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Renewable energy partnerships in development cooperation: Towards a relational understanding of technical assistance

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Abstract: Recent decades have witnessed a surge in international programmes established to assist the adoption of renewable energy technologies (RETs) in low and lower-middle income countries. So far, such programmes have yielded mixed success. While partnerships between international, national and local organisations have become the pre-eminent model for RET programmes, we know relatively little about their contribution. This article traces the role of renewable energy partnerships in development cooperation, shifting the analytical emphasis from barriers and drivers to key actors and their relationships. It presents a relational approach for the analysis of development assistance for renewable energy, drawing on theories concerning the role of strong and weak ties in inter-organisational networks. Through an analysis of seven empirical cases from Central America, the article provides insights into how different forms of inter-organisational relationships can facilitate implementation of RET programmes but do not necessarily enhance the capacities of local organisations in a way to support a more sustainable adoption of RETs. On the basis of this analysis, theoretical and policy implications are given concerning the potential of relational approaches for researching technology diffusion processes, and the role of strong and weak ties for the success – or failure – of renewable energy partnerships.

Keywords: Renewable energy technologies; technology transfer; development cooperation; cross-sector partnerships; sustainable development; theory of strong and weak ties

Word Count (*excluding contact details, abstract, keywords, acknowledgments and references*): 7929

1. Introduction

Renewable energy technologies (RETs) could play a central role in enabling sustainable development in low and lower-middle income countries. They bear the promise of enabling economic growth and enhancing energy access for rural populations while reducing the environmental impact of energy generation, in this way contributing to poverty alleviation and improved standards of living (UNDP and WHO 2009). As a result, RETs have become prominent in the field of international development cooperation (Chaurey et al. 2012; Pinkse and Kolk 2012). A plethora of development programmes aim at the adoption of RETs in the Global South, often with a special emphasis on off-grid rural electrification and small-scale applications for populations with limited access to modern energy services.[1] Some of these programmes are run by development banks, multilateral organisations and development agencies; others by nongovernmental organisations (NGOs) or national governments. So far, RET programmes have yielded a mixed record of success. Common problems arise from the fragmented implementation of RET interventions, their limited sustainability and restricted potential for replication (Acker

[1] The terms 'Global South' and 'Global North' refer to the continuing inequalities the Northern and Southern hemisphere. Although not strictly accurate, the term 'Global South' is used as an umbrella term for low and lower-middle income countries with a relatively lower Human Development Index.

and Kammen 1996; Chaurey et al. 2012; Foley 1992). In the last decade, partnerships between international, national and local organisations have become the pre-eminent model for RET programmes in development cooperation (Pinkse and Kolk 2012). While the number of 'sustainable energy partnerships' seems to grow by the day, relatively little is known about the actual practices of such partnerships (Doranova et al. 2011; Forsyth 2010). A growing body of case studies has informed the progressive development of RET programme designs, but it has fallen short of providing deeper insights into the micro-processes of inter-organisational learning that underlie international technical assistance (Grammig 2012; Sovacool and Drupady 2012). This makes it difficult to appreciate the ways in which renewable energy partnerships can contribute to a more sustainable uptake of RETs in the Global South.

The first part of this article traces the history of RET programmes in development cooperation and shows how renewable energy partnerships emerged as a 'silver bullet' approach to development assistance for renewable energy. It is argued that in order to better understand how partnerships can contribute to a more sustainable technology uptake of RETs, we need to shift our attention from static factors influencing programme outcomes to the actors involved and their dynamic relationships. The exploratory study presented in the second part of the article demonstrates the potential of such a relational approach. Drawing on theories concerning the role of strong and weak ties in inter-organisational networks, seven empirical cases of renewable energy partnerships in Central America are analysed. The analysis shows how the adoption of small-scale renewable energy technologies is affected by the project-centred dynamics of development cooperation, and how different forms of inter-organisational relationships can facilitate but also inhibit a more sustainable adoption of RETs. On the basis of this analysis, theoretical and policy implications are given concerning the potential value of relational approaches to research on technology diffusion, and the role of strong and

weak ties for the success – or failure – of renewable energy partnerships in development cooperation.

1.1 Renewable energy technologies in development contexts: Lessons learnt

Since the late 1990s, a growing body of literature has identified 'best practices' and 'lessons learnt' from past and current RET programmes (Brass et al. 2012; Sovacool and Drupady 2012). While the variety of case studies on this topic is remarkable, a closer look at this literature reveals shortcomings. Widely reported indicators - such as number of installed RET systems - lack information about the sustainability of the technologies (Brass et al. 2012). Often it seems to be assumed, rather than proven, that the expected benefits of RET will materialise (van Alphen et al. 2008; van Huijstee et al. 2007). Notwithstanding these weaknesses, studies of RET programmes have identified important economic, social, and political 'gaps' that affect the outcomes of RET programmes in terms of their resources, capacitation, implementation and policy (Forsyth 2010; Pinkse and Kolk 2012). The following paragraphs summarise the latent theoretical and empirical understanding of these gaps.

About 80% of the 1.2 billion people without access to electricity live in rural areas where poor market infrastructure inhibits the development of appropriate market-delivery solutions for RETs (Gradl and Knobloch 2011; Mills 2005; World Bank 2014). The (transaction) costs involved in acquiring and maintaining small-scale RETs in remote rural areas represent "an established market barrier to natural adoption" (Mills and Jacobson 2011, 536) notwithstanding the fact that many rural low-income households pay disproportionate prices for low-quality fuel-based energy services (Byrnes et al. 2013; Mills and Jacobson 2011). International development cooperation can reduce some of the ***resource gaps*** inhibiting the diffusion of RETs, but financial assistance tends to be limited in scope and duration (Byrne 2011). As a result, many local RET organisations operate

multiple business models, some of them based on direct sales for cash and (micro-) loans in emerging commercial markets, others involving donations and mixed finance models in various RET projects (Karakosta et al. 2010; Sovacool 2012). RET programmes may boost the turnover of local organisations but also add to the volatility of rural RET markets, as do changing currency rates (Balint 2006; Martinot et al. 2002; Karakosta et al. 2010). Insufficient funds for follow-up, maintenance and repair limit the sustainability of many donor-initiated RET interventions (Kaminski 2010). A growing number of initiatives now aim at the productive use of RETs in small enterprises in order to create demand and enhance financial sustainability (Cabraal et al. 2005; Romijn et al. 2010). However, a lack of local resources, poor market access and political instability often makes it difficult to translate energy access (e.g. in the form of a solar household system) into opportunities for income generation (Kapadia 2004).[2]

The sustainable adoption of RETs also requires the removal of ***capacity gaps*** at the local, national and international level (Acker and Kammen 1996). Most low and lower-middle income countries depend on imported technologies (Chaurey et al. 2012). RET systems have to be imported, installed and repaired by trained technicians. The investments needed to develop appropriate technical capacities were previously underestimated (Chaurey et al. 2012; ESMAP 2000). Market-based initiatives have given evidence to the importance of advancing business know-how along with technological expertise (Martinot et al. 2002). Donors face learning gaps due to a lack of long-term programme evaluations (Newell et al. 2009; Vincent and Byrne 2006). Rural populations tend to have limited access to education and little experience with modern technologies which can make it difficult for them to adopt RETs (Sovacool and Drupady 2012). Unsuccessful demonstration projects have reduced the attractiveness of RETs in places.

[2] Others pointed out that local demand for solar home systems may not derive from income generation. For example, Jacobson (2007) found that Kenya's rural middle class acquired solar home systems not so much for productive uses but rather for ''connective'' applications, such as mobile phones, radios and televisions.

However, some pilot projects engendered important learning opportunities (Romijn et al. 2010). Today, most programmes involve capacity building measures for local technicians and end-users (Chaurey et al. 2012).

Implementation gaps persist at multiple levels. Global RET initiatives produce diverse outcomes as they are inconsistently implemented by different national and local organisations. The plurality of actors involved makes it difficult to identify governance issues and evaluate impacts (Newell et al. 2009). NGOs and small and medium enterprises (SMEs) working in emerging RET sectors face the triple challenge of establishing appropriate supply chains and developing rural market infrastructure whilst simultaneously creating demand through the promotion of RETs (Byrne 2011; Martinot et al. 2002; Mills, Jacobson 2011). They also have to balance the requirements of emerging demand-oriented markets for the more affluent with donor-driven markets focusing on lowest-income areas. Recent RET programmes have put a larger emphasis on the active involvement of end-users and local technicians in the selection and adaptation of RETs after it became apparent that many projects had failed due to unforeseen practical problems and cultural barriers (Acker and Kammen 1996; Drinkwaard et al. 2010; Romijn et al. 2010; Sovacool and Drupady 2012).

In the absence of a strong government, ***regulatory gaps*** can be difficult to address (Newell et al. 2009). As donor agencies generate their own aid-related markets, they contribute to interacting levels of political economy (Byrne et al. 2011). The successful adoption of RETs requires consistent levels of political support at the international, national and local level, as well as the integration and coordination of policies (Sovacool and Drupady 2012). Policy makers find it difficult to manage the complex array of policy instruments that define the possibilities and limitations of RET programmes (Martinot et al. 2002). National RET agencies might improve coordination among stakeholders (Martinot et al. 2002); however, such agencies require significant investments and long-term

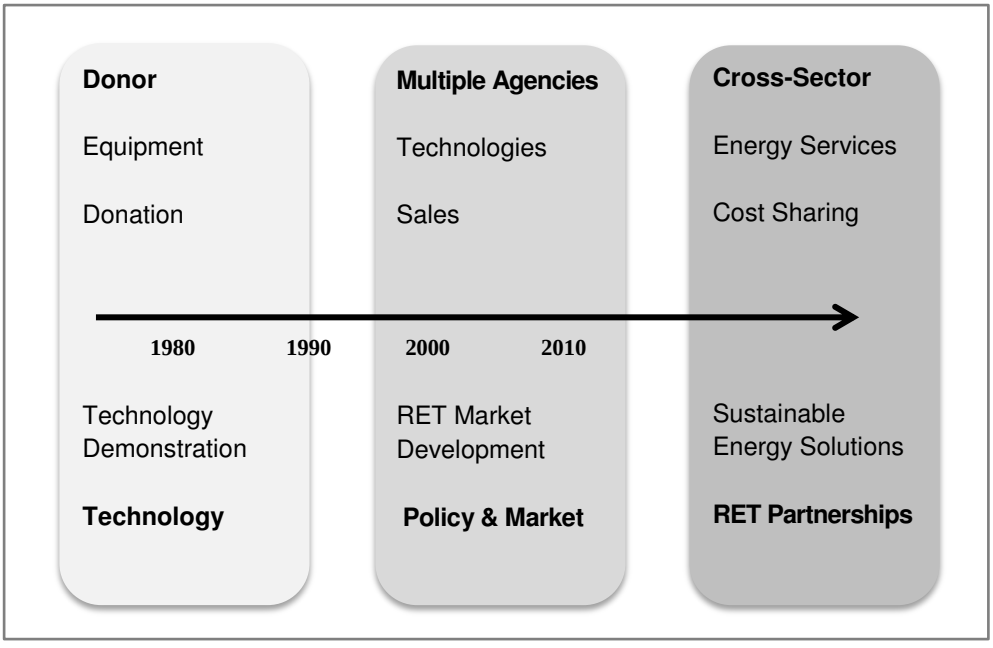
political commitment – resources that tend to be scarce in low and lower-middle income countries.

As this review shows, various factors affect the potential outcomes of RET programmes in development cooperation. What it also suggests is that the success of RET programmes depends to a large extend on whether (and how) these factors are addressed in dynamic interactions between the various actors involved in RET programmes (Drinkwaard et al. 2010; Grammig 2012).

1.2 Shifting Paradigms

In the past two decades, the complexity of development assistance for renewable energy has become more widely acknowledged. On the practitioner side, this informed a paradigm shift in RET programme design that is illustrated in Figure 1 (Martinot et al. 2002; Sovacool 2012). From the 1970s to the 1990s, most international donors invested in technology diffusion through demonstration projects, 'parachuting' technologies developed in the Global North to the Global South (Acker and Kammen 1996). Demonstration projects tended to be technology-oriented rather than problem-oriented and notwithstanding significant technological progress, many of these interventions failed to address important resource gaps, such as costs for maintenance; capacity gaps, such as the training of local technicians; implementation gaps, such as a meaningful involvement of end-users; and regulatory gaps that inhibited a more sustainable uptake of small-scale renewables (Martinot et al. 2002; Romijn et al. 2010). In the 1990s and 2000s, the 'donor paradigm' gave way to a more 'market-oriented' paradigm with programmes aiming to create appropriate business models for firms and NGOs, while sharing some of the costs and risks of market development (Martinot et al. 2002; Sovacool 2012). While many of these programmes addressed some important capacity and implementation gaps, they were also based on overly optimistic expectations regarding the economic

viability of RETs in rural markets where it can be difficult to predict which enterprises will eventually reach profitability (ESMAP 2000). Consequently, the transition from donor-initiated to demand-oriented markets for small-scale RETs proved to be difficult, in particular in poor rural areas lacking basic infrastructure (Acker and Kammen 1996; Martinot et al. 2002).[3] In the last decade, a more holistic 'sustainable energy paradigm' emerged (Sovacool 2012). Acknowledging the multi-level and cross-sector nature of socio-technical change, policy makers started to involve a greater variety of stakeholders in their programmes with a view at creating more sustainable energy services (Sovacool 2012; van Huijstee et al. 2007). Underlying this development towards cross-sector partnerships was the belief that wider participation would lead to more sustainable outcomes (Ellersiek 2011). Today, partnerships have become the pre-eminent model for donors working in sustainable development (Forsyth 2010; Mosse 2005).



[3] In some countries attempts at creating commercial RET markets were more successful than in others. Glemarec's (2012) analysis of market development projects in Africa and Asia shows that successful market development often requires significant investments of public resources in order to create the conditions needed to leverage private finance for RET diffusion.

Figure 1: Changing paradigms in RET programme design (based on Martinot et al. 2002; Sovacool 2012)

1.3 Renewable energy partnerships

Partnerships within the sustainable energy paradigm involve multiple organisations with complementary competences (Newell et al. 2009; Sovacool 2012): *International partnerships* between governments, multilateral agencies and development banks set up RET programme frameworks and funding streams. *Regional and national partnerships* translate global initiatives into national and local programmes, and initiate additional national programmes. Partnerships of this kind may involve different types of donor organisations, governmental agencies, banks and micro-finance institutions, utilities, universities, firms and NGOs. Finally, there are *project partnerships* that implement projects derived from RET programmes and smaller initiatives. Project partnerships further extend the range of partners to local businesses, community-based organisations, and groups of end-users.

Renewable energy partnerships at all levels vary in their focus and intensity as the partnership label is used for continuous and close collaborations as well as for roundtables, repeat contracting and consulting (Forsyth 2010; van Huijstee et al. 2007). In this way, the meaning of ‘partnership’ appears to be blurred, covering close alliances as well as arm’s length market relationships (Vincent and Byrne 2006). This is in stark contrast to the way the term is used across much of the academic literature, where ‘partnerships’ in development cooperation generally imply “a joint commitment to long-term interaction, shared responsibility for achievement, reciprocal obligation, equality, mutuality and balance of power” (Fowler 2000, 3). Studies of partnerships in development cooperation have found a frequent gap between the rhetoric and reality of cross-sector partnerships, with many partnerships being defined by the bureaucratic demands of donor

organisations rather than partnership principles (Ashman 2001; Elbers et al. 2014; Ellersiek 2011; Fowler 2000; Lister 2000; Vincent and Byrne 2006).

Renewable energy partnerships of the 'sustainable energy paradigm' are usually defined in terms of their expected potential to overcome the four crucial gaps outlined in the previous section (Pinkse and Kolk 2012): firstly, they are envisaged to reduce *resource gaps* by attracting investment and creating innovative cost-sharing models. Secondly, partnerships are expected to foster knowledge transfer and capacity building, thus diminishing *capacity gaps*. Thirdly, partnerships are thought to enhance the integration of donor-initiated and private markets and to enable a more meaningful involvement of local stakeholders, thereby closing crucial *implementation gaps* (Forsyth 2010). Fourthly, through networking and advocacy, partnerships may also contribute to the development of institutions addressing *regulatory gaps*. Following this description, partnerships of the 'sustainable energy paradigm' differ from previous forms of technical assistance in that they acknowledge the pivotal role of relationships between organisations in catalysing the multiple processes of technology diffusion.[4]

Existing empirical research on renewable energy partnerships has focused on international partnerships between policy makers in global climate governance (Bäckstrand 2008; Newell et al. 2009; Pinkse and Kolk 2012; Szulecki et al. 2011). Little is known about the actual practices by which programme implementing partnerships emerge and become consolidated (Chaurey et al. 2012; Doranova et al. 2011; Forsyth 2010). Studies of emerging markets and RET niches have identified broader processes of socio-technical change, often with an emphasis on the structural configuration and governance

[4] In contrast to past notions of technology transfer as linear transmissions of technology 'hardware' from a sender to a recipient country, RET partnerships are based on a broader understanding of technology diffusion as involving multiple and interdependent processes that enable the local assessment, acquisition, adaptation and development of RETs and that create the appropriate social, organisational and institutional conditions for their adoption. See Byrne et al. (2012), Cohen (2004), IPCC (2000), van Alphen et al. (2008), and Wilkins (2002).

of actor-networks and selection pressures (Byrne et al. 2011; Caniëls and Romijn 2008; Jacobsson and Johnson 2000; Smith et al. 2005; van Eijck and Romijn 2008). What they have not developed, however, is a deeper understanding of the relationships that characterise actor-networks in this field. Previous case studies of individual RET projects have revealed important insights into the ways in which development practitioners and different kinds of organisations shape the design and implementation of RET programmes (Balint 2006; Byrne 2011; Romijn et al. 2010; Wilkins 2002). There is a lack, however, of systematic research on inter-organisational collaboration in RET project partnerships. Research on inter-organisational partnerships in other fields has revealed high levels of failure, with relational aspects dominating the causes of these failures (Oerlemans et al. 2007). This suggests that in order to better understand the successes or failures of renewable energy partnerships we need to examine more closely how technology diffusion is driven by relationships between organisations in development cooperation.

1.4 Towards a relational understanding of development assistance

Rather than adopting what is a factor-oriented approach focusing on barriers and drivers of RET programmes or technological niches, this article focuses on the *relationships between actors involved in renewable energy partnerships*, arguing that the adoption of RETs is affected by these relationships and the way these are embedded in development cooperation more generally. Such an approach is derived from relational sociology and focuses on the *quality* of the relationships between social actors as opposed to the structural configuration of networks - which is the focus of social network analysis (Borgatti and Halgin 2011; Caniëls and Romijn 2008; Crossley 2011; Emirbayer 1997; Granovetter 1973) Drawing on theories concerning the role of strong and weak ties in inter-organisational networks, this article proposes a relational approach to the analysis of international technical assistance, focusing on project and programme partnerships involving local organisations, and their efforts to address learning and implementation

gaps. The intention is to justify a relational framework for the study of RET programmes by showing how such an approach can improve our understanding of *how* renewable energy partnerships may close persistent gaps in RET adoption, and *why*, in practice, they often fail to do so.

1.5 Strong and weak ties in technical assistance: A relational approach

As discussed above, renewable energy partnerships vary in their composition, duration and activities. Prior research in organisation studies has demonstrated that inter-organisational relationships can have decisive consequences for the ways in which organisations develop and operate, how they learn, and how they interact with others (Parmigiani and Rivera-Santos 2011). There are multiple ways of categorising inter-organisational relationships or ties (Cropper et al. 2010). One prominent way of thinking about them focuses on the strength of ties in terms of their duration, intensity and closeness (Granovetter 1973; Gulati et al. 2002). According to the 'theory of strong and weak ties', ties serve different functions depending on their strength (Granovetter 1973): inter-organisational relationships that are long-term, intense, and involve frequent interactions are considered to be '***strong***' because they result in greater trust and collaboration, and facilitate joint action and knowledge transfer (Parmigiani and Rivera-Santos 2011). Organisations connected through strong ties interact differently because they develop their relationships with reference to experiences of past interactions and in anticipation of future engagements (Crossley 2011). Consequently, they are more likely to understand each other's needs and capacities and find it easier to communicate of complex or tacit knowledge (van Wijk et al. 2008).

In contrast, '***weak***' ties are defined as relatively loose connections between organisations that arise from short-term rationales rather than long-term commitments (e.g. one-off transactions or membership in associations). Complex knowledge is rarely transferred

across weak ties, whose ‘strength’ lies in their fluidity and diversity (Granovetter 1973). Weak ties provide access to non-redundant information, helping organisations to advance their operations, and enhancing the integration of wider inter-organisational networks (Brass et al. 2004). The ‘strength of weak ties’ theory is based on the assumption that strong ties tend to be cohesive ties, i.e. ties between organisations that share contacts with third parties, whereas weak ties tend to be bridging ties, i.e. ties that connect organisations that are not connected through any third parties (Gulati et al. 2002).

Applying the theory of strong and weak ties to renewable energy partnerships in development cooperation, strong ties appear likely to enable more complex processes of inter-organisational learning and knowledge transfer, which are essential for the sustainable adoption of RETs (Romijn et al., 2010). They may also enhance the involvement of project stakeholders and allow for the development of joint visions and problem-solving capacities (Uzzi 1996). In contrast, weak ties can be assumed to play a significant role in the proliferation of RETs and in the development of RET markets (Caniëls and Romijn 2008). The relevance and implications of these two propositions are discussed below, drawing on seven empirical cases taken from field research with RET organisations in Central America. In this context, the term ‘RET organisations’ refers to local NGOs and social enterprises that are involved in the diffusion of RETs in rural areas. These service-oriented organisations install small-scale solar, hydro and biogas systems for RET programmes initiated by international donor organisations. While for-profit social enterprises and non-profit NGOs operate within different legal frameworks, in RET partnerships they fulfil a similar role as project implementing organisations that compete for funds from international donors and have to comply with donor requirements shaping their operational models and administration. Pressures arising from poor market infrastructure and the value-driven nature of their business further contribute to the

blurring of the traditional distinction between profit-driven SMEs and value-driven NGOs.[5] Whether for-profit or non-profit, RET organisations face multiple accountabilities – downwards to the 'beneficiaries' of RET interventions, and upwards to their donors that design and fund such interventions (Edwards and Hulme 1996).

2. Methodology

All case studies presented below are based on participant observation and qualitative interviews conducted with RET organisations in Honduras, El Salvador and Nicaragua in 2012 and 2013. During four months of fieldwork, I visited many project sites across the region, observed partnership meetings and interviewed 38 key informants working in renewable energy partnerships. Respondents were granted confidentiality in order to enable them to share critical or sensitive information. For the purpose of this article, seven cases of inter-organisational relationships were selected as they were reported by different RET organisations to be involved in RET interventions based on a mixed finance model (i.e. project costs were shared between donor and end-user, in some cases involving a micro-lending scheme). All cases refer to relationships reported to be ongoing at the time of the interview; some cases include additional information about past experiences. The presented cases were not chosen to assess success factors or represent best (or bad) practice; rather, they lend themselves to explore how inter-organisational relations shape opportunity structures for a more sustainable adoption of RETs. For the sake of clarity and space, the analysis focuses on how the reported

[5] The blurring between sectoral boundaries has been observed as a more general feature of service-oriented development organisations that establish business-like operations while promoting a 'value-oriented' organisational culture (Austin et al. 2007, Dahan et al. 2010, Parker and Selsky 2004). In order to gain resources and enhance their survival prospects, social enterprises and non-profit organisations compete in donor-initiated markets and institutionalise rules and organisational blueprints that give rise to 'isomorphic change' as well as 'sectorial ambiguity' around business and development objectives (DiMaggio and Powell 1983, Lewis 1998, Meyer and Rowan 1977).

relationships between local RET organisations and international ‘partners’ addressed - or ignored - learning and implementation gaps, while touching upon some related resource gaps.

3. Results: Partnership analysis with relational framework

3.1 Enabling relationships? Mixed evidence of strong ties in technical assistance

Much of the grey literature on partnerships in RET programmes assumes the presence of strong ties in project partnerships. In this study, a more nuanced picture emerged. Many Central American RET organisations reported their involvement in various projects, but only few described their relationships with donors, technology suppliers and end-users as close and more enduring ‘partnerships’. The development of ‘strong’ ties with project partners appeared to be the exception rather than the rule; a finding that confirms previous research on energy and water partnerships which found that many “partnerships still resemble the more traditional implementation model of development cooperation” (Ellersiek 2011, 98). As the following two case studies suggest, the project-centred character of development cooperation imposes inherent limitations to the development of strong relationships (Vincent and Byrne 2006):

> *Case 1* - In 2012, a manager of a Honduran social enterprise reported that an international donor had supported them in the development of a leasing scheme for rural solar PV installations, which in the face of poor financial infrastructure and rising levels of insecurity had not turned out to be successful. During subsequent attempts at developing a more sustainable business model for the rural market, a multilateral agency had launched a large-scale RET initiative. The subsidies provided by this programme rendered the firm’s commercial activities obsolete. As a result, it now installed systems for the international

programme which did not include sufficient resources for follow-up and after-sales service; costs the firm had previously included in its business model.

Case 2 - Another SME presented an impressive track record in delivering RET projects for various donor organisations. In an interview in 2012, its manager was quite outspoken about the lack of sustainability of many of their installations. He had won several contracts knowing that the systems he was installing were unlikely to last, due to certain technical specifications as well as an obvious lack of supporting infrastructure and resources for maintenance. In his experience, it was pointless to argue with project developers based in international organisations. They expected him to do his job in a certain way, and he delivered on their expectations.

Both cases show RET projects as being embedded in a donor-driven market, where the two social enterprises deliver on the preconceived development interventions of international donors which shape local RET markets in significant ways. RET 'partnerships' appear as being characterised by a division of labour based on short-term market transactions rather than long-term knowledge transfer or collaborative action. After having been supported by a 'market-based' development initiative, the SME presented in Case 1 was pushed into (what was claimed to be) a 'sustainable energy' programme. By diffusing subsidised systems with insufficient funds for follow-up, this programme appears likely to exacerbate existing implementation and resource gaps, in this way spoiling the market for the local enterprise and increasing its dependence on development assistance. The manager presented in Case 2 does not seem to worry about the outcome of (potentially negative) demonstration projects as his firm has adapted its business model to serve donor organisations diffusing RETs, rather than attend to the local recipients expected to adopt them, in this way clearly prioritizing upward accountability. Both cases speak to RET project 'partnerships' as being characterised by pronounced power asymmetries that arise from local organisations' need to obtain financial resources. Funding conditions imposed by donor organisations can have undesirable consequences

when they hamper the development of local RET markets (Case 1) or motivate opportunistic behaviour on the side of the implementing organisation (Case 2) – an issue also discussed by Elbers and Arts (2011) in their study of NGOs responses to donor constraints.

However, other organisations reported that they were involved in long-term partnerships; and that these partnerships had helped them to build trusted relationships with international and local partners:

> *Case 3* - One Nicaraguan RET NGO worked closely with an international NGO (INGO) based on a long-term partnership agreement. The INGO funded a number of joint projects as well as a locally-based assistant who provided continuous support in strategic planning and day-to-day operations, and facilitated the exchange of experiences between different partnerships created by the INGO. In two separate interviews in 2013, both NGOs considered their efforts to be successful. Most projects were based in a small number of rural communities where the local NGO had worked for several years. Its continuous presence had facilitated the maintenance and repair of RET systems through locally-trained technicians. Local individuals had also bought RETs from this NGO, in some cases assisted by a micro-lending scheme that had been set up for this purpose.

> *Case 4* - In another case of a partnership between a local and an international NGO, the relationship was mostly based on long-distance communication. The partnership had evolved over a series of projects funded by the INGO which had yielded mixed success. In a joint meeting in 2013, managers of the two organisations agreed that a history of joint projects facilitated communication but also that problems persisted. The INGO had pledged to increase its practical assistance which, to the disappointment of the local NGO mostly covered administrative matters rather than intense capacity building. Most problems around project implementation remained to be solved by the local NGO. After having worked hard to improve rapport with local communities, project managers found the project models provided

by the INGO increasingly inappropriate to the local context. They felt that their feedback was not appreciated. The manager of the INGO emphasised the importance of improving the local NGOs project proposals and administration as such shortcomings could hamper its performance.

Case 5 - A Nicaraguan university established a research group on RETs which enhanced the training of local engineers and led to the foundation of several RET organisations, including a social enterprise, a NGO and a cooperative, which then collaborated on different projects. Established links with international academics gave rise to a series of workshops in which local technicians were trained in working with different RETs, including in how to make solar panels from cheap packages of solar cells. While an extensive use of this technique did not turn out to be economically viable, it gave rise to a number of individual projects and enhanced the capacities of some local technicians.

As Cases 3, 4 and 5 illustrate, strong ties do feature in some RET initiatives where they shape technology diffusion and organisational development in significant ways. All three cases present long-term engagements between international and local actors which developed across a series of RET projects. When compared to Cases 1 and 2, the three cases confirm previous studies that have found long-term engagements to facilitate information exchange, knowledge transfer and coordination (Byrne 2011). Strong ties appear likely to improve project implementation but they also require continuous investment in the form of inter-organisational exchanges, assistance and training (Cases 3 and 4). As Case 5 illustrates, strong ties between local organisations and universities can strengthen an emerging RET sector. Collaborations with international partners provide opportunities for training and the diffusion of new technologies. Ideally, continuous interaction should aid the convergence of expectations (Borgatti and Foster 2003; Jacobsson and Johnson 2000); but as Case 4 shows, close partnerships have to be continuously (re-) negotiated. Inter-organisational communication can be fraught by

misunderstandings resulting into tensions, an issue that is also discussed by Balint (2006), Forsyth (2012) and Romijn et al. (2010).

Cases 1-4 evolve around two types of dyadic relationships: one between an external donor and a local RET organisation; and one between the RET organisation and a local organisation or group of 'beneficiaries'. Case 3 shows how local RET organisations maintaining strong links with both international and community-based partners can have an important role as *intermediaries* enabling learning processes on both sides. RET organisations that develop strong ties to local communities are better positioned to address prevalent learning, implementation and resource gaps on the local level (e.g. by training local technicians or setting up a dedicated micro-lending scheme) but they also face a trade-off between the depth or embeddedness of their activities and their geographical scope and scalability.

Cases 1, 2 and 4 suggest that organisations higher up the funding chain tend to see their role as *knowledge senders only*, an attitude which is difficult to reconcile with a seemingly more balanced 'partnership' framework and can inhibit inter-organisational learning and knowledge transfer. This confirms findings from a study by Ellersiek (2011) on water and energy partnerships that found local partner organisations endowed with beneficiary-related resources (e.g. the representation of beneficiaries) as having less of a say in decision-making processes and control-related activities. However, where local knowledge remains lodged solely in local competences, it becomes more difficult to adapt project blueprints to local contexts and to develop joint problem solving arrangements (Case 4).

3.2 Networking matters: Weak ties in technical assistance

Strong relationships require substantial investments in time and resources, restricting the number of close partnerships any RET organisations can maintain (Brass et al. 2004). Local RET organisations that work with only a small number of international partners also run a risk of becoming dependent on them (see e.g. Cases 1 and 3). Prior research has shown that organisations that focus exclusively on close partners find it harder to access information which could help them to advance and update their operations (Uzzi 1997). In this way, a lack of connectivity between different sets of organisations can lead to sector fragmentation and an increased risk of sudden failure (Uzzi 1996). These considerations point to the importance of weak ties in complementing strong ties and close inter-organisational collaboration.

Case 6 - In interviews conducted in 2012 and 2013, a number of RET organisations reported that they had implemented projects for a Central American RET agency. For a long time, the work of this agency had focused on demonstration projects that covered a broad variety of technologies and applications. Most project partnerships created by this organisation were short-term; several projects involved organisations with limited experience in working with RETs. While many of the initial demonstration projects did not turn out to be sustainable, they demonstrated the value of new applications, provided learning opportunities for local RET organisations, and broadened the local RET sector. Over the years, some RET organisations were awarded repeat contracts as the agency began to systematise its approach by designing programmes for specific technologies, sectors and geographic regions. These programmes were run by partnerships involving a wider range of actors.

Case 7 – The same Central American RET agency as well as other multilateral and bilateral development agencies ran regular forums and workshops, bringing together RET organisations from across the Central American region. According to interviews with several managers of RET organisations in 2012 and 2013, only few partnerships of a more durable nature emerged from these efforts. However, the main role of such events was seen in facilitating networking and information exchange: Conferences, forums and workshops

allowed participants to access important up-to-date information about different technologies, programme designs and funding opportunities.

Cases 6 and 7 testify to the importance of weak ties for the creation, development and consolidation of emerging RET markets, and illustrate their important role in the diffusion of RETs. Case 6 also illustrates how donor organisations engendered more complex project partnerships when shifting their emphasis from demonstration projects to more comprehensive 'sustainable energy' programmes. As Case 7 shows, weak ties 'spread the news'; they raise awareness, trigger interest, and they get new organisations involved. 'Networking' - in the colloquial sense of the term - takes place in networks of weak ties which enhance the flow of information. Such bridging ties appear to have been important for the growth and integration of an emerging RET sector. Some weak ties also lend themselves to closing smaller learning gaps that do not require the in-depth transfer of complex knowledge.

4. Discussion: Partnership Failures

All seven cases indicate that the successful diffusion of renewable energy technologies to a large extent depends on the creation of appropriate inter-organisational relationships. Different types of relationships perform different functions: Strong ties facilitate fine-grained knowledge transfer, extensive collaboration and the development of problem-solving capacities; whereas weak ties enhance access to non-redundant information and prevent the insulation of more durable renewable energy partnerships from the wider sector. Based on this analysis we can identify different types of partnerships failures. Firstly, there are failures that result from a *lack of connectivity*, i.e. the absence of ties where they are needed in order to develop and better integrate an emerging RET sector; a network failure that has also been identified by Caniëls and Romijn (2008). Secondly, there are partnership failures that occur because organisations have established

relationships that are inappropriate for the tasks they are meant to perform. For example, partnerships aiming at the sustainable diffusion of a new technology are likely to fail if they do not develop ties that are strong enough to facilitate the kind of knowledge exchange needed to fully embed the technology in a new context, as became evident in Cases 1 and 2. Finally, the seven cases also suggest the presence of a third type of partnership failure that arises when ties lead to *long-term dependency*, trapping those to be 'empowered' in unfavourable situations, a phenomenon also described by Jacobsson and Johnson (2000). This failure relates to the *kind of knowledge* exchanged in renewable energy partnerships and the *priorities of donor organisations* that design and fund RET interventions thereby shaping local RET organisations' access to (and, e.g. in Case 1, need for) financial resources (Bell 2012; Byrne et al. 2012; Doranova et al. 2011; Lister 2000).

Considering the seven cases presented above, what did local organisations actually learn from their international partners? In Cases 1, 2 and 4, local organisations learnt to deliver on pre-conceived RET projects. Moreover, capacity-building measures mostly aimed at improved project implementation (Case 3 and 4). The local NGO presented in Case 3 also received some technical assistance and learnt to engage successfully with community organisations, in this way strengthening its role as intermediary organisation. While this NGO and the social enterprise presented in Case 1 were supported in the development of their operations, their activities remained focused on the donor-driven RET market. With the exception of Case 5, the cases presented above give little evidence of RET energy partnerships advancing the technological and managerial knowledge base of Central American RET organisations in a way that could decrease their dependence on technical assistance. None of the RET organisations introduced above learnt to develop small-scale

renewable energy technologies that are more appropriate to their local contexts.[6] Instead, donor-driven RET programmes seem to have increased the specialisation of local organisations in a way that amounts to a lock-in effect, and hence a third type of network failure: Local SMEs and NGOs specialise in their niche – administering donor-initiated RET programmes to potential 'beneficiaries' – without advancing to a level that would allow them to become independent. Without a government or external investor able and willing to invest in a home-grown RET industry, they can only specialise further in what they can do already. As local RET organisations adapt to this role, they may forgo opportunities to contribute to more sustainable forms of low-carbon development.

Like other development interventions, RET programmes are driven and consolidated by the organisations involved in them, and their need to maintain relationships enhancing their access to resources. If Central American RET organisations want to keep their business going, they have to adapt to the priorities of international donor organisations. As demonstrated in the case of a manager who repeatedly installed inappropriate RET systems (Case 2), organisations can learn to consistently fail at delivering on wider development objectives that do not appear directly related to their interests (Knight 2002). Partnerships thus have the potential of closing important learning and implementation gaps thereby transforming institutional fields - *but they can also reproduce them* when this is in the interest of their constituent organisations (Brass et al. 2004). This third type of partnership failure seems to arise from the project-centred character of development cooperation and the asymmetric power relations it entails. By prioritising the efficient implementation of preconceived projects for international donors over the development of a sustainable renewable energy sector for local end-users, renewable energy partnerships

[6] As Case 5 demonstrates, universities may contribute to such learning. However, it can be doubted that without additional support they can initiate the technological advancement needed to nurture an emerging RET industry.

can fail to create the kind of transformative and learning relationships needed to 'empower' local organisations and communities across the Global South.

5. Conclusions and Policy Implications

Based on a review of the literature on RET programmes in development cooperation, this article provided an overview of critical gaps inhibiting the success of international technical assistance in this field. Tracing the incremental development of RET programme designs, it was shown how multi-actor partnerships came to be seen as a means for improving the sustainability of development assistance for renewable energy. It was argued that the dominant analytical focus on success factors rather than partnership relations made it difficult to appreciate how renewable energy partnerships could deliver on such expectations. Drawing on theories concerning the role of strong and weak ties in inter-organisational networks, a relational framework for the analysis of RET partnerships was proposed. This framework then guided the analysis of seven empirical cases, showing how different configurations of strong and weak relationships can facilitate but also inhibit a more sustainable uptake of renewable energy technologies.

5.1 Theoretical implications: From 'lessons learnt' to theory

While these insights can be seen as contributions in their own right, the main thrust of this article is exploratory and programmatic as it shows how our understanding of renewable energy partnerships could be enhanced through an analysis focusing on *actors and their relationships* rather than success factors. The theoretical signposts above give an indication of the potential of such approach. However, it is important to recognise that 'strong' and 'weak' ties are analytical constructs that provide for parsimony in theory but

represent just one (and perhaps a rather simplistic) framework for assessing the relationships between organisations (Cropper et al. 2010; Gulati et al. 2002). In addition, the short cases presented in this article cover only a few individual instances of one type of renewable energy partnerships. Case studies of this kind raise important questions about their generalizability. While the more detailed implications of each of the seven cases are likely to be case-specific, the study also confirmed and expanded upon several findings from other studies suggesting that some of the mechanisms identified in this article may apply to a wider range of renewable energy partnerships.

Overall, the article demonstrates the considerable contribution that relational theories could make to this field, as it brought into view micro-processes of inter-organisational learning and collaboration that have so far been hidden in the 'black box' of renewable energy partnerships. Further research is needed in order to better understand how different types of partnerships address resource, learning, implementation and regulatory gaps at the local, national and global level. Until now, researchers have not taken full advantage of the vast amount of literature in organisation studies to unravel the complexity of technical assistance for low-carbon development. Future research on renewable energy partnerships could draw on theories from economic sociology, organisation theory and social network analysis that seek to explain how distinct *constellations of actors*, *relationships* and *modes of governance* shape organisational behaviour and decision making (Cropper et al. 2010; Crossley 2011; Ellersiek 2011; Oerlemans et al. 2007). Such 'knowledge growth by extension' may turn out to be a fruitful strategy for all disciplines involved, given that research into learning processes in cross-sector and transnational settings is still in its infancy (Brinkerhoff and Morgan 2010; Knight 2002; Stagl 2007).

After having discussed the considerable promise of relational research on renewable energy partnerships, it is important to note a number of challenges that come with a

relational approach. In-depth micro-studies of renewable energy partnerships are time-consuming and prone to issues around access, sampling and generalizability. Furthermore, the multiplex and dynamic nature of inter-organisational relationships can make it difficult to differentiate effects (Brass et al. 2004); for example, learning may take place between individuals, between organisations, at the partnership and at the sector level – and many learning effects can be assumed to be interdependent. While relational studies have the potential for bridging the micro-macro divide and enhancing our understanding of multi-level phenomena (Crossley 2011), they also risk falling between the cracks created by macro-oriented policy discourses focusing on factors rather than relationships.

5.2 Policy Implications

By opening up the 'black box' of renewable energy partnerships, practitioners gain deeper insights into the wider implications of RET programmes. This article highlights three policy considerations for RET programmes in development cooperation. Firstly, and crucially, it suggests that *policy makers need to better understand the partnerships they create and in which they operate*. As has been shown, different types of inter-organisational relationships support different processes of technology diffusion. Detailed attention should be paid to organisational processes that facilitate inter-organisational learning (Romijn et al. 2010). For example, strong partnerships based on an intense and enduring engagement result in greater trust and collaboration, thereby facilitating efficient implementation of RET projects. Strong partnerships of this kind are defined by long-term partnership agreements, joint initiatives, and continuous exchanges of knowledge and experience. While they can increase dependencies in the short term, they may allow for self-sufficiency in the long-term if they involve the incremental transfer and translation of technological expertise and appropriate organisational capacities. Such in-depth learning is unlikely to be achieved in a series of arm's length project partnerships (Drinkwaard et

al. 2010). However, partnerships featuring strong ties should be complemented by initiatives enhancing weak ties which can aid technology diffusion and prevent the insulation of individual renewable energy partnerships from the wider sector. Consequently, it is important for policy makers to consider if the *quality* of inter-organisational relationships created in their programmes corresponds to the *content*, the kind of knowledge transfer they wish to achieve. An enhanced understanding of the distinct properties of different kinds of relationships can inform the development of more appropriate, and therefore more successful, renewable energy partnerships. Resource-related power differentials represent a challenge to effective partnering which can be addressed through long-term relationship building (Ellersiek 2011; Teegen et al. 2004). Policy makers need to acknowledge and question existing power imbalances in order to design the incentive structures of RET programmes in a way that encourages local organisations to reconcile upward and downward accountability (Edwards and Hulme 1996).

Secondly, and considering the three network failures discussed above, it appears that the sustainable transfer of renewable energy technologies might not be best achieved through the implementation of short-term RET projects. Individual project partnerships may bridge particular resource, learning, implementation and regulatory gaps, but due to their limited scope and duration they are unlikely to close them permanently. The knowledge required to implement individual donor-initiated projects is fairly limited when compared to the knowledge needed to achieve a more sustainable uptake of RETs on a larger scale. For the creation of more sustainable development paths, the performance of the *wider organisational network* is key. As donor organisations provide critical resources and influence their partners' needs for such resources, they shape organisations in emerging RET sectors in important ways (Lister 2000). Therefore, policy makers should take care not to lose sight of the 'bigger picture' when planning RET initiatives; programmes should

be designed around *organisational and sectorial development goals* so that they are more likely to be successful in achieving a wider and more sustainable uptake of RETs.

Thirdly, it is important that *policy makers develop explicit learning objectives for their own organisations*. Sustainable energy solutions are unlikely to be achieved by international experts who consider themselves as 'knowledge senders only'. As this article has shown, failures in programme implementation are not merely a problem of implementing organisations, but also a result of unsuitable policies and programme designs, and of inter-organisational relationships failing to appropriately empower and incentivise renewable energy partnerships. If donor organisations consider the *sustainable adoption of RETs* as their main objective, then they should approach partnerships with local organisations as both a means and an end to achieve such outcomes. This article shows that there are still lessons to be learnt about renewable energy technologies in development cooperation. If such learning extends from "learning about sustainability [to] learning as sustainability" (Stagl 2007, 58), 'empowering partnerships' may go a long way towards enabling *Sustainable Energy for All*.

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