



North–South partnerships for sustainable energy: Knowledge–power relations in development assistance for renewable energy



Lena J. Kruckenberg

School of Earth and Environment, Sustainability Research Institute & Leeds University Business School, Centre for International Business, University of Leeds, Leeds LS2 9JT, United Kingdom

ARTICLE INFO

Article history:

Received 6 April 2015

Accepted 12 October 2015

Available online xxxx

Keywords:

Sustainable development

Renewable energy

Partnerships

Technology transfer

NGOs

Rural electrification

ABSTRACT

Drawing on a case study of a North–South partnership between non-governmental organisations (NGOs), this paper examines knowledge–power relationships in partnerships for sustainable energy. It presents a framework for visualising and analysing the multiple knowledge challenges faced by development organisations assisting Southern communities in the adoption of off-grid renewable energy technologies (RETs). Partnerships between local and international organisations are seen as a means for meeting these challenges by bringing together complementary skills and knowledge, but they can be affected by power imbalances between partners inhibiting their performance. Through a micro-analysis of knowledge–power relations between two renewable energy NGOs, this paper shows how the ways in which knowledge is framed and valued in partnerships for sustainable energy determine opportunities for inter-organisational learning and collaboration. Partnership models emphasising an efficient division of labour between partners and ‘North–South knowledge transfer’ may be less likely to deliver effective outcomes than previously thought. Given that the sustainable adoption of off-grid RETs requires processes of social innovation, partnerships that engage in an open negotiation of knowledge may stand a better chance of achieving ‘sustainable energy for all’ (UN, 2015). Based on a discussion of this finding, the paper concludes by proposing a participatory tool for the negotiation of knowledge and knowledge–power relations in partnerships for sustainable energy.

© 2015 International Energy Initiative. Published by Elsevier Inc. All rights reserved.

Introduction

Energy has long been known to be a catalyst for economic development, and there is a clear relationship between energy use and human development (Bhattacharyya, 2012). Energy poverty is predominantly a problem of rural populations in low and lower-middle-income countries (Groh, 2014; Practical Action, 2014). Whereas OECD and transition economies have achieved an electrification rate of close to 100 percent, across the Global South, the rate amounts to just 76 percent, and less than 65 percent in rural areas (IEA, 2015).¹ Off-grid renewable energy technologies (RETs) have become recognised as potential drivers for rural development (Krithika and Palit, 2013; Ockwell and Mallett, 2012a).² According to estimates, more than a billion people affected by energy poverty could benefit from the diffusion of off-grid RETs, which provide access to electricity as well as a range of non-electrical energy services such as cooking, heating, cooling, crop drying, and

water pumping (Practical Action, 2014; World Bank, 2010). However, the diffusion of off-grid RETs in marginalised rural areas has proven to be challenging (Desjardins et al., 2014; Foley, 1992; Groh, 2014; Kumar et al., 2009).³ Case studies of development interventions aiming at the adoption of off-grid RETs reported mixed outcomes, with the impact and sustainability of international programmes being inhibited by persistent resource, capacity and participation gaps (Bhattacharyya, 2012; Kruckenberg, 2015; Kumar et al., 2009; Sovacool and Drupady, 2012). North–South partnerships between organisations with complementary resources and expertise are seen as having the potential to bridge some of these gaps, and they are thought to play an important role in the creation of alternative low-carbon development pathways (Chaurey et al., 2012; Fernández-Balder et al., 2012; Forsyth, 2012; Kruckenberg, 2015; Mallett, 2013; Morsink et al., 2011). However, it has been shown that the performance of North–South partnerships is contingent upon their ability to deal with inherent power imbalances between partners (Ashman, 2001; Ellersiek, 2011). Questions have

E-mail address: eeljk@leeds.ac.uk.

¹ The terms ‘Global South’/‘Southern’ and ‘Global North’/‘Northern’ refer to the inequalities existing between the Northern and Southern hemispheres. The term ‘Global South’ is used as an umbrella term for low and lower-middle-income countries with a relatively lower Human Development Index (World Bank, 2015).

² Following Palit and Chaurey (2011), in this paper, the umbrella term ‘off-grid RETs’ is used for renewable energy technologies which are not connected to high-voltage-transmission networks.

³ Whereas some emerging economies have been successful in creating RET markets, many low and lower-middle-income countries rely on technology imports and development assistance, which they receive from development banks, multilateral organisations, donor agencies, private investors, and NGOs (World Bank, 2010). As has been shown by Glemarec (2012), the development of commercial RET markets requires significant investments of public resources in order to attract private finance for RET diffusion.

been raised about how partnerships for sustainable energy (P4SEs) can approach this problem, and how they should be managed to enable productive collaboration between international and local organisations (El Fadel et al., 2013; Fernández-Baldor et al., 2012; Morsink et al., 2011).

This paper responds to these questions and aims to make three contributions. Firstly, it contributes to the literature on development assistance for renewable energy by presenting a framework for analysing the knowledge challenges faced by partnerships for sustainable energy, and for visualising their potential in covering, connecting, and transferring the technical and non-technical knowledge needed to meet these challenges. The second contribution of this paper relates to a broader literature on knowledge–power relations in North–South partnerships. Through a micro-analysis of knowledge–power dynamics between two renewable energy NGOs, the paper demonstrates how the ways in which knowledge is framed and valued in P4SEs can have important implications for their ability to address knowledge challenges. This is due to two problems. On the one hand, the ‘division of labour’ between partners with complementary knowledge allows a large scope of knowledge to be covered, but can also diminish incentives for inter-organisational learning and joint problem solving as partner organisations limit their focus to what they perceive to be their individual tasks. On the other hand, capacity building measures based on an assumed superiority of ‘global expertise’ vis-à-vis ‘local know-how’ can exacerbate power differentials that obstruct successful collaboration. Therefore, partnership frameworks emphasising efficient ‘knowledge management’ and ‘knowledge transfer’ may not prescribe the most effective ways for addressing knowledge challenges in P4SEs. Partnerships that *negotiate* knowledge challenges, and where partners value equity and articulate explicit learning strategies, are likely to stand a better chance of making a sustainable impact. Based on this finding, and as its third contribution, the paper proposes an interactive tool for the negotiation of knowledge and knowledge–power relations in partnerships for sustainable energy.

The remainder of this paper proceeds as follows. After a brief overview of three key criteria that have been identified as determining the impact of development assistance for renewable energy, the paper considers the complexity of RET interventions in Section 1. It presents a framework for mapping the multiple knowledge challenges faced by organisations that promote the uptake of off-grid RETs in poor rural areas and shows how partnerships between organisations with complementary expertise have come to be seen as a superior model for such interventions. The second part of the paper presents an in-depth case study of knowledge–power relations in a partnership between a Northern and a Central American renewable energy NGO, starting with a description of case selection and methodology in Section 2. Section 3 demonstrates how the framework for analysing knowledge challenges presented in the first part of the paper can be used for assessing the knowledge base of a partnership for sustainable energy. A micro-analysis of interviews and observational records of partnership meetings reveals that the way in which common knowledge challenges were addressed in the partnership increased rather than reduced power imbalances between the two NGOs (Section 4). Based on these findings, the paper outlines a participatory tool for the negotiation of knowledge and knowledge–power relations in P4SEs in Section 5. Section 6 concludes.

Development assistance for off-grid RETs: Lessons learnt

Off-grid RETs are expected to play an important role in reducing energy poverty (Practical Action, 2014). They bear the promise of fuelling economic growth while reducing the environmental impact of energy generation (Sovacool and Drupady, 2012; UNDP and WHO, 2009). Governments, development banks, bilateral and multilateral agencies, private enterprises and non-governmental organisations (NGOs) all engage in international development assistance for renewable energy, often with a special emphasis on off-grid rural electrification and small-scale applications for populations lacking access to modern

energy services (Chaurey et al., 2012; Sovacool and Drupady, 2012). However, as many RET initiatives fail to achieve sustainable outcomes, a growing body of literature has identified barriers and drivers to the adoption of RETs (Bhattacharyya, 2012; El Fadel et al., 2013; Mallett, 2013; Palit and Chaurey, 2011; Sovacool and Drupady, 2012). Academic reviews and practitioner evaluations suggest that the sustainability and impact of RET interventions to a large extent depend on

- a. whether they have made RETs an *affordable choice* to potential end-users. Off-grid RETs require technology promotion and innovative finance models that can absorb high transaction costs (e.g. by combining cash saving schemes or credit models with donations and governmental subsidies) without inhibiting the development of commercial RET markets (Chaurey et al., 2012; Sovacool and Drupady, 2012).
- b. whether *those using RETs consider them useful*. In poor areas, scarce resources are unlikely to be invested in technologies that do not meet high expectations (Bhattacharyya, 2012; Desjardins et al., 2014; Mulugetta, 2008). Many of the market barriers preventing the diffusion of RETs in rural areas, such as poor local infrastructure, also inhibit their productive use (Bhattacharyya, 2012; Desjardins et al., 2014).
- c. whether RETs are *appropriate to local contexts and capacities*. RETs are unlikely to have a lasting impact if they cannot be used, maintained, and repaired locally—which highlights the importance of after-sales service and capacity development (Fernández-Baldor et al., 2012; Kumar et al., 2009; Mulugetta, 2008).

While these criteria are supported by field studies, the scope of knowledge and capabilities required to meet them makes development assistance for renewable energy a particularly challenging endeavour, which also differs from other kinds of technical assistance (Desjardins et al., 2014; Ockwell and Mallett, 2012b). In contrast to technologies such as fossil-fuelled power plants, off-grid RETs have not been an essential part of Northern development pathways. The introduction of RETs to marginalised Southern communities therefore requires the creation of new development pathways rather than the mere expansion or transition of existing ones (Garud and Karnøe, 2001; Ockwell and Mallett, 2012b). This suggests that a linear transfer of RETs from Northern to Southern contexts might not be sufficient for advancing the uptake of off-grid RETs, and that for RETs to be adopted, the ways in which energy is supplied and used may have to be reconfigured in innovative ways (Berkhout et al., 2009; Fernández-Baldor et al., 2012; Mulugetta, 2008). Research into development assistance for renewable energy suggests that many RET interventions focus on the implementation of projects, on distribution channels, and on productive use, while only some aim at enhancing local production and innovation capacities, despite the latter having been found to be essential for the institutionalisation and stabilisation of low-carbon development pathways (Bell, 2012; Doranova et al., 2011; Kruckenberg, 2015; Ockwell et al., 2008).

Knowledge challenges of partnerships for sustainable energy

In recent years, the complexity of knowledge challenges faced by organisations involved in development assistance for off-grid renewable energy has become more widely acknowledged (Mulugetta, 2008). Fig. 1 below presents a framework for mapping knowledge challenges in RET interventions according to two dimensions: the degree to which knowledge is considered to be technical or non-technical, and the assumed scope of application (from local to global). Firstly, global ‘scientific and engineering knowledge’ (upper left-hand corner of the figure) is needed to design and produce RETs. Countries lacking the capabilities to manufacture RETs have to rely on equipment imported from international suppliers. Secondly, scientific and engineering knowledge

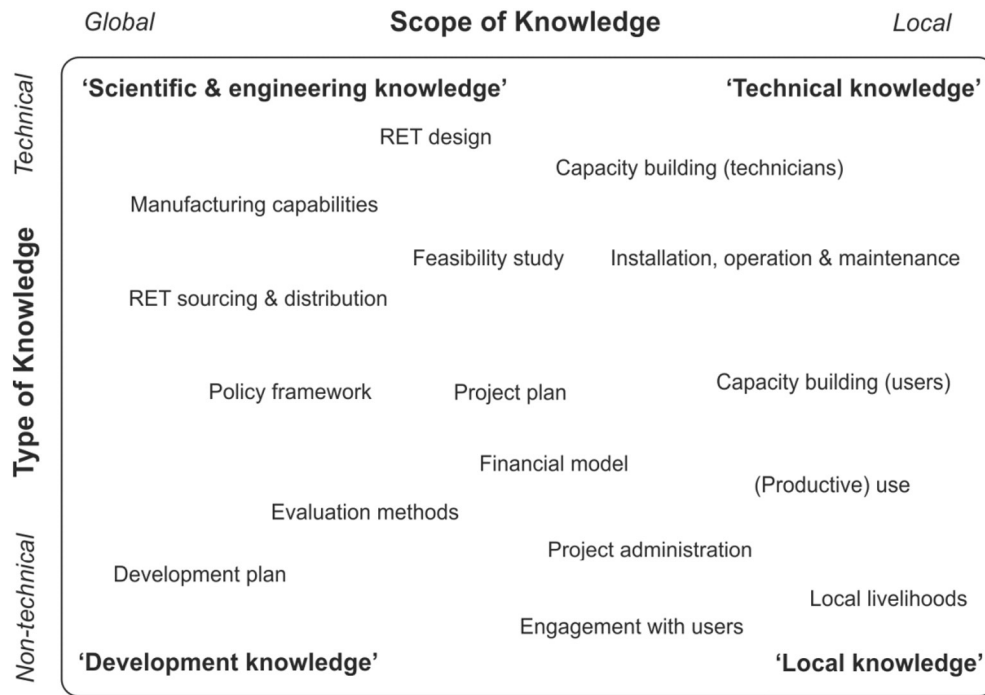


Fig. 1. Framework for identification of knowledge challenges (Source: author).

has to be complemented with local technical knowledge (upper right-hand corner) in order to adapt RET systems to local contexts, and to install, maintain, and repair them in remote communities (Fernández-Baldor et al., 2012). Without qualified local technicians, RET interventions are likely to fail (Kumar et al., 2009; Palit and Chaurey, 2011). Thirdly, the success of RET programmes also depends on adequate planning, administration, and evaluation (Kumar et al., 2009). RET project designs are based on global expertise in development cooperation (organisational 'development knowledge', bottom left-hand corner). Fourthly, in order to be successful, RET programme designs need to take into account non-technical 'local knowledge' (bottom right-hand corner of the figure). Without a detailed understanding of local livelihoods, appropriate technologies are difficult to identify (Morsink et al., 2011). The organisation, participation, and capacitation of end-users have become widely accepted as a prerequisite for the sustainability of RET interventions (Fernández-Baldor et al., 2012; Kumar et al., 2009).

Moving towards the centre of the figure, the importance of connecting these different kinds of knowledge becomes apparent. For example, the development of appropriate financial models requires both some degree of global financial expertise and insights into local economy and culture (Morsink et al., 2011; Mulugetta, 2008). Different stakeholders require capacity building measures not only in relation to RETs (i.e. technical knowledge) but also with regard to business and marketing skills (Desjardins et al., 2014; Mallett, 2013). When identifying suitable applications and distributing models, technical know-how has to be combined with local knowledge in a process likely to involve experimentation and collaborative problem solving (Byrne, 2011; Fernández-Baldor et al., 2012; Romijn et al., 2010). While the situated 'everyday' knowledge required for such processes may appear ordinary, its integration with more abstract forms of knowledge has been identified as a key challenge of technical assistance more generally (Leach and Scoones, 2006; Ramalingam, 2013). No single organisation is likely to cover the entire scope of technical and non-technical, and of global and local knowledge. There is no general solution or model for the adoption of off-grid RETs across the Global South (Mallett, 2013). Case studies suggest that the objectives of donors, implementing organisations, and beneficiaries are likely to differ (Brass and Krackhardt, 2012), as do the ways in which they learn about RETs as a potential solution to

energy poverty (Byrne, 2011). 'Global knowledge' on energy poverty is likely to be based on relatively abstract and codified knowledge, 'technical knowledge' is often developed in experimental learning, and 'local knowledge' mainly incorporates tacit knowledge gained through experience (Byrne, 2011; Kolb, 1984).

Against this background, it can be argued that development assistance for the adoption of off-grid RETs involves tackling a 'wicked problem space [comprising] multiple, overlapping, interconnected subsets of problems' (Weber and Khademian, 2008, 336). When dealing with 'wicked problems' (Rittel and Webber, 1973, 155), it is impossible to develop a coherent formulation of the problem independent from one's strategy for solving it (Weber and Khademian, 2008). Wicked problems require the triangulation and integration of multiple kinds of knowledge held by different stakeholders (Weber and Khademian, 2008). However, knowledge, as *mediated information*, cannot be easily decoupled from the context in which it was created, and where it has given meaning to certain information and experiences (Berger and Luckmann, 1979; Weber and Khademian, 2008). 'Knowledge emerges as a product of the interaction and dialogue between specific actors' (Long and Villarreal, 1994, 43). As we have seen above, different stakeholders learn in different ways, and they hold different understandings, values, and expectations (Byrne, 2011; Glasbergen, 2007; Long, 2001). Partners to P4SEs all 'know' the problem of energy poverty that an intervention seeks to address—but their manifold understandings of the problem prescribe different ways for dealing with it (Mulugetta, 2008). Therefore, partners to P4SE have to translate and negotiate knowledge in order to identify both problems and potential solutions (Byrne et al., 2012; Grammig, 2012). Considering the complexity of such an endeavour, both the attraction and the limitations of scalable programme models, project blueprints and 'magic bullets' for achieving sustainable technology transfer become all too obvious (Leach and Scoones, 2006; Ramalingam, 2013). Open engagement and participation are ideals which are difficult to align with narratives revolving around 'donors' and 'beneficiaries'; where technologies are given by those who are seen as 'successful' in their development, and who have developed advanced low-carbon technologies, to those who appear 'less successful' because they lack access to such technologies (Banerjee, 2003; Dagron, 2006; Long and Villarreal, 1994). Given the

sources that have fuelled the ‘successful development’ of the Global North, such notions are deeply problematic and raise important questions about the relationship between knowledge and power in RET interventions.

Partnerships for sustainable energy

A growing number of case studies of RET interventions have informed the progressive development of more inclusive RET programme designs, slowly shifting the focus from technology donations, to market building, and then to multi-actor partnerships aiming at the provision of sustainable energy services (Kruckenberg, 2015; Martinot et al., 2002; Sovacool, 2012). Partnerships for sustainable energy are seen as a vehicle for overcoming persistent barriers to the adoption of off-grid RETs, and for enhancing the participation of local stakeholders (Kruckenberg, 2015; Morsink et al., 2011). They bring together a range of actors with resources and expertise, with non-governmental support organisations providing financial resources, market building services, and capacity building (Desjardins et al., 2014; Morsink et al., 2011).

In the literature, the term ‘partnership’ tends to refer to long-term alliances with a certain degree of mutuality and reciprocal accountability; empirical research into NGO partnerships in development cooperation, however, suggests that many partnerships actually resemble donor–client relationships characterised by strong power differentials (Ashman, 2001; Elbers and Schulpen, 2013; Fowler, 2000; Lister, 2000; Mawdsley et al., 2002). The management of partnerships for the transfer of environmentally sound technologies has been found to be intrinsically difficult (Morsink et al., 2011). Understandings of what counts as *valuable resources* and *best practice* may vary significantly between collaborating partners when ‘multiple sources of authority add nuance and complexity to the determination of power and its exercise’ (Brinkerhoff and Brinkerhoff, 2011, 13). Grammig’s (2012) ethnographic study of technical assistance provides compelling insights into the knowledge challenges faced by development practitioners working under conditions of shifting identities, power asymmetries, and cultural distance. Ellersiek’s (2011) survey-based study of partnerships created by the EU Water and Energy Facilities indicates that partnerships can be affected by power differentials which, if left unaddressed, can limit their impact. She also found that partner-level attributes indicating closeness to the intended beneficiaries were associated with a lack of influence on the partnership level. This finding raises important questions about the perceived value of local knowledge and participation in P4SEs, and how power and knowledge are negotiated between Southern and Northern partners. This paper addresses these questions through an in-depth case study of knowledge–power relations in a NGO partnership for sustainable energy.

Methods

In their review of case studies on distributed energy generation, Brass et al. (2012) noted that notwithstanding a growing research interest in off-grid technologies for sustainable development, few sociological studies have been undertaken in this area. Little is known about the organisational practices constituting P4SEs as ‘lived reality’ (Forsyth, 2010; Morsink et al., 2011). This paper presents results of a qualitative study of development assistance for off-grid renewable energy in Central America. The research involved 6 months of field research with RET organisations in El Salvador, Honduras, and Nicaragua (Kruckenberg, 2015). This paper presents an in-depth case study of a partnership between a Northern and a Southern renewable energy NGO. The presented material is based on interview recordings and detailed observational records of partnership meetings during field visits in 2013. The wider case study involved a series of interviews and conversations with several members of both NGOs. The case study was selected because it lent itself for an in-depth exploration and systematic

micro-analysis of how NGOs deal with the ‘wicked’ nature of RET interventions, and how their partnerships are shaped by the ways in which they manage and negotiate knowledge. While the author made similar observations with regard to some other cases, the focus on a single case offers the advantage of preserving a high level of detail for the analysis (Flyvbjerg, 2006; Gerring, 2007). Theoretical propositions derived from an individual case study are limited in their formal generalizability but they can provide deeper insights into complex social phenomena (Platt, 2007; Yin, 2009). Findings presented here extend previous research on North–South partnerships by illuminating the encompassing nature of knowledge–power relations in P4SEs. Participants in this research were granted confidentiality to enable them to share success stories as well as negative partnership experiences. Therefore, the author uses acronyms when referring to the partner organisations ‘Northern NGO’ (NNGO) and ‘Southern NGO’ (SNGO). This partnership is presented in the next section.

Case study of NGO partnership for sustainable energy

In 2013, SNGO, a non-profit renewable energy organisation based in a remote area of Central America, was implementing projects for several international donors, including NNGO, a Northern renewable energy NGO that worked with partner organisations across the Global South. Over the course of a few years, SNGO and NNGO had completed a series of projects in off-grid rural electrification with solar photovoltaics systems and small wind turbines. In the past, NNGO had merely provided financial resources, which it had raised from the Northern renewable energy industry, but this approach had changed following a process of internal reorganisation. NNGO now worked with a ‘partnership model’ aiming at supporting the development of its Southern partner organisations. NNGO’s director saw the main expertise of NNGO in its market-oriented framework for poverty alleviation through rural entrepreneurship involving RETs. As NNGO’s own technical capabilities were fairly limited, it had planned to facilitate communication between Northern RET experts from among its donors and its Southern partner organisations. However, at the time of the research, NNGO’s staff prioritised fundraising, project development, and project monitoring. The latter activities were used for coaching Southern partners with the objective of steering them towards more market-oriented RET interventions.

Under international management but with local and international staff, SNGO had introduced different types of RETs to remote rural communities. In the past, its activities had been more technology-driven, but high transaction costs had limited its competitiveness in a volatile and mainly donor-oriented RET market. After a number of projects had failed to achieve lasting impacts, SNGO had shifted its focus to community development. It had hired local project managers to improve its access to local knowledge. In some cases, this had worked well, but in other cases, poor communication remained a problem. A continuous turnover of volunteers and staff made it difficult for SNGO to manage its technical expertise. Incoming engineers provided SNGO with abstract technical knowledge but also found it difficult to align their expectations to local realities. At the time of the research, the main priorities of SNGO’s management were to consolidate its organisational structure, to secure a more constant stream of funding, and to improve the sustainability of its projects. Its programme director hoped that its partnership with a more active NNGO would translate into more project funding and capacity building. However, it seemed that NNGO’s internal changes had mainly heightened its demands for formal standards in project development and project administration and not its funds available for its Central American programme. Given the small volume of the partnership’s projects, SNGO’s staff complained about NNGO’s growing demands for detailed planning and documentation; and some found it difficult to see how NNGO’s increasingly business-oriented project blueprints could be implemented in remote communities with limited market access.

Partnership map based on the framework

Fig. 2 below provides a schematic representation of the formal set-up of the P4SE between NNGO and SNGO. Three additional actors have been included in this figure due to their significant role for the partnership: NNGO's *donors* from among the RET industry, who provide financial support but whose scientific and engineering knowledge is not (yet) tapped into; SNGO's regional and international *suppliers* who, again, are not directly involved in the partnership's projects but provide the equipment and at times some technical advice; and the partnership's *'beneficiaries'* in rural communities, with whom SNGO sought to develop a stronger relationship. The figure corresponds to the framework introduced in Section 1.2 and illustrates the main expertise of the different stakeholders, potential knowledge gaps, and linkages of contact and collaboration. It reveals a 'chain-like' partnership set-up (donor–Northern NGO–Southern NGO–beneficiary). This configuration is well described in the literature on NGO partnerships in global development and, according to the experience of the author, common for development assistance for renewable energy in this region (Ashman, 2001; Mawdsley et al., 2002). SNGO's and NNGO's weak links to the RET industry (represented by dashed grey lines to donors and suppliers) testify to the partnership's focus on the provision of energy services rather than technology development.

Both organisations presented their partnership as a means of achieving what neither of them could accomplish alone. The *situated technical knowledge* of SNGO and its access to local knowledge were described as complementing NNGO's *global knowledge in development cooperation* and business models for RET interventions. Both organisations faced multiple accountabilities. SNGO had to deliver on the expectations of both its partner and of its local beneficiaries. NNGO had to ensure that authentic stories from its 'successes at the grassroots level' kept it attractive to its board and corporate donors. This meant that, on the one hand, NNGO's team had chosen to work with its Southern partner because they saw it as an organisation that would benefit from their support, while on the other hand, they needed SNGO to implement projects in a fairly professional (i.e. standardised) way. According to NNGO, high-quality proposals, efficient project administration, and projects aiming at (partial) cost recovery were essential for obtaining future grants. NNGO's staff considered it to be their responsibility to ensure that the partnership could proceed on this basis by developing their framework and enhancing SNGO's capabilities. In turn, they held SNGO's staff responsible for the adequate implementation of projects in line with international standards. SNGO's flexible approach to project delivery created problems for NNGO, whose staff wanted to avoid having to report changes to approved projects to its board and donors.

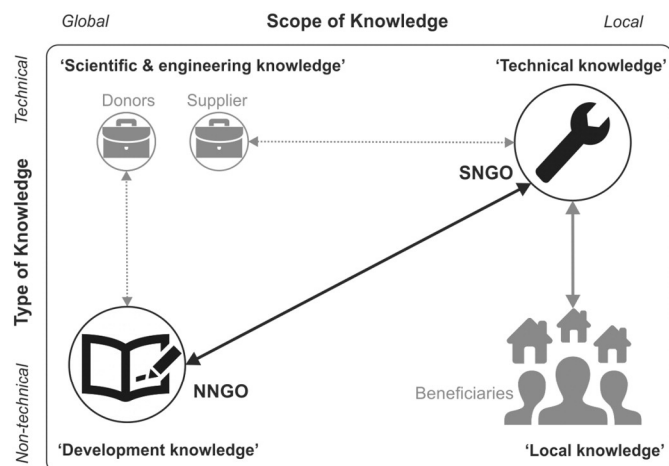


Fig. 2. Partnership map of P4SE between NNGO and SNGO.

It was by no means clear how NNGO's 'global' delivery framework could become translated into feasible project proposals, let alone sustainable project outcomes. Multiple knowledge challenges arising at the interface between technical/non-technical and global/local knowledge (illustrated in the centre of Fig. 1 above) were left unaddressed or declared to be the responsibility of the (respective other) partner. In the following section, the ways in which SNGO and NNGO approached this problem of a missing 'middle ground' is examined through a micro-analysis of two key events that evolved around this knowledge challenge: a capacity building workshop and a subsequent partnership meeting between the programme directors of NNGO and SNGO. In the following Section 3.2, summaries of detailed observational records will be presented, followed by a discussion of the results obtained in a micro-analysis of these data in Section 4.

Capacity building and partnership meeting

In response to a request by SNGO, NNGO organised a capacity building workshop during a field visit to SNGO. For the workshop, NNGO's staff had prepared a talk and an exercise about NNGO's framework for poverty alleviation through the productive use of RETs. The English slides used in the talk featured relatively abstract terms such as 'financial ecosystem', 'market failures', and 'business innovation', which made it difficult for some of SNGO's staff to follow the talk due to limited English proficiency and a lack of background knowledge in business. After the talk, SNGO's team was given a practical exercise on business models and cash flow projections based on sample spreadsheets. During the exercise, three problems became apparent. Firstly, the degree of universal business knowledge required to immediately make sense of differentiated business models for energy generation, energy distribution, and energy use, made it difficult for some people to participate in the exercise. Secondly, those who could follow the instructions tried to apply NNGO's framework to the realities of the marginalised rural communities in which NNGO wanted them to implement their projects, and where business opportunities were few and far between. They came up with real-life examples, like a group of farmers they had worked with, in order to discuss the application of the framework to local realities. How would one determine payments on the basis of hourly rates, when the existing system was based on sharing work and harvest, and involved little or no cash flow? How would a shed provided by an individual member appear in the cash flow model? NNGO's team responded that such details did not matter as their presentation was about the framework in general and not about any specific project. They asked SNGO's staff to make *hypothetical projections based on reasonable assumptions*. Some of SNGO's project managers, however, insisted that such assumptions were difficult to make. In their experience, specific details and contextual issues could determine a project's success or failure. Thirdly, a few of the more silent participants seemed to reject the very idea of aiming at cost recovery when working with the very poor and signalled disengagement and frustration.

SNGO's international staff tried to bridge the gap looming large between a capacity building exercise aimed at the transfer of an abstract model for the provision of sustainable energy services, and local staff trying to understand its implications for local practice. As frustration grew on both sides, SNGO's programme director volunteered to summarise the main principles of NNGO framework in simple Spanish. This effort caused NNGO's director to burst into applause and award the SNGO team a 'star', which he drew on a whiteboard. NNGO's team congratulated the Southern partner for 'finally' having grasped NNGO's framework for RET projects. While most workshop participants laughed about this reaction, and appeared relieved that the workshop was coming to an end, rising tensions were hard to ignore.

In a meeting a few days later (author in attendance), the regional programme directors for both NGOs discussed the development of the partnership, and discovered that they had rather contrary views on the meaning of capacity building in NGO partnerships. NNGO's

programme director reported that they had invested a lot in building the capacity of SNGO, trying to steer them in the right direction. However, NNGO's team grew increasingly frustrated with the iterative coaching process SNGO's submissions to NNGO invariably seemed to require. They had also been surprised by some of the problems SNGO faced, given their reputation as a fairly experienced RET organisation. Despite their difficulties, NNGO had continued to work with them because they were impressed with SNGO's technical know-how and dedication to work in a particularly difficult area. However, they needed SNGO to meet formal standards in their proposals and project administration. They were relieved that the workshop seemed to have helped SNGO to better understand what NNGO was aiming at.

This account came as a revelation to SNGO's programme director who admitted to having experienced NNGO's hands-on coaching as a 'punishment' rather than a capacity building process. He had tried to see SNGO's engagement with NNGO as an opportunity for his organisation to adapt to an increasingly business-oriented donor environment. He and his team had also been under the impression that NNGO's internal changes required SNGO – as its partner – to partake in its process of reinvention, and that SNGO's willingness 'to put itself out' and communicate openly about their problems would help NNGO to refine its framework. In return, he had expected more 'nurturing forms' of capacity building, such as training events with NNGO and its other partners. For grassroots organisations such as SNGO, pure subcontracting relationships could be frustrating as they required his team to present their projects as perfect solutions to multiple problems—despite the fact that in environments such as theirs, perfect solutions were hard to come by. This is why they had welcomed the opportunity to enter into a partnership which they had believed to be based on open exchange and mutual learning. NNGO's programme director was visibly surprised by this statement and admitted never having thought about their partnership in this way. While NNGO's team would consider this issue in their upcoming internal review, questions remained about the extent to which SNGO's experience was shared by other partner organisations, which appeared to be more experienced and, perhaps as a result, reported fewer problems.

Analysis and discussion: Knowledge–power relations in capacity building

This case study has not been presented to expose the strengths or weaknesses of the two NGOs. Rather, the case of NNGO and SNGO has been described in such detail as it lends itself to an examination of the complexity and pervasiveness of knowledge–power relations in partnerships for sustainable energy. Four issues relating to knowledge, partnership relations and knowledge–power dynamics have become apparent through an in-depth examination of this case.

Firstly, the case study provides a vivid example of an NGO partnership grappling to come to terms with how to assist remote rural communities in the adoption of RETs. The case study testifies to the 'wicked' nature of this endeavour. The different perspectives taken by the two NGOs tell us as much about the two organisations and their partnership, as they do about the problems they are trying to address. After some negative learning experiences, SNGO had come to appreciate the importance of non-technical knowledge for achieving lasting impacts. NNGO's focus on market-oriented approaches was seen as bearing the potential of enhancing the sustainability of their work. NNGO sought a competent partner who could benefit from their financial support and capacity building measures, but who would also be able to implement their framework in an efficient way. So in many ways, the case of SNGO and NNGO can be seen as a prime example of a partnership based on complementary knowledge bases.

While the division of labour between the two partners appeared relatively clear-cut, the ways in which NNGO's global knowledge could be combined with SNGO's local knowledge proved to be contested. Over the course of the capacity building workshop, the

limitations of knowledge transfer in the P4SE became evident. NNGO's frustration with what they perceived to be inadequate attempts by SNGO to implement their framework indicates some of the problems P4SEs face when they aim at knowledge management based on complementarity. NNGO's global 'expertise' in market-oriented development cooperation rested on the claim that it was *universal* in its applicability. This claim was challenged by SNGO's staff when they drew attention to the fact that NNGO's framework was based, albeit in unacknowledged ways, on assumptions regarding the presence of market institutions and practices that were not common in the communities SNGO worked in. This suggests that some of the knowledge challenges faced by the partnership arose from the fact that both SNGO's and NNGO's knowledge were ultimately of a *situated nature* (Moore, 1996; Mosse, 2014). Without an appreciation of the ways in which both local and global types of knowledge had been shaped by the contexts in which they had been created and used, it proved difficult (if not impossible) to integrate them in a meaningful way.

Secondly, the discussion between the two programme directors revealed that the two NGOs had developed different understandings of their *partnership*. The previous arrangement of a donor–contractor relationship had given SNGO a certain degree of freedom in project implementation. NNGO's internal transformation and the subsequent redefinition of its relationship with SNGO at a first appeared to empower SNGO by lifting it into the more privileged position of a 'partner'. However, the partnership status made it obligatory for SNGO to engage with NNGO's agenda, which reduced SNGO's room for manoeuvre in project implementation. Notwithstanding this limitation, and the additional costs involved in engaging with NNGO as a partner, SNGO had welcomed the partnership as an opportunity for mutual learning. This expectation was not shared by NNGO which saw its main value added to this partnership in its ability to provide capacity building along with financial resources. This view put NNGO into a position in which its legitimacy became dependent on its ability to transfer knowledge (Mawdsley et al., 2002). NNGO's focus on knowledge transfer rather than collaborative learning in a more equitable relationship had important implications for the development of the partnership.

This brings us, thirdly, to the issue of *power*. As a donor, NNGO had the right to determine the way SNGO made use of the financial resources NNGO had provided them with. The partnership set-up did not lessen but reinforced NNGO's power over SNGO, which now rested on NNGO's access to financial resources as well as its claim of a superior knowledge base. Problems in project development and implementation were interpreted by NNGO's staff as an expression of SNGO's limited capabilities to deliver on what NNGO considered to be their responsibility. NNGO's frustration with SNGO's failures to fulfil their expectations fed into a growing conviction among NNGO's staff that SNGO required more assistance. They expressed this view ever more forcefully in their capacity building measures, in which they confirmed their superior position. The moment when NNGO awarded SNGO a 'star' for summarising their framework testifies to this unequal teacher–student relationship.

NNGO's approach to capacity building mirrored its understanding of the partnership as a vehicle for knowledge transfer. When NNGO asked SNGO to make 'hypothetical projections based on reasonable assumptions', they wanted SNGO's team to deliver on an exercise for which they had already determined the outcome. In the experience of SNGO's project managers, the wicked reality of their project work generally resisted reliable projections and definite solutions. In their view, lasting impacts could only be achieved through the continuous adaptation to complex contextual issues and contingencies. However, given the knowledge–power dynamic of the partnership, SNGO's team could not draw attention to this problem without devaluing further its own knowledge base in the eyes of NNGO's team. SNGO's director faced a similar problem when he tried to negotiate the relative value of SNGO's contribution to the partnership. His appeal for mutual learning was met by NNGO's insistence on determining the value of mutual knowledge in this

partnership. Arguably, part of NNGO's power was derived from their ability to deny SNGO opportunities for knowledge exchange as they considered SNGO dependent on them in a way NNGO was not. This left little space for an open negotiation of knowledge between partners. Such a process would have required both partners to critically evaluate their knowledge – their partner's and their own – with a view to how it derived its meaning from certain experiences and assumptions, and how it could be used in a new context (Weber and Khademian, 2008).

Fourthly, it is important to pay attention to the wider context which allowed NNGO to reinforce its power in such a way. As has been noted above, both organisations tried to adapt their strategies in a way that would enhance their access to financial resources, and both described this process as a principal means of advancing *the cause*, as well as ensuring the survival of their organisations. However, by trying to meet expectations further up the chain, both organisations risked aggravating the 'accountability paradox' they were caught up in; this is a problem faced by many intermediary development organisations (Anderson et al., 2012; Najam, 1996). As knowledge became exchanged and evaluated, questions arose as to what types of knowledge were deemed important in this partnership (Chambers, 1997; Mawdsley et al., 2002).

Given the multiple challenges faced by development organisations trying to access local knowledge, one could argue that SNGO's 'technical know-how' and access to local knowledge could be seen as valuable a resource as NNGO's global 'expertise in development cooperation'. However, it is the donor's satisfaction with a project that determines future funding, and this satisfaction is determined by evaluation criteria which, to a larger or lesser degree, take into consideration the experiences of beneficiaries (Anderson et al., 2012). Where local experience and knowledge is not valued, the assumption that an increase in funds available for projects automatically translates into more impact has to be treated with caution. Partnerships that are defined by top-down knowledge–power relations, and which devalue the knowledge base of those closest to the problem appear less likely to achieve any sustainable impact (Ellersiek, 2011; Mawdsley et al., 2002).

Participatory tool for negotiating knowledge–power relations in partnerships for sustainable energy

The case study presented in the previous sections suggests that researchers and practitioners working in the field of sustainable energy should pay more attention to how partnership ideals are translated into actual practice. It shows that partners risk assuming consensus where there is none. The positive connotation of 'partnership' might discourage open debate of problems, and managerial labels like 'project implementation' distract from the complexity of development cooperation (Hirschman, 1967; Mawdsley et al., 2002). In order to achieve a wider uptake of off-grid RETs, multiple technical and social innovations are required (Mallett, 2013; Mulugetta, 2008). Multi-stakeholder partnerships that bring together local and international partners in an *open negotiation of knowledge challenges* may indeed be the best strategy for identifying solutions that work in different contexts. Such negotiation would require partners to acknowledge the situated nature of theirs and other partner knowledge, when evaluating its potential 'through the eyes of the involved people with their diverse roles at different societal levels' (Ulsrud et al., 2011, 302). In partnerships where persistent power differentials remain unaddressed, an open negotiation of knowledge challenges is difficult if not impossible to achieve. While power imbalances in North–South partnerships may not be altogether avoidable, it is essential that partner organisations recognise and address them (Ellersiek, 2011; Long, 2001). The question is how this can be done effectively.

Instead of providing a list of general recommendations to this end, this paper proposes a participatory tool for assessing *knowledge challenges* and *knowledge–power relations* in partnerships for sustainable energy. The proposed tool can be used by practitioners and researchers engaging with P4SE in a partnership meeting or workshop. Developed

in and alongside this study, the tool aims at facilitating a discussion between partners about knowledge challenges, power imbalances, and participation issues. Such discussion can be useful to realise a more accurate understanding of the potential and limitations of a given P4SE. Fig. 3 gives a schematic overview of the tool, which combines the framework for assessing knowledge challenges presented in Sections 1.2 and 3.1 of this paper with interactive methods for mapping governance networks (Schiffer and Hauck, 2010, 2013). The proposed tool involves a four-stage process for the assessment of the *partnership set-up, knowledge challenges, partnership relations*, and *anticipated outcomes*. At each stage participants are asked to discuss three key questions and to engage in an interactive exercise aiming at an output that can be used to develop a partnership agreement.

In the first step, partners are asked to negotiate a problem statement and general objective for their partnership, and to create a list of key stakeholders both inside the partnership and external to it. The second step then aims at the negotiation of the knowledge held by the different stakeholders, and the identification of knowledge challenges the partnership is likely to face. The discussion of three questions provided for this stage aims at guiding the creation of a partnership map based on the framework presented in Figs. 1 and 2 above. Partners are encouraged to locate and draw in their organisations according to their principal areas of expertise (global/local and technical/non-technical) on a whiteboard or flip chart. In the third stage, participants are asked to indicate the relationships between stakeholders. Different lines can be drawn in to visualise different kinds of relationships established in and around the partnership. The questions provided for this stage aim at initiating a discussion of the ways in which these relationships could be affected by power differentials, and whether or how partners could address these imbalances. In the last stage, partners are asked to identify criteria for success and failure. Most importantly, this step also involves a discussion about the relative value assigned to the experiences and expectations of the different parties involved. This step is important to better understand underlying power differentials between partners as it requires partners to articulate 'whose reality counts' (Chambers, 1997).

Conclusion: Negotiating knowledge in partnerships for sustainable energy

This paper has provided insights into the 'wicked' reality of partnerships for sustainable energy. It has presented a framework for visualising the multiple knowledge challenges faced by development organisations assisting Southern communities in the adoption of off-grid RETs, and for analysing the potential of P4SEs to meet these challenges. Through an in-depth case study of a North–South NGO partnership, it has shown how the ways in which knowledge is framed and valued in P4SEs can have important implications for their ability to address knowledge challenges. Finally, it has outlined an interactive tool which can assist in the negotiation of knowledge challenges, knowledge–power relations, and the development of partnership agreements for P4SEs.

Whereas an in-depth case study can lend itself to the creation of new and the extension of existing theory, its scope for formal generalisation is limited (Flyvbjerg, 2006; Weick, 2007). The findings reported in this paper confirm that partnerships assisting in the uptake of off-grid RETs are likely to face multiple knowledge gaps that have to be tackled in a dynamic process involving continued decision-making (Mulugetta, 2008; Rittel and Webber, 1973; Weber and Khademian, 2008). The findings also suggest that partnership models aiming at an efficient division of labour between partners and North–South knowledge transfer may be less likely to deliver effective outcomes than previously thought. Partnerships that manage knowledge by dividing between programming and programme implementation may not be successful in addressing 'wicked problems', as they require problems to be well-defined and stable, so that they can be processed in an institutionalised

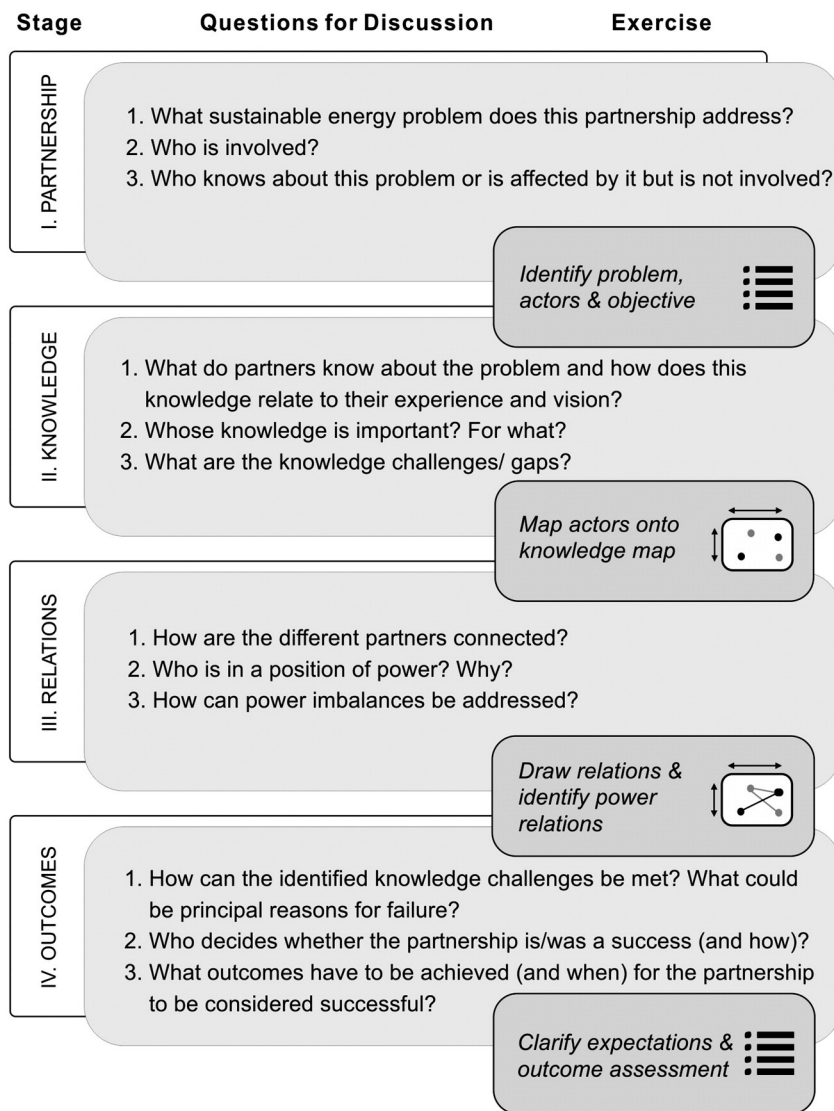


Fig. 3. Participatory tool for assessing knowledge–power relations in P4SEs.

division of labour. Rigid notions of North–South knowledge transfer bear the risk of decontextualizing ‘development expertise’ in a way that makes it appear *universal*, and as such superior to local knowledge, thereby aggravating power imbalances which inhibit the ability of P4SEs to address knowledge challenges (Chambers, 1997; Mawdsley et al., 2002; Moore, 2015).

While ‘one size fits all’ solutions for alleviating rural energy poverty are unlikely to emerge, the analysis presented in this paper confirms that multi-stakeholder partnerships may indeed be our best bet for identifying appropriate solutions. The performance of such partnerships is likely to be contingent on the ways in which partners deal with the knowledge challenges and power imbalances they face. Power is relational, and it is constructed discursively (Mosse, 2014). The case of SNGO and NNGO suggests that while power imbalances in P4SEs may not be avoidable, it is imperative to articulate them because this is central to any understanding of knowledge processes and potential trade-offs between efficiency and effectiveness in RET projects. Comparative research on P4SEs can help to further clarify how different partnerships navigate this trade-off, and what role equity plays in this process. The interactive partnership assessment tool proposed in this paper could facilitate such research aiming at a better understanding of how P4SEs can co-create new development pathways towards ‘Sustainable Energy for All’ (UN, 2015).

Acknowledgements

I am greatly indebted to everyone who participated in this study. I would like to thank Kerim Jaspersen, Dr Nicholas Loubere, Dr Rowshan Hannan, Dr Thomas Grammig, Christian Stein, Dr Charlotte Coleman, Jane Stoate, and Eleanora Humana for their encouragement and comments on previous drafts of this paper. Special thanks also go to Prof Andy Gouldson and Dr Hinrich Voss for their support in conducting this research, and to the University of Leeds, its Sustainability Research Institute, the ESRC Centre for Climate Change Economics & Policy, and the Society for Latin American Studies for their generous financial support.

References

- Anderson MB, Brown D, Isabella Jean. *Time to listen: hearing people on the receiving end of international aid*. 1st ed. Cambridge, MA: CDA Collaborative Learning Projects; 2012.
- Ashman D. Strengthening North–South partnerships for sustainable development. *Nonprofit Volunt Sect Q* 2001;30(1):74–98.
- Banerjee SB. Who sustains whose development? Sustainable development and the reinvention of nature. *Organ Stud* 2003;24(1):143–80.
- Bell M. International technology transfer, innovation capabilities and sustainable directions of development. In: Ockwell DG, Mallett A, editors. *Low-carbon technology transfer: From rhetoric to reality*. London: Routledge; 2012. p. 20–47.

- Berger PL, Luckmann T. The social construction of reality: a treatise in the sociology of knowledge. Harmondsworth: Penguin; 1979.
- Berkhout F, Angel D, Wieczorek AJ. Asian development pathways and sustainable socio-technical regimes. *Technol Forecast Soc Chang* 2009;76(2):218–28.
- Bhattacharyya SC. Energy access programmes and sustainable development: a critical review and analysis. *Energy Sustain Dev* 2012;16(3):260–71.
- Brass DJ, Krackhardt DM. Power, politics, and social networks in organizations. In: Ferris GR, Treadway DC, editors. *Politics in organizations: Theory and research considerations*. New York: Routledge; 2012. p. 355–75.
- Brass JN, Carley S, MacLean LM, Baldwin E. Power for development: a review of distributed generation projects in the developing world. *Annual Review of Environment and Resources* 2012;37(1):107–36.
- Brinkerhoff JM, Brinkerhoff DW. Public-private partnerships: perspectives on purposes, publicness, and good governance. *Public Adm Dev* 2011;31(1):2–14.
- Byrne R. Learning drivers: rural electrification regime building in Kenya and Tanzania. Brighton: Doctoral Thesis; 2011.
- Byrne R, Smith A, Watson J, Ockwell D. Energy pathways in low-carbon development: the need to go beyond technology transfer. In: Ockwell DG, Mallett A, editors. *Low-carbon technology transfer: From rhetoric to reality*. London: Routledge; 2012. p. 123–42.
- Chambers R. *Whose reality counts? Putting the first last*. London: Intermediate Technology; 1997.
- Chaurey A, Krithika P, Palit D, Rakesh S, Sovacool BK. New partnerships and business models for facilitating energy access. *Energy Policy* 2012;47:48–55.
- Dagron AG. Knowledge, communication, development: a perspective from Latin America. *Dev Pract* 2006;16(6):593–602.
- Desjardins S, Gomes R, Pursnani P, West C. Accelerating access to energy: lessons learned from efforts to build inclusive energy markets in developing countries. http://www.shellfoundation.org/ShellFoundation.org_new/media/Shell-Foundation-Reports/Access_to_Energy_Report_2014.pdf, 2014. (accessed February 28, 2015).
- Doranova A, Costa I, Duysters G. The role of absorptive capacity in technological learning in CDM projects: evidences from survey in Brazil, China, India and Mexico. *Int J Technol Glob* 2011;5(3/4):230–54.
- El Fadel M, Rachid G, El-Samra R, Bou Boutros G, Hashisho J. Knowledge management mapping and gap analysis in renewable energy: Towards a sustainable framework in developing countries. *Renew Sust Energy Rev* 2013;20:576–84.
- Elbers W, Schulpen L. Corridors of power: the institutional design of North–South NGO partnerships. *Volunt Int J Volunt Nonprofit Org* 2013;24(1):48–67.
- Ellersiek A. Same same but different: power in partnerships an analysis of origins, effects and governance; 2011 (Tilburg: s.n.).
- Fernández-Baldor Á, Hueso A, Boni A. From individuality to collectivity: the challenges for technology-oriented development projects. In: Oosterlaken I, van den Hoven, Jeroen M, editors. *The capability approach, technology and design*. Dordrecht, New York: Springer; 2012. p. 135–52.
- Flyvbjerg B. Five misunderstandings about case-study research. *Qual Inq* 2006;12(2):219–45.
- Foley G. Renewable energy in third world development assistance: learning from experience. *Energy Policy* 1992;20(4):355–64.
- Forsyth T. Panacea or paradox? Cross-sector partnerships, climate change, and development. *Climate Change* 2010;1(5):683–96.
- Forsyth T. Reducing the cost of technology transfer through community partnerships. In: Ockwell DG, Mallett A, editors. *Low-carbon technology transfer: From rhetoric to reality*. London: Routledge; 2012. p. 340–53.
- Fowler A. Introduction beyond partnership: getting real about NGO relationships in the aid system. *IDS Bull* 2000;31(3):1–13.
- Garud R, Karnøe P. Path dependence and creation. Mahwah, NJ: Lawrence Erlbaum Associates; 2001.
- Gerring J. *Case study research: principles and practices*. New York: Cambridge University Press; 2007.
- Glasbergen P. Setting the scene: the partnership paradigm in the making. In: Glasbergen P, Biermann F, Mol APJ, editors. *Partnerships, governance and sustainable development: Reflections on theory and practice*. Cheltenham: Edward Elgar; 2007. p. 1–25.
- Glemarec Y. Financing off-grid sustainable energy access for the poor. *Energy Policy* 2012;47:87–93.
- Grammig T. *Technical knowledge and development: observing aid projects and processes*. London: Routledge; 2012.
- Groh S. The role of energy in development processes—the energy poverty penalty: case study of Arequipa (Peru). *Energy Sustain Dev* 2014;18:83–99.
- Hirschman AO. *Development projects observed*. Washington, D.C.: The Brookings Institution; 1967.
- IEA. *Energy access database*. <http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/#d.en.8609>, 2015. (accessed January 03, 2015).
- Kolb DA. *Experiential learning: experience as a source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall; 1984.
- Krithika P, Palit D. Rural electrification through decentralised off-grid systems in developing countries. In: Bhattacharyya SC, editor. *Rural electrification through decentralised off-grid systems in developing countries*. London [u.a.]: Springer; 2013. p. 187–225.
- Kruckenberg LJ. Renewable energy partnerships in development cooperation: towards a relational understanding of technical assistance. *Energy Policy* 2015;77:11–20.
- Kumar A, Mohanty P, Palit D, Chaurey A. Approach for standardization of off-grid electrification projects. *Renew Sust Energy Rev* 2009;13(8):1946–56.
- Leach M, Scoones I. *The slow race: making technology work for the poor*. London: Demos; 2006.
- Lister S. Power in partnership? An analysis of an NGO's relationships with its partners. *J Int Dev* 2000;12(2):227–39.
- Long N. *Development sociology: actor perspectives*. London, New York: Routledge; 2001.
- Long N, Villarreal M. The interweaving of knowledge and power in development interfaces. In: Scoones I, Thompson J, editors. *Beyond farmer first: Rural people's knowledge, agricultural research and extension practice*. London: Intermediate Technology; 1994. p. 41–52.
- Mallett A. Technology cooperation for sustainable energy: a review of pathways. *WENE* 2013;2(2):234–50.
- Martinot E, Chaurey A, Lew D, Moreira JR, Wamukonya N. Renewable energy markets in developing countries. *Annu Rev Energy Environ* 2002;27(1):309–48.
- Mawdsley E, Townsend J, Porter G. *Knowledge, power and development agendas: NGOs North and South*. Oxford: INTRAC; 2002.
- Moore HL, editor. *The future of anthropological knowledge*. London, New York: Routledge; 1996.
- Moore HL. *The End of Development: Analysis on BBC Radio 4*. London: BBC Radio 4; 2015 (09 March 2015).
- Morsink K, Hofman PS, Lovett JC. Multi-stakeholder partnerships for transfer of environmentally sound technologies. *Energy Policy* 2011;39(1):1–5.
- Mosse D. Knowledge as relational: reflections on knowledge in international development. *Forum Dev Stud* 2014;41(3):513–23.
- Mulugetta Y. Human capacity and institutional development towards a sustainable energy future in Ethiopia. *Renew Sust Energy Rev* 2008;12(5):1435–50.
- Najam A. NGO accountability: a conceptual framework. *Dev Policy Rev* 1996;14(4):339–54.
- Ockwell D, Mallett A. Introduction: low-carbon technology transfer – from rhetoric to reality. In: Ockwell DG, Mallett A, editors. *Low-carbon technology transfer: From rhetoric to reality*. London: Routledge; 2012a. p. 3–19.
- Ockwell DG, Mallett A, editors. *Low-carbon technology transfer: From rhetoric to reality*. London: Routledge; 2012b.
- Ockwell DG, Watson J, MacKerron G, Pal P, Yamin F. Key policy considerations for facilitating low carbon technology transfer to developing countries. *Energy Policy* 2008;36(11):4104–15.
- Palit D, Chaurey A. Off-grid rural electrification experiences from South Asia: status and best practices. *Energy Sustain. Dev.* 2011;15(3):266–76.
- Platt J. Case study. In: Outhwaite W, Turner SP, editors. *The SAGE handbook of social science methodology*. Los Angeles: Sage; 2007. p. 100–18.
- Practical Action. *Poor people's energy outlook 2014*. <http://practicalaction.org/ppoe2014>, 2014. (accessed March 22, 2015).
- Ramalingam B. *Aid on the edge of chaos: rethinking international cooperation in a complex world*. Oxford: Oxford University Press; 2013.
- Rittel HJ, Webber M. Dilemmas in a general theory of planning. *Policy Sci* 1973;4(2):155–69.
- Romijn H, Raven R, de Visser I. Biomass energy experiments in rural India: Insights from learning-based development approaches and lessons for Strategic Niche Management. *Environ Sci Pol* 2010;13(4):326–38.
- Schiffer E, Hauck J. Net-Map: collecting social network data and facilitating network learning through participatory influence network mapping. *Field Methods* 2010;22(3):231–49.
- Schiffer E, Hauck J. Net-Map: collecting social network data and facilitating network learning through participatory influence network mapping. Workshop at the XXXIII Sunbelt Social Networks Conference; 2013. (Hamburg).
- Sovacool BK. Design principles for renewable energy programs in developing countries. *Energy Environ Sci* 2012;5(11):9157–62.
- Sovacool BK, Drupady IM. Energy access, poverty, and development: the governance of small-scale renewable energy in developing Asia. Farnham: Ashgate; 2012.
- Ulsrud K, Winther T, Palit D, Rohracher H, Sandgren J. The Solar Transitions research on solar mini-grids in India: learning from local cases of innovative socio-technical systems. *Energy Sustain Dev* 2011;15(3):293–303.
- UN. Sustainable Energy for All Initiative. <http://www.un.org/wcm/content/site/sustainableenergyforall/home/Initiative>, 2015. (accessed March 16, 2015).
- UNDP, WHO. *The Energy Access Situation in Developing Countries*. <http://www.who.int/indoorair/publications/energyaccesssituation/en/>, 2009. (accessed March 23, 2015).
- Weber EP, Khademian AM. Wicked problems, knowledge challenges, and collaborative capacity builders in network settings. *Public Adm Rev* 2008;68(2):334–49.
- Weick KE. The generative properties of richness. *Acad Manag J* 2007;50(1):14–9.
- World Bank. *Development and climate change: World Development Report 2010*. Washington: The World Bank; 2010.
- World Bank. *Country and Lending Groups*. <http://data.worldbank.org/about/country-and-lending-groups>, 2015. (accessed January 15, 2015).
- Yin RK. *Case study research: design and methods*. 4th ed. London: Sage; 2009.