populism, the project of mapping communities of interest and practice concerning RETs is a valuable way forward. Attending to poverty alleviation through community-based renewable energy governance requires some symmetrical recognition of rights to collaborate in

energy citizenship as components in a social energy system, and our priority is to look comparatively at circumstances in which such decisions are better made.

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