Pathways to Sustainable Energy as an (Inter-)Organisational Challenge

A Relational Study of Partnerships for Off-grid Renewable Energy in Central America

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The candidate confirms that the work submitted is her own, except where work which has formed part of jointly-authored publications has been included. The contribution of the candidate and the other authors to this work has been explicitly indicated below. The candidate confirms that appropriate credit has been given within the thesis where reference has been made to the work of others.

- Chapter 4:

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Abstract

Off-grid renewable energy technologies have great potential for achieving sustainable energy for all, yet their diffusion in the Global South has proven difficult. While multi-stakeholder partnerships have come to be seen as vehicles for overcoming these difficulties, little is known about the inter-organisational relationships that constitute them. An exploratory study of these partnerships provides opportunities for theorising the role of multi-stakeholder partnerships in path creation.

This transdisciplinary study investigates the (inter-)organisational challenges faced by organisations that seek to create pathways to sustainable energy access for rural populations in Honduras, El Salvador and Nicaragua. An extended case study of partnerships involving local non-governmental organisations and social enterprises aims to develop a better understanding of the opportunities and limitations of such partnerships. A constructivist research strategy and relational framework guide an investigation of pathway creation as a social process accomplished by hybrid organisations that are embedded in relationships with one another and in a wider selection environment. This study shows that the configuration, quality and strength of inter-organisational relationships – and the way in which partnerships align incentives and visions, and approach knowledge gaps – can determine their potential.

The micro-level enquiry into how local renewable energy organisations navigate an organisational environment shaped by partnerships leads to the development of novel methods for mapping inter-organisational partnerships and networks. Based on a comparative analysis of the relational embeddedness of four Central American renewable energy organisations, the study presents insights into how these organisations adopt hybrid operational models, and use hybrid relationships, to address (inter-)organisational challenges of pathway creation in a selection environment characterised by a blurring of sectoral boundaries. These findings inform a framework for hybrid organising as a cross-level phenomenon, which lends itself to an extension of theorising on path(way) creation as an embedded (inter-)organisational process.

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BoP	Base of the Pyramid
CDM	Clean Development Mechanism
EEP	Energy and Environment Partnership with Central America
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GNI	Gross national income
HFO	Hybrid form of organisation
HTO	Hybrid type of organisation
MLP	Multi-level perspective
NGO	Non-governmental organisation
NNGO	Northern non-governmental organisation
P4SE	Partnership for sustainable energy
PPP	Purchasing power parity
PV	Photovoltaic
OECD	Organisation for Economic Co-operation and Development
QDA	Qualitative data analysis
REDD	Reducing emissions from deforestation and degradation
RET	Renewable energy technology
SME	Small and medium-sized enterprise
SNGO	Southern non-governmental organisation
UN	United Nations
UNECLAC	UN Economic Commission for Latin America and the Caribbean
USAID	US Agency for International Development

Preface

Sustainable energy for all offers powerful benefits for stimulating economic growth […], reducing poverty, cleaner air, reduced mortality and reduced risk of dangerous climate change. What is standing between us and these achievements?[1]

Off-grid renewable energy technologies (RETs) have the potential to enable 'win–win–win' solutions to multiple sustainable-development challenges: they can fuel sustainable development in marginalised places, enhance energy security and mitigate climate change. The introduction of RETs to poor rural contexts has been taking place for more than 30 years; but since the turn of the century, international initiatives aiming at a more widespread adoption of such technologies have become wedded to a sustainable-development paradigm that celebrates the proliferation of micro-finance and emerging markets for energy services at the 'Base of the Pyramid' (BoP) (see Chapters 1 and 2 of this thesis). Academics, business leaders and development practitioners advocate hybrid organisations – such as social enterprises and multi-stakeholder partnerships – as vehicles for the diffusion of off-grid RETs in low-income and lower-middle-income countries. Partnerships between public-, private- and third-sector organisations in particular have come to be seen as both more effective and more efficient than previous forms of international development assistance for renewable energy (see Chapter 2).

Reports by newspapers and non-governmental organisations (NGOs) about the potential of cross-sector and global–local partnerships for 'empowering' people in marginalised places triggered my curiosity and led me to develop the doctoral research presented in this thesis. Partnerships for sustainable energy (P4SEs) proved to be a timely topic. Less than a month after I had started my PhD, United Nations (UN) Secretary-General Ban Ki-moon launched the Sustainable Energy for All initiative (Ban Ki-moon, 2011). A question included in his remarks to the General Assembly (quoted above) resonated with the research I was about to undertake: exactly *how* do we get from a situation in which at least a billion people living in rural areas have no access to electricity and rely on wood, charcoal or animal waste for cooking and heating to a future in which sustainable energy services are

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[1] Ban Ki-moon. (2011). Remarks to the General Assembly on Sustainable Energy for All: 01 November 2011. Retrieved December 18, 2015, from http://www.un.org/apps/news/infocus/sgspeeches/print_full.asp?statID=1363

available to all? What can be done to establish a development pathway to an outcome that seems such a desirable – and yet such a distant – prospect?

The fundamental problems underlying Ban Ki-moon's question can of course be examined from multiple perspectives: a political economist might focus on the very processes that perpetuate marginalisation and energy poverty in remote places; an economist might choose to investigate the resources required; and a political scientist might look at the processes of negotiation needed to mobilise these resources. However, for the research presented in this doctoral thesis, yet another perspective was adopted – that of a sociologist, with a background in organisation studies and international development, who wished to engage with transdisciplinary sustainability research and business studies. This perspective let to the reformulation of the Secretary-General's question as one that asks about the opportunities and limitations of global–local partnerships between public-, private- and third-sector organisations for the development of pathways to sustainable energy for poor rural populations.

The research I undertook to address this question led me to engage with several bodies of literature – on low-carbon-development pathways, development assistance for renewable energy, inter-organisational relationships and networks, qualitative network research, hybrid organisations, and relational theories in economic sociology. By creating a dialogue between insights from these different disciplines and those that emerged from the analysis of empirical data I collected during six months of fieldwork, I was able to shed new light on the (inter-) organisational challenges faced by Central American organisations involved in P4SEs. The findings of this research are presented in this doctoral thesis.

Like many doctoral research projects, this one resembled a journey that is reflected in its research design, contributions and thesis structure. While my transdisciplinary approach proved to be a fruitful research strategy, there were also challenges associated with it. My research findings had to be framed in a way that enabled them to contribute to the different discourses with which I had engaged. As a result, I pursued a publication strategy that allowed me to address audiences in different disciplines: my first article was published in a journal on energy policy, and my second in one focusing more specifically on energy and sustainable development. The third and fourth papers – written for an organisation-studies readership – presented the methodological contribution of my doctoral research, and extended theory on hybrid organising respectively. This paper-based doctoral thesis now brings together and discusses the four articles as what they have always been: the

outcome of one relational study of partnerships for off-grid renewable energy in Central America.

While I conducted this study, the UN Sustainable Energy for All initiative gained momentum: 2012 was declared the International Year of Sustainable Energy for All, and 2014–2024 the Decade of Sustainable Energy for All. Action agendas and investment prospectuses were created, a network of knowledge hubs was set up, and a tracking framework was developed. In September 2015, the UN Secretary-General announced the foundation of a new international not-for-profit organisation, the Sustainable Energy for All Partnership; this will spearhead the further development of the UN initiative. Four years after starting my research on P4SEs, things appear to have come full circle. I hope that some of the findings presented in this thesis will be useful to those who share the Secretary-General's vision for how public-, private- and third-sector organisations working in partnership can make sustainable energy for all a reality in the not-too-distant future.

Lena J. Kruckenberg

Leeds, December 2015

Solar water pump system in rural Nicaragua

Chapter 1: Introduction – A Relational Study of Partnerships for Off-grid Renewable Energy in Central America

1.1 Introduction

The transdisciplinary research presented in this doctoral thesis explores the (inter-)organisational challenges faced by organisations seeking to establish pathways to sustainable energy access for poor rural populations in Honduras, El Salvador and Nicaragua. It focuses on inter-organisational partnerships involving Central American renewable energy organisations. Prior work on pathways to sustainable energy has been inconclusive as to when and how such partnerships contribute to a sustainable uptake of RETs (Forsyth, 2010; Mallett, 2013; Morsink, Hofman, & Lovett, 2011). The study is guided by the overarching question:

- What are the opportunities and limitations of inter-organisational partnerships involving local organisations for the development of pathways to sustainable energy in rural Central America?

A constructivist research strategy and a relational conceptual framework inform an extended case study of pathway creation as a social process accomplished by organisations that are embedded in relationships with one another, and in an environment shaped by local and global forces. The framework treats multi-stakeholder P4SEs as both organisational structures and 'processors' of socio-technical change that co-evolve with their environment. A second research question aims to refine the framework and related theories of processes of path creation:

- What can we learn about pathway creation from a micro-level enquiry into the (inter-)organisational challenges faced by local renewable energy organisations, and how they address them?

A third research question relates to the methodology of the study:

- What methods for qualitative network research lend themselves to a systematic – yet in-depth – investigation of the content of different kinds of interdependent relationships and their configurations in entire organisational networks?

The research presented in this thesis engages with and seeks to extend four bodies of literature. First, it introduces a relational framework for the analysis of development assistance for renewable energy that shifts the analytical focus from success factors to the actors involved, and their relationship. The usefulness of such an approach is demonstrated by the study's principal findings on how different kinds of inter-organisational relationships and partnerships can enable – but also hinder – the creation of development pathways to sustainable energy (Chapters 2, 3,5 and 6). Second, the study makes a contribution to qualitative network analysis by introducing new methods for mapping inter-organisational partnerships and networks (Chapters 3 and 4). Third, it connects two distinct bodies of literature on hybrid organisations through the conceptualisation and empirical investigation of hybrid organising as a cross-level phenomenon (Chapter 5). Fourth, the study extends prior theorising on path(way) creation as an (inter-)organisational process (Chapter 6).

This introductory chapter lays out the overall background of the research presented in this thesis and explicates the development of its objectives, analytical framework, research design and related research questions. It commences with a review of the literature on off-grid RETs for rural development in low-income and lower-middle-income countries, tracing the development of multi-stakeholder partnerships as the principal model for delivering international development assistance for off-grid renewable energy (Section 1.2), and identifying gaps in the understanding of such partnerships. Section 1.3 articulates the principal objectives and empirical research question that guided the doctoral research, and presents the analytical framework of the study, indicating its theoretical objective and related second research question. Section 1.4 introduces the empirical context of the study and justifies its selection. A presentation of the study's research design leads to the articulation of its methodological objective and related third research question in Section 1.5. The chapter closes with an overview of the thesis in Section 1.6.[1]

1.2 Literature Review: Sustainable Energy for All?

Humankind faces daunting challenges in meeting its energy needs. There is a clear relationship between energy use and human development (OECD/IEA, 2010; World

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[1] This chapter includes some material that is also covered in the literature review and methods sections of Chapters 2, 3, 4 and 5. As acknowledged in the guidelines for the alternative (i.e. paper-based) style of doctoral thesis, the stand-alone nature of the four papers makes it difficult to avoid some repetition of content and references.

Bank, 2010). Raising energy access and the standard of living of the world's poor to a moderate-to-good level would require doubling today's energy use (Smith, 2009). Realising this increase with energy sources such as fossil fuels is not environmentally feasible (OECD/IEA, 2015). RETs are thought to play an important role in addressing this energy dilemma, as they show promise in enhancing energy access and enabling economic growth at lower environmental costs (Bradshaw, 2013). Renewable energy is derived from natural sources that can be replenished, and is hence by definition sustainable (Sørensen, 2010; Tester, 2005). Depending on geographical location and season, RETs harness solar, wind, hydro, geothermal and biomass energy at increasingly competitive prices, which is why a more widespread adoption of RETs has come to be seen as key to advancing global development in a climate-compatible way (OECD/IEA, 2015; UN, 2015).[2]

1.2.1 Off-grid RETs for Rural Development in Low-income and Lower-middle-income Countries

Energy poverty has been identified as a key barrier to human development across the Global South, where it disproportionately affects rural populations (Bhattacharyya, 2012; Practical Action, 2014).[3] Of the 1.2 billion people with no access to electricity, about 80% live in rural areas (World Bank, 2014). Off-grid RETs can provide access to electricity as well as to a range of non-electrical energy services such as cooking, heating, cooling, crop-drying, and water-pumping (Practical Action, 2014).[4] In recent years, RETs have come to be recognised more widely as potential drivers of sustainable rural development (Chaurey,

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2 The definition of 'renewable' energy sources is not always clear-cut. Some low-carbon technologies exhaust their sources of energy; for example, there are geothermal systems that deplete steam reservoirs over time, but nonetheless are widely considered to be 'renewable' (Sørensen, 2010).

3 The terms 'Global South' and 'Global North' refer to the continuing inequalities of the Northern and Southern hemispheres. Although not strictly accurate, the term 'Global South' is used as an umbrella term for low-income and lower-middle-income countries with a relatively low Human Development Index and a gross national income (GNI) per capita of less than US$12,746 (World Bank, 2015a). In this dissertation, the concepts 'Global South', 'Southern', 'low-income and lower-middle-income countries' and 'development contexts' are used interchangeably and in a descriptive way.

4 Following Palit and Chaurey (2011), the umbrella term 'off-grid renewable energy technologies' is used for renewable energy technologies which are not connected to high-voltage-transmission networks. Such technologies include but are not limited to solar PV installations; solar dryers for grains, fruit and fish; small-scale anaerobic digesters producing methane from agricultural waste or dung; micro hydro plants; and wind turbines.

Ranganathan, & Mohanty, 2004; Colombo, Masera, & Bologna, 2013; Krithika & Palit, 2013; Urban & Sumner, 2012).

However, many barriers inhibit a more widespread adoption of off-grid RETs in the Global South (Bhattacharyya, 2013b): cash-strapped governments of low-income and lower-middle-income countries tend to prioritise grid extensions – and with carbon-intensive energy systems being an integral part of institutionalised development pathways, there are incentives for low-income and lower-middle-income countries to 'catch-up and carbonise' (Arango & Larsen, 2010; Byrne, Smith, Watson, & Ockwell, 2011; Karakosta, Doukas, & Psarras, 2010).[5] Governments also find it challenging to devise adequate policies promoting off-grid technologies; and, when introducing subsidies for rural applications, they run the risk of undermining emerging commercial markets for RETs (Radulovic, 2005). The successful development of BoP markets for off-grid RETs in some emerging economies required significant and long-term investments of public resources (Glemarec, 2012). Such investments may not be an option in many low-income and lower-middle-income countries, where the neo-liberal energy policies of the 1990s and 2000s have led to the privatisation of state-owned utilities, which now lack incentives to improve energy services in poor remote areas (Gent & Tomei, 2015a).

New business models have been proposed for the development of sustainable energy markets for the poorest segments of global society (Aron, Kayser, Liautaud, & Nowlan, 2009; Gradl & Knobloch, 2011; The Economist, 2012; Wilson & Zarsky, 2009). According to their proponents, processes of 'creative destruction' (Schumpeter, 1954) will soon lead to a 'Green Leap Revolution' (Hart, 2011, p. 98) at the BoP (Bairiganjan et al., 2010; Gradl & Knobloch, 2011).[6] Despite such optimistic claims, such a revolution appears a distant prospect in most countries of the Global South (IEA/OECD, 2014; Kolk & van den Buuse, 2012; REN21, 2014). Most off-grid RETs remain beyond the financial means of the rural poor (Chaurey et al., 2004). Enterprises serving BoP markets tend to have at least parts of their portfolios subsidised (Kolk & van den Buuse, 2012). Most programmes promoting off-grid RETs in poor rural contexts are run by international development organisations that create their own aid-related 'markets' and shape the selection

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5 The pathway concept is discussed in more detail in Section 1.3.2.2.

6 The 'Bottom' or 'Base of the Pyramid' (BoP) is the socio-economic segment that is by and large excluded from the current system of global capitalism and that primarily participates in the informal economy (London & Hart, 2011). In Latin America, this segment includes households with up to US$10 purchasing power parity (PPP) per capita per day in 2005 US dollars (IDB, 2015).

environment of RETs (El Fadel, Rachid, El-Samra, Bou Boutros, & Hashisho, 2013) through "interacting and interdependent levels of political economy from the village to the international arena" (Byrne et al., 2011, p. 31).[7]

1.2.2 Development Assistance for Off-grid Renewable Energy

Off-grid RETs have become prominent in the field of international development cooperation, where their assumed benefits align with dominant narratives of sustainable development as reconciling current and future human needs for natural resources (Chaurey, Krithika, Palit, Rakesh, & Sovacool, 2012; WCED, 1987). A plethora of development programmes aim at the adoption of RETs in the Global South, often with an emphasis on off-grid rural electrification and small-scale applications for rural populations (Bhattacharyya, 2012; Chaurey et al., 2012; Terrapon-Pfaff, Dienst, König, & Ortiz, 2014b). However, the diffusion of off-grid RETs to rural areas has proven to be challenging (Desjardins, Gomes, Pursnani, & West, 2014; Foley, 1992; Kumar, Mohanty, Palit, & Chaurey, 2009; Martinot, Chaurey, Lew, Moreira, & Wamukonya, 2002).[8] Case studies of programmes promoting the uptake of off-grid RETs have revealed mixed outcomes, with impacts being inhibited by persistent gaps related to resources, capacity, implementation and regulation (Brass, Carley, MacLean, & Baldwin, 2012; Forsyth, 2010; Pinkse & Kolk, 2012; Sovacool & Drupady, 2012).[9] They suggest that RET programmes need to meet three criteria in order to be successful.

First, the technologies they introduce have to be *affordable* – not only at the point of installation, but also when it comes to maintenance and repairs (Sovacool & Drupady, 2012; Terrapon-Pfaff et al., 2014b). This finding has led to experiments with mixed finance models designed to absorb high transaction costs (e.g. by combining micro-credit with subsidies) without inhibiting the development of

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7 The concept of the selection environment comprises several dimensions: "'(1) the nature and size of the costs and benefits to potential adopters of a technology; (2) consumer and regulatory preferences and rules; (3) the transfer of information about successful innovations and the factors that facilitate or deter imitation; and (4) the systemic character of technology, economy and social institutions" (Kemp, 1993, p. 84).

8 Whereas some emerging economies have been successful in creating their own RET markets following significant financial and political investment (Glemarec, 2012), many low-income and lower-middle-income countries rely on technology imports and development assistance, which they receive from development banks and agencies, private investors and NGOs (World Bank, 2010).

9 For a detailed overview of the gaps related to resources, capacity, implementation and regulation, see Chapter 2.

commercial RET markets (Bhattacharyya, 2013a; Monroy & Hernandez, 2008). It has also elicited ongoing debates about micro-finance and the 'productive use' of off-grid RETs for income-generating purposes, which could enhance 'financial sustainability' beyond the completion of a RET project (Cabraal, Barnes, & Agarwal, 2005; Kapadia, 2004).

Second, successful outcomes depend on technologies being *appropriate to local contexts and capacities*, so that they can be installed, used, maintained and repaired (i.e. *self-sustained*) by local technicians and end-users. This finding highlights the importance of appropriate technology design, local capacity-building and project follow-up, as well as a need to create a supporting selection environment (Fernández-Baldor, Hueso, & Boni, 2012; Mulugetta, 2008; Ockwell, Watson, MacKerron, Pal, & Yamin, 2008; Terrapon-Pfaff, Dienst, König, & Ortiz, 2014a). Technologies are more than bits of disembodied hardware; they are also constituted by 'software' (such as technical know-how) and 'orgware' (such as organisational structures and management skills) (Cohen, 2004; Hekkert, Suurs, Negro, Kuhlmann, & Smits, 2007; Rosenberg, 1982). For the successful adoption and implementation of RET technologies, "capacity must be enhanced locally as well as transferred" (Forsyth, 2005, p. 174). It has therefore been suggested that project-implementing organisations should be embedded in the local contexts where they work (Fernández-Baldor et al., 2012; Terrapon-Pfaff et al., 2014a).

Third, end-users have to consider the technologies introduced by a programme as *useful* and develop a sense of ownership (Terrapon-Pfaff et al., 2014a)*.* The needs and expectations of rural populations vary and may relate to agricultural production (e.g. irrigation) as well as to connectivity purposes (e.g. access to modern media) or to domestic appliances (e.g. fridges). Scarce resources are unlikely to be invested in maintaining technologies that do not meet high expectations (Bhattacharyya, 2012; Desjardins et al., 2014).[10] If renewable energy interventions are to be successful, rural users must be viewed as valued consumers and as active participants in renewable energy projects, as opposed to passive 'beneficiaries' (Sovacool, 2012a).

While these three criteria may appear common-sensical, the scope of financial resources, knowledge and capabilities required to meet them makes development assistance for renewable energy a particularly challenging endeavour (Desjardins

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10 As noted by Mulugetta (2008, p. 1422), the "relics of […] unfulfilled expectations lie littered [across some rural areas] as reminders of misguided and indifferent interventions on the part of donors, NGOs and government agencies".

et al., 2014; Ockwell & Mallett, 2012; Pinkse & Kolk, 2012). In contrast to technologies such as fossil-fuelled power plants, off-grid RETs have not been an essential part of the socio-economic development of the Global North. Therefore, the introduction of RETs to marginalised Southern communities requires the institutionalisation of alternative development pathways (Berkhout, Angel, & Wieczorek, 2009; Leach, Scoones, & Stirling, 2010; Ockwell, D. G. & Mallett, A., 2012). Attempts at creating a universal model for the adoption of off-grid RETs have largely failed, suggesting that the ways in which energy technologies and services are transferred and diffused may have to be reconfigured in innovative ways (Byrne, Smith, Watson, & Ockwell, 2012; Drinkwaard, Kirkels, & Romijn, 2010; Radulovic, 2005).[11]

Questions also remain about the (long-term) impact of project-centred development interventions (Fowler, 2000; Ramalingam, 2013). Common evaluation indicators – such as the number of installed RET systems – lack information on the long-term impact of a given intervention (Brass et al., 2012). Often it seems to be assumed, rather than proven, that the expected benefits of RETs will materialise (van Alphen, Hekkert, & van Sark, 2008; van Huijstee, Francken, & Leroy, 2007). Only a few studies have examined the sustainability of RET programmes after implementation (Terrapon-Pfaff et al., 2014a, 2014b); several of these found the longevity of RETs installed by development agencies to be fairly limited (Bond & Templeton, 2011; Green, 2004; Romijn, Raven, & Visser, 2010).[12]

The problem of assessing the sustainability of RET interventions arises partly from the complex nature of the expected outcomes (Banerjee, 2003; Sathaye et al., 2011; van Opstal & Hugé, 2013). Most programmes aim at the adoption of a RET that is expected to contribute to the sustainable development of a marginalised population. However, this objective leaves questions open as to what kind of use is required – and how long and how widespread this must be – to claim 'adoption',

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11 Research on technology transfer has moved beyond technical accounts of linear or one-directional technology transfer and now examines the interdependent processes enabling the local development and adaptation of low-carbon technologies and creating the appropriate selection environment for their adoption. See Byrne, Smith, Watson, and Ockwell (2012), Cohen (2004), IPCC (2000), Ockwell, Watson, MacKerron, Pal, and Yamin (2008) and Wilkins (2002).

12 A number of studies have compared outcomes across different programmes and regions (Barry, Steyn, & Brent, 2011; Sovacool & Drupady, 2012). Due to a lack of coordination between the various agencies providing technical assistance for renewable energy, as well as widespread hesitation to discover and report programme failures, there are no reliable databases available on RET interventions in low-income and lower-middle-income countries (El Fadel et al., 2013; REN21, 2014).

and as to what kinds of benefits over how long a period have to accrue to make it a meaningful contribution to 'sustainable development', a concept that is itself ambiguous (Glasbergen, 2007; Parris & Kates, 2003). A number of frameworks have been devised for evaluating the sustainability of RET interventions (Bhattacharyya, 2012; Ilskog & Kjellström, 2008; Terrapon-Pfaff et al., 2014a). While they identify factors that affect the technical, economic, social, ethical, environmental or institutional sustainability of a given programme, such frameworks can also obscure the interdependent nature of these factors, and the complexity of RET interventions as processes of socio-technical change (Terrapon-Pfaff et al., 2014b).[13] For the creation of development pathways towards sustainable energy access, it is important to take into account not only the potential of RETs but also interacting social, technological and environmental systems, and the way they co-evolve (Leach et al., 2010).

Development assistance for renewable energy involves tackling 'wicked' problems of a unique and situated quality.[14] The diverse stakeholders involved in RET programmes come with specific understandings, expectations and claims (Glasbergen, Biermann, & Mol, 2007). They may all 'know' the problem of energy poverty that a given project seeks to address – but the different understandings that they bring to it may prescribe rather different ways of engaging and dealing with it (Weber and Khademian 2008). Therefore, technology transfer, diffusion and adoption are likely to require complex and resource-intensive processes of knowledge transfer and knowledge creation (Byrne et al., 2011).[15] Research on RET interventions has confirmed the essential role of prior knowledge and qualified personnel for the appropriation of RETs (Byrne, 2011; Doranova, Costa, & Duysters, 2011; Forsyth, 2010), and has shown that the development of inter-

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13 For example, a project may fail because an installation breaks down prematurely (i.e. a problem of technical sustainability); because there was no technical support available to fix a minor technical problem (i.e. a problem of institutional sustainability); or because users were disappointed by low returns and decided not to pay for a repair (i.e. a lack of social and economic sustainability).

14 'Wicked' problems comprise complex and interconnected subsets of problems that make it difficult or even impossible to develop a coherent formulation of these problems that is independent of one's strategy for solving them (Rittel and Webber, 1973; Weber and Khademian, 2008). Chapter 3 examines this concept more in detail.

15 In this doctoral thesis, the term 'technology transfer' is used mainly for the first step of the importing and piloting of a new technology developed and produced abroad, whereas 'technology diffusion' covers the processes of domestic or transnational innovation, adaptation and proliferation. Technology adoption then indicates the actual uptake of a technology by end-users.

organisational networks for enhancing absorptive capacity is particularly important in the early stages of a socio-technical transition process (Carlsson & Stankiewicz, 1991; Forsyth, 1999). However, the actual dynamics of such networks and the inter-organisational learning processes that they enable are still poorly understood (Doranova et al., 2011; Stagl, 2007).

Based on case studies of RET interventions, Fernández-Baldor et al. (2012) have developed a framework for user-driven technology assistance; this extends a well-established body of literature on 'appropriate', 'intermediary' or 'alternative' technologies (Carr, 1985; Kaplinsky, 1990), using an emerging discourse on human capabilities in technologies for development (Oosterlaken, 2013; Oosterlaken & van den Hoven, 2012). It emphasises the important role of inter-organisational and personal relationships in technical assistance, suggesting that the way in which technical assistance is delivered determines its impact (Fernández-Baldor et al., 2012). However, there has been no systematic investigation of how different types of relationship enable or inhibit sustainable outcomes.

Over the course of the past two decades, the complexity and organisational challenges of development assistance for renewable energy have become more widely acknowledged. On the practitioner side, this has informed a paradigm shift in RET programme design towards a holistic 'sustainable energy paradigm' (Martinot et al., 2002; Sovacool, 2012b).[16] Policy-makers started to involve an ever-greater variety of stakeholders in their programmes, based on the assumption that wider participation would lead to more sustainable outcomes (Ellersiek, 2011; Morsink et al., 2011; Sovacool, 2012b; van Huijstee et al., 2007; Wilson & Zarsky, 2009), and that partnerships could enhance the effectiveness *and* efficiency of development interventions (Biermann, Chan, Mert, & Pattberg, 2007; Brinkerhoff, 2002).

1.2.3 Partnerships for Sustainable Energy

Inter-organisational partnerships have become the model that is most advocated for donors seeking to assist in the development of sustainable energy services for the Global South (Forsyth, 2010; Morsink et al., 2011; Wilson & Zarsky, 2009). At the global or international level, P4SEs involve multi-lateral agencies, governments, multi-national enterprises and transnational NGOs (El Fadel et al., 2013; Szulecki, Pattberg, & Biermann, 2011). At the regional and national levels, partnerships connect different types of private investors and donor organisations, government

16 Chapter 2 includes a more detailed account of this paradigm shift.

agencies and utilities, financial institutions, universities, technology manufacturers and civil-society organisations that collaborate in the development of RET programmes and projects (Forsyth, 2012; Morsink et al., 2011).[17] Projects implementing P4SEs further extend the range of partners to local businesses, civil-society organisations and groups of end-users (Fernández-Baldor et al., 2012; Terrapon-Pfaff et al., 2014a; Wilson & Zarsky, 2009).[18]

P4SEs differ from previous forms of technical assistance in that they acknowledge the pivotal role of relationships between various types of organisations in catalysing processes of technology transfer, diffusion and adoption (Forsyth, 2005). They are seen as having the potential to bridge the gaps related to resources, capacity, implementation and regulation that are known to have inhibited the adoption of off-grid RETs in the past (Chaurey et al., 2012; Forsyth, 2012; Mallett, 2013; Morsink et al., 2011): it is envisaged that they will attract investment and facilitate the development of innovative cost-sharing models (El Fadel et al., 2013; Wilson & Zarsky, 2009). Through networking and advocacy, partnerships are thought to create a more nurturing selection environment (Mulugetta, 2008; Pinkse & Kolk, 2012). P4SEs are also expected to engage local stakeholders, to foster knowledge-exchange and capacity-building, and to facilitate the transition from donor-initiated to demand-driven markets for off-grid RETs (Bäckstrand, 2008; Bairiganjan et al., 2010; El Fadel et al., 2013; Forsyth, 2010). However, there has been little research on the actual implications of different kinds of partnerships for the creation and growth of local sectors and markets for off-grid RETs (Byrne, 2011; Forsyth, 2010; Martinot et al., 2002).

The partnership label is used for close alliances as well as for roundtables, advocacy networks and market relationships (Forsyth, 2010; Glasbergen &

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17 Primary actors involved in RET projects in development settings are often more diverse than their counterparts in the Global North. REN21 (the renewable-energy-policy network for the 21st century) lists the following actors as being of particular importance:

> *end users (private individuals and communities); national, regional, and local governments; utility companies; rural electrification agencies; development banks and multilateral organisations; international and national development agencies; NGOs; private donors; […] manufacturing and installation companies […] up-and-coming private investment companies, O&M entities, system integrators, national-level importers, regulators, extension agents, local technicians and industries, microenterprises, and micro-finance institutions (REN21, 2012, p. 83).*

18 The term 'P4SEs' is used as a label for inter-organisational partnerships that aim to diffuse and assist in the adoption of off-grid RETs and related energy services in rural areas across the Global South by linking international donors and technology providers to local end-users.

Groenenberg, 2001; Tomlinson, 2005; van Huijstee et al., 2007; Vincent & Byrne, 2006). This is in stark contrast to the way the term has been used across much of the literature, where 'partnerships' involve (or at last aim at) "a joint commitment to long-term interaction, shared responsibility for achievement, reciprocal obligation, equality, mutuality and balance of power" (Fowler, 2000, p. 3).[19] Studies of cross-sector partnerships in other fields have found a frequent gap between the rhetoric and reality of cross-sector partnerships (Elbers, 2012; Elbers & Schulpen, 2013), where "multiple sources of authority add nuance and complexity to the determination of power and its exercise within partnerships" (Brinkerhoff & Brinkerhoff, 2011, p. 13). Little is known about the extent to which P4SEs are affected by such problems (Ellersiek, 2011).

As the transaction costs of cross-sector partnerships can be high, the achievement of the right balance of incentives can be assumed to be challenging (Teegen, Doh, & Vachani, 2004). Many partnerships for sustainable development seem to be defined by the demands of donor organisations rather than by normative partnership principles (Lewis, 1998b; Lister, 2000; Vincent & Byrne, 2006) and their performance appears to be contingent upon their ability to deal with inherent power imbalances between partners (Ashman, 2001; Ellersiek, 2011). This suggests that the two notions of partnership as an 'end in itself' (i.e. an expression of values) and as an instrumental 'means' (Brinkerhoff, 2002) do not always coincide. It also shows that partnerships may comprise various forms of hybrid organising, and that they can be subject to multiple governance mechanisms based on hierarchical, market and community forms of order (Ménard, 2004). The organisational forms, relationships and governance mechanisms of P4SEs – in particular those that involve local organisations – are largely unidentified (Forsyth, 2005, 2010).

Studies of emerging markets for low-carbon technologies have identified broader processes of socio-technical change, often with an emphasis on the structural configuration and governance of actor-networks and selection pressures (Byrne et al., 2011; Caniëls & Romijn, 2008; Jacobsson & Johnson, 2000; Smith, Stirling, & Berkhout, 2005; van Eijck & Romijn, 2008). Yet P4SEs seem to develop their own

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19 While many embrace the notion of partnership, there is little agreement as to what partnership actually means (Brinkerhoff, 2002). Partnerships tend to be described as inter-organisational initiatives that address issues too complex to be resolved by unilateral action (Gray & Wood, 1991). Most recent definitions of partnership in this field take a narrower stand and define partnerships as "collaborative arrangements in which actors from two or more spheres of society (state, market and civil society) are involved in a nonhierarchical process, and through which these actors strive for a sustainability goal" (Glasbergen, 2007, p. 2; van Huijstee, Francken, & Leroy, 2007, p. 77).

logics by adapting to external as well as internal conditions (Forsyth, 2010; Pinkse & Kolk, 2012). Based on an analysis of data from the Global Sustainability Partnerships Database, Szulecki and colleagues (2011) found that the output of international partnerships varies with actor composition, formal organisational structure and degree of institutionalisation. However, questions remain as to how the formal records analysed in this research relate to the *actual practices* of different types of renewable energy partnerships. While case studies of individual RET projects have revealed insights into the ways in which development practitioners and individual organisations have shaped the design and implementation of RET programmes, they *have not involved any systematic research on the inter-organisational relationships, networks and forms of organising that characterise P4SEs* (Balint, 2006; Byrne, 2011; Grammig, 2012; Romijn et al., 2010).

As donor-run programmes institutionalise rules and organisational blueprints, they give rise to 'isomorphic change' in partner organisations and their networks, which need to adapt to their demands in order to gain resources and enhance their chances of survival (DiMaggio & Powell, 1983; Meyer & Rowan, 1977). It is not clear how the proliferation of the partnership model impacts on the practices and relationships of the organisations involved, and how it shapes emerging service sectors and markets for off-grid RETs. It is widely acknowledged in the alliances literature that the performance of partnerships largely depends on evolutionary processes of interactive learning and mutual adjustment that allow for the gradual development of trust-based relationships and inter-organisational collaboration (Doz, 1996; Inkpen & Currall, 2004; Koka & Prescott, 2002). Yet research on inter-organisational partnerships in other fields has also revealed high levels of failure, with relational aspects dominating the causes of these failures (Das & Teng, 2001; Eden & Huxham, 2001; Oerlemans, Gössling, & Jansen, 2007). The management of partnerships for the transfer of environmentally sound technologies has been described as intrinsically challenging (Morsink et al., 2011). International alliances have been found to be "inherently unstable organisational forms and prone to failure" (Inkpen, 2009, p. 397), not least because of cultural barriers arising from differences in values, language and behaviours (Graham, 2009).

The world of development agencies is notoriously difficult to translate in 'distant' rural localities (Mosse, 2005), and the organisational routines and priorities of 'mission-driven' NGOs are different from those of firms and governmental agencies (Lewis, 1998a). Consequently, the understandings of 'market potential' and (legitimate) 'best practices' may vary between partners of P4SEs. Cross-sector

partnerships have a practical as well as an ideological dimension, as they reflect and diffuse wider norms and advocacy coalitions (Brinkerhoff & Brinkerhoff, 2011). Organisations entering partnerships are not merely driven by interests but have their own identities that adhere to distinct ideologies (den Hond, 2010; Forsyth, 2010). They can face "considerable moral hazard concerns" (Gulati, 1998, p. 300) when cross-sector partnerships strive simultaneously for public and private benefit (Lewis, 1998a). Narratives about the purpose of the participating organisations might have to be adapted, decision-making processes reformed, incentives rebalanced and the perceptions of other stakeholders reconsidered (Lewis et al., 2003; Werhane, Kelley, Hartman, & Moberg, 2010). Smith, Stirling and Berkhout (2005, p. 1503) note: "The challenge […] is to analyse how contrasting visions and expectations enrol actors into coalitions […] and shape the way that they seek to respond to selection pressures". Little is known about how organisations in P4SE can *organise* this process.

Only a few academic studies in the field of sustainable energy have specifically addressed the nexus of technology innovation and market development through inter-organisational networks in the Global South (Caniëls & Romijn, 2008). The role of inter-organisational partnerships in creating self-sustained pathways to sustainable energy has not been researched in an in-depth and systematic manner (Forsyth, 2005, 2010; Pinkse & Kolk, 2012). Existing research has either focused on specific instruments – such as the Clean Development Mechanism (CDM) (Disch, 2010; Doranova et al., 2011; Sirohi, 2007) – or evaluated projects and programmes at the national or regional level.[20] Collaborations between different actors have mostly been approached from a rather formal and often prescriptive perspective (Forsyth, 2012; Morsink et al., 2011; Wilson & Zarsky, 2009). This has allowed for the creation of typologies of cross-sector partnerships – such as that developed by Forsyth (2010) based on CDM projects and initiatives aimed at reducing emissions from deforestation and degradation (REDD) – but has not contributed greatly to a better understanding of the development of *hybrid forms of organising as 'lived reality'*. What is widely acknowledged, however, is that 'partnership innovations' are essential for market-driven sustainable development in general, and for climate-compatible development in particular (Brinkerhoff & Brinkerhoff, 2004, 2011; Seitanidi & Lindgreen, 2010).

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20 See, for example, Best (2011); Bambawale, D'Agostino, and Sovacool (2011); Gómez and Silveira (2012); Mulugetta (2008); Rehman et al. (2010); Sovacool and Drupady (2012); and van Alphen, Hekkert, and van Sark (2008).

There is a growing body of grey literature celebrating the potential of cross-sector renewable energy partnerships from the perspective of NGOs and inter-governmental organisations.[21] However, anecdotal evidence and prescriptive guidelines are no substitute for a rigorous analysis of the underlying collaborative and competitive processes and forms of organising. Moreover, the business side of international aid and technology-transfer projects often remains unaddressed. Vertical relationships based on 'contracting-out' or arising from supply chains may not amount to 'partnerships' in the value-oriented sense of the term (Brinkerhoff & Brinkerhoff, 2011) – but they can involve the transfer and exchange of the kind of knowledge vital to technology transfer and diffusion (Hansen & Ockwell, 2014), as can associative ties to other organisations that already work with a given technology (Eapen, 2012).

Given the potential of 'empowering' partnerships, it is surprising that only a few academic studies have specifically addressed the nexus of technology innovation and market development through inter-organisational networks involving Southern organisations (Caniëls & Romijn, 2008; Forsyth, 2005, 2010, 2012; Mallett, 2013; Pinkse & Kolk, 2012). In order to better understand the opportunities and limitations of P4SEs to create pathways to sustainable energy, more in-depth empirical research is needed on the inter-organisational arrangements that constitute such partnerships involving local organisations, on how they organise their activities, and on how they shape emerging sectors and markets for off-grid RETs (Chaurey et al., 2012; Doranova et al., 2011; Forsyth, 2010; Mallett, 2013).

1.2.4 Research Gaps

Based on the literature review, three research gaps have been identified:

  a. While multi-stakeholder partnerships have come to be seen as enabling more efficient and more effective development assistance for renewable energy, little is known about the *actual inter-organisational relationships and practices* that constitute such partnerships. This applies in particular to partnerships involving Southern renewable energy organisations that link international technology providers to rural end-users. Given that local capabilities have been found to be essential for the long-term (i.e. self-sustained) uptake of off-

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21 See, for example, Bairiganjan et al. (2010); Hammond, Kramer, Tran, Katz, and Walker (2007); Gradl and Knobloch (2011); Wilson and Zarsky (2009).

grid RETs, this research gap makes it difficult to appreciate more fully *the opportunities and limitations of inter-organisational partnerships involving local organisations for the development of pathways to sustainable energy.*

b. P4SEs have been predominantly perceived as vehicles for the delivery of development assistance for renewable energy, and so as organisational models or *structures*. However, the review implicitly suggests that P4SEs could also be seen as *processors*: when addressing the 'wicked' problem of delivering sustainable energy services to poor rural populations, partner organisations in P4SEs may not only respond to a given selection environment, but also perceive, articulate and seek to shape this in the light of their own visions and interests. There is little understanding of the *(inter-)organisational challenges* involved in this process.

c. P4SEs are likely to require partner organisations to adapt their practices. It is not clear, however, *how the proliferation of partnership models impacts on local organisations involved in such partnerships, and shapes emerging service sectors and markets for off-grid RETs*. Considering the manifold organisational challenges of inter-organisational partnerships and market building initiatives identified in the review, questions arise as to how P4SEs can strengthen local renewable energy organisations – or whether they in fact just put additional strains on them.

1.3 Research Objectives and Research Strategy: Towards a Relational Approach to Pathway Creation

1.3.1 Principal Research Objective and Research Question

It is the objective of the doctoral research presented in this thesis to address the three research gaps identified in Section 1.2.4. A micro-level enquiry into P4SEs in Central America explored the (inter-)organisational challenges faced by organisations seeking to establish pathways to sustainable energy access for poor rural populations in Honduras, El Salvador and Nicaragua. Given that previous research had found the embeddedness and capacity of local organisations to be critical for the sustainability of RET interventions and for the development of BoP markets for off-grid technologies, the study focused on local renewable energy organisations and their partnerships (i.e. P4SEs).

The research was guided by the overarching empirical research question:

- What are the opportunities and limitations of inter-organisational partnerships involving local organisations for the development of pathways to sustainable energy in rural Central America?

Two related research questions (one theoretical and one methodological) emerged during the development of the framework and the research design for the study; these are presented in Sections 1.3.2.4 and 1.5.3.2 respectively.

1.3.2 Framework

"In empirical science everything depends on how fruitfully and faithfully thinking intertwines with the empirical world of study" (Blumer, 1954, p. 5). For a study like the one presented here, it is important to clarify how theoretical thinking, on one hand, and the openness of exploratory field research, on the other hand, meet in order to allow for a rich analysis of the phenomenon under study. The exploratory thrust of this research required the development of a conceptual framework that would enable an in-depth exploration of the practices and relationships of P4SEs at the micro-level, while at the same time opening up the analysis to wider contextual forces. Two distinct bodies of literature were identified that could provide elements for this framework but implied distinct perspectives on the phenomenon of P4SEs: the literature on sustainable technology transitions, and that on path dependency and path creation.

1.3.2.1 Sustainable Technology Transitions and Multi-level Perspective

There is a large body of literature that approaches the development and diffusion of RETs as changes of – and in – socio-technical systems. Several established frameworks lend themselves to the analysis of socio-technical configurations, including new market structures, actors and institutional settings (Geels, Hekkert, & Jacobsson, 2008; Hughes, 1986; Markard & Truffer, 2008).[22] A middle-range theory known as multi-level perspective (MLP) has been adopted as a framework for multiple studies in the field of energy transitions. According to the MLP, socio-

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22 These concepts include but are not limited to 'technological systems' (Carlsson and Stankiewicz, 1991); 'sectoral systems of innovation' (Malerba, 2002); national and regional 'systems of innovation' (Edquist , 2005); 'strategic niche management' (Kemp, Schot, and Hoogma, 1998); 'technological innovation systems' (Markard and Truffer, 2008); and 'innovation journeys' (Geels et al, 2008).

technical transitions emerge from the interplay of social phenomena situated at the niche, the regime and the wider landscape level (Geels, 2004, 2011; Geels et al., 2008).[23] Most MLP studies employ a particular narrative, starting with the assumption of stability of a given (i.e. fossil-fuelled) energy regime, then assessing how the development and growth of 'renewable energy' niches do (or do not) change the regime.

While this approach has proven to be fruitful for research adopting a historical perspective, it can be challenging to identify and delineate niches in a fragmented multi-actor system in the making, where overlapping and instable regimes create contradictory opportunity structures. Moreover, the assumption of stability of regimes can be problematic when applied to energy systems in many low-income and lower-middle-income countries, where erratic governmental action, ineffective institutional arrangements, a continuous lack of resources, and the involvement of various powerful international actors create a situation that is characterised by a political economy of enormous complexity (Angel & Rock, 2009; Berkhout et al., 2009). In these settings, the supposedly clear analytical distinction between factors situated at the niche, regime and landscape levels can be difficult to draw, and carries the risk of imposing structure where it is misplaced.

MLP and related systems approaches have also been criticised for an overly structural perspective leaving little room for the analysis of agency: actors appear to '(re-)enact' trajectories of socio-technical change shaped by selection pressures (Geels, 2011; Smith et al., 2005). Most of these approaches are based on an 'outsider's ontology' (Garud, Kumaraswamy, & Karnøe, 2010) – a view on the system from the outside – which facilitates the identification of systematic patterns and their theorisation at the system level. This perspective puts severe restrictions on an exploratory study of the relational practices of partnerships that actively seek to create new development pathways. For such research, a framework is needed that facilitates 'zooming in' in order to adopt an insider's point of view on the choices and practices of organisations in partnerships – as well as 'zooming out' in order to examine situated patterns of inter-organisational engagement and their implications. As partner organisations set out to realise visions of sustainable

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23 The MLP framework focuses on the relations between incumbent and emerging technological systems. Regimes are defined as relatively stable configurations of institutions that shape the selection environment and stabilise technological development. Regimes are situated at the meso-level and are subject to broader (macro) exogenous forces ('landscape factors'). Micro-level niches are organisational testing fields that protect innovations from the selection pressures of the dominant socio-technical regimes (Geels, 2004).

energy futures corresponding to their interests and understandings of the problem of energy poverty *in and through partnerships with others* attempting to do the same, they accomplish a "collective structure of interlocked actions" (Clark, 2000, p. 233). This focus on the distributed and interdependent *agency* of partner organisations embedded in – and attempting to shape – socio-technical systems links the research to literatures on path dependency and path creation (Garud & Karnøe, 2003).

1.3.2.2 Development Pathways: Path Dependency and Path Creation

Development pathways refer to "the particular directions in which interacting social, technological and environmental systems co-evolve over time" (Leach et al., 2010, p. xiv). Like 'sustainability', the concept of the pathway "anchors performance in the present on a series of comparisons and contrasts with anticipated futures and recollected pasts" (Garud & Gehman, 2012, p. 980). It also emphasises the process-like character and evolutionary nature of socio-technical change (Foxon, 2011a). A given *selection environment* can be seen as the temporarily bounded outcome of path-dependent processes that enable and constrain the actions of those embedded in it, shaping their perceptions of the past, present and future, and, as a result, their expectations and decision-making processes (Bassanini & Dosi, 2001; Foxon, 2011b; Kemp, 1993; Markard & Truffer, 2008). Expectations are also foundational in the coordination of different actors; they mediate between different levels of organisation, and adapt to changing conditions and emergent problems (Borup, Brown, Konrad, & van Lente, 2006). "Pathways reflect the outcome of multitudes of decisions made by interacting actors" (Foxon, Pearson, Arapostathis, Carlsson-Hyslop, & Thornton, 2013, p. 147). While a focus on path dependency implies a certain degree of structural determinism (Bassanini & Dosi, 2001; Garud et al., 2010), the concept of *path(way) creation* emphasises the agency of social actors coordinating their actions in a way that they can bind "objects, relevance structure, and time into an overall co-evolutionary process" (Garud & Karnøe, 2001, p. 25), which leads to the emergence of new or 'alternative' development pathways (Leach et al., 2010). Actors play "an active role in determining what portions of the past [and present] they would like to mobilize to support their imagined futures" (Garud et al., 2010, p. 763); but their agency is both distributed (between actors) and embedded in (and, as such, constrained by) their relationships with one another and the wider selection environment (Garud & Karnøe, 2003). From this perspective, the path-dependent trend we see

expressed in the composition of a given selection environment reflects only one (or some) of many possible pathways (Foxon, 2013; Leach et al., 2010).

Both path dependency and path creation are concepts that can be used for the analysis of past, present and future socio-technical configurations and development pathways. Like structure and agency, they may be seen as two sides of the same coin (Giddens, 1979): pathways are shaped by the path-dependent regularities of social reproduction, but these regularities are constantly (re)produced and, as such, are open to change. However, agency "has to take into account opportunity cost in exercising choice" (Mutch, 2006, p. 615). Central to the relational pathways approach adopted in this research is therefore the recognition that *pathways are (co)created by heterogeneous actors, that they are (re-)enacted into existence, and that they are thus dynamic and of an inter-subjective nature* (Foxon, 2013; Garud & Karnøe, 2001; Leach et al., 2010).

Against this background, development assistance for renewable energy – and attempts at creating pathways to sustainable energy for all – can be seen as involving multiple *(inter-)organisational challenges*. The translation of global policy into successful impacts at the local level requires international organisations to engage with local organisations on whose capacity and goodwill they ultimately rely (Bai, Wieczorek, Kaneko, Lisson, & Contreras, 2009). Global and local forces enable and constrain sense-making and agency (Hernes, 2008). As P4SEs set out to pursue their vision of sustainable energy access at the BoP, they face obstacles arising from 'selection environments', often articulated in terms of what they lack (i.e. resource deficits, knowledge gaps and institutional voids) as opposed to what they comprise. While the chances of success may appear relatively slim, Bassanini and Dosi (2001) suggest that the principal forces unlocking alternative development pathways include new technological paradigms, heterogeneity among actors, the co-evolutionary nature of socio-economic development and adaptation, and the incorporation of (novel) organisational forms from external contexts. P4SEs are characterised by the presence of all four of these forces.

1.3.2.3 Relational Approach

Organisations are not islands, as their ability to access resources depends on networks of relationships connecting them to other organisations (Clark, 2000; Jack, 2010; Oerlemans et al., 2007; Pfeffer & Salancik, 1978; Uzzi, 1997). Relational approaches in organisation studies compare, situate and examine organisational phenomena in a state of interplay, assuming their interdependence

and relationality (Özbilgin, 2006). They frame relations between organisations not as static ties that can easily be standardised (a view implied in more structuralist approaches to network science), but rather as being pre-eminently dynamic in nature and as evolving through trajectories of interactions (Crossley, 2011; Emirbayer, 1997; Mutch, 2006). Relationships are seen as being shaped by expectations derived from established frames for different kinds of relationships, and the categorical identities associated with them, while remaining open to adaptation and change (Fuhse & Mützel, 2011).

Rather than begin at the macro level of the entire transition process, this study examined P4SEs in their *everyday contexts* while acknowledging "that coordination among […] actors depends on their being constrained in particular ways by a global order of social constructs and agency which emerges from – but also stands apart from – local socio-technical practices" (Disco & van der Meulen, 1998, p. 324). From this perspective, P4SEs are not merely organisational structures but also 'processors' of change that co-evolve with their environment. An exploration of pathway creation from a relational perspective hence involves focusing on *how partner organisations simultaneously co-create and follow pathways as they give meaning to one another, to their relationship, to the problem of sustainable energy the partnership seeks to address, and to the wider selection environment in which their partnership is embedded*.

The relational approach adopted for this study had three ontological benefits (Özbilgin, 2006): it allowed P4SEs to be examined in their historical context and situatedness; it enabled a focus on the analytic tension between processes that are path-dependent and those leading to the creation of new development pathways; and it considered situated action and subjective perceptions of partners as well as objective structures to be relevant to the analysis of P4SEs as 'lived reality' (ibid.).[24]

Figure 1-1 provides a schematic overview of the overarching framework. Given the exploratory nature of this research, the framework was developed more as a 'sensitising device', guiding the development of subsets of research questions without being fully 'operationalised' or imposed on the qualitative data collected during fieldwork.

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24 The underlying constructivist approach involving a relational ontology, an inter-subjective epistemology and a naturalistic set of methods is articulated in Section 1.5.
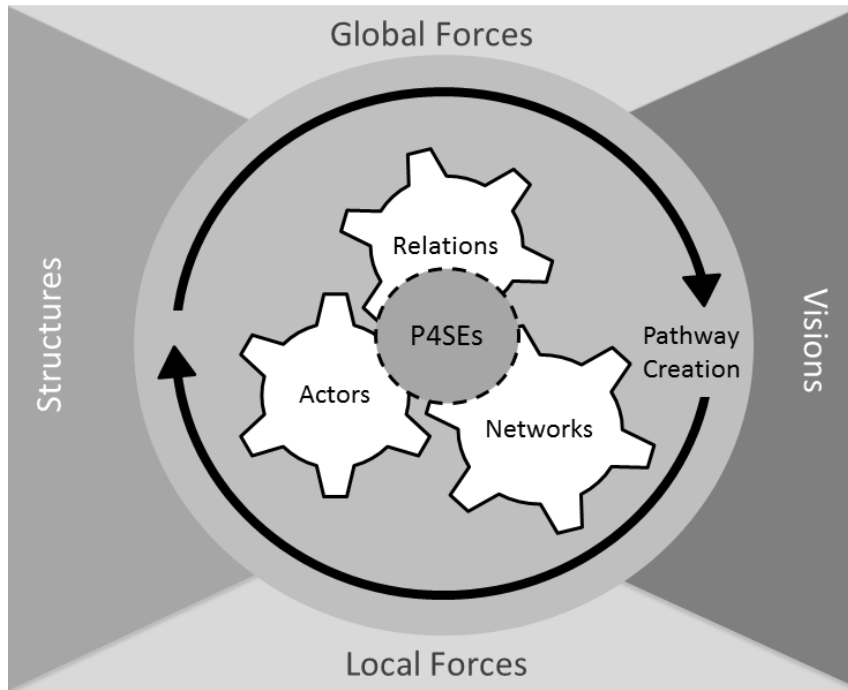
Figure 1-1: Framework (Source: Author)

In view of the inconsistent use of the term 'partnership' in the literature, and the suggested gap between the rhetoric and reality of cross-sector partnerships addressing sustainability challenges, it was decided not to predefine 'P4SEs' in a narrow way, in order to retain an open approach to the (inter-)organisational challenges associated with different types of partnerships and associated partnering strategies. A preliminary working definition was adopted that defined P4SEs as *configurations of inter-organisational relationships between two and more organisations aiming at a sustainable (i.e. self-sustained) adoption of off-grid RETs in a specific rural context*. This relatively open definition allowed partnerships to be explored as hybrid forms of organising, as opposed to an expression of value or an organisational blue-print.[25]

Considering the similarly inconsistent use of the term 'sustainable energy' in the literature, and the multiplicity of meanings associated with the underlying concepts of sustainability and sustainable development, an open and pragmatic stance was again adopted. The sustainability of renewable energy interventions was examined with a view to identifying whether the technologies introduced by a P4SE could be sustained over time; whether the *intervention* led – or appeared likely to lead – to a

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25 The overall framework – and in particular the concepts of partnerships and development pathways – are revisited in Chapter 6, where the main contributions of the four papers are discussed, and conclusions are drawn for the doctoral thesis as a whole.

more widespread adoption of the technology beyond an initial intervention; and whether a technology was described by end-users as making a meaningful contribution to local development more generally.

1.3.2.4 Theoretical Research Question

The following overarching theoretical research question emerged during the development of the framework:

- What can we learn about pathway creation from a micro-level enquiry into the (inter-)organisational challenges faced by local renewable energy organisations, and how they address them?

1.4 Research Setting: Off-grid Renewable Energy in Rural Central America

1.4.1 Selection of Research Setting

The selection of a suitable research setting for this study was based on four criteria. First, it aimed at identifying a region in the Global South with significant renewable-energy resource potential (i.e. solar, hydro and wind). Second, it was decided to exclude large 'emerging' economies such as China, India and Brazil, as the initial literature reviewed had revealed their experience and scope for pathway development to be distinct from that of the majority of low-income and lower-middle-income countries. Third, the selection process focused on lower-middle-income countries that were seeking to increase the proportion of renewable energy in their respective energy matrices but that lacked manufacturing capacity for off-grid RETs, as in such contexts P4SEs would aim both to transfer and to diffuse off-grid RETs through donor-oriented – as well as private – markets. Fourth, various practical considerations were taken into account: given that in-depth research into project-implementing partnerships was likely to require extensive fieldwork in rural areas, it seemed advisable to select a country where the doctoral researcher would be able to communicate without the help of an interpreter or translator. The candidate's prior experience of living and travelling in rural Honduras, and her well-established personal links to El Salvador were seen as increasing the likelihood of successful fieldwork. As both countries fulfilled all four criteria, a scoping trip to Honduras and El Salvador was conducted in early 2012.

Following this first trip to Central America, the focus of the study shifted towards El Salvador and Nicaragua, principally due to the further deterioration of the security situation in Honduras, and Nicaragua's continuing efforts to harness its significant renewable energy potential.[26] It was decided not to expand the research to Guatemala for practical reasons, as well as there being concerns regarding the researcher's safety. Panama, Belize and Costa Rica were excluded due to their significantly higher Human Development Index.[27] While Costa Rica in particular is well known for its excellent track record in the field of renewable energy, the relative wealth and political stability of the country markedly distinguishes its selection environment for off-grid RETs from that of El Salvador, Honduras and Nicaragua.

1.4.2 Renewable Energy in Central America

Situated in a region highly vulnerable to climate change, the three Central American countries of El Salvador, Honduras and Nicaragua are among the poorest of the region, with a GNI per capita (2011 PPP) of US$7,240, US$4,137 and US$4,266 respectively (UNDP, 2015). Between 47% (Honduras) and 34% (El Salvador) of the population live in rural areas (UNDP, 2015). Figure 1-2 shows a map of the region, which – after a long period of war and political unrest – is still experiencing high levels of violence inhibiting development and economic growth (Martí i Puig, Salvador & Sánchez-Ancochea, 2013). Achievements in poverty reduction since 2000 have been only modest, with a reduction of about 9%, compared with the Latin American average of 40% (World Bank, 2015b). Similarly, Gini coefficients of between 48 and 57 indicate high levels of inequality, which – in contrast with those for some other Latin American countries – have remained remarkably stable for the past two decades (UNDP, 2015).

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26 The homicide rate in Honduras of about 90 per 100,000 is the highest in the world; El Salvador is ranked fourth (World Bank, 2015b). Following a risk assessment, various precautionary measures had been put in place. However, the experience of the first trip confirmed that lone travel in Honduras and El Salvador was difficult, in particular for women. Whereas in El Salvador the researcher could access a private car and rely on friends to assist in travel arrangements, such support would not have been available in Honduras.

27 On the Human Development Index, Panama, Belize and Costa Rica have all been ranked as high, whereas El Salvador, Guatemala, Honduras and Nicaragua have mid-range scores (UNDP, 2015).

Figure 1-2: Map of Central America
(Source: http://www.freeusandworldmaps.com)

Central America has impressive renewable energy potential: according to recent estimates, its geothermal power potential is more than 20 times the current capacity; less than 1% of the available resource potential of wind power is currently being harnessed; there is considerable regional potential for small-scale hydropower, waste-to-energy and bioenergy, and the region is exposed to two to three times the annual solar radiation of countries such as Germany and Italy (Dolezal, Majano, Ochs, & Palencia, 2013). A recent case study on Nicaragua suggests that the country could cost-effectively achieve an energy matrix with 80% of generating capacity based on renewable energy generation by 2030, even without large-scale hydropower (de Leon Barido, Johnston, Moncada, Callaway, & Kammen, 2015).

All three countries have a long history of combining hydroelectric power with fossil-fuelled thermal energy generation. Government-driven efforts in the 1960s and 1970s to expand coverage in (semi-)urban areas were followed by the introduction of neo-liberal energy policies in the 1990s and 2000s, which involved the privatisation of previously state-owned utilities, the unbundling of generation and distribution, and the initiation of market liberalisation (Batlle, Barroso, & Pérez-Arriaga, 2010; Gent & Tomei, 2015a). The shift from a statist to a neo-liberal energy regime increased fossil-fuel dependence: thermal generation enabled a rapid response to energy shortages in a way that private investors perceived to be less risky than investments in RETs (World Bank, 2011). However, political constraints led to a situation in which rising fuel costs were not passed on to consumers and

gave rise to serious financial problems for governments (Byer, Crousillat, & Dussan, 2009).

After two decades of liberalisation, and increasing discontent with private-sector-led energy sectors, Central American governments now seek a more active role in shaping the energy sector and safeguarding the provision of energy services (Ellerbeck & Lafontaine, 2010; Gent & Tomei, 2015a). Policy changes, part-renationalisation in places and a stronger emphasis on the importance of enhanced energy access have given rise to an interventionist mode of energy governance, which is "characterized by hybrid forms of governance [involving] a multiplicity of state and non-state actors and networks of private–public partnerships" (Gent & Tomei, 2015b, p. 25).

As dependency on imported oil for generation remains a problem (Dolezal et al., 2013), the governments of El Salvador, Honduras and Nicaragua are pursuing plans to increase the share of renewable energy in their respective energy matrices (UNECLAC/CEPAL, 2014), but they aim to do so primarily though the development of large-scale projects (Meza, 2014), such as hydropower and geothermal plants – and, more recently, solar parks and wind farms. Figure 1-3 shows the percentage share of electricity generated from renewable sources, while Figure 1-4 provides a rough illustration of the energy mix of the three countries. It is important to note, however, that both figures relate to electricity generated for the respective national grid and exclude off-grid installations.
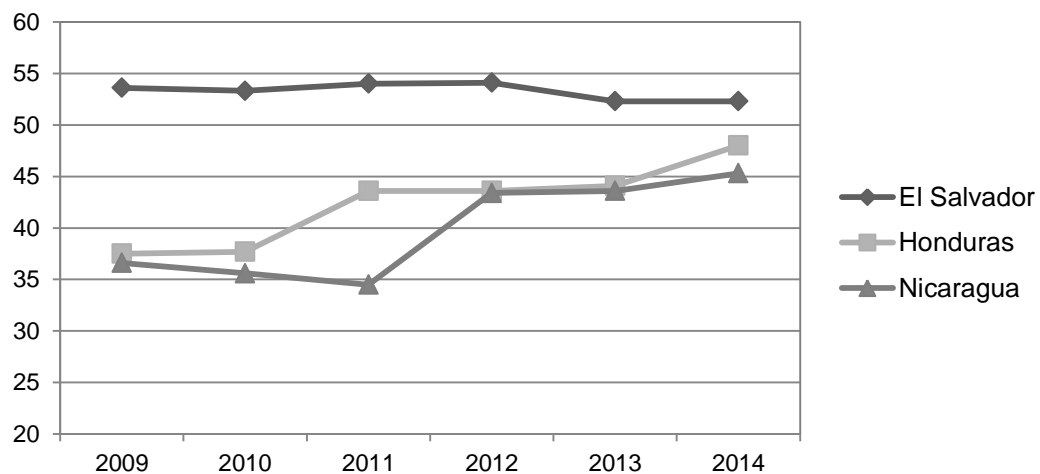
Figure 1-3: Percentage share of electricity from renewable energy sources (installed capacity) (Source: UNECLAC/CEPAL, 2015)
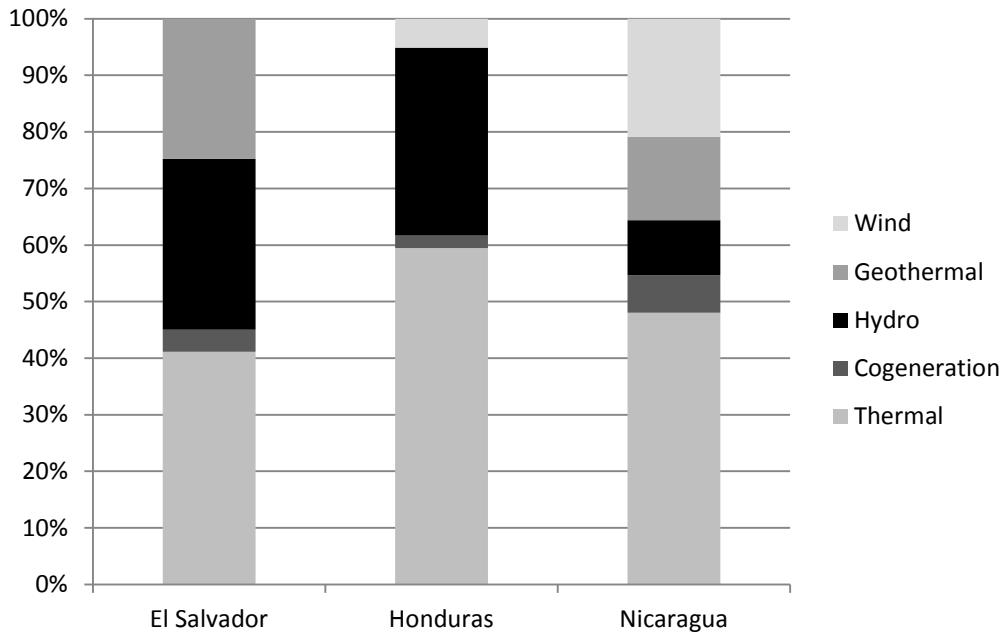
Figure 1-4: Energy matrices in 2014 (Source: UNECLAC/CEPAL, 2015)[28]

Since the 1990s, significant advances have been made in widening energy access in Central America (Meza, 2014). In the small and densely populated country of El Salvador, only 6.3% of the population lack access to electricity – whereas in the two larger countries of Honduras and Nicaragua, that share is about 17.8% and 22.1% respectively (World Bank, 2015b). However, the percentages of those having to make do without electricity remains significantly higher in rural areas, with 14.3%– 16%, 15%–34.2% and 50%–57.3% respectively (IEA, 2015; World Bank, 2015b).

Irrespective of whether energy generation for the national grid draws on renewable or conventional sources, geographic inaccessibility and adverse cost-to-return ratios discourage grid extension to such places (Dolezal et al., 2013; UNECLAC/CEPAL, Club Madrid, GTZ, & UNDP, 2010). Against this background, off-grid RETs have come to be seen as a viable alternative for the rural electrification of such communities (Dolezal et al., 2013). Albeit to varying degrees, governments and international development organisations run programmes and projects aiming to transfer off-grid RETs to rural BoP populations in all three countries (Balint, 2006; Dolezal et al., 2013). Among the international organisations promoting low-carbon development in Central America are the Global Environment Facility, the Carbon Finance Unit of the World Bank, the Inter-American

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28 The annual share of generation was recorded by the UN Economic Commission for Latin America and the Caribbean (UNECLAC). El Salvador's share of 0.5% biogas was omitted.

Development Bank, and various international cooperation agencies, including the German Corporation for International Cooperation (*Deutsche Gesellschaft für Internationale Zusammenarbeit*: GIZ), US Agency for International Development (USAID), and Japan International Cooperation Agency (Dolezal et al., 2013). A Type II partnership that was launched at the UN World Summit on Sustainable Development in Johannesburg in 2002 – the Energy and Environment Partnership with Central America (EEP) – promoted the diffusion of off-grid technologies until November 2014.[29] Funded by the governments of Austria and Finland, and then the European Union, it invested most of its US$18 million in projects developed by community organisations (EEP, 2015).

There are no aggregated data available on the numbers and types of off-grid systems installed in the three countries. However, for off-grid installations in Nicaragua alone, estimates of the volume of recent initiatives exceed US$500 million (Gent, 2014). Initial desk research further confirmed that Central American social enterprises are developing new models for rural electrification and lend themselves to an investigation of the (inter-)organisational challenges posed by partnerships aiming to develop sustainable energy services in poor rural communities (IFC, 2007; Prahalad, 2010; Rogers, Hansen, & Graham, 2006).[30] Expert interviews conducted during the scoping trip and the first phase of field research further revealed the existence of three distinct organisational fields promoting RETs in Central America[31]: first, there are public and private organisations involved in the installation and operation of large-scale power plants (hydro, geothermal and wind), often based on long-term power-purchasing agreements (World Bank, 2011). Second, there is an emerging market for business-oriented applications of RETs, which is mostly served by small and medium-sized enterprises (SMEs) based in urban locations and supported by organisations such as National Cleaner Production Centres. Third, there is a diverse field of international, national and local organisations, both for-profit and not-for-profit, that has evolved around the energy demands of poor rural

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29 In contrast to Type I partnerships, which are between governments, Type II partnerships aim to include private and civil-society actors in global environmental governance and the management of sustainable development (Bäckstrand, 2008).

30 For example, two organisations from Honduras and three from Nicaragua had been recent recipients of Ashden Awards, which are presented by London-based charity Ashden to for-profit and not-for-profit organisations that deliver sustainable energy services.

31 Interviews I-02, I-09, I-15, I-26, I-27, I-38 and I-42 as listed in Appendix B.

communities and businesses, and the transfer and diffusion of off-grid technologies. The research presented in this thesis focused on this 'third' hybrid sector of renewable energy organisations.

1.5 Research Design and Methods: Extended Case Method and Qualitative Network Research

Given the exploratory nature of the research, a qualitative research strategy was chosen for an in-depth enquiry into the quality and configurations of inter-organisational relationships constituting project-implementing P4SEs. A constructionist perspective seemed most appropriate given the subject, framework and objectives of this research.

1.5.1 Constructivist Perspective

The constructivist perspective implies the assumption of multiple realities and thus a "relativist ontology" (Denzin & Ryan, 2007, p. 588). Social realities are seen as socially constructed and as such (inter-)subjective and negotiable – which does not imply that they are not 'real' in their consequences (Berger & Luckmann, 1979). The status of organisations as social actors depends on their being recognised as organisations by their own members as well as by other stakeholders and audiences (King, Felin, & Whetten, 2010). Inter-organisational relationships evolve along trajectories of interactions between members of different organisations (Oerlemans et al., 2007). To a greater or lesser extent, inter-organisational relations are intertwined with interpersonal relations (Sorenson & Rogan, 2014). Trajectories of shared experiences are 'storied' as *relationships between organisations* that give an inter-subjective meaning to past interactions and prescribe rules for future engagement (Crossley, 2010; White, 1992). Therefore, inter-organisational networks exist as patterns of interactions, but also as cognitive maps shaping these interactions (King et al., 2010).

From a constructivist perspective, knowledge is actively constructed rather than discovered, and there is "an inevitable historical or sociocultural dimension to this construction" (Schwandt, 2003, p. 305). The epistemological position adopted for this research was *transactional*, assuming the origin of (subjective) knowledge to be found in human relationships (Gergen & Gergen, 2007; Lincoln & Guba, 2003): "meaningful reality [...] is constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social

context" (Crotty, 1998, p. 42). When seeking to support the uptake of off-grid RET organisations, partnerships act on their perceptions of the situation as well as drawing on their visions and interests, which (to a larger or lesser degree) vary between different partner organisations (Glasbergen, 2007). A constructivist perspective therefore allowed the complexity and 'wickedness' of pathway creation to be acknowledged more fully as an (inter-)organisational challenge.

1.5.2 Extended Case Method

Qualitative research designs are often 'emergent designs' created in a "reflexive process which operates throughout every stage of a project" (Hammersley & Atkinson, 2007, p. 21). The dynamic process of designing a two-stage research design for this study was guided by the twin-paradigmatic principles of openness and appropriateness common to qualitative research strategies, as well as practical concerns relating to field access and the role of pre-existing theories.[32] The remainder of this section presents an overview of the development of the emergent research design and outlines its fundamental features.

The constructivist perspective adopted for this research, and its exploratory nature, suggested a reflexive methodology with naturalistic methods that would facilitate the reconstruction of social practices and relationships from the points of view of both the social actors involved and the researcher. Moreover, previous research on processes of collaboration and learning among organisations pointed to the importance of informal participant observation and interviewing (Knight & Pye, 2007). A research design was required that would allow the researcher to 'zoom in' in order to adopt an insider's point of view on the choices and practices of organisations in partnerships – as well as 'zooming out' in order to examine situated patterns of inter-organisational engagement and their implications. Qualitative interviews complemented by participant observation that aimed to witness action first hand, while being embedded in the communicative processes of the field, corresponded well with this approach.

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32 The principle of 'appropriateness' (or 'faithfulness') to the subject under study is one of the central premises for such research, and requires a research design sensitive to the field in its particular qualities and issues (Atkinson, 2005; Flick, 2007). Qualitative research tends to be characterised by its 'openness' towards methods and techniques, without implying that it is carried out in an arbitrary manner. Processes of data collection and data analysis need to be systematic and rigorous in order to arrive at credible, confirmable, and ultimately *appropriate* accounts of social phenomena.

The constructivist perspective also allowed analytic strategies aiming at the creation of grounded theory through the analysis of empirical data on a relatively unexplored social phenomenon to be combined with those aiming at the extension of pre-existing theory. The relational framework developed for the research linked it to established streams of theorising on the role of different types of inter-organisational relationships in technology transfer (such as strong-tie/weak-tie theory – see Chapter 2), knowledge–power dynamics in development cooperation (Chapter 3), hybrid organisations (Chapter 5), and the embedded agency of organisations involved in the creation of alternative socio-technical development pathways (Chapter 6). After weighing up the relative merits and demerits of different ethnographic and case-study-oriented research strategies, it was decided that the Extended Case Method devised by Michael Burawoy (1998, 2009), drawing on the work of the Manchester School of Anthropology (Evens & Handelman, 2006; Gluckman, 1958), would provide the best fit for the research topic, objectives and setting of the study.

The situational research strategy implied by the Extended Case Method is defined by four extensions:

> *the extension of the observer into the lives of the participants under study; the extension of observations over time and space; the extension from microprocesses to macroforces; and […] the extension of theory. Each extension involves a dialogue: between participants and observer, between successive events in the field, between micro and macro, and between successive reconstruction of theory. These dialogues orbit each other, each in the gravitational field of the others. (Burawoy, 2009, xv)*

While emphasising the importance of participant observation for investigating a situated social phenomenon over time, the Extended Case Method remains open to multi-sited ethnography – a strategy rejected by classical anthropologist approaches to ethnography. Burawoy (1998, 2009) acknowledges that while micro-processes can be observed at the local level, the identification of global forces shaping local contexts requires the reflexive use of established theories. Empirical research aiming at the four extensions prescribed by the Extended Case Method is seen as allowing researchers to confront theory with rich empirical cases enabling its reconstruction and extension (Burawoy, 2009). It suggests an *encompassing sampling strategy* and approach to case-based comparisons that examines instances observed at different locations (i.e. in individual P4SEs) in the wider context that connects these instances, aiming to explain the characteristics of the wider phenomenon (in this case, pathway creation for sustainable energy), as a function of the varying manifestations of individual instances (i.e. P4SEs) (Tilly, 1984).

1.5.3 Two-stage Research Design

Adopting the research strategy of the Extended Case Method, it was estimated that about six months of field research would be required in order to be able to conduct participant observation on multiple partnerships as well as a sufficient number of accompanying in-depth interviews. It was then decided to split the six months into two phases of fieldwork of three months each, separated by about nine months of data analysis. The resulting two-stage research design allowed the researcher to prepare outputs presenting initial findings of the first phase, before refining research questions and methods for the second phase of the research. A continuous reflection on the methods used in fieldwork, and the challenges it posed to the researcher, led her to engage with a cross-faculty research group on this topic. This engagement fed into the preparation of a forthcoming co-edited volume on the experience of conducting fieldwork, for which the researcher co-authored chapters on working in marginalised contexts and on researching the aid industry (Crawford, Kruckenberg, Loubere, & Morgan, forthcoming).

1.5.3.1 First Phase: Researching Partnerships

The first spell of field research was conducted in early 2013. Six weeks were spent in San Salvador (El Salvador) with the EEP described in Section 1.4.2. This initial phase of immersion aimed to gain a better overview of activities pursued by different renewable energy organisations in El Salvador, Honduras and Nicaragua. The researcher accompanied EEP staff on fieldtrips to five project sites in El Salvador and Nicaragua, attended meetings with partner organisations, and conducted 11 qualitative interviews with experts based in El Salvador. The director of the Central American agency kindly agreed to share its project database with the researcher, in this way facilitating the identification of NGOs, social enterprises and renewable energy associations involved in the transfer and diffusion of off-grid technologies across the region, and enabling her to trace the development of some projects and relationships over time. The director also allowed the researcher to identify the organisation as having participated in this research.

In parallel, a Northern renewable energy NGO that worked with organisations involved in renewable energy projects across Nicaragua had been contacted. The second half of the first phase of fieldwork was spent in Nicaragua, observing the work of this organisation and its local partners, which again involved participant observation of partnership meetings and joint visits to project sites as well as series of 19 qualitative interviews with representatives of public-, private- and third-sector

organisations working on the diffusion of off-grid RETs in rural Nicaragua. Research participants were granted confidentiality in order to enable them to share critical or sensitive information.[33] An anonymised overview of interviews and participant observation conducted in the first phase of fieldwork is presented in Appendix B. A list of questions used in the interviews, and the templates used for contact emails and consent forms (all translated into English) are provided in Appendices A and C.

During fieldwork, the selection of interviewees and partnerships for further investigation was primarily guided by research interest, as well as by practical and methodological considerations. Given the small size of the organisational field, it was decided that snowball sampling and evaluations of lists of attendees of workshops, conferences and fairs would provide a good starting point. While the vast majority of organisations invited to participate in the research responded positively to a request for an initial interview, it was not possible to conduct participant observation with all of them. Sometimes, opportunities arose – such as trips with donor organisations visiting their partner organisations, meetings between partner organisations, capacity-building workshops for young technicians, trips to projects in rural communities, and celebrations of completed projects – and sometimes such opportunities did not arise. Moreover, security risks associated with lone travel in some Central American countries limited flexibility (e.g. when no car or lift was available). Notwithstanding such difficulties, it was decided to conduct the research across borders, as a focus on just one country would have made it close-to-impossible to publish results without revealing the identity of individual organisations.

The relatively open research strategy during fieldwork led to significant discrepancies in the quality and quantity of data collected on different organisations and partnerships, an issue that had to be taken into consideration in the data-analysis stage. The analysis of the qualitative data collected in the first phase of the research focused on the configuration and quality of inter-organisational relationships constituting partnerships in the field of off-grid renewable energy.[34]

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33 A short research proposal outlining the research design and related materials (such as draft contact emails and consent forms) was approved by the AREA Faculty Research Ethics Committee at the University of Leeds following an ethical-review procedure (reference Number: AREA 11-214).

34 While partnership settings, configurations and relationships varied across P4SEs, no systematic variation between the three countries could be identified after the first phase of fieldwork, and many organisations also operated across Central American borders. Against this background, it was decided not to pursue a country-level comparative approach.

The first two journal articles included in this thesis (Chapter 2 and Chapter 3) present the main findings of the first phase. The first article features an extended literature review of the emergence of partnership models in the context of development assistance for off-grid renewable energy, and proposes a relational framework for the analysis of such partnerships, drawing on the theory of strong and weak ties. Seven empirical cases from the scoping study and the first phase of field research were analysed for this paper, drawing on field notes of observations, interview recordings, and project documents obtained during fieldwork. Case selection aimed to strike a balance between scope (variations between cases) and depth (thick descriptions). Extensive memoing assisted in the analytic process, which started from a list of hypotheses that had been created during and after fieldwork, and which was revisited and revised during data analysis and during a more focused literature review on the theory of strong and weak ties in economic sociology.[35] Visualisations of the composition of different partnerships were also created; these facilitated the comparative analysis of different partnership set-ups. Figures 1-5 and 1-6 are examples of such preliminary analytical maps.

For the second article, the knowledge–power dynamics arising in a dyadic partnership between a Northern and a Southern (Central American) renewable energy NGO (illustrated in Figure 1-6 below as INGO1 and RET1 respectively) were analysed in great detail. This case had been selected for further analysis partly because of the amount and richness of the data collected on this particular partnership, which included detailed observations of field visits to project sites, and interviews with several members of both organisations, as well as observations of meetings and a capacity-building workshop. The micro-analysis was conducted with the assistance of the qualitative-data-analysis (QDA) software ATLAS.ti, which facilitated a fine-grained analysis of typed-up field notes of observations, project documents and audio recordings of interviews and of a partnership meeting

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35 Memoing is a seminal method of qualitative research. Memos are written 'to document and reflect' (Saldaña, 2009: 32) and may include descriptions (e.g. of particular aspects or features), commentaries (e.g. on the meaning of codes or categories), explanations (e.g. of analytic strategies) and explorations (e.g. of emergent ideas). While memos are considered to be partial and provisional, the analysis, evaluation and integration of series of memos can lead to the final stages of qualitative data analysis (Charmaz, 2014; Saldaña, 2009).

between the two NGOs.[36] Following the second phase of field research, some information obtained in follow-up interviews was included.
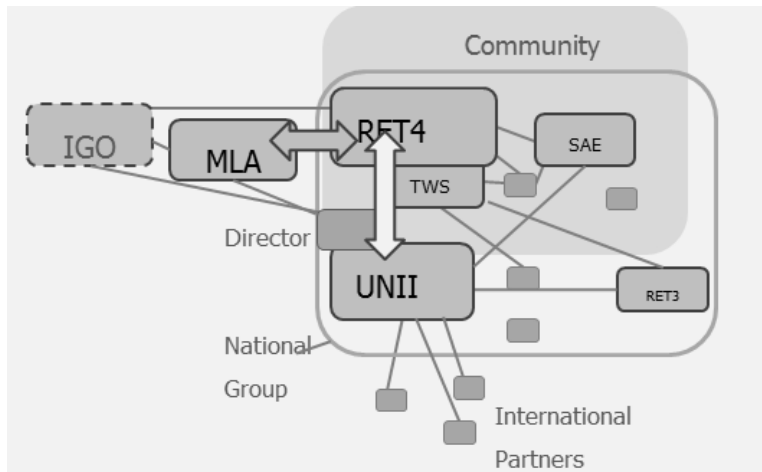
Figure 1-5: Illustration of partnership network (Source: Author)[37]
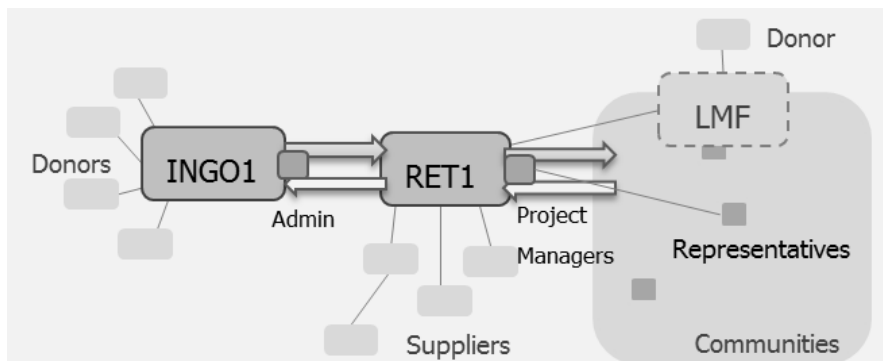
Figure 1-6: Illustration of North–South NGO partnership (Source: Author)[38]

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36 ATLAS.ti is a QDA software package that facilitates the analysis of text-based – as well as visual and audio – data (Friese, 2012). It allows audio files to be coded, and sections of the material to be selectively transcribed for more in-depth analysis. These sections remain linked to the audio file so that they can be expanded upon at a later stage. Given the volume of the material and the fact that data had been collected in Spanish and also in English and German, it was decided to describe and translate only sections that were particularly dense and rich in content. The coding of the audio recordings of interviews also reduced the threat of premature de-contextualisation that is inherent in analytic coding using QDA software. For example, when listening to different statements of partnerships, it was always clear who had provided the statement and in what context – which would have not been as transparent if working with snippets of text.

37 Key: IGO – inter-governmental organisation; MLA – multi-lateral agency; RET – renewable-energy-technology organisation; TWS – technology workshop; SAE - sustainable agriculture and environment group; UNI – university.

1.5.3.2 Second Phase: In Search of the Partnership Effect

Three key outcomes of the first phase of the study suggested a shift in the analytical focus of the field research to be conducted for the second phase. First, the analyses conducted for the first and second articles (Chapters 2 and 3) had confirmed the *important role of local renewable energy organisations* in ensuring the long-term sustainability of renewable energy interventions, and in developing rural markets for off-grid technologies. Second, it had become apparent that these *local renewable energy organisations were hybrid* in nature: for-profit social enterprises and not-for-profit renewable energy NGOs operated within different legal frameworks, but they fulfilled a similar role in P4SEs – as project-implementing organisations. Pressures arising from poor market infrastructure and the value-driven nature of their operations contributed to the blurring of the sectoral boundary between profit-driven SMEs and value-driven NGOs. Third, case studies analysed in the first phase had indicated that these small local organisations *were simultaneously involved in various kinds of hybrid inter-organisational arrangements* – sometimes labelled as 'partnerships' and sometimes not – that appeared to make for a surprisingly complex organisational environment.

While the research presented in the first two articles had examined how different kinds of inter-organisational relationships and partnerships could enable (or hinder) local renewable energy organisations to achieve a more sustainable adoption of off-grid technologies, it had not allowed the more systematic examination of how these organisations navigated the various inter-organisational arrangements in which they were embedded, and used these strategically. Given the results of the first phase of the research, questions arose as to how the partnership paradigm had shaped the organisational environment and the (inter-)organisational practices of local renewable energy organisations. This observation corresponded to the third research gap identified in Section 1.2.4. What were the implications of a proliferation of 'partnerships' for the development of pathways to sustainable energy? How did the observed organisational hybridity relate to the heterogeneous organisational networks in which these organisations seemed to operate? These and related questions could be answered by shifting the analytical focus of the research from partnerships as dyads or project networks to the *entire organisational networks* of local renewable energy organisations.

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38 Key: INGO – international NGO; RET – renewable-energy-technology organisation; LMF - local microfinance organisation.
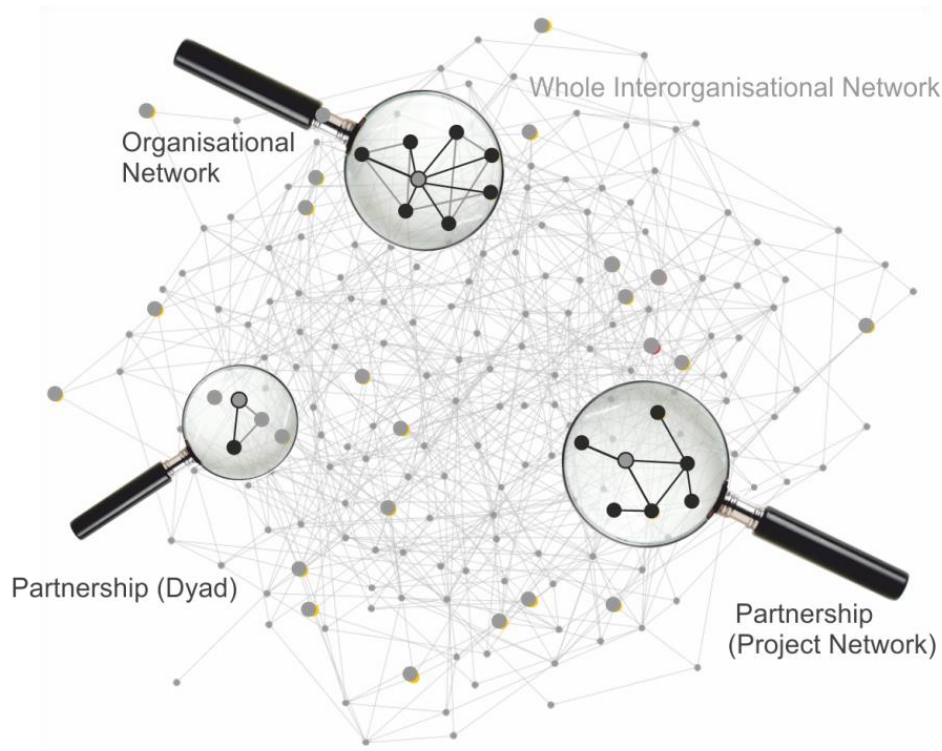
Figure 1-7: Analytic shift (Source: Author)

Figure 1-7 illustrates this analytical shift: the grey network in the background represents the overall network of all organisations involved in the transfer, diffusion and adoption of off-grid RETs in the region (estimated by the researcher based on information obtained in expert interviews[39]). The slightly enlarged grey circles indicate local renewable energy organisations embedded in this network. The two magnifying glasses at the bottom of the figure highlight the two organisational forms that had been the focus of the research in the first phase: dyadic relationships and partnerships between multiple organisations. In contrast, the magnifying glass at the top of the figure shows a schematic representation of an entire organisational network, which includes all inter-organisational relationships maintained by the renewable energy organisation located at its centre. While maintaining a relational approach (i.e. focus on configurations of inter-organisational relationships), an enquiry into the organisational networks and inter-organisational embeddedness of local organisations was expected to provide important insights into the (inter-) organisational challenges faced by local renewable energy organisations seeking to

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39 Interviews I-04, I-21,I-26, I-33, I-42 and I-49 as listed in Appendix B.

contribute to the development of pathways to sustainable energy. The unstructured interviews conducted in the first phase had led to the collection of rich qualitative data on individual relationships and partnerships, but had fallen short of providing a formal overview of how local renewable energy organisations connected, navigated and strategically manipulated their heterogeneous organisational 'ecosystems'. The decision to collect qualitative data on entire organisational networks required the development of a data-collection tool tailored to the specific needs of the investigation. This led to the formulation of a methodological research question to be addressed in this research:

- What methods for qualitative network research lend themselves to a systematic – yet in-depth – investigation of the content of different kinds of interdependent relationships and their configurations in entire organisational networks?

After a thorough review of methods for qualitative network research, it was decided to develop a visual network survey. This type of survey is a novel method for collecting both qualitative and quantitative network data through the use of standardised network maps visualising actor attributes and relations in the form of different icons and lines (Gamper, Schönhuth, and Kronenwett, 2012; Hogan, Carrasco, & Wellman, 2007). Network maps facilitate systematic enquiries into inter-organisational embeddedness from an insider's perspective and stimulate narrative accounts of how different relationships and forms of organisation enable or constrain agency in networks and partnerships. The visual network survey developed for this research combined a structured interview process with visual elements and many open-ended questions. As all respondents were owner-managers, directors or project managers with a background in engineering, the use of the digital data-collection software VennMaker was deemed appropriate. The software assisted the researcher in translating interviewees' responses into digital network maps, which could then be examined on the screen of the researcher's laptop (Gamper et al., 2012; Kronenwett & Schönhuth, 2011).[40] With its relatively high level of standardisation, the survey format enabled a comparative analysis of relationships, and of knowledge transfer and creation, within individual organisational networks, as well as systematic comparisons between the networks

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40 VennMaker is a software-based tool for the collection and validation of qualitative and quantitative network data. The software was developed at the universities of Trier and Mainz (Germany), initially for research on personal networks and for consultancy purposes (Gamper, Schönhuth, & Kronenwett, 2012; Kronenwett & Schönhuth, 2011).

of six Central American renewable energy organisations. In addition, another 21 unstructured interviews were conducted with governmental officials, project managers in development agencies, experts in Central American universities and directors and managers of renewable energy organisations.[41]

Chapter 4 addresses the methodological research question posed above and presents the chosen method, the data collection and the data analysis conducted for the second phase of the research in more detail. Show cards with the questions included in the visual network survey (in English) and a sample of a multi-layered analytical network map are provided in Appendices D and E. The findings of the second phase of the research are presented in Chapters 4 and 5.

1.6 Overview of the Thesis

This paper-based doctoral thesis comprises four research articles. Each of the four articles is free-standing in the sense that it can be read and understood independently. The two published articles included in the thesis (Chapters 2 and 3) present the outcomes of the first phase of the study, which focused on the content and configuration of inter-organisational relationships in P4SEs, and how these relationships can (or cannot) contribute to a more sustainable uptake of RETs in poor rural areas (Kruckenberg, 2015a, 2015b). The third and the fourth articles (Chapters 4 and 5) report the results of the second phase of the study, which focused on the embedded agency of local renewable energy organisations. The content and focus of these two research papers is methodological and theoretical respectively, and they were written for an audience of scholars with a principal interest in organisation studies. At the time of writing, the third article is under review with *Organizational Research Methods*, and the fourth article is in preparation for submission.[42]

The remainder of this chapter gives an overview of the four articles (Chapters 2 to 5 inclusive), highlighting their principal contributions, and of Chapter 6, which provides an overarching discussion of all findings from which conclusions are drawn for the study as a whole.

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41 In the second phase, participant observations were conducted with five organisations. Some of the interviews and field visits followed up on contacts established in the previous phase of fieldwork.

42 The university's regulations require a minimum of three articles. It was decided to include an additional (fourth) article because one of the articles is a methods paper, and it was deemed essential to present substantial outcomes of both phases of the research.

The first article (Chapter 2) examines the role of P4SEs in international development cooperation (Kruckenberg, 2015b). It presents a *relational approach* to the analysis of development assistance for sustainable energy, drawing on theories concerning the role of strong and weak ties in inter-organisational networks. An analysis of *seven case studies* shows how different forms of inter-organisational relationships can facilitate the implementation of renewable energy projects and programmes without necessarily enhancing the capacities of local organisations in a way that would support a more sustainable uptake of RETs. Three types of *partnership failures* are identified that can inhibit the effectiveness of P4SEs. On the basis of the analysis, policy implications are given concerning the *role of strong and weak inter-organisational relationships* in the success of P4SEs. The principal contribution of this article is programmatic as much as empirical, as it demonstrates how our understanding of P4SEs, and of processes of technology transfer more generally, can be enhanced through research adopting a relational approach.

Drawing on an in-depth analysis of one of the seven cases, the second article (Chapter 3) investigates knowledge–power relationships in P4SEs (Kruckenberg, 2015a). It presents a *new framework for visualising and analysing the multiple knowledge challenges* faced by organisations seeking to assist Southern communities in the adoption of off-grid RETs. Through a *micro-analysis of knowledge–power relations* between a Northern and a Southern renewable energy NGO, the article shows *how the ways in which knowledge is framed shapes opportunities* for collaboration and learning in partnerships in P4SEs. Given that the sustainable adoption of off-grid RETs in poor rural contexts requires P4SEs to address 'wicked' problems, partnerships that engage in an open negotiation of knowledge stand a better chance of achieving sustainable outcomes than those that aim at 'North–South knowledge transfer'. The article develops a *participatory tool for the negotiation of knowledge and knowledge–power relations in P4SEs*, which is based on the findings of the case study and draws on the experience of the author of working with several partnerships.

The third article (Chapter 4) presents the methodology developed for the second phase of the study and addresses its methodological research question. It provides a general introduction into novel methods for visual network research, outlining how digital and hand-drawn network maps can be used for researching the relational embeddedness of organisations. Its principal contribution lies in the *introduction of a typology of three visual methods* for research on organisational embeddedness and (inter-) organisational networks: *participatory network mapping, the network*

map interview and the visual network survey. Drawing on the visual survey developed for this doctoral study, the article further shows *how visual network data can be triangulated with other qualitative data* – and also how visual methods for qualitative network research can form part of *mixed-method research designs based on Social Network Analysis*, for which an example is provided by the co-author. Based on a discussion of the potential, practicalities and limitations of visual network research for researching (inter-)organisational embeddedness, the article *identifies critical design issues* related to the use of visual methods in qualitative network research.

The fourth article (Chapter 5) reports the results of the research conducted in the second phase of the research. It presents an *in-depth comparative analysis of the organisational networks* of four renewable energy organisations (two for-profit and two not-for-profit); through this, insights are gained about the organisations' strategies for developing sustainable energy markets for rural BoP populations. Examining the *embedded agency of local renewable energy organisations as intermediary actors*, the article shows how these organisations combine features of private- and third-sector organisations, and engage in various forms of inter-organisational arrangements, in order to adapt to – and shape – an environment where sectoral boundaries are contested or are of reduced relevance. The analysis is framed as an *investigation of hybrid organising as a cross-level phenomenon*. It builds on and *connects two previously unrelated bodies of literature on hybrid organisations* at the organisational and inter-organisational levels, and introduces the concepts of *organisational, relational and sectoral hybridity*. While the article makes an important empirical contribution to the thesis as a whole, its main thrust is theoretical, focusing on hybrid organising as a cross-level phenomenon, and its potential role in the (co-)evolution of organisations and organisational fields.

The thesis concludes with Chapter 6, in which the principal contributions of all four papers are discussed in relation to the three research gaps and the overarching research questions. It starts with a discussion of findings on *how partnership constellations and the strength of relationships between partners can determine the potential* of P4SEs to achieve lasting impacts. Based on an encompassing analysis of the case studies presented in Chapters 2 to 5, *three partnership strategies* are identified: *'North–South Transfer'*, *'Division of Labour'* and *'Joint Endeavour'*. The *opportunities and limitations of each* of the three types are outlined, focusing on their approaches to path-dependence and strategies for pathway creation. Relating the principal contribution of Chapter 5 to the overarching framework of the study, it is shown *how a relational analysis of hybrid organising as a cross-level*

phenomenon yielded novel insights into the (inter-)organisational challenges of pathway creation and contributed to a better understanding of how P4SEs can give rise to, but also obstruct, the development of pathways to sustainable energy. This leads to a discussion of the potential of visual network research for enabling such research. After a reflection on the overall research process and the related limitations of the study, Chapter 6 concludes with an overview of the main contributions of this doctoral research, identifying implications for future research and policy-making.

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Chapter 2: Renewable Energy Partnerships in Development Cooperation – Towards a Relational Understanding of Technical Assistance[44]

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[45] 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.

2.1 Introduction

Renewable energy technologies (RETs) could play a central role in enabling sustainable development in low and lower-middle income countries. They bear the

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45 In this first article, the term of 'renewable energy partnership' was used for 'Partnership for Sustainable Energy (P4SE)'.

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 & WHO, 2009). As a result, RETs have become prominent in the field of international development cooperation (Chaurey, Krithika, Palit, Rakesh, & Sovacool, 2012; Pinkse & 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.[46] 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 & 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 & 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, Costa, & Duysters, 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 & 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

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46 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-income and lower-middle-income countries with a relatively lower Human Development Index.

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.

2.2 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, Carley, MacLean, & Baldwin, 2012; Sovacool & 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, Hekkert, & van Sark, 2008; van Huijstee, Francken, & Leroy, 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 & 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 & 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 & Jacobson, 2011, p. 536) notwithstanding the fact that many rural low-income households pay disproportionate prices for low-quality fuel-based energy services (Byrnes, Sibley, Sullivan, & Ward, 2013; Mills & 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, Doukas, & Psarras, 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; Karakosta et al., 2010; Martinot, Chaurey, Lew, Moreira, & Wamukonya, 2002). 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, Barnes, & Agarwal, 2005; Romijn, Raven, & Visser, 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).[47]

The sustainable adoption of RETs also requires the removal of ***capacity gaps*** at the local, national and international level (Acker & Kammen, 1996). Most low-income 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, Jenner, & Baker, 2009; Vincent & 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 & Drupady, 2012). Unsuccessful demonstration projects have reduced the attractiveness of RETs in places. 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).

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47 Others pointed out that local demand for solar home systems may not derive from income generation. For example, Jacobson (2007, p. 144) 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.

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 & Kammen, 1996; Drinkwaard, Kirkels, & Romijn, 2010; Romijn et al., 2010; Sovacool & 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, Smith, Watson, & Ockwell, 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 & 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).

2.3 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 2-1
(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 & 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).

Donor	Multiple Agencies	Cross-Sector
Equipment Donation	Technologies Sales	Energy Services Cost Sharing
1980 → 1990 → 2000 → 2010 →		
Technology Demonstration	RET Market Development	Sustainable Energy Solutions
Technology	**Policy & Market**	**RET Partnerships**
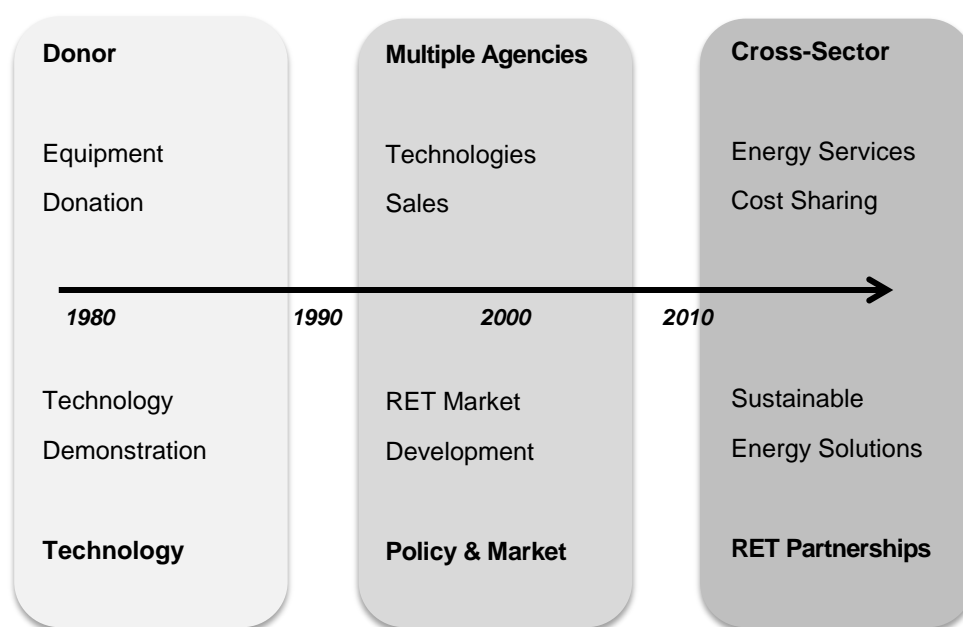
Figure 2-1: Changing paradigms in RET programme design (based on Martinot et al.,
2002; Sovacool, 2012)

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).[48] 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).

2.4 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 & 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

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48 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.

imply "a joint commitment to long-term interaction, shared responsibility for achievement, reciprocal obligation, equality, mutuality and balance of power" (Fowler, 2000, p. 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, Knippenberg, & Schulpen, 2014; Ellersiek, 2011; Fowler, 2000; Lister, 2000; Vincent & 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 & Kolk, 2012): first, they are envisaged to reduce *resource gaps* by attracting investment and creating innovative cost-sharing models. Second, partnerships are expected to foster knowledge transfer and capacity building, thus diminishing *capacity gaps*. Third, 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). Fourth, 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.[49]

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 & Kolk, 2012; Szulecki, Pattberg, & Biermann, 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 of actor-networks and selection pressures (Byrne et al., 2011; Caniëls & Romijn, 2008; Jacobsson &

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49 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, Smith, Watson, and Ockwell (2012), Cohen (2004), IPCC (2000), van Alphen, Hekkert, and van Sark (2008), and Wilkins (2002).

Johnson, 2000; Smith, Stirling, & Berkhout, 2005; van Eijck & 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, Gössling, & Jansen, 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.

2.5 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 & Halgin, 2011; Caniëls & 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.

2.5.1 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 & Rivera-Santos, 2011). There are multiple ways of categorising inter-organisational relationships or ties (Cropper, Ebers, Huxham, & Smith Ring, 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, Dialdin, & Wang, 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 & 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, Jansen, & Lyles, 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, Galaskiewicz, Greve, & Tsai, 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 & 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, wind 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.[50] 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 & Hulme, 1996).

2.6 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 key informants working in renewable energy partnerships. Respondents were granted confidentiality in order to enable them to share critical or sensitive information. For

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50 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, Gutiérrez, Ogliastri & Reficco, 2007; Dahan, Doh & Teegen, 2010; Parker & 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 'sectoral ambiguity' around business and development objectives (DiMaggio & Powell, 1983; Lewis, 1998; Meyer & Rowan, 1977).

the purpose of this article, seven cases of inter-organisational relationships were selected as they were reported by different RET organisations 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 relationships between local RET organisations and international 'partners' addressed - or ignored - learning and implementation gaps, while touching upon some related resource gaps.

2.7 Results: Partnership Analysis with Relational Framework

2.7.1 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, p. 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 & 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 & Foster, 2003; Jacobsson & 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).

2.7.2 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.

2.8. 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. First, 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). Second, 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, Smith, Watson, & Ockwell, 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.[51] 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

51 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.

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

2.9 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.

2.9.1 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 & 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.

2.9.2 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. First, 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, Doh, & Vachani, 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 & Hulme, 1996).

Second, 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 sectoral development goals* so that they are more likely to be successful in achieving a wider and more sustainable uptake of RETs.

Third, 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, p. 58), 'empowering partnerships' may go a long way towards enabling *Sustainable Energy for All.*

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Chapter 3: North-South Partnerships for Sustainable Energy – Knowledge-power Relations in Development Assistance for Renewable Energy[52]

Abstract

Drawing on a case study of a North-South partnership between non-governmental organisations (NGOs), this article 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 complimentary 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 article 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 article concludes by proposing a participatory tool for the negotiation of knowledge and knowledge-power relations in partnerships for sustainable energy.

3.1 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

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(Bhattacharyya, 2012). Energy poverty is predominantly a problem of rural populations in low-income 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).[53] Off-grid renewable energy technologies (RETs) have become recognised as potential drivers for rural development (Krithika & Palit, 2013; Ockwell & Mallett, 2012).[54] 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, Gomes, Pursnani, & West, 2014; Foley, 1992; Groh, 2014; Kumar, Mohanty, Palit, & Chaurey, 2009).[55] 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 & 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, Krithika, Palit, Rakesh, & Sovacool, 2012; Fernández-Baldor, Hueso, & Boni, 2012; Forsyth, 2012; Kruckenberg, 2015; Mallett, 2013; Morsink, Hofman, & Lovett, 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).

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53 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).

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

55 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.

Questions have 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, Rachid, El-Samra, Bou Boutros, & Hashisho, 2013; Fernández-Baldor et al., 2012; Morsink et al., 2011).

This article responds to these questions and aims to make three contributions. First, 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 article 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 article 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 article proposes an interactive tool for the negotiation of knowledge and knowledge-power relations in partnerships for sustainable energy.

The remainder of this article 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 (Section 3.2), the article considers the complexity of RET interventions in Section 3.3. 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 in Section 3.4. The second part of the article 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 3.5. Section 3.6 demonstrates how the framework for analysing knowledge challenges presented in the first part of the article can be used for assessing the knowledge base of a P4SE. 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 3.7). Based on these findings, the article outlines a participatory tool for the negotiation of knowledge and knowledge-power relations in P4SEs in Section 3.8. Section 3.9 concludes.

3.2 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 whilst reducing the environmental impact of energy generation (Sovacool & Drupady, 2012; UNDP & 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 & 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 & Chaurey, 2011; Sovacool & 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 & 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 & Mallett, 2012). 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 & Karnøe, 2001; Ockwell & Mallett, 2012). 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, Angel, & Wieczorek, 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, Costa, & Duysters, 2011; Kruckenberg, 2015; Ockwell, Watson, MacKerron, Pal, & Yamin, 2008).

3.3 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). Figure 3-1 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).
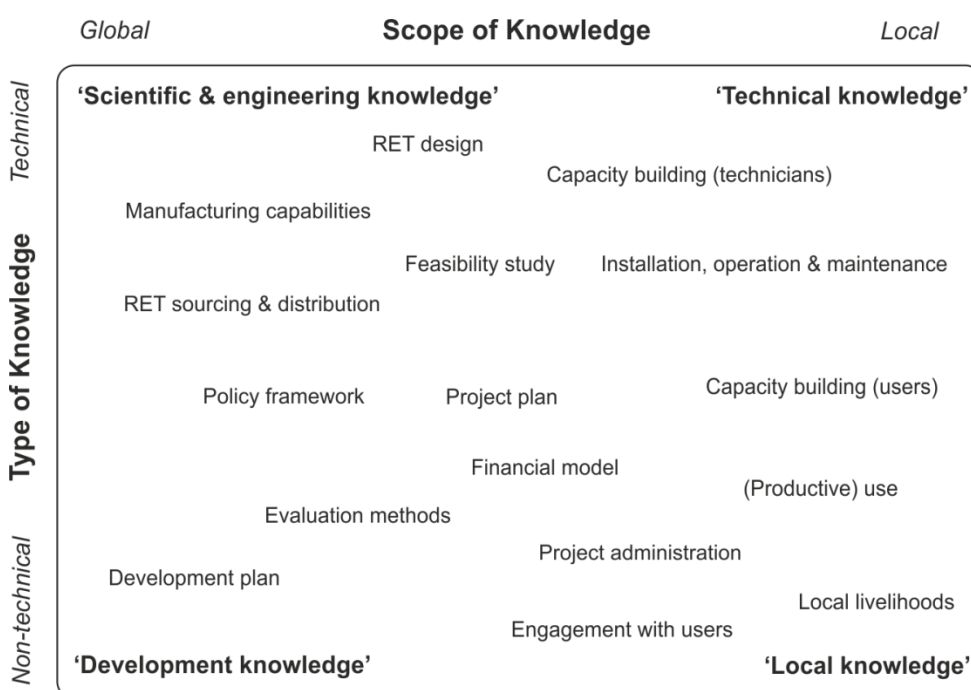
Figure 3-1: Framework for identification of knowledge challenges (Source: Author)

First, 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. Second, scientific and engineering knowledge 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 & Chaurey, 2011). Third, 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). Fourth, 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 has 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, Raven, & Visser, 2010). Whilst 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 & 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 & 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 & Khademian, 2008, p. 336). When dealing with "wicked problems" (Rittel & Webber, 1973, p. 155), it is impossible to develop a coherent formulation of the problem independent

from one's strategy for solving it (Weber & Khademian, 2008). Wicked problems require the triangulation and integration of multiple kinds of knowledge held by different stakeholders (Weber & 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 & Luckmann, 1979; Weber & Khademian, 2008)."Knowledge emerges as a product of the interaction and dialogue between specific actors" (Long & Villarreal, 1994, p. 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, Smith, Watson, & Ockwell, 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 & 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 & 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.

3.4 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, Chaurey, Lew, Moreira, & Wamukonya, 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 & Schulpen, 2013; Fowler, 2000; Lister, 2000; Mawdsley, Townsend, & Porter, 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 & Brinkerhoff, 2011, p. 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 article addresses these questions through an in-depth case study of knowledge-power relations in a NGO partnership for sustainable energy.

3.5. Methods

In their review of case studies on distributed energy generation, Brass and colleagues (Brass, Carley, MacLean, & Baldwin, 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 article presents results of a qualitative study of development assistance for off-grid renewable energy in Central America. The research involved six months of field research with RET organisations in El Salvador, Honduras and

Nicaragua (Kruckenberg, 2015). This article 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 NGO partnerships deal with the 'wicked' nature of RET interventions, and how their partnership are shaped by the ways in which they managed and negotiated 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 the acronyms of 'Northern NGO' (NNGO) and 'Southern NGO' (SNGO) when referring to the partner organisations. This partnership is presented in the next section.

3.6 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.

3.6.1 Partnership Map Based on the Framework

Figure 3-2 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 3.3 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.
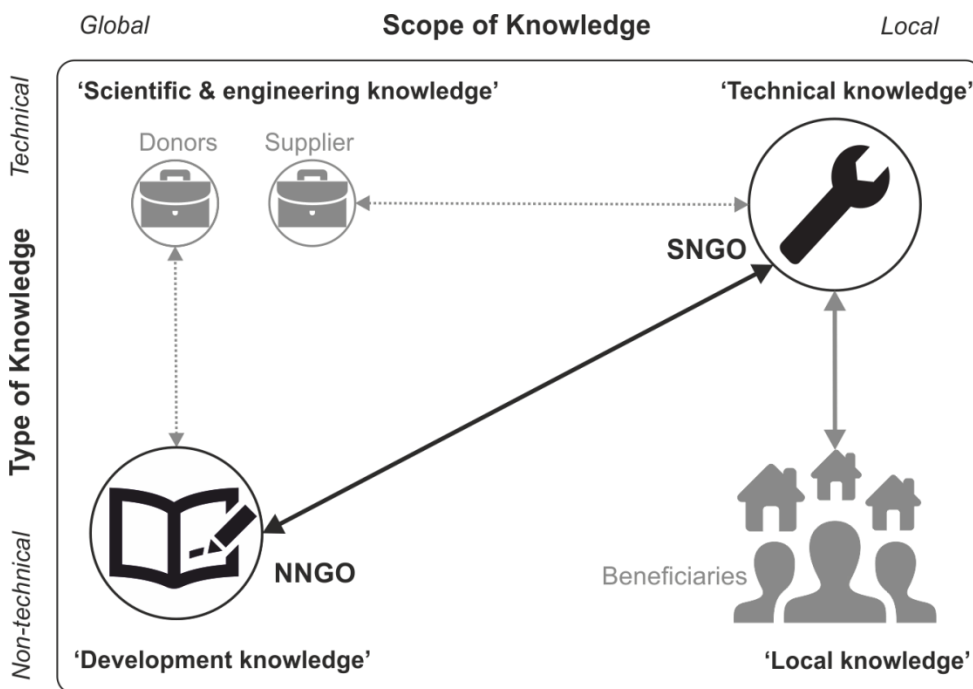
Figure 3-2: Partnership map of P4SE between NNGO and SNGO (Source: Author)

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.

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 Figure 3-1 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 3.6.2, 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 3.7.

3.6.2 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. First, 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. Second, 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. Third, 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 SNGOs 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.

3.7 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.

First, 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.

Second, 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, third, 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 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).

Fourth, 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, Brown, & Jean Isabella, 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).

3.8 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 partners' knowledge, when evaluating its potential "through the eyes of the involved people with their diverse roles at different societal levels" (Ulsrud, Winther, Palit, Rohracher, & Sandgren, 2011, p. 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 article 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. Figure 3-3 gives a schematic overview of the tool, which combines the framework for assessing knowledge challenges presented in Sections 3.3 and 3.6.1 of this article with interactive methods for mapping governance networks (Schiffer & 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 Figures 3-1 and 3-2 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.

Stage	Questions for Discussion	Exercise
I. PARTNERSHIP	1. What sustainable energy problem does this partnership address? 2. Who is involved? 3. Who knows about this problem or is affected by it but is not involved?	*Identify problem, actors & objective*
II. KNOWLEDGE	1. What do partners know about the problem and how does this knowledge relate to their experience and vision? 2. Whose knowledge is important? For what? 3. What are the knowledge challenges/ gaps?	*Map actors onto knowledge map*
III. RELATIONS	1. How are the different partners connected? 2. Who is in a position of power? Why? 3. How can power imbalances be addressed?	*Draw relations & identify power relations*
IV. OUTCOMES	1. How can the identified knowledge challenges be met? What could be principal reasons for failure? 2. Who decides whether the partnership is/was a success (and how)? 3. What outcomes have to be achieved (and when) for the partnership to be considered successful?	*Clarify expectations & outcome assessment*

Figure 3-3: Participatory tool for assessing knowledge-power relationsin P4SEs
(Source: Author)

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).

3.9 Conclusion: Negotiating Knowledge in Partnerships for Sustainable Energy

This article 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 article 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 & Webber, 1973; Weber & 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 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 article 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 article 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).

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Chapter 4: Beyond the Matrix – Visual Methods for Researching Inter-organisational Embeddedness and Networks

Lena J. Kruckenberg & Christian Stein[56]

Abstract

Visual network research opens up new avenues for investigating how organisations are embedded in, and navigate, the various relationships connecting them to other organisations. This article outlines how digital and hand-drawn network maps can be used for researching inter-organisational embeddedness and networks. It presents a typology of three methods for visual network research: Participatory network mapping, network map interview and visual network survey. Drawing on two empirical studies, it demonstrates how these methods can be used for the collection and analysis of relational data, and how they can be integrated in qualitative and mixed method research designs. Based on a discussion of some of the practicalities and limitations of visual methods for researching (inter-) organisational embeddedness, the article indicates their potential for more agency- and process-oriented network research.

4.1 Introduction

Organisations are not islands. Their ability to access resources depends on networks of relationships connecting them to other organisations (Pfeffer & Salancik, 1978). Given the attention inter-organisational alliances, multi-stakeholder partnerships and network governance have received in the past decades, it is not surprising that the literature on the inter-organisational domain has grown both in size and scope (Brass, Galaskiewicz, Greve, & Tsai, 2004; Cropper, Ebers,

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56 This methods article was developed, written and revised by the doctoral candidate as a single-authored piece. The second author Christian Stein kindly provided two additional empirical examples from his own research which strengthened the article. He also commented on previous drafts and invited colleagues to do the same. At the time of writing, the article is under review with *Organizational Research Methods.*

Huxham, & Ring, 2011). Whereas in the past, concepts such as 'inter-organisational network' and 'inter-organisational embeddedness' were metaphors for the interdependent nature of organisations, since the 1990s they have been used as analytical constructs for empirical research into patterns of relationships between and among organisations (Bergenholtz & Waldstrøm, 2011; Cropper et al., 2011). Research on the inter-organisational domain has developed in differentiated ways, with 'connectionist' approaches focusing on the content or *quality of relationships* between organisations, and 'structuralist' approaches bringing into focus their *structural configuration* in networks (Borgatti & Foster, 2003). The resulting fragmentation of the literature has left gaps in our understanding of how organisations are embedded in, and navigate strategically, networks of various kinds of inter-organisational relationships (Baker & Faulkner, 2002; Bergenholtz & Waldstrøm, 2011). Repeated calls have been made to transcend the connectionist/structuralist divide, but this would require the development of methods enabling a simultaneous investigation of the content of different kinds of relationships and their structural configuration in networks (Borgatti, Brass, & Halgin, 2014, p. 5; Cropper et al., 2011; Jack, 2010). This article outlines the potential of visual methods for addressing this methodological gap.

Visual methods have a long-standing tradition in network research, where visual representations of patterns of social relations can facilitate the collection and analysis of relational data (Freeman, 2000; Schönhuth & Gamper, 2013a). Dedicated methods for the visualisation of quantitative relational data on social networks have significantly advanced our understanding of social networks (Carrington & Scott, 2011; Knox, Savage, & Harvey, 2006). In contrast, qualitative methods for visualising and analysing social networks using network maps or 'sociograms', once prominent among the founders of network research, for a long time received comparatively little attention (Hogan, Carrasco, & Wellman, 2007). Over the past decade this imbalance has been addressed by scholars developing visual methods for research into personal networks (Gamper, Schönhuth, & Kronenwett, 2012; Hogan et al., 2007; McCarty, Molina, Aguilar, & Rota, 2007). A small number of researchers, including the authors, are now using visual methods in research into the inter-organisational domain (Author 2014; Conway & Steward, 1998; Eckenhofer, 2013; Schiffer & Hauck, 2010). In this article, we draw on this research to demonstrate the potential of visual methods for bridging the connectionist/structuralist divide. We aim to make three contributions. First, we introduce current developments in visual network research to an audience of organisation studies scholars. Second, we present a new typology that

systematises contemporary approaches to visual network research. Third, we outline three methods that are particularly pertinent for researching inter-organisational embeddedness and networks. We demonstrate the potential and limitations of these methods and indicate how visual network research can open up new avenues for enhancing our understanding of the ways in which organisations are embedded in, and navigate, relationships with other organisations.

We proceed by providing an overview of established approaches for research into the inter-organisational domain. We identify a conceptual and related methodological gap that has inhibited the development of methods that allow for combining an in-depth examination of inter-organisational relationships with an analysis of their structural configuration. In the second part of the article, we then show how visual methods could contribute to such research and enhance our understanding of inter-organisational embeddedness. We outline three methods involving the use of network maps: Participatory network mapping, network map interview and visual network survey. Drawing on three empirical examples, we discuss the merits, challenges and limitations associated with the presented methods, and demonstrate how they can extend existing approaches to Social Network Analysis and qualitative network research.[57] We conclude by indicating the potential contribution of visual methods to a more agentic and process-oriented research on inter-organisational embeddedness and networks.

4.2 Researching Inter-organisational Embeddedness: Connectionist and Structuralist Approaches

When studying inter-organisational embeddedness, researchers investigate how the ways in which organisations relate to other organisations enable or constrain them in their operations (Baker & Faulkner, 2002). This may involve a) an inquiry into the quality or content of the different relationships that connect an organisation to other organisations (*relational embeddedness*); b) an analysis of the structural configuration of such relationships and the relative position an organisation occupies in a network (*structural embeddedness*); and c) an investigation of the inter-subjective meanings attached to both relationships and network structures (Fuhse & Mützel, 2011; Gulati, 2007; Kilduff & Tsai, 2003; Rowley, Behrens, &

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57 Social Network Analysis (SNA) is an umbrella term widely used for methods for the formal analysis of quantitative relational data, whereas social network research may involve the study of both quantitative and qualitative relational data.

Krackhardt, 2000; Uzzi, 1997). Before outlining the potential of visual methods for enhancing our understanding of inter-organisational embeddedness, we need to address some of the challenges involved in researching inter-organisational relationships and networks.

Inter-organisational relationships evolve along trajectories of interactions between members of different organisations (Oerlemans, Gössling, & Jansen, 2007). To a larger or lesser extent, inter-organisational relations are intertwined with interpersonal relations (Sorenson & Rogan, 2014). Trajectories of shared experiences are 'storied' as relationships between organisations that give an inter-subjective meaning to past interactions and prescribe rules for future engagement (Crossley, 2010; White, 1992). Therefore, interactions across organisational boundaries are often presented as being determined by the embeddedness of organisations - but they also amount to *agency* in that they can be purposeful and infused with strategy (Emirbayer & Goodwin, 1994; Johanson & Vahlne, 2011). The very notion of embeddedness points to the tension between structural and agentic accounts which characterises this field (Granovetter, 1985; Gulati & Srivastava, 2014). Inter-organisational networks exist as patterns of inter*actions*, but also as cognitive maps, which to some extent shape or constrain these interactions. This gives rise to a number of conceptual and methodological challenges when we investigate them empirically (Mehra et al., 2014; White, 1992). Whether data on inter-organisational relationships are derived from observations or documents, or reported by members, they are vulnerable to criticism regarding the accuracy and completeness of the sources they are based on, and the judgments involved in their abstraction and standardisation (Edwards, 2010; Salancik, 1995). As we will see below, methods for data collection vary in the degree of control researchers have over the process of abstracting and standardising relationships (McKether, Gluesing, & Riopelle, 2009).

Empirical research on networks between organisations has been labelled 'connectionist' when it focuses on the content, quality and meaning of relationships between organisations (Borgatti & Foster, 2003; Oerlemans, Gössling, & Jansen, 2007). From the connectionist perspective, an organisation is embedded in a network of multiple and multifaceted relationships with other organisations (Hollstein, 2011; Jack, 2010). An in-depth analysis of the diverse relationships maintained by one organisation allows for examining the interdependent nature of these relationships. For example, problems encountered in an alliance may lead to attempts at strengthening the relationship with a supplier. However, qualitative relational data that can inform an in-depth analysis of large inter-organisational

networks are difficult to collect, store and analyse in systematic ways, which has limited the contribution of qualitative network research to our understanding of *network structure*.[58]

In contrast, structuralist network research (and in particular SNA) focuses on the formal analysis of large datasets of quantitative relational data usually stored in data matrices. Like tables with columns and rows for each actor, adjacency or 'connection' matrices record whether or not a particular type of relationship connects sets of organisations. From a structuralist perspective, an organisation is embedded not in one, but in multiple inter-organisational networks ('multiplexity') - each of them composed of a different type of relationship. For example, a firm may be seen as embedded in a network of collaborations, in a network of loose 'networking' relationships, and a network of arm's length market relationship. These networks may overlap to some extent, but they are unlikely to be fully congruent: the firm may have a collaborative relationship with some of its suppliers - but not with all of them. Notwithstanding such differences, a formal analysis (SNA) of any of the three networks would be based on the assumption that all instances of one type of relationship are sufficiently similar to be treated as if they were the same. [59] From a structuralist perspective, differences exist in the multiplicity of relationships established between different sets of actors – not in the relationships themselves (Shipilov & Li, 2014). Formal models of network structure also fall short of revealing how organisations navigate actively the relationships that connect them to other organisations, "and what kind of collective or corporate action flows form the organisation of [such] links" (Stinchcombe, 1990, p. 381).

Whereas connectionist research has been criticised for missing the larger picture of the 'wood' by focusing on the individual 'tree' of relational content (and related intentions), one could argue that structuralist research bears the opposite problem of mapping the wood but missing the trees (Crossley, 2010; Jack, 2010; Oerlemans, Gössling, & Jansen, 2007, Stinchcombe, 1990). The two approaches can be seen as two alternative responses to the same practical problem: while the number of relations connecting large networks are too high for each relationship to

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58 Of 11,400 publications on 'inter-organisational networks' listed on Google Scholar, only 29 referred to 'qualitative network research' or 'qualitative network analysis' (string searches conducted in April 2015).

59 This assumption is not without problems (Emirbayer & Goodwin, 1994). As shown by Bearman and Parigi's (2004), widely reported differences in the composition of personal networks might have been an artefact of a well-established survey question used in the collection of network data.

be examined in detail, small networks are by definition limited when it comes to the investigation of more complex structural features. Figure 4-1 below gives an overview of approaches for calibrating this underlying trade-off between connectionist and structuralist approaches when researching inter-organisational embeddedness and indicates how different conceptual frameworks correspond to methodological choices.
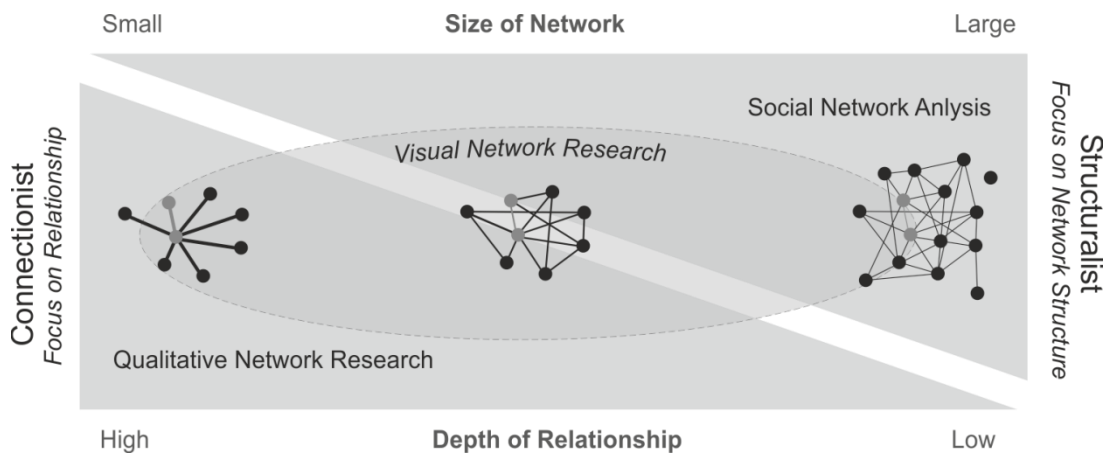
Figure 4-1: Approaches for researching the inter-organisational domain (Source: Authors)

A qualitative study of one type of *dyadic relationship* can advance our understanding of relational embeddedness (i.e. the quality or content of relationships), but not of structural embeddedness (i.e. the structural configuration of such relationships). An analysis of the same dyad within the context of an *organisational network* (network illustrated at the left-hand side of the figure) bears only an implicit structural dimension, as it allows for examining how the relationships that constitute an organisational network relate to one another. For example, one could explore how an organisation's market relationships grow into, or affect, the development of collaborative ties. As 'egocentric networks', organisational networks imply a focus on one organisation ('ego'), its relationships with other organisations ('alteri'), and, depending on the design, the relationships between these organisations (Gulati, Dialdin, & Wang, 2002; Hennig, Borgatti, Krempel, & Schnegg, 2012). Only when the relationships between alter organisations are included in the analysis (network illustrated in the centre of the figure), the structural embeddedness of an organisation can be examined more fully (Bellotti, 2015; Hogan et al., 2007). For example, firms embedded in sparsely connected networks are more likely to arbitrage non-redundant information

exchanges – but for this to become apparent, alter-alter relationships have to be analysed in a systematic way (Burt, 1992). With its predominant focus on the analysis of *whole inter-organisational networks*, Social Network Analysis (illustrated at the right-hand side of the figure) can extend our understanding of structural embeddedness through an investigation of an organisation's relative position within a wider network (Bellotti, 2015; Gulati, 2007).[60] However, such formal analysis requires the standardisation of relationships (illustrated by relationships drawn in thinner lines), which limits insights into relational embeddedness.[61]

Figure 4-1 illustrates how research into the inter-organisational domain has evolved on the basis of distinct perspectives, frameworks and methods that emphasised either one or the other side of this trade-off. The resulting connectionist/structuralist divide has limited our understanding of inter-organisational embeddedness and the ways in which organisations co-evolve within configurations of different kinds of relationships with other organisations (Baker & Faulkner, 2002; Cropper et al., 2011; Jack, 2010). It is the objective of this article to indicate the potential of *visual network research* for bridging this gap as indicated in the figure by the light grey ellipse spanning the entire continuum from connectionist to structuralist network research approaches.

4.3 Visual Network Research

What sets visual network research apart from other forms of network research is the use of network visualisations or 'network maps' in both data collection and data analysis. Network maps lend themselves to the collection and verification of qualitative and quantitative relational data in ways perceived to be more engaging

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60 Focusing on inter-organisational embeddedness, in this paper we adopt an insider view on organisational networks as the 'egocentric' networks of individual organisations (Gulati, Dialdin & Wang, 2002). In contrast, inter-organisational networks can comprise multiple organisations of which some are not, or at least not directly, connected with one another (Baker & Faulkner, 2002). Interpersonal or multi-level conceptualisations of inter-organisational networks are beyond the scope of this paper.

61 Comparative research into dyads and organisational networks as 'social capital' often treat the presence of particular (standardised) ties and structural features as attributes of organisations, and employ statistical methods to analyse how performance measures (or other organisational features) vary between organisations that differ in these attributes (Fuhse & Mützel, 2011; Rowley, Behrens & Krackhardt, 2000). Such variable-centred approach differs from the network perspective adopted in this paper.

than a standard network survey (Hogan et al., 2007; Melville et al., 2015).[62] Network maps allow for the visualisation of several 'visual variables' such as actor attributes in the form of icons in different shapes, sizes, and colours; relational attributes as lines varying in strength, colour and direction (arrows); and contexts, for example through the use of pre-structured templates compartmentalising a network into different segments (Conway & Steward, 1998; Gamper et al., 2012). Network maps can stimulate narrative accounts of how different relationships and networks enable or constrain agency, and therefore may be seen as part of an emerging dialogical approach to visual data in organisational research (Hollstein, 2011; Meyer, Höllerer, Jancsary, & van Leeuwen, 2013).

In data analysis, they can render visible patterns of relationships difficult to spot when examining other relational data, in this way enabling us to take network research beyond the formal analysis of network matrices (Mehra et al., 2014; Straus, 2013).

Based on a review of the literature on visual network research and network maps (Hollstein & Pfeffer, 2010; Schönhuth & Gamper, 2013b; Straus, 2013), and our own experiences in working with such methods, we have developed a typology of three principal methods for visual network research: participatory network mapping, network map interview, and visual network survey. At first glance, the three methods appear rather similar. They all use actor-generating questions for identifying the organisations constituting a given network, in this way determining its boundaries. Network maps are then created by drawing actors on a sheet of paper or screen (if a digital devise is used), and connecting them with lines representing different types of relationships. Follow-up questions and an initial interpretation and validation of the map complete the data collection process. Beyond this common procedure, however, participatory network mapping, network map interview and visual network survey differ in a number of important respects, including in the visualisation process, the role of the researcher in this process, the main analytical focus as well as procedures for data collection and data analysis. Table 4-1 provides an overview of the methods, which we briefly introduce below before presenting three empirical examples in greater detail.

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62 Recent research has confirmed that social networks tend to be recalled as triads or groups, but not as dyads, which speaks to the use of network maps in data collection (Brashears & Quintane 2015; Mehra et al. 2014). Hogan and colleagues (2007) compared the use of standardised network maps to a conventional survey method and found network maps to deliver accurate relational data.

Participatory Network Mapping lends itself for exploring perceptions of embeddedness, and how they relate to notions of agency (Schiffer & Hauck, 2010). Predominantly used in group settings, participatory network mapping aims at the (co-)creation, discussion and joint interpretation of network maps made from simple materials with the aim of generating new insights for participants as well as the researcher. Researchers encourage participants to move from the description of specific encounters and practices to their elaboration as relationships and networks (Emmel & Clark, 2009). A low degree of standardisation allows for an open and flexible mapping of 'egocentric ' and 'whole' network maps, in this way facilitating enquiries into perceptions of relational and structural embeddedness (Emmel & Clark, 2009; Schiffer & Hauck, 2010). However, caution must be exercised when working with maps of large and complex networks, as the accuracy of reported relationships beyond the immediate environment is likely to decrease with social distance (Krackhardt & Kilduff, 1999). Due to their lack of standardisation, 'freehand' network maps cannot readily be translated into connection matrices for quantitative analysis, but they can be analysed as primary data allowing for more direct insights into perceptions of embeddedness which otherwise can be difficult to obtain (Edwards, 2010; Hollstein & Pfeffer, 2010).

	Participatory Network Mapping	**Network Map Interview**	**Visual Network Survey**
Approach	*Participatory*: Participants produce network maps in an interactive process	*Conversational*: Interviewees map network within the context of a semi-structured interview	*Survey*: Researcher/ software creates map based on responses to questionnaire
Role of the Researcher	Facilitator	Interviewer	Administrator
Main Analytical Focus	*Reflexive*: Focus on respondents' cognitive maps of networks & perceptions of embeddedness and agency	*Relational*: Focus on 'storied relationships'	*Comparative*: Focus on patterns of relationships and comparisons between networks
Map in Data Collection	Network mapping guides reflection & discussion	Focus on narratives elicited by drawing process	Map used for verifying quantitative and qualitative relational data
Data Analysis	Network maps interpreted by research participants; visual analysis of maps drawing on documentation of process	Network maps analysed in conjunction with interview recordings/transcripts, observational records	Network maps as tool for comparative analysis of qualitative and quantitative relational data

Table 4-1: Overview of methods for conducting visual network research

In a ***Network Map Interview***, a network map is drawn by either the participant or the researcher in the context of a semi-structured interview (Conway & Steward, 1998; Hogan et al., 2007). Some guidelines for this process form part of the interview schedule, which is why maps tend to feature some structured or even standardised elements. For example, maps of egocentric networks are often based on network templates on which 'ego' is located at the centre of concentric circles representing the relative closeness or importance of alters to ego – a technique that was originally developed for the analysis of personal support networks (Kahn & Antonucci, 1980). Software packages like EgoNet.QF, E-NET, VennMaker and NetCanvas support the creation of digital network maps on a computer, tablet or digital white board (Gamper et al., 2012; Halgin & Borgatti, 2012; Melville et al., 2015; Straus, Pfeffer, & Hollstein, 2015). Network map interviews lend themselves for the in-depth exploration of relational embeddedness, as interviewees are asked to reflect on similarities and differences between relationships. This enables the comparison of multiple 'storied relationships', which can illuminate the ways in which actors navigate different kinds of relationships when pursuing certain objectives. Narrative data obtained throughout the drawing process may be seen as important an outcome as the map itself.

Visual network surveys aim at the creation of standardised network maps through what has been termed 'sociometric questioning' (Zwijze-Koning, 2005). Data collection takes place in the context of a highly structured interview process, which combines elements of a conventional network survey with visual elements (Hollstein & Pfeffer, 2010). Most visual network surveys involve the collection of both qualitative and quantitative relational data (Gamper et al., 2012). Specialist software packages translate survey responses into network maps, which are then presented to respondents for verification and further evaluation (Gamper et al., 2012; Melville et al., 2015). Whereas respondents seem to experience visual network surveys as more engaging than conventional network surveys, the highly structured process and use of predetermined templates are likely to limit their identification with the map (Hogan et al., 2007; Hollstein & Pfeffer, 2010). Depending on their design, visual network surveys create maps of egocentric or whole networks that can be translated into connection matrices. This makes visual network surveys the method of choice for formal cross-sectional and longitudinal investigations of embeddedness (Lubbers et al., 2010).

4.4 Using Visual Methods for Researching Inter-organisational Embeddedness

In this section, we present one empirical example for each of the methods introduced above. Drawn from two different studies, the examples indicate the potential of participatory network mappings, network map interviews and visual network surveys for researching inter-organisational embeddedness. They also demonstrate some of the practicalities involved in using these methods, how they can be combined with each other, and used in the context of different research designs. Table 4-2 below provides an overview of the three examples.

In the first study, *participatory network mapping* and *network map interviews* complemented Social Network Analysis in a two-stage investigation of an inter-organisational network of public, private and third sector organisations governing natural resource management in the Upper Blue Nile region of Ethiopia (Stein et al., 2014). In the first phase of this research, quantitative relational data had been collected on a whole inter-organisational network of 85 organisations. The resulting connection matrices had been analysed using SNA. In the second phase, participatory network mapping and network map interviews were used as two distinct but complementary methods for contrasting the structural insights gained in the first phase with an inquiry into the meanings attached to different relationships and network configurations. This allowed for complementing what had been a study of structural embeddedness with an in-depth analysis of relational embeddedness.

4.4.1 Participatory Network Mapping

Participatory network mapping was conducted using Net-Map, a tool for mapping multi-actor governance arrangements (Schiffer & Waale, 2008). Groups of 8-10 research participants created network maps on large sheets of paper. Two researchers assisted each group and took notes documenting the process. Research participants discussed and then chose the specific topic of their respective maps within a broader framework determined by the researchers. Participants were invited to write on sticky notes the names of organisations that in their view influenced the particular topic/issue of the map (for example, 'who influences agricultural water management in the study area?'). They were then asked to place the sticky notes on a large sheet of paper and to draw in collaborative relationships connecting these organisations (see Figure 4-2 for a photograph of one of the maps). In a third step, research participants placed stacks of checker pieces on the map in order to indicate the relative power of different

actors in the network. A joint interpretation of the network maps completed the process.

Participatory network mapping proved to be a useful method for exploring relational embeddedness in an interactive and reflexive process. The Net-Map method encouraged active participation but at the same time provided for some degree of structuration. As many of the participants came from organisations included in the map, the mapping process encouraged them to reflect on the embeddedness of their own organisation, and to consider their objectives, strategies and activities in the context of what was done by others. The network map helped to keep the discussion focused on the quality, content and implications of different relationships and problems associated with cross-sector coordination. After the workshop, all network maps were digitalised using the software package Visone. Digitalisation enhanced clarity and enabled further visual analysis. For example, the use of layout algorithms allowed visualising nodes that were connected closer to one another while pushing unrelated nodes further apart. This facilitated the identification of more interconnected groups of organisations as well as key actors. However, many important findings had already emerged during the workshop. For example, tensions between centralised planning and more self-organised governance mechanisms had come to the fore. The discussion of the network maps with the research participants extended into an ex-post analysis of the observational records and digitalised maps. This yielded insights into how these tensions inhibited effective cross-sector coordination in the Upper Blue Nile region.
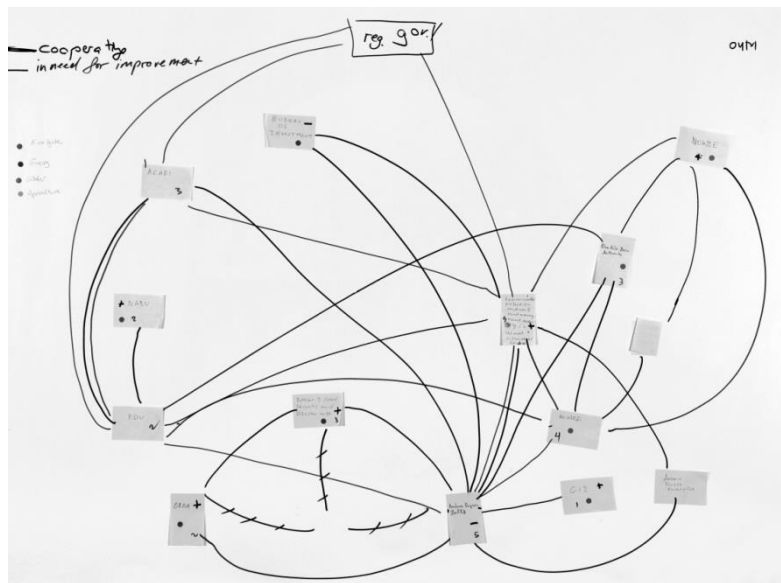
Figure 4-2: Net-Map network map on ecosystem management

4.4.2 Network Map Interview

With the participatory network mapping focusing on actors' perceptions of the whole network, the second visual method - *network map interviews* - aimed at obtaining rich data on the organisational networks of seven governmental organisations that had been identified as key actors. Network map interviews were conducted in order to better understand the opportunities and constraints associated with the relational embeddedness of each of these organisations. Groups of three to four high-level representatives of relevant departments within the same ('ego') organisation were interviewed using a semi-structured interview guide and network map template. On the template, the 'ego' organisation was illustrated as a small circle at the centre of three concentric circles, which indicated the relative importance of an organisation to the respondents' organisation (i.e. the closer, the more important). The template map was further divided into four sub-sectors representing four policy domains (water, agriculture, ecosystems and energy, see Figure 4-3 below for illustration). The maps were drawn on paper in order to enable interviewees to participate more actively in the creation of the network map.

The network map interviews proceeded in three steps. First, interviewees were asked to note on sticky notes the names of organisations in their organisation's network, and to place these notes on the template while taking into consideration the main policy domain of the organisation named on the note, and its importance to the ego organisation. Second, the interviewees were asked to indicate whether or not their organisation was connected to each of the named organisations through flows of funding, information exchange, and collaboration. One by one, the three types of relationships were drawn in. Interviewees were also asked to identify relationships they considered to be in need for improvement. Third, the finalised map was used to explore the quality, content and implications of some relationships in greater detail, followed by a discussion of how the embeddedness of the organisation affected its operation and ability to coordinate activities with others. The map proved to be useful for comparing different relationships, but also provided an opportunity to discuss the absence of relationships that could improve coordination. Given that the structural embeddedness of each of the organisations had already been analysed using SNA, alter-alter relations were only considered where interviewees deemed them important. The semi-structured interview process and template map facilitated comparisons between relationships. However, a number of interviewees struggled to identify the main policy domain of some of their alter organisations, indicating that the boundaries of 'policy silos' were more fluid

than anticipated. A few participants changed their mind about the relative importance of organisations when they considered different types of relationships. After the interview, the multiplex network maps created in the interviews were digitalised and disaggregated using the software package VennMaker (see Figure 4-3 below). By focusing on one type of relationship at a time (e.g. funding flows), common patterns became easier to detect, which also facilitated comparative analysis. This led to the identification of organisations that served as gatekeepers for several organisations. While these organisations channelled resources and enabled some degree of indirect coordination, their presence also appeared to obstruct 'partnership innovation' and the development of new – and perhaps more effective – mechanisms for inter-organisational coordination.
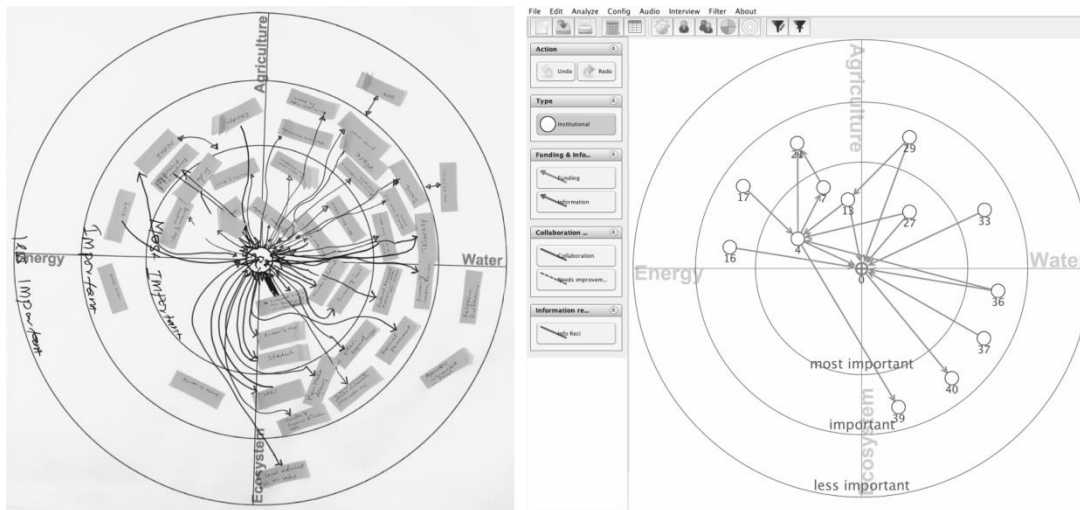
Figure 4-3: Paper-based ego-centric network map created in network map interview and digitalised and disaggregated map created with software package VennMaker

In a second study, a visual network survey was designed to complement a qualitative inquiry into renewable energy partnerships in international development assistance. Based on semi-structured interviews, participant observation and document analysis, the first phase of this research had revealed the important role of local for-profit and non-profit renewable energy organisations in partnerships for off-grid renewable energy (Kruckenberg, 2015). However, it had been more difficult than anticipated to gain an overview of how these small enterprises navigated networks populated by public, private and third sector organisations.

	Participatory Network Mapping	Network Map Interview	Visual Network Survey
Visualisation in Data Collection	Researcher-facilitated participatory mapping exercise based on 'Net-Map' tool (Schiffer & Waale, 2008). Paper-based maps of entire multi-stakeholder networks as perceived by participants; some degree of structuration & standardisation. Map facilitated communication between participants	Semi-structured interview revolving around creation of hand-drawn egocentric map based on structured and semi-standardised template. Map guided interview and enabled in-depth discussion with researcher on relationships and relational embeddedness	Survey alternating questionnaire elements with network mapping. Fully standardised digital maps of organisational networks; created by researcher using software. Process facilitated systematic collection of relational data for comparative analysis; map was used for verification
Analytical Focus	*Reflexive:* Actors' perceptions of multi-stakeholder networks addressing a governance issue, and how actors' embeddedness provides both opportunities and constraints for addressing these issues	*Relational:* Exploration of the relational embeddedness of key organisations and how it conditions operations and opportunities for cross-sector coordination	*Relational and comparative:* Comparative analysis of relational embeddedness & knowledge flows in heterogeneous organisational networks
Data	Paper-based map, observational records, digital map	Paper-based map, observational records, digital map	Digital map, recording of mapping process (software and audio backup)
Visualisation in Data Analysis	Interpretation of map & communicative validation by research participants; digitalisation of paper-based maps (Visone), ex-post analysis of digital network map & observational records	Digitalisation of paper-based maps (VennMaker); disaggregation of relationships; visual analysis of patterns of relations; network maps guiding analysis of narrative data	Audio files coded with QDA software (Atlas.ti); triangulation and preparation of case records; development of analytic maps for comparative analysis using vector graphics editor
Outcomes	Researchers and participants gained a better understanding of how embeddedness facilitates and constrains cross-sector coordination	Detailed understanding of opportunities/constraints for cooperation associated with the relational embeddedness of key actors	In-depth and systematic analysis of relational embeddedness, insights into the role of different types of relationships in technology transfer
Challenges	Difficulties to record process in sufficient detail. Video recording could have enabled more in-depth analysis	Structuration: some relationships did not match a specific sector; perceived importance varied depending on relationship	Technical problems with laptop/software; network maps on laptop screen less accessible than anticipated

Table 4-2: Overview of empirical examples

4.4.3 Visual Network Survey

A *visual network survey* was developed to facilitate an inquiry into the relative importance of different types of relationships for transferring and developing the technical and non-technical knowledge needed to build markets for off-grid renewable energy technologies. With its relatively high level of standardisation, the survey format enabled a comparative analysis of relationships within individual organisational networks, as well as systematic comparisons between the networks of six enterprises. The survey was conducted in an interview setting using a laptop and the software package VennMaker (Kronenwett & Schönhuth, 2011). The software allowed to combine a fully structured questionnaire with drawing elements and open questions (Gamper et al., 2012). As the respondents were either owner-managers or experienced project managers with a background in engineering, the use of a digital tool was deemed appropriate.

The interview process entailed four steps: At the start of the survey, respondents were asked to name all organisations their organisation had worked with in the past three years (additional organisations could be added later in the process). Six closed questions were then asked to determine organisational attributes such as type of the organisation, size, area of operation, and main expertise, as well as the number of years the ego organisation had worked with it, and the relative importance of the relationship for the success of the ego organisation. Based on the responses, the software generated an egocentric network map, which was then presented to the interviewee for verification. Like in the second example, concentric circles illustrated the relative importance of each of the alter organisations to ego. In a second step, respondents were provided with four statements describing a weak 'networking' relationship, a market relationship, a cooperative relationship and a strong collaborative relationship. Descriptions were modelled on how such relationships had been described in in-depth interviews conducted in the first phase of the study. Respondents were asked to select which relationship statements best described the relationship with each of the alter organisations. Open follow-up questions encouraged more detailed responses. After all relationships had been drawn in, the map was once again presented to the respondent. In the third step, respondents indicated knowledge flows between the ego organisation and alter organisations, taking into consideration the type and direction of the knowledge flow. Finally, in the fourth and last step of the survey, respondents were asked questions about the ego organisation, about relationships they considered particularly challenging or rewarding, and about relationships between alter organisations that appeared to them as of particular importance. The entire

mapping process was recorded by the software. However, a 13-inch laptop screen proved to be too small to benefit fully from the various features of the network mapping software. Notwithstanding some technical issues, the richness of the qualitative network data obtained exceeded all expectations. When compared to the in-depth interviews that had been conducted in the first phase of this research, responses to the open questions that had been included in the survey appeared more focused.

Data analysis proceeded in three steps. In the first step, audio recordings of the interviews were coded and analysed using a QDA software package (Atlas.ti), and then triangulated with other qualitative data that had been collected on these same organisation(s) (including previous interviews, observational records of meetings and project documents). This process enabled the verification of the relational data collected via the survey, increased their richness and fed into a structured case record on each network. In a second step, a vector graphic editor was used to design a bespoke template for visual analysis.
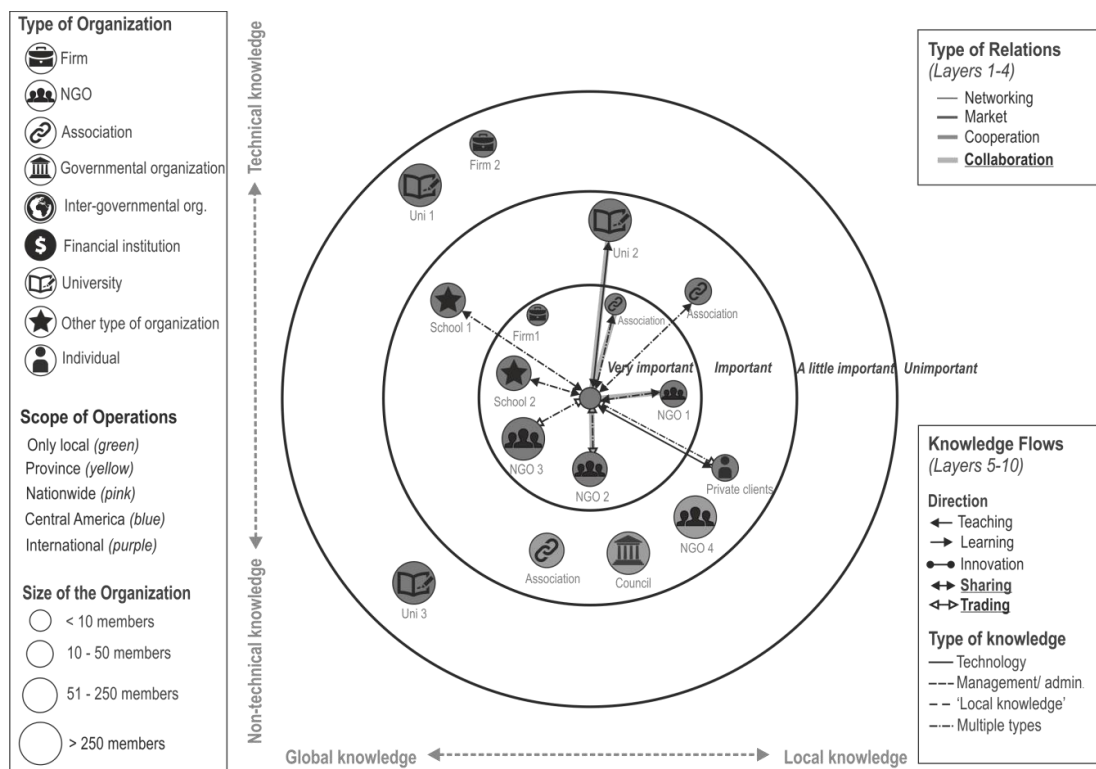
Figure 4-4: Analytical network map created in vector graphics editor (activated: collaboration, knowledge sharing and knowledge trading)

The template was based on the initial map but enabled the simultaneous visualisation of up to five organisational and ten relational attributes. The tool facilitated a systematic analysis of complex patterns of multiplex relationships by overlaying and comparing different sets of relations, yielding insights into what types of relationships enabled what kinds of knowledge transfer and innovation. For example, it became apparent that innovation often took place in relationships that entailed an exchange of technological, as well as non-technical knowledge, and that such exchange could take place in collaborations as well as in long-term arm's length relationships. The comparative analysis of ties within networks was accompanied by the retrieval and re-examination of the case records and coded material, and accompanied by memo writing. In the third and last step, the memos and analytical network maps are now being used in a comparative analysis of the relational embeddedness of the six organisations. Preliminary results show how network composition relates to market building strategies, and indicates that relationships, which at a first glance had appeared rather similar, are used in different ways to pursue distinct strategies.

4.5 Discussion

The three empirical examples presented above provide some indication of how participatory network mapping, network map interview and visual network survey can be adapted and combined in order to accommodate different research interests, analytical frameworks and methodological requirements when researching inter-organisational embeddedness. They illustrate how visual methods can be triangulated with other qualitative methods, as well as form part of mixed-method research designs based on Social Network Analysis. In both studies, visual network research was conducted at the second stage of a two-stage research design. In order to increase complementarity, methods were chosen from the respective opposite end of the continuum between open and fully standardised approaches. In the first instance, participatory network mapping and network map interviews were used to complement a formal analysis of structural embeddedness based on SNA with an in-depth investigation of relational embeddedness. In the second study, a visual network survey was designed to enable a systematic comparative analysis of the relational embeddedness of key actors in an evolving organisational field. In this case, data collected at both stages of the research were included in final data analysis.

The empirical examples also illustrate how different visual methods shape the interface between researcher and participant in distinct ways, ranging from a relatively open and participatory mapping process to the fully standardised (and ultimately researcher-driven) procedure of a network map survey. Such effects may be reinforced or reduced by the choice of data-collection tools.[63] The degree of structuration and standardisation of both procedure and network map has important implications for data collection and data analysis (Hollstein & Pfeffer, 2010). A flexible, unstructured drawing process can be an engaging but challenging experience for research participants (Töpfer & Hollstein, 2015). A structured procedure and standardised map can speed up data collection and deliver outcomes that are more comparable. However, the higher the degree of standardisation imposed by the researcher, the more difficult it becomes for participants to identify with 'their' maps (Hollstein & Pfeffer, 2010; McCarty et al., 2007). Complex maps that visualise multiple 'visual variables', like the one presented in Figure 4-4, may lead to information overload (Straus, 2013).

Moreover, the nature of the map, and what it represents, varies with the degree of standardisation. Freehand network maps may be interpreted as self-generated cognitive aids. Like pictures or photographs, they can be analysed using qualitative methods for visual research (Meyer et al., 2013; Ray & Smith, 2012; Wheeldon & Ahlberg, 2011). Semi-standardised maps are more inter-subjective in nature because their content and design is shaped by both participant and researcher (Eden, 1992). As 'boundary objects', they facilitate communication between researcher and research participant; and they may guide a qualitative analysis of both visual and non-visual relational data. The first two empirical examples illustrate such approach. In the first example, participants interpreted their own maps before researchers analysed these maps taking to account their observations of the participatory mapping exercise and ensuing discussion. In the second example, network maps were used as illustrative devices guiding semi-structured interviews. In both cases, subsequent digitalisation and disaggregation enabled further visual analysis, transforming the hand-drawn maps into analytical tools (Figure 4-3). In contrast, the fully standardised map presented in the third example was designed for data verification and data analysis from the outset. The highly structured interview process guided the interview more than the actual map, which in this case

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63 While concerns have been raised that digital tools can intimidate research participants (Olivier, 2014), according to our experience this depends on the context. For example, situations where research participants had a high exposure to digital technologies can render digital tools more engaging than paper-based methods.

was created by a software package rather than research participants. The template used in data collection was subsequently developed into an analytical tool that facilitated the triangulation and verification of different kinds of relational data (Figure 4-4). Each analytical map 'summarised' the content of a detailed case record, serving an analytic function not too dissimilar from matrix display methods in qualitative data analysis (Conway & Steward, 1998; Miles, Huberman, & Saldaña, 2014).

While the three visual methods presented in this article vary in the degree of standardisation they prescribe, there are also overlaps. For example, both participatory network mapping and network map interview can be used to create freehand or semi-standardised maps. Fully standardised network maps created with a visual network survey can be converted into connection matrices, enabling mixed-methods research. However, the same survey may also include several series of open-ended questions on the content of different relationships. Analytic methods are currently being developed which involve the triangulation of the narrative, visual and quantitative relational data created in visual network surveys. Herz and colleagues (2015) propose a method for 'qualitative structural analysis' that integrates elements of structural analysis based on SNA with established techniques for the analysis of qualitative data, such as sequential analysis, sensitising concepts, and memo-writing. With the advancement of visual network research as a paradigm situated between qualitative and quantitative network research, we hope to see such analytic methods mature, benefitting from cross-fertilisation with literatures on social network analysis, visual methodologies and methods for qualitative network research (Bellotti, 2015; Kilduff & Tsai, 2003; Wheeldon & Ahlberg, 2011).

We now turn to the limitations of visual methods for research into inter-organisational embeddedness and networks. All three examples testify to how visual methods allow for examining relationships in the context of their structural configuration in networks, in this way enabling researchers to address the connectionist/structuralist divide illustrated in Figure 4-1.[64] However, they also suggest that there still is a need to calibrate requirements for depth and detail of relationships with the size of the network one wishes to study. While visual methods

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64 In the second and third example, the structural dimension remained implicit as the research aimed at a systematic enquiry into how the different relationships constituting an organisational network relate to one another; for example, how they enable or prevent cross-sector coordination, and what the implications are of relationships that change or cease to exist for the development of the organisational network as a whole.

facilitate research into interdependent relationships in networks, 10-20 detailed accounts of different relationships, may be seen as the limit for most research participants (Hogan et al., 2007). Researchers seeking detailed insights into relational embeddedness thus face restrictions in the size of networks they can study, or resort to sub-samples of relationships. Standardised visual network surveys can be used to collect data on large and complex inter-organisational networks, arguably making for a more engaging experience for respondents than roster-based sociometric methods (Hogan et al., 2007; Zwijze-Koning, 2005). However, many question the extent to which network maps beyond a certain size can be accurately recalled and verified by respondents. Researchers working with ego-centric network maps face a similar problem when deciding whether or not to include alter-alter relations. Given that a network of just ten organisations can be connected by up to 45 ties, and a network of 50 by up to 1,225, the collection of data on alter-alter relationships can require a significant amount of time and patience from both interviewer and interviewee (McCarty et al., 2007). Depending on the research interest, a thorough examination of ego-alter relationships, and how these relate to one another, may be prioritised over a formal assessment of alter-alter relationships.[65] Attempts have been made to reconstruct whole networks based on aggregated maps of egocentric networks and Net-Maps, like the one presented in Figure 4-2 (Schiffer & Hauck, 2010). The accuracy of such reconstructions requires careful evaluation.

4.6 Conclusion: The Potential and Limitations of Visual Network Research

In this article, we introduced current developments in visual network research to an audience of organisation studies scholars. We presented a typology of three visual methods for researching inter-organisational embeddedness. Drawing on two empirical studies, we outlined how visual methods can be triangulated with other qualitative methods, as well as form part of mixed-method research designs based

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65 Two of the examples did not involve any systematic collection of alter-alter relationships, prioritising an in-depth investigation of relational embeddedness over that of structural embeddedness. In both cases, interviewees were asked to identify alter-alter relations of particular importance to them, but the data created in this way did not lend themselves to a formal structural analysis. In the case of the network map interview, this was not a problem because such analysis had already been performed. However, in the case of the visual network survey this decision implied that the connection matrices created through the survey were of little analytical value.

on Social Network Analysis. Three empirical examples illustrated the ways in which participatory network mapping, network map interview, and visual network survey shape the interface between researcher and research participants in distinct ways, and how these methods lend themselves for the creation of different kinds of network maps. This led to a discussion of some of the implications for how these maps can be analysed, followed by a summary of some of the principal limitations of visual network research. It may be argued that these limitations diminish the contribution of visual methods to Social Network Analysis. This said, some of the principal benefits of visual methods relate to the ways they enable researchers to take network research beyond the structural analysis of connection matrices.

The two studies reported in this article illustrate how visual methods open up new avenues for investigating the ways in which organisations are enabled or constrained by the relationships connecting them to other organisations *without denying their agency*. Inter-organisational relationships and network structures are subject to transformations induced by interactive responses (Emirbayer & Goodwin, 1994). In all three examples, insights were gained into how organisations develop and use relationships and networks. It is not the least this implicit focus on the storied nature of relationships, and how 'storied' relationships inform agency in strategic ways, which makes visual network research a promising approach for scholars in contemporary organisation studies (Ibarra, Kilduff, & Tsai, 2005; Ketchen, Boyd, & Bergh, 2007). The visual network survey and network interviews presented above facilitated an exploration of how different organisations are not merely embedded in, but also develop and use, relationships and networks in distinct ways. Here, the perspective adopted by the researchers was that of an organisation navigating (or managing) its network. In contrast, in the first example, a different stance was taken as research participants were invited to draw and discuss wider issue-related networks. Implying an outside view on an entire inter-organisational network, while still enquiring into the perceptions and strategies of some of its members, the method yielded insights into processes of network governance. As the three examples illustrate, visual network research bears a great potential to researchers who wish to explore inter-organisational embeddedness and networks adopting a more agentic or process-oriented stance to network research at a time of heightened interest in hybrid organisational forms, 'networking', and network governance. We hope that this article has encouraged some of our readers to joins us in further developing and refining of visual methods for conducting network research *beyond the matrix*.

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Chapter 5: Hybrid Organising as a Cross-level Phenomenon – The Embedded Agency of Renewable Energy Organisations Serving the Base of the Pyramid

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Abstract

Organisations have been theorised as hybrid when they combine features of different types of organisations, such as social enterprises. The term 'hybrid organisation' has also been used for inter-organisational arrangements that are governed by principles other than pure hierarchy or market, such as partnerships. Notwithstanding that both conceptualisations of hybrid organising have been related to changes in the sectoral organisation of society more generally, the relationship between the two concepts and related streams of theorising remains unclear. Adopting a micro-analytic approach, we investigate this relationship drawing on qualitative network research on renewable energy NGOs and social enterprises building markets for off-grid technologies in rural Central America. We demonstrate how these organisations combine features of private and third sector organisations and engage in hybrid inter-organisational relationships in order to adapt to – and shape – an environment where sectoral boundaries are contested or of reduced relevance. Based on this research we propose a framework for future research on hybrid organising as a cross-level phenomenon.

5.1 Introduction

As goal-oriented social actors, most organisations resemble ideal-types of organisations characterised by distinct sectoral characteristics: profit-oriented businesses compete in the markets of the private sector; state agencies constitute the public sector shaped by bureaucratic hierarchy; and networks of charitable non-governmental organisations (NGOs) make up the voluntary or 'third' sector (Billis, 2010c; Brandsen & Karré, 2011). Since the 1990s, scholars across the social

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sciences have pointed to a shifting and blurring of boundaries between these sectors as more public services are provided by private businesses and NGOs (Cornforth & Spear, 2010; Eikenberry & Kluver, 2004; Evers, 2005), management practices in public and third sector organisations have come to resemble more closely those of profit-seeking organisations (Maier, Meyer, & Steinbereithner, 2014; Selsky & Parker, 2005), and private businesses discover their social responsibility and adopt social and environmental missions (Aguilera, Rupp, Williams, & Ganapathi, 2007; Parrish, 2010; Shamir, 2008). Based on these observations, two conceptualisations of hybrid organising have emerged. One considers the phenomenon of *hybrid types of organisations* (HTOs) such as public sector spin-offs and social enterprises combine features of formally distinct types of organisations (Battilana & Lee, 2014; Billis, 2010c; Boyd, Henning, Reyna, Wang, & Welch, 2009; Doherty, Haugh, & Lyon, 2014; Jay, 2013; Karré, 2011). The other addresses *hybrid forms of organisation* (HFOs) at the inter-organisational level and examines relations between organisations that are governed by principles other than pure hierarchy or market, such as cross-sector partnerships (Bruce & Jordan, 2007; Jolink & Niesten, 2012; Thompson, 2003).

Notwithstanding that both conceptualisations of hybrid organising have been related to changes in the organisation of society more generally, the relationship between the two concepts and related streams of theorising has rarely been addressed (Battilana & Lee, 2014; Cornforth & Spear, 2010). While discourses on hybrid organising have the potential of transcending disciplinary boundaries, their respective foci on the organisational or inter-organisational level has kept them apart. A resulting lack of cross-fertilisation has inhibited our understanding of why we seem to witness an increase of both hybrid types and hybrid forms of organisations (Adler, 2001; Billis, 2010a; Borys & Jemison, 1989), and how these two phenomena are related.

Adopting a micro-analytic approach, we investigate this relationship. Drawing on qualitative network research on renewable energy organisations promoting off-grid technologies in rural Central America, we present the cases of four hybrid organisations that combine features of private and third sector organisations. By linking international technology suppliers to poor rural end users, these organisations play an important role in developing sustainable energy services for

populations that find themselves at the Base of the Pyramid (BoP).[67] They also connect organisations of different types, and, as we show in this article, their embeddedness in heterogeneous organisational networks enables them to employ distinct market building strategies when engaging with a complex organisational field shaped by hierarchical, market and community forms of organisation.

We make three contributions. First, we review and connect two hitherto unrelated bodies of literature on hybrid organising on which basis we develop the proposition that *organisations may combine elements of distinct organisational types, and engage in hybrid inter-organisational arrangements, in order to adapt to – and shape – an environment characterised by institutional voids and sectoral blurring.* Second, a micro-analytic study of the organisational networks of renewable energy organisations in Central America allows us to confirm and expand on our initial proposition. Adopting a relational approach, and using innovative methods for investigating the embeddedness of organisations in organisational networks, our analysis shows how organisational hybridity can be linked to heterogeneous organisational networks comprising public, private, and third sector organisations. Hybrid inter-organisational relationships are used in strategic ways for market building at the Base of the Pyramid. Third, and based on our analysis and findings, we propose the concepts of *organisational, relational and sectoral hybridity*, which we connect in a framework for investigating hybrid organising as a cross-level phenomenon, and its role in the (co-)evolution of organisations and organisational fields.

We proceed by reviewing conceptualisations of hybrid types of organisations and hybrid forms of organisation drawing on reviews and original work. We identify a theoretical link between these concepts based on the ways in which hybrid organising at both the organisational and inter-organisational level has been related to a blurring of boundaries between the public, private and third sector. We then present the context, research design and methods of a qualitative study of the organisational networks of four hybrid organisations. The presentation of the results of this research focuses on the relational embeddedness and the embedded agency of these hybrid organisations. We discuss how hybrid organising at the organisational, inter-organisational and sectoral level can be seen as inextricably

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67 The Base of the Pyramid is the socio-economic segment that is by and large excluded from the current system of global capitalism and primarily participates in the informal economy (London & Hart, 2011). In Latin America and the Caribbean, the region of particular relevance to this article, this segment includes households with up to US$10 purchasing power parity (PPP) per capita per day in 2005 US dollars (IDB, 2015).

linked, and how an understanding of the former can shed light on the emergence of the latter – and vice versa. Based on this discussion, we propose a framework for investigating the interactions and nested effects of organisational, relational and sectoral hybridity.

5.2 Two Perspectives on Hybrid Organising

Hybridity is a relational concept; it invariably implies comparing and distinguishing between different ideal types (Billis, 2010c). The term 'hybrid' is most commonly used to refer to social and cultural phenomena that (re-)combine distinct elements in a way that seems persistent rather than transitionary (Battilana & Lee, 2014). In organisation research, a growing but fragmented body of literature considers *hybrid types of organisations* (HTOs) combining features of public, private and/or third sector organisations, such as trading charities or government-sponsored enterprises (Boyd et al., 2009; Doherty et al., 2014; Jäger & Schröer, 2014; Karré, 2011). Another literature discusses *hybrid forms of organisation* (HFOs) at the inter-organisational level, where the concept is used to denote configurations of inter-organisational relationships which deviate from primarily hierarchical or market-based forms of socio-economic order, such as partnerships or associations (Bruce & Jordan, 2007; Jolink & Niesten, 2012; Ménard, 2004). While the two conceptualisations by and large have been developed independently from one another, they offer complementary insights. In the following section we review and bring into dialogue the two literatures on HTOs and HFOs, with the aim to provide insights into how they relate to one another.

5.2.1 Hybrid Types of Organisations

A growing number of scholars point to shifts in the form and identity of organisations (Billis, 2010a; Schreyögg & Sydow, 2010). Changing or disintegrating boundaries between the private, public and third sector have been related to the emergence of *hybrid types of organisations* combining features from different types of organisations (Billis, 2010c; Doherty et al., 2014; Smith, 2014). Albeit persistent by definition, organisational hybridity has been found to be dynamic rather than static in character (Cornforth & Spear, 2010). Prominent examples of HTOs include social enterprises pursuing profits as well as a social or environmental mission, and 'quangos' – quasi non-governmental organisations that are funded by governmental agencies (Battilana & Lee, 2014; Billis, 2010c; Boyd et al., 2009; Doherty et al., 2014; Haigh & Hoffman, 2012).

Hybrid organisations are identified by comparing different organisational types (Billis, 2010c; Brandsen & Karré, 2011). These ideal-types are usually distinguished with reference to the distinct institutional logics characterising the public, private and voluntary sector (Billis, 2010c; Karré, 2012): Formal and hierarchically structured agencies make up the public sector, profit-seeking private firms compete in markets constituting the private sector, whereas the third sector comprises more informal not-for-profit NGOs engaging with civil society.[68]

Private, public or third sector organisations derive their status as distinct social actors "from the expectations of others, including the state, individual members of the [organisations themselves] and other stakeholders and audiences who monitor and hold them accountable for their actions" (King, Felin, & Whetten, 2010, p. 292). Once the type of an organisation has been identified, associated points of reference enable predictable interactions within organisations as well as between them (King et al., 2010). While organisations vary in the degree to which they match the ideal-type, in most cases the resemblance is sufficient to allow members and outsiders to identify their type and the sector to which they belong (Billis, 2010c; Brandsen, van de Donk, & Putters, 2005). HTOs challenge this tripartite order. They combine features of distinct organisational types and relate to different institutional logics in a way that they cannot easily be classified, and therefore lack an unequivocal association with any of the three sectors.

Based on van de Donk (2001), Figure 5-1 depicts the tripartite heuristic and illustrates why hybrid organisations call for an extension of this well-established framework. The three corners of the triangular figure open up a relational space, structured by three lines demarcating sectoral boundaries based on key features such profit versus mission orientation, the division between a public and a private sphere, and predominantly formal versus informal forms of organising. According to this framework, organisations that can be positioned close to the corners of the triangle represent ideal forms of private, public or third sector organisations. In the centre of the figure, a circle indicates the existence of a hybrid space (HS) where

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68 While the characteristics of public and private sector organisations are widely agreed upon, third sector organisations tend to be described in terms of what they are not (i.e. non-governmental, non-profit). Positively defined criteria such as membership association, volunteering or an informal status vary between frameworks. As a result, frameworks that are based on a tripartite distinction between public, private and third sector organisations tend to resemble one another without necessarily being fully congruent (Billis, 2010a; Brandsen & Karré, 2011; Karré, 2012).

the dichotomous boundaries appear blurred.[69] There is "no generalised theory on how [this analytic space] 'between the sectors' can be conceptualised" (Jäger and Schröer, 2014, p. 1287). Moreover, there is no consensus whether hybrid organisations cross boundaries in an active effort (i.e. resisting the tripartite order) or whether they can transgress such boundaries because the boundaries themselves lack relevance in the hybrid organisational space these organisations occupy. Brandsen and colleagues (2005) reflect on this issue when they discuss hybrid organisations as griffins (i.e. mystical beast combining features of different animals) and as chameleons (i.e. animals changing the colour of their skin to blend in with their environment).
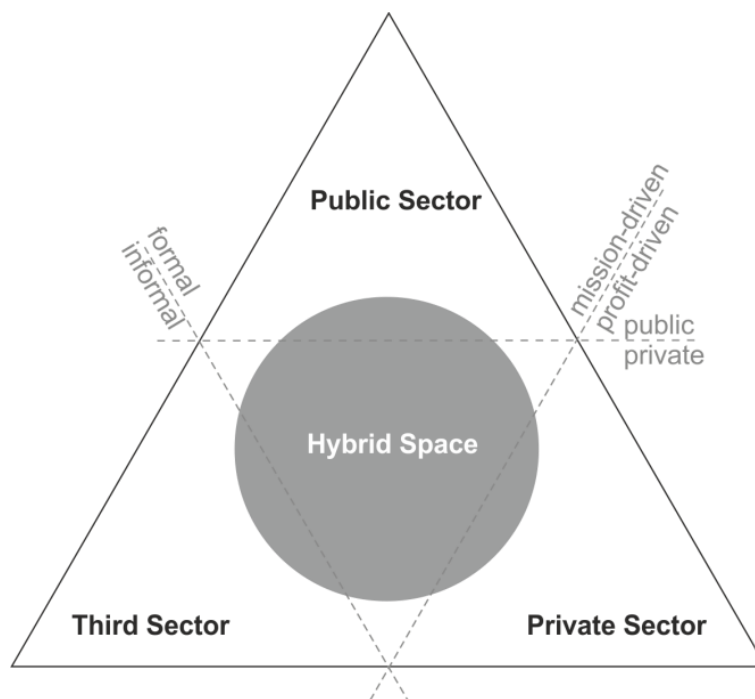
Figure 5-1: Hybrid space according to tripartite framework (based on Brandsen et al., 2005 and van de Donk, 2001)

The fragmentation of the literature on HTOs has inhibited the development of a common classification system (Brandsen & Karré, 2011; Smith, 2014). Existing

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69 The size of the hybrid space that opens up between the three ideal types depends on how narrowly (or broadly) they are defined. According to this definition, formal non-governmental organisations managed by professional staff would not be classified as third sector organisations, but as 'entrenched hybrid organisations' (Billis, 2010; Cornforth & Spear, 2010).

typologies tend to emphasise particular interfaces between the public, private and third sector (Billis, 2010c; Haigh & Hoffman, 2012; Karré, 2011). Billis (2010c, 2010b) has presented one of the most comprehensive classification systems for third sector hybrids, identifying nine potential hybrid 'zones' based on different combinations of public, private and third sector characteristics. He relates his classification to a four-cell model of hybrid organisations based on the differentiation of 'shallow' and 'entrenched' forms, and by distinguishing between types that developed 'organically' from a sectoral ideal-type versus others that are 'enacted' (i.e. established) by other organisations. While this framework has proven to be useful for categorising third sector hybrids (Billis, 2010c), its explanatory power is limited by its focus on the boundaries of the third sector. Karré (2011) presents a model for the analysis of public organisations venturing into the market place which comprises ten dimensions clustered into three groups: structure and activities, strategy and culture, and governance and politics. Like Billis (2010c), he describes the evolution of many hybrid organisations as a transformative process in which ideal-type organisations morph into hybrid types.

Empirical research on HTOs has focused on how they combine different structural features, identities and cultures (Battilana & Lee, 2014; Doherty et al., 2014; Jäger & Schröer, 2014; Smith, 2014).[70] A growing body of research examines how organisations integrate or decouple elements that determine their hybridity, and the idiosyncratic challenges and sectoral ambiguities they face (Aiken, 2010; Billis, 2010b; Ebrahim, Battilana, & Mair, 2014; Jäger & Schröer, 2014; Lewis, 1998). The inward-looking perspective of most research conducted on hybrid organisations has distracted from the fact that their hybridity relates to "both internal and external aspects of organisational life" (Battilana & Lee, 2014, p. 403). Organisations are no islands - they adopt and combine organisational forms through external relationships they maintain with other organisations (DiMaggio & Powell, 1983). There is an on-going debate about the consequences of the proliferation of hybrid organisations for the provision of public services and the development of the third sector (Billis, 2010c; Brandsen et al., 2005; Evers, 2005; Koppell, 2006). Yet little is known about the inter-organisational embeddedness of hybrid organisations, and how their hybridity relates to particular demands arising from their immediate environment (Battilana & Lee, 2014; Evers, 2005; Jay, 2013). In order to better understand why hybrid organisations are hybrid, and how their hybridity relates to

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70 Three recent reviews offer a more detailed overview of the literature on hybrid types of organisations: Battilana and Lee (2014); Doherty, Haugh and Lyon (2014), and Jäger and Schröer (2014).

their performance, we need to examine more closely how they engage with other organisations both hybrid and non-hybrid (Doherty et al., 2014). This appears to be all the more important given that changing governance structures and cross-sector engagement are important features of the contexts in which many hybrid organisations operate (Cornforth & Spear, 2010; Jäger & Schröer, 2014).

5.2.2 Hybrid Forms of Organisation

Research into the ways in which organisations connect and relate to one another in inter-organisational entities and networks has a long-standing tradition in organisational research (Baker & Faulkner, 2002; Cropper, Ebers, Huxham, & Smith Ring, 2010). In this context, the concept of hybrid organisational arrangements was introduced in the 1980s to describe the phenomenon of "global strategic partnerships [shifting] the basis of competition […] from firm vs. firm to rival transnational groupings of collaborators" (Powell, 1987, p. 68). Bory and Jemison (1989) defined hybrid organisations as "organisational arrangements that use resources and and/or governance structures from more than one existing organisation" (Borys & Jemison, 1989, p. 235). Whereas Bory and Jemison described such hybrid forms as "theoretical orphans" (Ibid.), since then these 'orphans' have been adopted and nurtured under different names, including (but not limited to) inter-organisational networks, strategic alliances, and partnerships. Over the past two decades, the concept of HFOs itself has become more closely associated with the role of different kinds of governance structures and mechanisms for coordinating and controlling transactions between organisations (Bruce & Jordan, 2007). The formation of HFOs has been explained by the optimisation of gains from cooperation and ownership arrangements (based on agency theory and property rights theory), the safeguarding of contractual hazards (transaction cost theory), gains from access to complementary resources (resource based view), an enhanced relative position (network analysis) as well as increased strategic flexibility (Jolink & Niesten, 2012).[71]

From their inception, HFOs were contrasted with two ideal-types: hierarchy and market (Hennart, 1993; Williamson, 1991). However, controversies arose as to whether HFOs represent an intermediary form to be located on a continuum between hierarchies and markets (Thorelli, 1986; Williamson, 1991), or rather constitute a different ideal-type characterised by distinct governance mechanisms

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71 For recent reviews of the literature on HFOs see Jolink and Niesten (2012), Ménard (2004) and Bruce and Jordan (2007).

and logics of exchange (Podolny & Page, 1998; Powell, 1990). Various labels have been coined for this third ideal-type, including hybrid, plural, community and network forms of organisation (Adler, 2001; Bradach & Eccles, 1989).[72] The apparent proliferation of this third form of organisation has been linked to underlying changes in the global economy requiring new forms of coordination and knowledge management (Adler, 2001; Borgatti & Foster, 2003; Powell, 1990). Table 5-1 presents an overview of the three organisational forms.

Attributes	Hierarchy	Market	Community
Coordination/ Governance	Ex ante coordination based on *authority* (i.e. bureaucratic administration)	Ex post coordination through *price* mechanism and competition	Self-organised governance based on *trust*, reciprocity, loyalty
Envisaged order	Designed and purposeful	Spontaneously generated outcomes	Both consciously organised and spontaneous outcomes
Flexibility	Low	High	Medium
Relations & Communication	Rule-driven, hierarchically structured, routines	Competitive, price signals	Cooperation, relational communication
Tone	Formal	Precision/suspicion	Open-ended
Actor's commitment	Medium/High	Low	Medium/High
Conflict resolution	Administrative fiat	Haggling	Reciprocity & reputation
Financial resources	Taxes	Sales	Donations

Table 5-1: Stylised overview of trichotomy of hierarchy, market and community
(based on Powell, 1990 and Thompson, 2003)

While to some, this tripartite analytical framework proved to be a helpful point of entry for theorising inter-organisational entities and networks, others pointed to its limited use for synthesising explanations derived from research on a huge variety of inter-organisational entities and networks (Bruce & Jordan, 2007; Jolink & Niesten, 2012). Moreover, empirical research showed that hierarchy, market and community forms of organisation are not mutually exclusive, and that they are accomplished by complementary but also interchangeable mechanisms for coordination and control

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72 With the rise of the network paradigm, the latter term proved to be problematic given that "from a structural perspective, every form of organisation is a network, and market and hierarchy are simply two manifestations of the broader type" (Podolny & Page, 1998, p. 59). In order to avoid confusion we therefore use the 'community' term.

(Adler, 2001; Bradach & Eccles, 1989; Bruce & Jordan, 2007; Entwistle, Bristow, Hines, Donaldson, & Martin, 2007). For example, contracts with suppliers can entail strong hierarchical elements (Stinchcombe, 1990) as well as trust-based relations (Uzzi, 1997). Inter-organisational partnerships vary in the ways they combine characteristics of an integrated organisation (i.e. hierarchy) and of independent organisations forming a 'community' (Hardy, Phillips, & Lawrence, 2003; Ménard, 2004). Adler (2001) proposed a framework that classifies hybrid forms according to the relative salience of hierarchy, market and community forms of governance, in this way re-establishing the concept of HFOs as one referring to combinations of distinct types of governance structures. Extending this line of theorising, and drawing on work by Ménard (2004), we define HFOs as *sets of relationships between formally independent organisations that involve partner-specific communication, joint planning and the exchange and/or pooling of resources, and that are subject to multiple governance structures based on hierarchical, market and/or community forms of order*. According to this definition, the analytical space occupied by HFOs is one where distinct mechanisms for coordination and control intersect and give rise to complex patterns of interactions that cannot be explained with sole reference to hierarchy, market or community.

It is important to note that this heuristic can be related to the tripartite framework presented in the previous section (Elsner, Hocker, & Schwardt, 2010; Foxon, 2013, Podolny & Page, 1998): Hierarchical governance structures are a characteristic feature not only of the vertical integration of firms but also of public administration; market relationships governed by the 'hidden hand' are associated with the private sector; and the third sector 'partnerships' are commonly described as shaped by trust, reciprocity and loyalty. HFOs such as public-private partnerships combine governance elements (Brandsen et al., 2005; Schuppert, 2011). As they draw on more diverse sets of resources and capabilities, they have been found to be effective in creating diverse organisational ecosystems including BoP markets, and in buffering uncertainties (Hammond, 2011; Ménard, 2004). In Figure 5-2 HFOs are illustrated by different kind of overlaps and cross-hatches.
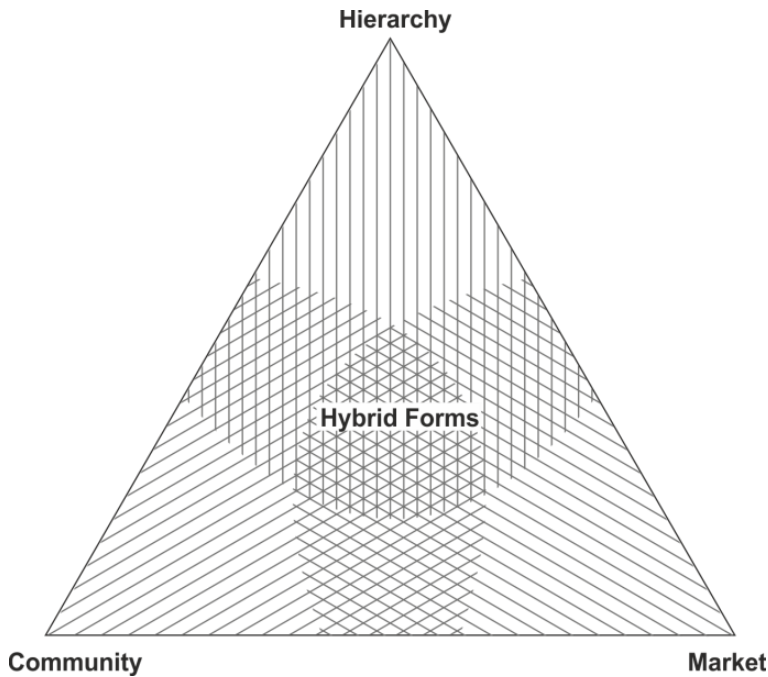
Figure 5-2: Hybrid forms of organisation

5.2.3 Hybrid Organising as a Cross-level Phenomenon

On the most general level, the concept of hybridity builds on the premise that all organisations are shaped by their environment (Battilana & Lee, 2014). Institutionalised ideas that form part of this environment pressure organisations into adopting distinct structures, identities and relational practices, which can be seen as one of the principal reasons as to why organisations operating in the same environment tend to become increasingly similar, and why they come to resemble ideal-types (Boxenbaum & Jonsson, 2008; DiMaggio & Powell, 1983). However, in the case of organisational fields situated at the boundaries of two or three sectors of society (i.e. in a *hybrid space*), we can expect different types of organisations to face similar – albeit at times conflicting – isomorphic pressures.

Hybrid spaces tend to be characterised by institutional voids marking the absence of widely accepted rules and norms guiding organisational practice (Hajer, 2003). They have been found to open up opportunities for experiments in organisational design involving new combinations and permutations of institutionalised practices (Mair, Marti, & Ventresca, 2012; Padgett & Powell, 2012). They also tend to be characterised by sector-crossing activities and relations, such as public-private partnerships (Cornforth & Spear, 2010; Hammond, 2011; Smith, 2014). The emergence of both HTOs and HFOs can therefore be linked to changes in the

environment of organisations resulting from the shifting and blurring of sectoral boundaries and the emergence of hybrid spaces. We extend this line of reasoning by proposing that *hybrid organisations combine elements of distinct organisational types (e.g. social enterprises), and engage in hybrid forms of inter-organisational engagement (e.g. public-private partnerships) in order to adapt to – and shape – an environment where sectoral boundaries are contested or appear of reduced relevance.*

Exactly how HTOs and HFOs relate to each other, and how they interact when shaping and responding to their environment, calls for empirical research on the actual practices and relationships of hybrid organisations operating across sectoral boundaries (Boyd et al., 2009; Entwistle et al., 2007; Jolink & Niesten, 2012). It remains unclear "what drives organisations to adopt characteristics from other sectors and how the different origins and paths hybrids take influence the governance structures they adopt" (Cornforth & Spear, 2010, p. 14). While HTOs are often presented as solution-oriented and capable of addressing some of the most pressing challenges of our time (Boyd et al., 2009), there has also been some controversy as to whether hybrid organising leads to positive or negative outcomes at the sectoral level (Billis, 2010b; Brandsen & Karré, 2011). There is a shared assumption, however, that HTOs and HFOs reflect and, as social actors, also *contribute* to the blurring of sectoral boundaries and related institutionalised practices at the organisational and inter-organisational level. When social enterprises develop new business ecosystems and access channels outside the private sector, they create and structure hybrid spaces (Hammond, 2011).

In the following, we present an in-depth study of the embedded agency of organisations operating in a hybrid space (HS) characterised by sectoral blurring and institutional voids. The study lends itself for an empirical investigation of our proposition that organisations combine elements of distinct organisational types, and engage in hybrid forms of inter-organisational engagement in order to adapt to, but also shape, an environment where sectoral boundaries are contested or appear of reduced relevance. Drawing on qualitative network research on four renewable energy organisations promoting off-grid technologies in Central America, we demonstrate how these organisations come to combine features of private and third sector organisations in strategic ways when developing BoP markets, and how they use HFOs to connect and navigate heterogeneous organisational networks.

5.3 Research Context

5.3.1 The Organisational Case of Renewable Energy Organisations

Energy poverty has been identified as one of the principle barriers to sustainable development (IEA, UNDP, & UNIDO, 2010). Of the 1.2 billion people around the world with no access to electricity, about 80% live in rural areas (World Bank, 2014). Stand-alone off-grid systems and mini-grids are expected to play an important role in achieving the objectives set by the United Nations Secretary General's 'Sustainable Energy for All' initiative (REN21, 2014).[73] Since the 1980s, a plethora of development initiatives have sought to assist in the transfer of off-grid renewable energy technologies to developing countries (Krithika & Palit, 2013). After the predominantly donation-based demonstration projects of the 1980s and 1990s failed to deliver the expected outcomes, market-oriented initiatives were developed to support NGOs and private enterprises in developing markets for off-grid renewable energy technologies in rural BoP contexts (Kruckenberg, 2015b; Martinot, Chaurey, Lew, Moreira, & Wamukonya, 2002; Sovacool, 2012). Many of these initiatives turned out to be more complex and costly than anticipated (Balint, 2006; IFC, 2007). While a business case has been made for BoP energy markets in principal, the costs of overcoming market barriers in poor and remote areas has rendered many commercial enterprises unviable (Bhattacharyya, 2013; Chaurey, Ranganathan, & Mohanty, 2004; IFC, 2007; Kolk & van den Buuse, 2012).[74]

Cross-sector partnerships have come to be seen as important vehicles for addressing energy poverty in such marginalised contexts (Chaurey, Krithika, Palit, Rakesh, & Sovacool, 2012; Forsyth, 2010; Kruckenberg, 2015b; Pinkse & Kolk, 2012), in particular those that involve mixed-finance models combining private payments and/or microcredit with subsidies (Desjardins, Gomes, Pursnani, & West,

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73 Following Palit and Chaurey (2011), we use the umbrella term 'off-grid renewable energy technologies' for technologies which are not connected to high-voltage-transmission networks. Such technologies include but are not limited to solar PV installations, including solar water pumps; solar dryers for grains, fruit and fish; small-scale anaerobic digesters producing methane from agricultural waste or dung; micro hydro plants; and wind turbines.

74 The experience of E+Co, a previously award-winning non-profit financial institution, is just one case in point. Set up in 1994, E+Co made 287 investments totalling over $45 million, providing not only capital but technical assistance to sustainable energy entrepreneurs in Central America, Southeast Asia and Sub-Saharan Africa (Prahalad, 2010; Usher, 2013). However, in 2012 the investor ran into financial difficulties and in 2012 only narrowly avoided a complete liquidation (Bank, 2012). Following a restructuring, E+Co is no longer an active impact investor (Ibid.).

2014; Sovacool, 2012). By linking international donors and technology providers to rural end-users, local renewable energy organisations play a key role in such partnerships (Acker & Kammen, 1996). Notwithstanding their important role for the creation of new pathways to sustainable energy, these small for-profit and not-for-profit organisations are often framed as 'policy implementing agencies' rather than key agents of socio-technical change (Kruckenberg, 2015a).

In the context of a study on renewable energy partnerships, we inquired into how Central American renewable energy organisations engage with various kinds of organisations when building markets for off-grid technologies. We found that most of these organisations operate several business models at any time, ranging from the sale of technological equipment to project development, feasibility studies and capacity building measures, as well as specialist forms of eco-tourism for international volunteers. We encountered NGOs operating like small utilities, private enterprises mission-driven to an extent that they resembled NGOs, and not-for-profit NGOs using microfinance schemes to facilitate sales to private customers. Among these organisations, organisational hybridity appeared to be the norm, rather than the exception. Furthermore, all of these organisations were involved in sector-crossing activities through various kinds of inter-organisational arrangements, and therefore made for an exceptionally telling case of hybrid organising at the inter-organisational level. Adopting a micro-analytic approach, and responding to calls for more research on organisational phenomena in "unconventional research contexts" (Bamberger & Pratt, 2010, p. 665), we explored the embedded agency of four of these hybrid organisations through an in-depth investigation of their organisational networks.

5.3.2 Empirical Context: Renewable Energy Organisations in El Salvador, Honduras and Nicaragua

Situated in a region highly vulnerable to climate change, the three Central American countries El Salvador, Honduras and Nicaragua seek to reduce their dependency on oil for the generation of electricity by increasing the share of renewable energy in their respective energy matrices (Dolezal, Majano, Ochs, & Palencia, 2013; UNECLAC/CEPAL, 2010). All three countries are classified by the World Bank as lower-middle-income economies with GNI per capita of more than $1,045 but less than $12,736 in 2014 (World Bank, 2015a) and are characterised by high inequality (World Bank, 2015b). Since the 1960s, the power sectors of three countries have transitioned from a statist to a neoliberal, and then to an interventionist mode of

energy governance, which is "characterised by hybrid forms of governance [involving] a multiplicity of state and non-state actors and networks of private-public partnerships" (Gent & Tomei, 2015b, p. 25). Whereas access to energy has improved significantly over the past two decades, the energy needs of poor rural communities based in remote locations are difficult, and in places impossible, to meet through the expansion of the national grid (UNECLAC/CEPAL, Club Madrid, GTZ, & UNDP, 2010). In the small and densely populated El Salvador, 6.3% of the population lack access to electricity, whereas in the two larger countries Honduras and Nicaragua that share is about 17.8% and 22.1% respectively (World Bank, 2015b). However, when focusing on rural areas, the percentages of those having to make do without access to electricity is significantly higher, with 14.3%, 34.2% and 57.3% respectively (World Bank, 2015b). While governments in Central America seek to enhance and de-carbonise their energy systems, they favour large-scale infrastructure projects which are less likely to benefit sparsely populated areas (Meza, 2014).

Albeit to a varying degree, in all three countries international development organisations run programs and projects aiming at the transfer of off-grid renewable energy technologies to rural BoP populations (Balint, 2006; Dolezal et al., 2013). Local renewable energy organisations – registered as for-profit enterprises or not-for-profit NGOs – make key contributions to such initiatives: they import, assemble, adapt, sell, install, maintain and repair off-grid technologies; as contractors they plan and manage feasibility assessments and develop and implement entire projects; they promote renewable energy technologies in remote locations, engage in capacity building and market-building activities, and, through forums and associations, they also lobby governments for changes in the legislation of decentralised energy generation. Like other organisations working at the BoP, these organisations face a plethora of micro-level challenges including persistent resource deficits, knowledge gaps, institutional voids and poor physical infrastructure (Hammond, 2011; Kruckenberg, 2015b). In their attempts at creating markets where there are none, they engage with various kinds of stakeholders in innovative ways.

5.4 Research Design, Data and Methods

In the context of an 'extended case study' (Burawoy, 2009) of partnerships for sustainable energy in Central America, the lead author conducted qualitative interviews with senior staff in 17 renewable energy organisations operating in rural

areas of El Salvador, Honduras and Nicaragua. During six months of fieldwork in 2012-2014, she further observed day-to-day operations of 11 of these organisations including field visits and project meetings. Participating organisations were granted confidentiality in order to enable their members to share critical or sensitive information.[75] In 2014, the lead author further conducted a visual network survey that allowed for a systematic reconstruction of the entire organisational networks of six organisations belonging to a hybrid spectrum of local renewable energy organisations ranging from a not-for-profit NGO with limited income generating activities to a sustainability-oriented private enterprise promoting low-carbon technologies. Two organisations formally registered as private enterprises and two listed as not-for-profit NGOs were selected for an in-depth comparative analysis. The cases were selected to represent the broad spectrum of organisational hybridity encountered in this field within the scope of a research article. Case selection also aimed at balancing the need for contextualising information with concerns regarding anonymisation, and took into consideration the quality and comparability of the collected data.

5.4.1 Visual Network Survey

Visual network surveys are a novel method for collecting both qualitative and quantitative network data through the use of standardised network maps visualising actor attributes and relations in the form of different icons and lines (Gamper, Schönhuth, & Kronenwett, 2012; Hogan, Carrasco, & Wellman, 2007).[76] The maps facilitate systematic inquiries into inter-organisational embeddedness from an insider's perspective and stimulate narrative accounts of how different relationships and forms of organisation enable or constrain agency. The visual network survey developed for this research combined a structured interview process with visual elements and open-ended follow-up questions. As all respondents were owner-managers, directors or project managers with a background in engineering, the use of the digital data collection software VennMaker was deemed appropriate. The software assisted the researcher in translating interviewees' responses into digital

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75 This bears important implications for the amount and quality of contextualising information we can provide. According to our estimates, there are about 60 organisations of this kind operating in the three countries (based on size of membership in associations and interviews). In order to minimise the risk of individual organisations being identified, we therefore decided not to include information on the country in which each of the organisation is based and the types of small-scale renewable energy technologies these organisations work with.

76 See Chapter 4 for details.

network maps, which then could be immediately examined by the researcher and the interviewee (Gamper et al., 2012; Kronenwett & Schönhuth, 2011).[77]

The survey involved four steps: First, respondents were asked to name all organisations their organisation had worked with in the past three years and with which they had developed relationships beyond discrete market transactions. Six closed questions were then asked to determine key attributes of the listed organisations (organisational type, size, area of operation, main expertise, duration of relationship/acquaintance, relative importance of the relationship for the organisation subject to this interview). Based on the responses, which were entered by the interviewer, the software generated a visualisation of a network map, which was then presented to the respondent for follow-up questions. Second, respondents were provided with four statements describing different kinds of relationships: an arm's length relationship involving the exchange of information, a market relationship, a relationship aimed at coordination tasks or activities, and a strong collaborative relationship. The vignette-like statements had been developed on the basis of how such relationships had been described in semi-structured and ethnographic interviews conducted in the previous phase of the study. Respondents were asked to select which relationship statements described the relationship of their organisation with each of the others in the network. After all relationships had been drawn in, once again the map was presented to the respondent. Follow-up questions encouraged more detailed responses about different relationships and organisational forms. Third, respondents indicated knowledge flows between their organisation and the organisations on the network map. Finally, in the fourth and last step of the survey, respondents were asked questions about their own organisation and its history, and about relationships between organisations in their network.

5.4.2 Data Analysis

Data analysis proceeded in three steps. In the first step, audio recordings of the visual network survey were analysed using the QDA software package Atlas.ti, and then triangulated with other qualitative data that had been collected on these same organisations, such as the audio files of previous interviews, fieldnotes of observations, media reports, project documents and statements made about these

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77 VennMaker is a software-based tool for the collection and validation of qualitative and quantitative network data. The software was developed at the universities of Trier and Mainz (Germany), initially for research on personal networks and consultancy purposes (Gamper, Schönhuth, & Kronenwett, 2012; Kronenwett & Schönhuth, 2011).

organisations by other research participants, many of them belonging to partner organisations. This process enabled the verification of the relational data collected via the survey and fed into a structured case record on each organisation. In a second step, and based on the network maps created through the survey, a bespoke template for the visual analysis of network data was created using a vector graphic editor. The template allowed for the simultaneous visualisation of up to five organisational and ten relational attributes. Each analytical map 'summarised' the content of a detailed case record, serving an analytic function not too dissimilar from matrix display methods in qualitative data analysis (Conway & Steward, 1998; Miles, Huberman, & Saldaña, 2014). Figure 5-3 illustrates the tool, which facilitated overlaying and comparing different types of relationships.
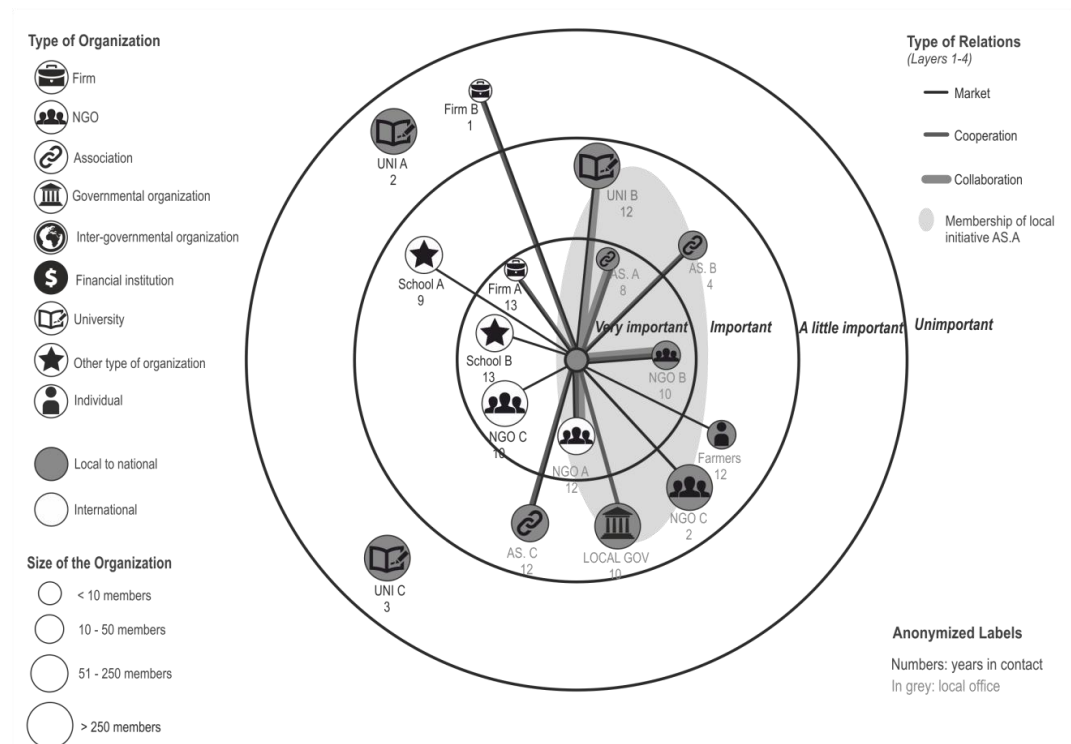
Figure 5-3: Sample analytical map

The comparative analysis of patterns of relationships within individual networks was accompanied by the retrieval and re-examination of the case records and coded material, and accompanied by memo writing. In the last step, a comparative analysis of the network maps and summary records of all four organisations allowed for an in-depth yet systematic examination of a) their *organisational hybridity* as HTOs, b) their *inter-organisational embeddedness* in heterogeneous

organisational networks, c) the *agency* they derive from connecting these networks with a view to their strategies for market building, and d) the *role of hybrid forms of organisation* (HFOs) in this process. Following an overview of the four case studies conducted for this research, we present our findings organised around these four subheadings.

5.5 Analysis and Findings

5.5.1 Overview of Cases

Table 5-2 provides an overview of the main data sources used in the analysis and summarises key features of the four organisations.[78] All four renewable energy organisations have operated in the region for more than ten years. They offer technical services, such as feasibility assessments, technology sourcing, installation and repair, as well as services that are more organisational and educational in character, such as the planning and management of different kinds of development projects and capacity building measures for users and local technicians. In their attempts to develop energy services where there are none, all four organisations face multiple micro-level challenges resulting from rural poverty, poor infrastructure, low levels of education and a lack of market-supporting institutions which could facilitate market development (Kruckenberg, 2015b). The ways in which the four hybrid organisations combine income generation with mission-driven activities also varies across cases. Albeit to varying degrees, all four organisations serve at least two different markets. First, they deliver renewable energy projects in the context of international development cooperation, where they seek to mitigate their dependency on individual donors. Second, they serve an emerging private market for off-grid technologies and energy services.

ALPHA generates most of its revenue by designing and implementing renewable energy projects in rural areas (A1-A4). The owner-manager sees the key competence of the social enterprise in its technical expertise as well as in its ability to work with various kinds of partner organisations (A1, A2). Of the four local people employed by the enterprise, two lecture at local universities on a private basis (A1-A3). Most of the business is generated through long-standing collaborations with international partners, including ALPHA's main supplier, an

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78 Names of organisations are pseudonyms. All references provided in this analysis refer to sources listed in Table 5-2 below. Quotations were translated by the lead author and are as such indicated by single quotation marks.

international NGO, and two foreign schools for which ALPHA offers volunteering packages (A1, A2). ALPHA seeks to develop a private market for its products and services (A3). External sources describe the business as competent and reputable, but also report that ALPHA's insistence on the high quality material it obtains from its international supplier makes it difficult for the social enterprise to attract local customers and to succeed in bidding processes for international development projects (A6).

A private enterprise with just two permanent employees, BETA is the principal dealer for a specialist foreign manufacturer that assisted the owner-manager in setting up the business and remains a close collaborator (B1, B2). The enterprise relies on contract work in the context of bilateral and multilateral aid, which led to significant variations in turnover across years (B1, B2, B5). BETA imports nearly all of its equipment and has given up plans to manufacture locally, citing the limited availability of appropriate local resources as the main obstacle (B2, B5). However, in partnership with universities, the enterprise develops and evaluates new applications for the Central American context, as it seeks to grow its share of sales to private customers (B1, B2, B5).

GAMMA is a not-for-profit NGO with more than twenty years of experience in working with renewable energy sources for rural electrification (C1, C2). While the NGO has been involved in projects at a national scale, most of its projects are located in the relatively remote region where the organisation is based (C1, C2). The majority of its 30-40 members of staff are of local origin (C2, C7). The NGO pursues a holistic approach to rural development. It implements renewable energy projects using a mixed finance model involving grants and donations and a participatory community engagement model (C7, C8). GAMMA resembles a small public utility in that it does not only install community-based renewable energy systems and mini-grids but also operates them on a fee-for-service basis (C1, C2). Revenues are also generated from a larger system feeding into the national grid. In contrast to many other renewable energy organisations, GAMMA manufactures key components for its installations. GAMMA is well-regarded for its technical competence and experience in working with local communities (C8).

Organisation	ALPHA	BETA	GAMMA	DELTA
Type, Size, Background	Social enterprise with 4 permanent employees (assistance on a project basis); operates in rural areas all over the country; founded by owner after studying and working abroad	Social enterprise with 2 employees; operates on the national scale (few projects abroad); setup by manager following invitation of manufacturer supporting the enterprise as local dealership	NGO specialised in community-based systems. Most of its 30 employees are from area where organisation mostly operates. NGO set up by director aiming to continue and expand previous activities in this field	Not-for-profit NGO created as spin-off of university initiative. With 7 employees the NGO implements most projects in an area where it has trained local assistants. Some work in other parts of the country
Operations	- Delivery of renewable energy projects for international donors - School program: Projects with foreign students - Private business (<20% of turnover) - Lecturing at universities (on a private basis)	- Sales/installation of low-carbon technology in context of development cooperation - Installations of small- and medium-scale systems for private customers (including feasibility assessments, capacitation and follow-up)	- Development and operation of community-based systems/mini-grids - Contract work for aid industry (design, installation and repair) - Rural development projects for donors - Grid-connected system: revenues through feed-in	- Rural development projects for donors - Contract work for aid industry (design, installation and repair) - Volunteering program - Sales through micro-finance scheme (small-scale, project-based)
Data	Visual Network Survey (A1), in-depth interview (A2), fieldnotes of meeting with donor agency (A3), website (A4), profile obtained from partner organisation (A5), comments from other organisations (A6)	Visual Network Survey (B1), fieldnotes of field visit, ethnographic interview and meeting with partner (B2), fieldnotes of conversation with client (B3), website (B4), comments provided by other organisations (B5), documentary (B6)	Visual Network Survey (C1), fieldnotes of visit to workshop & joint field trip (C2), and of meeting with donor (C3), feature article (C4), news section of regional agency (C5), donor project evaluation (C6), website (C7), comments from other organisations (C8)	Visual Network Survey (D1), interview with director (D2), fieldnotes of field visit with donor organisation (D3), profile from website (D4), project documentaries (video clips) (D5, D6) comments from other organisations (D7)

Table 5-2: Overview of cases[79]

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79 Codes provided in brackets (such as A1) are used for referencing purposes in the remainder of the article.

A university spin-off, DELTA was registered as a not-for-profit NGO aiming to foster rural development through the productive use of renewable energy (D1, D2, D4). DELTA implements rural development projects for various donor organisations while also running an international volunteering program (D1, D2, D7). With seven permanent employees, the organisation operates on the national level. The majority of its projects are implemented in a region where the organisation has established strong links with local communities and employs temporary assistants. DELTA works with a comparatively broad portfolio of technologies (D2, D4, D7). While its technical expertise seems to vary across technologies, its continuous presence in the communities facilitates follow-up (D2, D7).

5.5.2 Organisational Hybridity

All four renewable energy organisations belong to a hybrid spectrum of organisations that combine features of private and third-sector organisations. ALPHA and BETA both present themselves as profit-seeking enterprises contributing to sustainable development (A1, A2, B2). However, high transaction costs limit profitability and make it difficult to develop local demand (A2, B2, B5). Profits are reinvested in business development (B2). When working with international partners, neither ALPHA nor BETA consider themselves as beneficiaries 'of charity like NGOs' (A2), but rather as enterprises offering specialist services to philanthropic and development organisations (A2, B2). Overall, the corporate status is seen as an asset rather than an obstacle as donors and clients seem to welcome a value-oriented but 'professional' approach (A2). Voluntary initiative is presented as an expression of corporate social responsibility but also as a means for enhancing reputation (A2, A4, B2).

BETA's manager describes the 'development of the business and not the generation of profits' as the main objective of the enterprise (B1). BETA does not claim to pursue any particular 'social mission' beyond the diffusion of a low-carbon technology with a potential to enhance rural development. However, BETA's embeddedness in international development cooperation links the enterprise to the various missions pursued by its donors, as well as that of its supplier, which received awards for its contribution to international development (B2, B4-B6). Like not-for-profit NGOs, both enterprises emphasise the importance of capacity building measures for beneficiaries and private customers (A1, A2, B1, B2). According to ALPHA's manager, it is ALPHA's 'understanding of corporate social responsibility' that makes it 'better than other enterprises in capacity building' (A2). ALPHA wants

to see all of its systems fulfilling their 'expected lifetime' and users 'should not depend on ALPHA for maintenance and minor repairs' (A1).

As a not-for-profit NGO, GAMMA depends on grants and favourable loans to subsidise the installation of community-based renewable energy systems in poor rural communities (C1, C2). Its social mission and holistic approach to sustainable development matches its formal status. However, to an outsider the organisation appears more like a 'non-profit enterprise' or municipal utility than a not-for-profit NGO (C2, C4). This perception holds true to the extent that GAMMA has formed an associated corporate structure that enables it to hold a concession for energy distribution in the region where it predominantly operates. One of GAMMA's plants feeds into the national grid, and the NGO also runs a separate mechanical workshop that pays for salaries and overheads (C7, C8).

DELTA's operations also focus on the implementation of renewable energy projects in the context of development cooperation, but together with an international NGO, the organisation also generates income through a volunteering program for foreign students. Following a shift in donor policies towards market-oriented development and mixed-finance models, the DELTA has gained experience in managing micro-credit schemes. Like a social enterprise, the NGO has set up a small lending scheme enabling households to purchase equipment such as solar panels (D1, D3, D7). According to DELTA's director, the NGO does not aim at sales 'like a commercial enterprise' but rather see their micro-finance activities as part of a wider initiative promoting the uptake of renewable energy technologies in the rural communities where it works (D2).

5.5.3 Inter-organisational Embeddedness

All four organisations are embedded in heterogeneous networks involving local, national and international organisations. In Table 5-3 we provide a brief overview of the organisational networks of ALPHA, BETA, GAMMA and DELTA which are based on our analysis of the visual network surveys.

ALPHA's network connects an international technology supplier, an engineering firm and a local business association (*private sector*). The enterprise works with a local municipality (*public sector*) and four NGOs (*third sector*), as well as with three universities, two foreign schools, and cross-sector renewable energy associations/networks (*hybrid space*). ALPHA has engaged in continuous information exchange with all 15 organisations in its network, and maintains market relationships with all but the local municipality and two universities. With the

majority of its contacts having been part of ALPHA's network for eight years or more, ALPHAs network appears remarkably stable. Some of its key contacts – including the supplier and one of the schools – were already established when the owner set-up business (A1, A2). The hybridity of ALPHA as a local enterprise is reflected in the organisation's network. Depending on the context, ALPHA appears primarily as a business (e.g. in its local business association) or as a mission-driven organisation (e.g. when working with international donor organisations). In other contexts, the profit/not-for-profit distinction appears to be less salient, for example in the case of the two renewable energy associations that welcome members from both the private and the third sector. One of these associations links most of ALPHAs local contacts into an organisational form that resembles a local cross-sector partnership. Figure 5-3 above presents the analytic network map of ALPHA's case study.[80]

Number of Organisations of which international	ALPHA	BETA	GAMMA	DELTA
Overall Network	**15**	**18**	**17**	**20**
	5	6	11	8
Public Sector	**1**	**3**	**8**	**3**
	0	1	6	3
Private Sector	**3**	**4**	**0**	**6**
	2	2	0	0
Third Sector	**4**	**2**	**8**	**6**
	1	2	5	5
Hybrid	**7**	**9**	**1**	**5**
	2	1	0	0

Table 5-3: Composition of organisational networks of the four organisations

BETA was setup in the context of a network of organisations that at the time of fieldwork were adapting to some of their principal donors moving away from the region, which required them to seek relationships with new funders (B2, B5). BETA's network therefore appears more fluid than that of ALPHA, which is less affected by such changes. In BETA's network of 18 organisations, the most preeminent feature is its close collaboration with its supplier and with another dealer

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80 Network maps of ALPHA, BETA, GAMMA and DELTA are included in Appendix E.

based in a neighbouring country. Private sector links further include two private customers (*private sector*). In the past three years, BETA has delivered projects for two governmental ministries and an intergovernmental organisation (*public sector*), as well as two international development NGOs (*third sector*). With one international NGO and with the intergovernmental organisation, BETA has developed long-term relationships involving extended information exchange. Furthermore, BETA has signed partnership agreements with four universities and is a member of a cross-sector initiative for international knowledge exchange. The social enterprise has implemented projects for three rural cooperatives and seeks to develop a more long-term relationship with a farmers association (*hybrid space*).

GAMMA's network comprises 17 organisations. With eight of these, GAMMA has worked for more than a decade. In the case of GAMMA, none of the NGO's relationships with private enterprises was deemed to go beyond discrete market transactions (*private sector*). GAMMA coordinates its activities with local municipalities, and has engaged in continuous information exchange with a governmental ministry. It has implemented projects for six bilateral and multilateral development organisations (*public sector*) and five international NGOs of which one has supported the GAMMA for more than a decade. GAMMA assists a sister NGO and, on a project basis, collaborates with two other renewable energy NGOs in the country (*third sector*). GAMMA has played an active role in the development of an association of renewable energy organisations involving both for-profit and not-for-profit organisations (*hybrid space*).

DELTA's network of 20 organisations includes five local and national businesses. With one of these suppliers, the NGO exchanges information and experiences on a more regular basis (*private sector*). Like BETA and GAMMA, DELTA delivers renewable energy projects for bilateral and multilateral agencies, but it does not engage much with governmental actors (*public sector*). DELTA has worked with five international (donor) NGOs. One of these NGOs has supported DELTA for more than a decade, both financially and with technological expertise and administrative support. In addition, DELTA has run projects with a local NGO, a church and a local clinic, itself supported by an international NGO (*third sector*). It has established collaborative agreements with two universities, and, like ALPHA and GAMMA, DELTA is an active member of a hybrid renewable energy association. DELTA also maintains a closer relationship with a social enterprise that emerged from the same university initiative that led to DELTA's creation, and which is one of DELTA's key suppliers (*hybrid space*).

5.5.4 Embedded Agency

All four networks reflect a remarkable degree of cross-sector engagement. As emphasised by ALPHA's manager, 'in order to succeed, organisations in this field need to strengthen and deepen their relationships with other organisations involved. Such relationships make it easier for each of the organisations to do its job' (A2). The visual network survey included questions on the quality, duration and relative importance of each the reported inter-organisational relationships. A comparative analysis of the four case studies revealed that all four organisations derive agency from connecting heterogeneous sets of organisations, which enhance their access to resources. Different inter-organisational relationships fulfil specific and often complementary functions, which research participants could articulate clearly.

For example, as a social enterprise, ALPHA engages with municipalities, universities and local NGOs to identify opportunities for projects, which are then discussed with local partners, and sometimes with its international supplier, before they are proposed to a potential donor (A1-A3). ALPHA's manager favours implementation arrangements allowing the social enterprise to focus on technical aspects, with a local NGO or municipality assisting with community engagement (A2). Project-related partnerships of this kind are developed by continuous networking at the local level, which is facilitated by a tightly-knit network bringing together various kinds of organisations promoting renewable energy in the area (A2, see also Figure 5-3). Within this context, ALPHA has established a close collaboration with a local renewable energy NGO, which involves extensive mutual support. Aiming to expand local demand, ALPHA's manager works with previous clients and beneficiaries – including farmers, rural cooperatives and other businesses – and has adopted a leading role in a local business association (A2). ALPHA's manager describes their activities in university education, occupational training and local capacity building as essential for strengthening an emerging renewable energy sector, but also sees them as making the enterprise more attractive to donors, facilitating follow-up, and reducing the risk of market-spoiling through failed demonstration systems (A1, A2).

BETA exchanges information on a continuous basis with several international donor organisations (B2). Many of its projects are developed following specific requests from donor organisations and intermediaries that have obtained the necessary financial resources (B2). Following a series of bilateral development projects, BETA has established partnerships agreements with several universities (B1, B2). In exchange for BETA donating parts of the installations, the agreements allow BETA to showcase the systems installed at these universities and to use them for capacity

building purposes. The agreements also provide a framework for collaboration on student projects, feasibility studies and research into new technology applications. The latter enable BETA to better assist its supplier in product development (B1, B2). In contrast to ALPHA, BETA only works with universities specialising in agriculture and not in engineering, as it seeks to promote its *products* to future customers – and not the *technology* as such (B2). Because ALPHA and BETA strive to expand their private customer base, the two enterprises offer feasibility studies free of charge provided that they get the contract if a project goes ahead (A1, A3). BETA's manager also hopes to extend a project-based relationship with a large farmers association with an established network of competent technicians and its own microcredit program (B1).

GAMMA focuses on existing local demands for modern energy services, which, due to rural poverty and a lack of public infrastructure, are difficult to meet without subsidies (C2, C8). Once the NGO has identified a suitable community for a project, it applies for grants from international donors (both inter-governmental and non-governmental) that could cover some of the initial costs of feasibility assessments and equipment (C2, C4). GAMMAs involvement in a renewable energy association provides it with a platform for accessing project funds from international donors, and facilitates knowledge exchange with other renewable energy organisations. The association is also an important vehicle for lobbying for changes in governmental policy and tariffs. This is a matter of particular importance to GAMMA as a growing number of its community-based systems come within the reach of the national grid, and one already generates revenue from feed-in (C1, C8). GAMMA's mixed finance model requires participating communities to set up local energy committees that are responsible for collecting and managing the contributions made by the communities (C2).

DELTA seeks to continue its work in the communities where it has already implemented projects (D2). This strategy requires the NGO to diversify its project portfolio: once it has run a series of projects around a certain technology or development issue, it develops follow-up projects addressing a related issue or involving a complementary technology (D2). While DELTA's community engagement strategy facilitates follow-up and continuous technical assistance (D1), it also increases the organisation's own need for continuous capacity building and knowledge exchange (D7). A long-term partnership with an international NGO providing technical assistance and administrative support, established links with universities and with a local supplier, along with DELTAs involvement in a hybrid renewable energy association, have enabled the NGO to pursue diversification as a

market building strategy (D1, D2, D7). While series of pilot projects make for great learning opportunities, they are also prone to technical faults (D1, D7). Some repairs have been paid for by follow-up projects funded by sympathetic donors (D7). In order to enhance the financial sustainability of its projects, and to prevent failing installations from becoming an obstacle to market development, DELTA's director plans to develop more projects aiming at income generation (D1, D3). This will require DELTA to embark on partnerships strengthening its capabilities in market and business development (D1).

5.5.5 Hybrid Forms of Organisation

All four organisations have established HFOs that involve partner-specific communication, joint planning and the exchange and/or pooling of resources, and which are subject to heterogeneous governance structures. For example, relationships with donor organisations are governed by market principles (competitive bids, sales contracts etc.) as well as varying degrees of hierarchy, as donors impose priorities and prescribe administrative and reporting procedures (A1, B2, C1, D2). However, all four organisations have also developed at least one trusted 'partnership' with an international donor (A1, B1, C1, D1). Table 5-4 provides an overview of principal forms of hybrid organisation as identified in the analysis.

The term 'partnership' is used for different types of relationship, many of them hybrid, ranging from long-term collaboration to project-based arrangements (A1, B2, C1). Most relationships with private sector organisations, and in particular with suppliers, are governed by market principles (e.g. competition based on price, quality and customer support), but several are also characterised by long-term support (including loans, donations and extensive capacity building) that cannot be explained in market terms (A2, B2). DELTA combines community-type governance with market-based and hierarchical elements when it sets up local energy committees that represent the communities involved in their projects and coordinate and collect their contributions (manual labour, financial contributions).

Relationships with public and third-sector organisations at the local and national level can be based on market transactions (i.e. contract work) and, at the same time, involve trust-based 'community'-type arrangements facilitating the coordination of project work and joint problem solving (A2, C1, D1). Local renewable energy organisations can be simultaneously close partners and competitors for international funds (A1, A6, C1, D7).

Many inter-organisational arrangements involve more than two organisations (C1). Associations and networks are characterised by a certain degree of organisational hierarchy and related leadership issues, but they also enable collective representation and mutual support based on solidarity (A1, B2, C1). They serve as platforms for knowledge exchange and training, and are hubs for the development of joint proposals and projects (A1, C1). ALPHA, GAMMA and DELTA all have partnership agreements with other renewable energy organisations, some of them project-based others not, that arose from their engagement in associations and networks (A1, A2, C1, D1).

Relations with…	Hierarchy	Market	Community
Donors **(all three sectors)**	Programs run by international agencies: Coordination based on *authority*; delivery of blueprints, rule-driven and with low degree of flexibility	Competitive bids: coordination through *price* mechanism; contract work as market discrete transactions	Open ended long-term partnerships; coordination based on *trust* and loyalty
Private customers **(private)**	Energy committees representing users and responsible for community contribution (collection of fees, organisation of manual labour)	Competition on price, quality and follow-up (haggling)	Engagement with private customers as learning opportunities (i.e. technology adaptation); capacity building enhancing sustainability
Suppliers **(private and hybrid)**	Exclusive dealership arrangement	Series of discrete transactions (can lead to more continuous information exchange)	Close collaboration with supplier that provides technical and financial assistance when needed (e.g. assistance in design, advance deliveries)
Local partner organisations **(public, third sector, hybrid)**	Project partnerships led by a local organisation	Competitors or partners in international bids	Cooperation and collaboration in and across projects; mutual support based on trust and reciprocity
Associations **(mostly hybrid)**	Leadership structures shape emerging organisational field; representation in bureaucratic policy processes	Emerging hub for projects and joint proposals	Open-ended knowledge exchange, cooperation and mutual support based on solidarity

Table 5-4: Hybrid forms of organisation

5.6 Discussion

We have presented the findings of an in-depth study of renewable energy organisations addressing the problem of energy poverty in rural Central America. Our micro-analysis focused on a) the organisational hybridity of these HTOs, b) their inter-organisational embeddedness in heterogeneous organisational networks, c) the agency they derive from connecting these networks with a view to their strategies for market building, and d) the role of hybrid inter-organisational arrangements (HFOs) in this process. Our analysis revealed that the four organisations combine features of private and third-sector organisations in distinct ways; that their hybridity allows them to connect and operate in cross-sector organisational networks; and that HFOs enable them to use such networks strategically in order to access scarce resources and for market development. Our findings confirm that hybrid organising at organisational and inter-organisational levels can be seen as intrinsically related and even mutually reinforcing strategies for navigating – and shaping – hybrid spaces.

While in the context of international development cooperation, renewable energy organisations tend to be described as project implementing organisations and as such decision-takers (Kruckenberg, 2015a), our in-depth analysis of the networks and engagement strategies of ALPHA, BETA, DELTA and GAMMA revealed that these hybrid organisations derive agency from cross-sector engagement. Notwithstanding obstacles such as adverse local conditions, high levels of uncertainty and pronounced dependencies on external organisations for imported goods, donations and technical expertise, the four renewable energy organisations have succeeded in creating their own niche markets. They manage uncertainty, diversify risks and mitigate dependencies by engaging with an impressive array of different types of organisations, in what can be seen as an interactive and strategic response to their challenging situation. This situation is "no fait accompli" (Jolink & Niesten, 2012, p. 157) but is dynamic and evolving. By connecting organisations from different sectors, the four hybrid organisations have created idiosyncratic organisational "ecosystems" (Hammond, 2011, p. 197) that allow them to remain economically viable in their mission to deliver off-grid technologies and energy services to poor rural communities. Hybridity at the organisational level facilitates the strategic use of hybrid forms of organisation at the inter-organisational level, as these organisations attempt to institutionalise markets for BoP populations.

5.6.1 Hybrid Space

It is important to examine the hybrid space populated by the four organisations in its specific historical context. Traditionally, energy poverty in rural communities has been seen as an infrastructure problem that requires a public sector response. While governments in Central America seek to enhance and de-carbonise their energy systems, they have limited resources for (and perhaps interest in) installing relatively costly low-carbon energy systems in sparsely populated areas (Meza, 2014). Moreover, neoliberal energy policies of the 1990s and 2000s have led to the privatisation of previously state-owned utilities and the promotion of a regional electricity market (Gent & Tomei, 2015a), shifting the energy system from the public towards the private sector. Private utilities lack incentives to improve their services to poor remote areas. Neither is there an obvious business case to be made for private investors or technology providers. This pushes the problem of access to clean energy in rural areas to a third sector dominated by international development cooperation. Since the 1990s, policies of international donor agencies investing in the diffusion of off-grid technologies in Central American countries have come to focus on market development and partnerships involving a multiplicity of actors. This required local renewable energy organisations to develop (semi-)commercial markets and to implement mixed-financed projects in an efficient manner (Kruckenberg, 2015b).

Taken together, these historical developments have contributed to the shifting and blurring of sectoral boundaries, creating what can be characterised as a 'hybrid space' (HS). No renewable energy organisation enters this space without a social or environmental mission as there are no big profits to be made with the provision of clean energy services to the rural poor, nor is there a public authority that makes a comprehensive provision of such services a formal requirement. At the same time, a strong social or environmental mission is not sufficient a condition for organisations to survive in a context where a business-like appearance generates competitive advantage for obtaining scarce resources. Business-like operations, however, are difficult to establish in a context characterised by the absence of market-supporting institutions and poor local infrastructure. Against this background, the hybridity of ALPHA, BETA, GAMMA and DELTA can be seen as a response to environmental pressures that call for new combinations and permutations of organisational practice.

Our findings further showed how the four organisations combine features of different types of organisations in different ways in order to promote the adoption of off-grid technologies in poor rural contexts, surviving in an "institutional void [....]

amidst institutional plurality" (Mair et al., 2012, p. 820). All four have developed strategies that involve hybrid organising as a potential source of competitive advantage. Depending on the situation, they appear predominantly mission-driven or more business-like (or, as in the case of GAMMA, even come to resemble a public sector organisation). Their hybrid configuration is not a coincidence or a result of a strategy aiming at cross-sector engagement for the sake of it. Rather, it relates to the hybrid space that these organisations occupy, and where sectoral boundaries seem to lack practical relevance.

5.6.2 Hybrid Organising as a Cross-level Phenomenon

Whereas prior research theorised hybrid organising on the organisational or inter-organisational level, this study has shown that HTOs and HFOs can be *complementary and mutually reinforcing*: Because they combine features from distinct types of organisations, hybrid types of organisations appear uniquely qualified to build, enter and benefit from relationships that derive meaning from distinct institutional logics, and are subject to multiple forms of governance. Conversely, organisations that are embedded in sector spanning organisational networks, and that use hybrid forms of organisation to navigate and shape these networks, are exposed to isomorphic pressures from more than one sector, and hence are more likely to adopt hybrid features.

Findings from this research further suggest that HTOs and HFOs can be seen as an organisational response to an environment where sectoral boundaries appear of reduced relevance. By adapting to such environment, hybrid organisations structure and stabilise hybrid spaces; such as in the instances of ALPHA, BETA, GAMMA and DELTA in building markets for off-grid renewable energy technologies. From this perspective, hybrid organising at the organisational, inter-organisational and sectoral level appears inextricably linked.

While this finding has been derived from a small number of cases, and therefore has to be seen as limited in its formal generalisability, it calls for more systematic research on the interactions and nested effects of hybrid organising at different levels, which could further our understanding of hybrid organising as a cross–level phenomenon. In the remainder of this article we develop a framework for such research, introducing the concepts of sectoral, relational and organisational hybridity. *Sectoral hybridity* is defined as a hybrid organisational space characterised by sectoral ambiguities and sectoral blurring. *Relational hybridity* arises from relationships between organisations that fulfil multiple purposes and are

subject to hierarchical, market and community forms of governance. *Organisational hybridity* involves the combination of features of distinct types of organisations into a single organisation. Adopting these three concepts instead of HTO, HFO and HS allows for a further specification and analysis of the *degrees of hybridity* of organisations, their relationships, and the organisational space they occupy, and how these degrees may change over time. Figure 5-4 links these concepts into a systematic framework by a three-way nested effect, illustrated by a bold line at the left hand side of the figure, and three two-way interactions, illustrated by dashed lines on the right hand side of the figure.
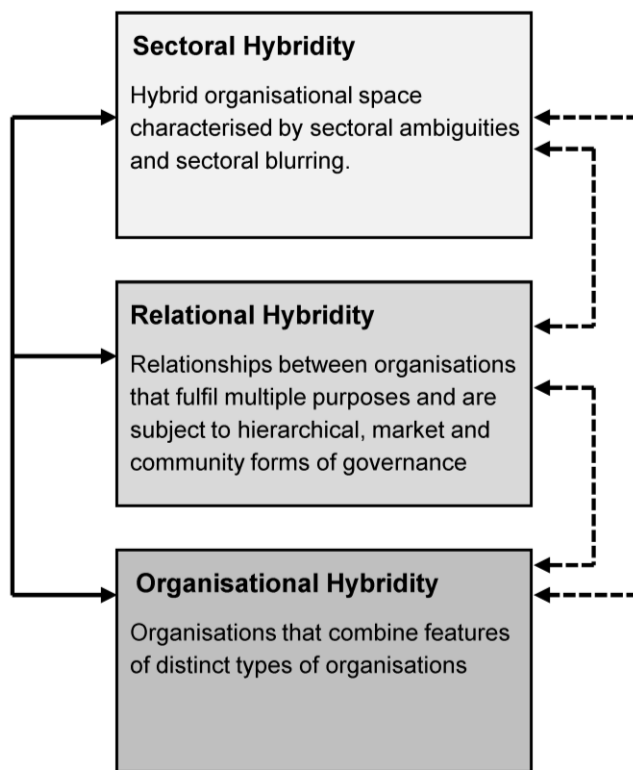
Figure 5-4: Hybrid organising as a cross-level phenomenon: Identifying interactions between sectoral, relational and organisational hybridity

ALPHA, BETA, GAMMA and DELTA were founded in an organisational space characterised by a high degree of sectoral hybridity. From their inauguration, the four organisations combined features of private and third-sector organisations in a way that enabled them to establish cross-sector relations that are meaningful in different contexts: ALPHA and BETA were set-up with strong links to a supplier and to international donor organisations. GAMMA had existing links to donors and

universities. DELTA was founded in conjunction with a social enterprise as a university spin-off, and soon entered a long-term partnership with one of its donors. From their inception, the four organisations were embedded in hybrid inter-organisational relationships that allowed them to engage with a diverse organisational field characterised by institutional voids. In their attempts at building BoP markets for off-grid RETs, ALPHA, BETA, GAMMA and DELTA seek to use these relationships to structure this field in a way that allows them to access resources, reduce uncertainties, and manage dependencies. While our findings suggest a three-way effect, a longitudinal design would be required to assess the degrees of organisational, relational and sectoral hybridity at the foundation of these organisations, and how these have changed over time.

Hybridity is by definition a variegated and dynamic phenomenon. While other cases of hybrids *suis generis* have been reported in the literature (Haigh & Hoffman, 2012), our research does not allow us to claim that all hybrid organisations are 'born' into hybrid spaces created by sectoral blurring, nor that all hybrid organisations reinforce sectoral hybridity through the creation of networks of hybrid relationships. As noted by King, Felin and Whetten (2010), extreme cases "offer unique illustrations of how organisations are social actors, semi-independent of the populations and categories to which they might belong" (p. 301). Despite this boundary condition, many of the relational–temporal factors that characterise the environment and operations of ALPHA, BETA, DELTA and GAMMA do not strike as being particularly unique. We continue to witness signs for shifting and blurring sectoral boundaries in various contexts around the world, as more public services are provided by private and third sector organisations, management practices continue to converge, and ever more questions arise about the responsibilities of private enterprises. Against this background, the framework presented in Figure 5-4 presents an analytical point of entry for future research on hybrid organising as a cross-level phenomenon, which could allow for coming to a better understanding of the interactive and nested effects between sectoral, relational and organisational hybridity, and their role in the (co-)evolution of organisations and organisational fields.

5.7 Conclusion

In this research article we have made three contributions. First, we have brought into dialogue, and then extended, two previously unconnected streams of theorising on hybrid organisations at the organisational and inter-organisational level. We

proposed that organisations may combine elements of distinct organisational types, and engage in hybrid forms of organisation, in order to adapt to–-and shape – an environment where sectoral boundaries are contested or appear of reduced relevance. Our in-depth analysis of the organisational networks of four hybrid renewable energy organisations allowed us to confirm and expand on this proposition. It revealed that these organisations had been created in a hybrid space which required them to adopt features of different sectoral types. Organisational hybridity facilitated the development of heterogeneous organisational networks connecting public, private, third sector and hybrid organisations. Each of the four organisations used hybrid forms of organisation in strategic ways for the development of niche markets for off-grid renewable energy and energy services in rural BoP contexts.

Second, we presented a relational approach and innovative methods for examining hybrid organising as a cross-level phenomenon. Previous research on hybrid organising was either characterised by an inward-looking insider view on HTOs, which led to an emphasis on (intra-)organisational practice, culture and strategy; or it was conducted from an outsider perspective and focused on the structure of relations and governance mechanisms at the inter-organisational level (i.e. HFOs). In contrast, the visual network survey we developed for this study enabled us to adopt an insider but also outward-looking perspective and allowed for an explorative yet systematic investigation of how hybrid organising at the organisational level relates to hybrid organising at the inter-organisational level. Our approach and corresponding methods bear significant potential for future research into the relational foundations of organisations and markets, at the Base of the Pyramid as well as more generally. Such research could lead to significant

contributions to ongoing debates on how and why transformational change occurs within different systems of exchange (Padgett & Powell, 2012).[81]

Third, the empirical research presented in this article demonstrated the usefulness of examining hybrid organising as a cross-level relational phenomenon. We introduced the concepts of organisational, relational and sectoral hybridity, and presented a framework for future research on the cross-cutting interactions and nested effects of hybrid organising at different levels. Such research would help to better understand how changes in relations at the wider societal level have repercussions for organising at the organisational and inter-organisational level – and vice versa. It hence bears a great potential for theorising the emergence and institutionalisation of novel organisational forms at different levels. At a time when cross-sector engagement is widely advocated as enabling solutions to complex social and environmental problems, such insights could be of tremendous practical as well as academic value.

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81 Our research can be seen as extending recent work on the emergence of organisations and markets. Our findings are in line with Padgett and Powell's (2012) proclaimed mantra that "in the short run, actors create relations; in the long run, relations create actors" (p. 2). The two scholars anchor their theorising in the observation that actors can occupy roles in multiple networks and connect them across domains (Padgett & Powell, 2012a). On the level of the individual, such reasoning can be traced back to Simmel's (1955) [1908] theory of intersecting social circles creating webs of group affiliations. In this article, however, we shifted this argument to the organisational level: hybrid organisations are involved in transactions governed by logics that evolved in distinct social sectors. Their own hybridity, and the hybrid forms of organisation they employ, enable these organisations to emulate, connect and transform relational logics in a way that allows them to shape their own organisational ecosystems, notwithstanding having their room for manoeuvre severely curtailed by resource dependency. At the same time, the creation of these hybrid types of organisations was no "virgin birth" (Ibid.) but resulted of changing patterns of relations at the sectoral level.

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Chapter 6: Discussion and Conclusion

6.1 Introduction

The transdisciplinary research presented in this thesis investigated the (inter-) organisational challenges faced by organisations that seek to create pathways to sustainable energy access for rural populations in Honduras, El Salvador and Nicaragua. An extended case study of P4SEs was guided by the principal empirical research question:

- What are the opportunities and limitations of inter-organisational partnerships involving local organisations for the development of pathways to sustainable energy in rural Central America?

A constructivist research strategy and a relational framework guided an investigation of pathway creation as a social process accomplished by organisations that are embedded in relationships with one another and in a wider selection environment shaped by local and global forces. This relational approach to pathway creation treated P4SEs not merely as organisational structures but also as 'processors' of socio-technical change that co-evolve with their environment. A theoretical research question aimed at the extension and evaluation of the framework:

- What can we learn about pathway creation from a micro-level enquiry into the (inter-)organisational challenges faced by local renewable energy organisations, and how they address them?

As the focus of the study shifted from individual P4SEs to the implications of the partnership paradigm for the development and strategy of local renewable energy organisations, a methodological research question emerged:

- What methods for qualitative network research lend themselves to a systematic – yet in-depth – investigation of the content of different kinds of interdependent relationships and their configurations in entire organisational networks?

This chapter discusses the principal findings of the study in response to these questions. After a brief introduction, Section 6.2 addresses the principal empirical research question, discussing the findings on how partnership constellations and

the strength of relationships between partners can determine the potential of P4SEs to achieve lasting impacts. Based on an encompassing analysis of the case studies presented in Chapters 2 to 5, three partnership strategies are identified: 'North–South Transfer', 'Division of Labour' and 'Joint Endeavour'. The opportunities and limitations of each of the three types are outlined, focusing on their approaches to path(way) dependency and creation. Section 6.3 addresses the theoretical research question; drawing on the key findings of Chapter 5, it shows how a relational analysis of hybrid organising as a cross-level phenomenon yielded novel insights into pathway creation as an (inter-)organisational process. In response to the third (methodological) research question, Section 6.4 articulates the methodological contribution of the study and discusses the role of the visual network survey in enabling research on hybrid organising. This leads to a reflection on the principal limitations of the study in Section 6.5. Section 6.6 recapitulates the principal contributions of this doctoral study to the four bodies of literature it engaged with; Section 6.7 identifies policy implications; and Section 6.8 draws conclusions.

6.2 Towards a Relational Understanding of P4SEs

The findings presented in Chapters 2, 3 and 5 confirm that without multi-stakeholder partnerships, the long-term adoption of RETs in poor rural areas can be difficult or even impossible to achieve. Persistent resource deficits, complex knowledge challenges and institutional voids are unlikely to be addressed successfully by one organisation alone.[82] The vast majority of research participants interviewed for this research deemed partnerships between organisations to be essential for achieving sustainable energy for all; but, like in the academic literature, there was less agreement as to what kind of partnerships (and partnership relationships) would be needed. In order to come to a better understanding of the opportunities and limitations of P4SEs for the development of pathways to sustainable energy in rural Central America, this research investigated – from a relational perspective – the dynamic inter-organisational relationships that constitute such partnerships, the practices they give rise to, and the strategies pursued by organisations that partake in them.

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82 The knowledge map included in Chapter 3 (Figure 3-1) demonstrates this point visually, as it maps out the various kinds of local/global and technical/non-technical kinds of expertise required to design appropriate models for the selection, delivery and (self-sustained) uptake of RETs in marginalised rural contexts.

6.2.1 Partnership Configurations and Strength of Relationships

The findings presented in Chapters 2 and 3 suggest that the *composition and configuration of partnerships – and the quality and strength of relationships between partners – shape the opportunities of P4SEs to realise sustainable impacts, and their limitations in doing so.*

The case study of SNGO and NNGO presented in Chapter 3 testifies to the problems associated with a chainlike partnership set-up, which – in the context of international development assistance for off-grid renewable energy – was found to be a common configuration. Chainlike North–South partnerships link international donor organisations and technology providers to rural end-users via local intermediaries. Project-implementing organisations face an 'accountability paradox' when they do not depend on the satisfaction of rural 'beneficiaries' for receiving project funds from international donors (Anderson, Brown, & Jean, 2012): irrespective of whether their activities yield any long-term benefits for the intended 'beneficiaries', meeting the expectations of donor organisations is all that counts for their own survival and growth (Najam, 1996).[83]

Drawing on the theory of strong and weak ties, Chapter 2 demonstrates how different challenges inhibiting the diffusion of off-grid RETs require the development of distinct types of inter-organisational relationships. Case studies confirm that long-term partnerships based on strong relationships can facilitate close collaboration, allowing organisations to learn from and with one another, and developing joint problem-solving abilities (Chapter 2). However, as illustrated by the case of NNGO and SNGO in Chapter 3, strong relationships cannot be established overnight; they tend to require commitment beyond an individual project or initiative, and demand continuous investment and re-negotiation. The cases presented in Chapters 2 and 5 provide further evidence for the importance of a balanced portfolio of less resource-intensive, 'weak' ties that facilitate the continuous flow of information needed to develop and consolidate emerging markets for off-grid RETs.

6.2.2 Partnership Failures

The findings on partnership configurations and relationships suggest that the successful diffusion of off-grid RETs depends on the creation not of just any kind of

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83 The case of SNGO and NNGO illustrates this problem: SNGO was asked to implement business models that were based on assumptions inapplicable to most of the communities where the organisation works. See also Cases 1 and 2, presented in Chapter 2.

multi-stakeholder partnerships, but of *partnerships that are appropriate to the tasks they are meant to perform*. Related to this argument, *four types of partnership failures* are identified (Chapters 2 and 3). First, the research confirms the existence of partnership failures arising from the absence of relationships where they are needed (Caniëls & Romijn, 2008; Jacobsson & Johnson, 2000), such as the non-inclusion of community-based organisations. Second, relationships between partners can fail to deliver expected outcomes if they are inappropriate to the task they are meant to perform – for example, when ties between international and local organisations are too weak to enable the kind of organisational learning needed to address knowledge gaps and institutional voids. Third, there are partnerships that trap local organisations in situations where they are restricted in the contribution they can make (Jacobsson & Johnson, 2000). In the context of development assistance for off-grid RETs, this failure in particular relates to local organisations specialising in the efficient implementation of demonstration projects devised by international donors, forgoing opportunities to develop and to contribute to forms of low-carbon development that are likely to be more sustainable.[84] Fourth, the case of NNGO and SNGO presented in Chapter 3 points to a partnership failure arising from knowledge–power dynamics in partnerships, and confirms and extends the findings of Ellersiek (2011).

6.2.3 Visions and Incentives

The findings presented in Chapters 2, 3 and 5 show that organisations establish and use different kinds of inter-organisational relationships in strategic ways. P4SEs are driven and consolidated by the organisations involved in them, and by their need to maintain relationships that enhance their access to resources. *Visions of sustainable energy for all, and incentives for organisations involved in P4SEs, may be related or partially aligned, but they do not always coincide.* An extreme – albeit not uncommon – example of this can be found in the case of a renewable energy organisation that repeatedly won tenders for RET projects knowing that these were likely to fail (Case 2, Chapter 2). While its manager wished to contribute to a more sustainable diffusion of off-grid RETs, he saw limited scope for such a contribution at a time when rural end-users could not afford RETs, and international development organisations seemed to prioritise efficiency in project implementation over the long-term effectiveness of their projects. This observation indicates a

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84 As shown with regard to Cases 1, 2 and 4 in Chapter 2, such specialisation can obstruct rather than advance the development of locally appropriate technologies and delivery models.

conflict between the stated goals of P4SEs and the incentives encouraging organisations to participate in them.

Short-term incentives for opportunist behaviour exist on the part of donors as well as implementing organisations. Most international donors providing development assistance for off-grid RETs in Central America claim that RET interventions have several socio-economic and environmental benefits. However, only a few donor organisations allocate sufficient funds to evaluation of the long-term impact of their initiatives. The sustainability of installed systems is merely assumed – and ultimately becomes the responsibility of local organisations and beneficiaries that lack the resources required for maintenance and repairs.[85] Case 1 in Chapter 2 is one of many that testify to the problematic consequences of this approach. The case also points to the market-spoiling effect of failed demonstration projects. *The opportunities of P4SEs to make a meaningful contribution to the development of pathways to sustainable energy therefore seem to depend on how incentives and vision can be aligned*, a point that was also made by Glasbergen (2007). The achievement of the right balance of incentives in project-implementing and market-building P4SEs can be challenging (Teegen, Doh, & Vachani, 2004). As shown in Chapters 2 and 5, *market-building* initiatives require the calibration of incentives for a greater variety of organisations.[86]

6.2.4 Partnership Strategies

An overarching analysis of all the case studies included in Chapters 2 to 5, focusing on how different partnership configurations (constellations and strengths of relationships) are linked to different visions and incentives for participating organisations, allows *three distinct partnership strategies* to be identified. While these strategies are ideal types in the sense that some partnerships combine them, they follow distinct rationales and imply distinct partnership configurations and approaches to technology transfer, knowledge and learning. They also map onto a

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85 However, partnership meetings, interviews with donors and recent contract work by both GAMMA and DELTA (Chapter 5) suggest that a growing number of donors have started to allocate more funds to projects that aim at the repair, expansion and improvement of existing installations (Interviews I-01, I-04, I-10, I, 49, V-06 as listed in Appendix B).

86 For example, BETA has signed long-term partnership agreements with local universities that help it to promote its products to potential customers while gaining access to new facilities (see Chapter 5). BETA also seeks to develop a partnership with a farmers' organisation that has established a micro-finance scheme and a network of technicians. Such a partnership would open up new markets for BETA, and widen the portfolio of the farmers' association.

more governance-oriented classification of cross-sector partnerships based on distinct assurance mechanisms developed by Forsyth (2010). Drawing on examples of the case studies presented in the previous chapters, the three strategies are explained below. Table 6-1 provides an overview of their key features.

6.2.4.1 North–South Technology Transfer

The first strategy is based on a conventional understanding of development assistance for off-grid renewable energy as aiming at the *North–South transfer* of RETs, along with universal models for their diffusion. Renewable energy 'interventions' are deemed necessary because poor rural communities in the Global South lack the resources, absorptive capacity and institutions needed to access and benefit from RETs. Technology transfer is seen as requiring a *chain of partner organisations* that connect international donors and technology providers to rural beneficiaries, in this way enabling Northern donor organisations to transfer technologies to – and build capacities in – BoP contexts. Partnerships pursuing a 'North–South Transfer' strategy can comprise weak relationships (e.g. market ties) as well as long-term partnership ties developed in series of projects and capacity-building measures. Partnerships described in Chapter 2 (Cases 1, 2 and 4), and the approach chosen by NNGO presented in Chapter 3, are examples of partnerships of this type.

The narrative underlying this strategy frames Northern expertise as of universal applicability (Dagron, 2006; Ramalingam, 2013): Knowledge is transferred from those who already know (i.e. Northern organisations) to those who are considered to be in need of their knowledge (i.e. Southern organisations and communities of beneficiaries). Partnership relations are likely to be governed by hierarchies as well as by market-related mechanisms. Assurance mechanisms in substitutive 'North–South Transfer' partnerships are defined in contracts (Forsyth, 2010). Partnership challenges are expected to arise from the limited absorptive capacity of Southern partners. Increasingly, partnerships pursuing this strategy require beneficiaries to contribute to their projects (e.g. through payments and manual labour) as 'full local ownership', and a related sense of responsibility is considered essential for achieving lasting impacts.[87] Such 'ownership' can be problematic when recipients lack the resources, capabilities and incentives to maintain the RET systems installed in demonstration projects.

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87 Interviews I-05, I-16, I-22 and I-30, and observations O-09, O-10 and O-23 as listed in Appendix B.

6.2.4.2 Division of Labour

The second partnership strategy focuses on partnerships as a means of achieving outcomes that no organisation can accomplish on its own. Partnerships are seen as facilitating a *division of labour* that leverages the comparative advantages of partner organisations. The composition of partnerships varies with the more specific division of labour. Partnerships pursuing this strategy are based on weak ties, such as market relationships and those that aid coordination. They are more likely to be governed by market-based rather than hierarchy-based governance mechanisms. Partnership contracts emphasise complementarity when determining tasks and responsibilities for each partner (Forsyth, 2010). Social, economic or technical obstacles to technology diffusion are assumed to be challenging but *manageable*.

Knowledge transfer plays a less important role in partnerships pursuing a 'Division of Labour' strategy. Each organisation is expected to focus on what it does best and to learn from the process of being involved rather than from other partners. Partnership challenges can arise from the composition of the partnership and its coordination – in particular, where heterogeneous sets of partners are involved or opportunistic behaviour seems likely. Dependencies arising from resource investment and/or coordination can translate into power asymmetries. Examples of the 'Division of Labour' model are the more recent partnerships mentioned in relation to Case 6, which involves multiple RET organisations with complementary skill-sets (Chapter 2). Partnerships aiming at an efficient division of labour are also established by local organisations using hybrid forms of organisation to create bespoke organisational 'ecosystems' for the development of new markets (Chapter 5). For example, ALPHA seeks project-based partnerships with local-development NGOs and cooperatives that it considers more competent in dealing with the social and organisational side of RET projects, allowing the social enterprise to focus on the technical aspects (Chapter 5).

6.2.4.3 Joint Endeavour

The third type of partnership strategy aims not at the efficient implementation of projects or tasks but at learning among partners. Unlike in 'North–South Transfer' partnerships, this learning is not framed in terms of knowledge transfer but focuses on the co-creation of knowledge that could enable partner organisations to better address complex sustainability challenges. In contrast to the other two strategies, obstacles preventing a sustainable adoption of off-grid RETs are not assumed to be easy to manage or even fully understood.

Strategy	North–South Transfer	Division of Labour	Joint Endeavour
Strategy	Partnership is a vehicle for the delivery of development assistance for renewable energy: Northern donor provides expertise and financial resources to Southern organisation that implements RET projects	Partnership enhances energy access by enabling an efficient division of labour between organisations that can together address a sustainability challenge too big to be left to one organisation alone	Partner organisations co-create new technologies and delivery models that are appropriate to local contexts
Rationale	Northern donors should support Southern organisations and beneficiaries with donations and capacity-building	Partnerships allow for leveraging the comparative advantages of partner organisations while maintaining their autonomy	Partnerships facilitate the development of appropriate solutions to complex development challenges
Configuration	Chain: Southern organisation implements projects for donor. No or little direct contact between donor and beneficiaries	'Cluster': loose connections between multiple organisations. Varies according to division of labour	Group: strong relationships connecting two or more organisations, high transitivity and social coherence
Relations	Weak or strong (project-based or across series of projects)	Weak (market ties and information exchange), some strong (across projects)	Predominantly strong (long-term coordination and collaboration)
Governance	Predominantly hierarchy	Predominantly market	Predominantly community
Knowledge	'Global' expertise transferred to local contexts. Solutions for problems are assumed to be available but requiring (more) competent implementation	Each partner brings in specialist knowledge. Problems are assumed to be manageable	Partners join forces in co-creating knowledge. Problem and solutions are assumed to be complex and only partially known
Learning	Organisations learn from each other – but the main direction of knowledge flows is North–South	Organisations learn from the experience (learning by doing)	Partner organisations learn together (i.e. with each other instead of from each other)
Power Asymmetry	Beneficiaries and intermediaries depend on donations; power imbalance potentially reinforced by knowledge–power dynamics	Partners may vary in resource input, responsibilities and prestige	Power imbalances acknowledged but reduced by sharing of resources and joint problem-solving strategies
Partnership Challenges	Absorptive capacity of implementing organisation; ignorance of donor organisation. Increased focus on ownership and cost-recovery gives rise to new challenges	Finding the right set of partners. Coordination of tasks and responsibilities, negotiation of vision and incentives ('sectoral ambiguities')	Collaboration is likely to be resource-/time-intensive, and requires the development of trust and a joint vision; risk of becoming too dependent on partner organisations
Examples	Chapter 2: Cases 1, 2, 4 and 6 (demonstration projects) Chapter 3: SNGO–NNGO	Chapter 2: Case 6 (recent project partnerships) Chapter 5: ALPHA (partnerships with local-development NGOs/cooperatives) and BETA (partnership with farmers' association)	Chapter 2: Cases 3 and 5 Chapter 5: ALPHA (long-term partnership with local RET NGO), BETA (with supplier) and DELTA (with international NGO)

Table 6-1: Three types of partnership strategies

Partners in 'Joint Endeavour' partnerships tend to question whether technologies and delivery models developed in the North are applicable to marginalised contexts in the South, arguing that the sustainable adoption of off-grid technologies may require the co-creation of new (or at least adapted) technologies and delivery models. This approach stands in the tradition of the appropriate technology movement. It starts with an examination of the resources, capabilities, institutions and expectations that are present in recipient communities, rather than those that are not (i.e. a gaps model or 'institutional void'). Partnerships of the 'Joint Endeavour' type evolve through long-term collaboration involving resource-sharing and joint problem-solving. Therefore, they are more likely to be governed by community-based forms of governance that are less prone to power asymmetries. Partnership contracts, if put in place, are based on the "assumption that collaboration helps parties" (Forsyth, 2010, p. 686). Partnerships challenges arise from the costs associated with long-term collaboration, the high level of commitment it requires, and the dependencies it can engender. Case studies 3 and 5 (presented in Chapter 2) are examples of 'Joint Endeavour' partnerships. ALPHA's long-term and close collaboration with a local renewable energy NGO also resembles the 'Joint Endeavour' strategy (Chapter 5). It involves extensive knowledge exchange and intensive mutual support, and was described as having led to several 'innovations', and as improving the capabilities of both organisations to achieve outcomes that are more sustainable. DELTA's partnership with an international NGO providing technical assistance also corresponds more to the 'Joint Endeavour' than to the 'North–South Transfer' strategy (Chapter 5). While the international partner organisation has provided continuous technical and administrative assistance for more than a decade, the two organisations have evolved together and developed joint problem-solving strategies, and appear to have learnt from – as well as with – each other.

6.2.5 Opportunities and Limitations of P4SEs for the Development of Pathways to Sustainable Energy

The three partnership strategies imply *distinct views on path dependency and opportunities for pathway creation*; these are summarised in Table 6-2. According to the 'North–South Transfer' narrative, energy poverty is caused by a lack of development on the part of the beneficiaries (i.e. the absence of a development pathway that could lead to the development of modern energy services). Development interventions initiated by international partners are seen as providing opportunities for 'catch-up' development. Donor organisations ultimately determine

the demand for RETs. The strong focus on what development assistance could 'add' or 'compensate for' takes priority over an analysis as to why it is not there already. The underlying assumption that the absence of a modern energy system implies the presence of a 'void' – or a development 'gap' – that can be filled by the introduction of a new technology is not without problems (Leach & Scoones, 2006).[88]

The 'Division of Labour' strategy implies a closer examination of the resource deficits, knowledge gaps and 'institutional voids' that prevent potential end-users from accessing markets for off-grid RETs and related energy services. Partnerships are then designed to bridge specific gaps, e.g. by making micro-loans available to rural end-users or RET demonstration systems accessible to students. The 'Joint Endeavour' strategy focuses even more on the path-dependent processes that inhibit the development of energy systems in BoP contexts in the first place. From this perspective, path dependency is framed as a self-reinforcing poverty trap, locked in through both global and local forces. The challenge is to better understand how to co-create pathways that 'unlock' the selection environment in such a way that appropriate (and hence sustainable) access to energy can be realised. *Different understandings of path-dependent processes in recipient communities can therefore be seen as being linked to different strategies for pathway creation.*

When comparing the three approaches, the 'Joint Endeavour' strategy may appear to be the one most likely to achieve sustainable impacts, because it aims at the co-creation of appropriate technologies and delivery models with the explicit aim of achieving long-term adoption. However, as shown in Chapter 2, strong partnerships of this kind cannot be created overnight; they tend to incur high transaction costs; they can increase dependencies between partners; and the situated solutions they seek to co-create can be difficult to scale up. This raises important questions about their cost–benefit ratio.

While the 'Joint Endeavour' strategy implies building on (path-dependent) processes in the selection environment of the recipient, it may be seen as a disruptive organisational form when compared with previous models of development assistance for renewable energy that are more hierarchical. As

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88 While institutional voids are often viewed as indicating the absence of institutions, Mair, Marti, and Ventresca (2012) found that they in fact can occur amidst institutional plurality, pointing towards a mismatch of institutions with a view to changing expectations or visions, or as an outcome of contradictions arising from intersecting institutional logics that structure different spheres of social life.

demonstrated in the literature review on policy shifts (see Chapter 2), and in the case study of NNGO and SNGO (Chapter 3), path-dependent processes shape not only the local selection environment, but also the strategies and practices of organisations involved in P4SEs.

The 'North–South Transfer' strategy aligns well with previous donor-driven models for the delivery of development assistance for renewable energy.The long-term effectiveness of donor-driven 'demonstration projects' may be limited – but they can still make an important contribution to the high upfront costs associated with introducing RETs to a new context. Demonstration projects can also serve as important learning opportunities for local organisations and beneficiaries. Moreover, some local renewable energy organisations have developed operational models that enable them to combine a 'North–South Transfer' partnership that covers high upfront costs with other arrangements that assist with follow-up.[89]

Partnerships of the 'Division of Labour' type are most likely to succeed where a solution has been identified but requires strengthening or upscaling; or where the aim is a (re)combination or integration of different (path-dependent) processes and organisational forms. Unlike the 'Joint Endeavour' type, this strategy may not be the best suited to creating new pathways in particularly challenging environments (such as remote communities with a subsistence economy), as this involves addressing problems too 'wicked' in nature to be disaggregated into distinct tasks and responsibilities. 'Division of Labour' partnerships are also less likely than 'North–South Transfer' ones to be able to absorb the high costs of introducing new technologies. However, where some degree of market development has already been achieved, an enhanced division of labour can increase efficiency and competitiveness, and can thereby strengthen nascent markets for RETs.

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[89] For example, GAMMA seeks donations from international and national organisations that contribute to the initial costs of installation (as in a demonstration project), but it then runs the installed systems on a fee-for-service basis (Chapter 5). This model was developed in the context of a 'Joint Endeavour' partnership with an international organisation, and now involves some partnerships of the 'Division of Labour' type for fee collection and community work.

	North–South Transfer	Division of Labour	Joint Endeavour
Strategy	Partnership as vehicle for the delivery of development assistance for renewable energy: Northern donors provide expertise and financial resources to Southern organisations that implement RET projects for them	Partnerships enhance energy access by enabling an efficient division of labour between organisations that together can address a sustainability challenge too big to be left to one organisation alone	Partner organisations co-create new technologies and delivery models that are appropriate to local contexts
View on Path Dependency	*Local*: The problem of path dependency is framed as one of a lack of development and a resulting shortage of energy supply. *Partnership* builds on previous delivery models for international-development cooperation	*Local*: Path-dependent processes have inhibited market development (i.e. 'institutional voids'). *Partnership* combines, consolidates and integrates emergent processes	*Local*: Path dependency as poverty trap. Durable inequalities created by global and local forces result in a 'lock-in' situation. *Partnership* arises from concerted effort aiming at pathway creation
Demand	Donor determines demand	Partnership bridges gaps in market access	Partners identify and co-create demand
Opportunities for Pathway Creation	Demonstration projects introduce off-grid RETs to poor rural communities. Partnership meets costs of installation and provides initial learning opportunities for Southern organisations and beneficiaries	Synergies strengthen emerging pathways as enhanced efficiency increases competitiveness; 'upscaling' of delivery models in nascent markets	Technology innovation and social innovation: co-creation of appropriate technologies and sustainable delivery models for particularly challenging contexts
Limitations	Knowledge/technologies transferred may be inappropriate; accountability paradox can encourage opportunistic behaviour; responsibility for long-term sustainability rests with Southern organisation and/or beneficiary; risk of market spoiling	Limited potential for addressing complex problems (difficult to divide tasks and responsibilities). Responsibility for long-term sustainability may not be clear, leading to 'passing-the-buck' behaviour	High costs as long-term and resource-intensive investment is required; difficult or even impossible to scale up

Table 6-2: Opportunities and limitations

Based on this discussion, it appears that the three partnership strategies offer different kinds of opportunities for contributing to the development of pathways to sustainable energy in rural Central America, and that they are subject to different limitations. P4SEs pursuing a 'North–South Transfer' strategy appear most appropriate for the *initial introduction* of Northern technologies to contexts with a high potential of benefiting from them. 'Division of Labour' strategies are more appropriate for *market-oriented development* interventions in places where there is already some local demand and market access. In remote rural areas with *no market access* or where severe poverty obstructs market development, 'Joint Endeavour' partnerships may be the only option available for establishing sustainable energy access. The 'Joint Endeavour' strategy is also well suited to

P4SEs that aim to develop, adapt or co-create new technologies.[90] *The trade-off between the efficiency and effectiveness identified in Chapters 2 and 3 appears in fact to be mediated by how a partnership strategy relates to a selection environment shaped by (path-dependent) local and global forces, and by the experiences, expectations and visions of participating actors. Path-dependent processes that obstruct the creation of pathways to sustainable energy arise not only from the local context, but also from institutionalised delivery models and related practices established by the organisations involved in P4SEs.*[91]

As demonstrated by the case of NNGO and SNGO in Chapter 3, partners of P4SEs may approach their partnership in different ways: NNGO's director perceived the partnership as pursuing an extended 'North–South Transfer' strategy, which – through continued capacity-building and requests for more market-oriented interventions – was expected to shift towards a 'Division of Labour' arrangement. In contrast, SNGO's director had perceived the same partnership as aiming for a long-term 'Joint Endeavour' strategy, characterised by the co-creation of new delivery models and joint problem-solving. The resulting lack of strategic alignment gave rise to misunderstandings and tensions. The four case studies of ALPHA, BETA, GAMMA and DELTA presented in Chapter 5 further demonstrate that local renewable energy organisations simultaneously operate in various kinds of inter-organisational arrangements through which they pursue different objectives. For example, ALPHA has 'North–South Transfer' arrangements with some international donors; it has a 'Joint Endeavour' partnership with a local renewable energy NGO in the context of an association; and it works in 'Division of Labour' partnerships with local-development NGOs and cooperatives that allow it to focus on technology-oriented tasks. The four case studies provide detailed insights into how local

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90 As shown in Chapter 2, most P4SEs aim at delivery and offer few opportunities to enhance the capacity of local renewable energy organisations with a view to R&D and manufacturing.

91 An example of the problem of path-dependent institutionalised practices in development assistance for renewable energy may be found in the high number of projects introducing off-grid RETs to communities that within a few years become connected to the main grid, and often then abandon their RET systems. When examining potential causes for this problem, it becomes apparent that projects that are close to existing infrastructure (such as the road network) are less costly to implement, and therefore can appear to be a more efficient use of resources. Road access also facilitates visits by representatives of donor organisations as well as the 'productive use' of RETs due to better market access (Cabraal, Barnes, & Agarwal 2005; Yadoo & Cruickshank, 2010). However, as the national grid also expands along the road system, the expected gains in effectiveness and efficiency can be short-term. Implementing organisations make strategic location choices (Fruttero & Gauri, 2005) that are informed by concerns regarding their own prospects for survival and growth, as well as by visions of sustainable energy for all.

renewable energy organisations evolve in *webs of partnership affiliations* that enable and constrain their relative contributions to pathway creation. Whereas some partnerships result from a shift in donor policies towards the 'sustainable energy paradigm' (as described in Chapters 2 and 3), others are initiated and driven by the local organisations themselves (Chapter 5). This suggests that the proliferation of partnerships as hybrid forms of organising shapes emerging sectors and markets for off-grid RETs; and that local organisations play an active role in this process.

6.3 The (Inter-)Organisational Challenges of Pathway Creation

The findings presented in Chapters 2 and 3 demonstrate that the successful transfer, diffusion and adoption of off-grid RETs depend not just on the presence (or absence) of certain conditions or success factors, but also on *the ways in which these conditions are co-created and addressed by P4SEs involving local renewable energy organisations*. Chapter 5 then presents the results of a comparative analysis of the organisational networks of four renewable energy organisations, focusing on how these hybrid organisations navigate various forms of inter-organisational engagement and partnerships. The *sectoral hybridity* of the organisational space populated by these organisations is shown to make it difficult for them to access the resources needed to tackle persistent resource deficits, knowledge gaps and institutional voids that obstruct the uptake of off-grid RETs in poor rural areas. An analysis of hybrid organising as a cross-level phenomenon reveals how local renewable energy organisations adopt hybrid organisational forms at the organisational level (*organisational hybridity*) and inter-organisational level (*relational hybridity*) in order to overcome such obstacles, and how the resulting increase in cross-sector engagement can be seen as reinforcing sectoral hybridity. This section responds to the second overarching research question by discussing how this analysis, and the proposed framework of hybrid organising as a cross-level phenomenon, can extend our understanding of pathway creation.

6.3.1 Hybrid Organising for Pathway Creation

When examining the network map of ALPHA included at the back of the thesis, several features seem remarkable – the complexity of its network, its heterogeneous composition, and the broad variety of hybrid inter-organisational

arrangements it comprises – especially given the small size of this social enterprise. Like the other three cases analysed in Chapter 5, the case of ALPHA provides a powerful illustration of how local renewable energy organisations face and respond strategically to (inter-)organisational challenges on multiple levels: first, they face network challenges that arise from their embeddedness in a context characterised by a blurring of sectoral boundaries, and where institutional voids and mismatches make it difficult or even impossible to access the scarce resources available for (co-)creating pathways to sustainable energy based on off-grid RETs. These challenges of sectoral hybridity cannot be met fully by any organisation that is embedded in just one sector (public, private or voluntary). Second, as resource access requires cross-sector engagement, it is necessary to have hybrid relationships that can address multiple purposes by (re)combining relational practices and relevance structures from different sectors. Third, organisations combine and integrate features from different sectoral types in their operational models as this facilitates resource access in a context marked by sectoral and relational hybridity.

While the local renewable energy organisations investigated for this study all work towards a vision of a pathway to sustainable energy access through the use of off-grid RETs, their missions and operations are more specific, informed by different (albeit overlapping) perceptions of the selection environment. All four organisations play "an active role in determining what portions of the past [and present] they would like to mobilise to support their imagined futures" (Garud, Kumaraswamy, & Karnøe, 2010, p. 763). However, their agency is distributed, and embedded in (and as such constrained by) their relationships with other organisations, and the wider selection environment (Foxon, Pearson, Arapostathis, Carlsson-Hyslop, & Thornton, 2013; Garud & Karnøe, 2003; Oerlemans, Gössling, & Jansen, 2007; Pfeffer & Salancik, 1978).

The findings presented in Chapter 5 lend themselves to an extension of theories of path(way) creation that emphasise the *embedded and distributed agency* of actors involved in pathway-creation processes (Garud & Karnøe, 2003; Garud et al., 2010). From this perspective, organisations are embedded in a selection environment, but also contribute to its (re)production (Garud & Karnøe, 2001; Garud et al., 2010; Giddens, 1979). Selection environments are seen as emergent contexts for actors' attempts to shape processes of sustainable development and socio-technical change in a certain direction, knowing that others are attempting the same (Garud et al., 2010). Path(way) creation requires that heterogeneous actors convene around novel technological paradigms, and involves innovation as well as

the creation of new development options through the transfer, (re)combination and transformation of existing resources and institutionalised practices (Bassanini & Dosi, 2001; Garud & Karnøe, 2001; Foxon et al., 2013). Actors are seen as being embedded in the structures and relations that they (co-)create – but these relations also shape them over time (Garud & Karnøe, 2001; Granovetter, 1985).

In its specific attention to hybrid organising as a cross-level phenomenon, the research presented in this thesis extends this previous work on path creation *by examining processes of pathway creation in a hybrid organisational space, and by relating them to the (re)configuration of organisational forms at the organisational, inter-organisational and sectoral levels*. Figure 6-1 provides a schematic overview of this extension, showing how the cross-level analytic framework presented in Chapter 5 can be related to the (inter-)organisational challenges faced by organisations working towards a vision of 'Sustainable Energy for All' in a selection environment characterised by sectoral hybridity (on the left-hand side of the figure); and how organisations engage in hybrid organising when responding to these challenges (on the right-hand side).

The figure is framed by two arrows that indicate how hybrid organising forms part of emergent processes of pathway creation that involve a cross-level (re)configuration of organisational forms that facilitate the coordination of embedded and distributed agency aimed at a vision of the future, which is enabled as well as constrained by various path-dependent processes constituting a dynamic selection environment. This selection environment is perpetually 'in the making', being the starting point of, medium for and outcome of embedded and distributed action (Garud & Karnøe, 2001; Giddens, 1979). While organisations attempt to shape and strategically manipulate the selection environment in a way that they believe aids their cause, this process also shapes them as organisations and agents of socio-technical change. This view resonates with recent research on the emergence of organisations and markets in relational sociology, where it has been suggested that "in the short run, actors create relations; in the long run, relations create actors" (Padgett & Powell, 2012, p. 2).
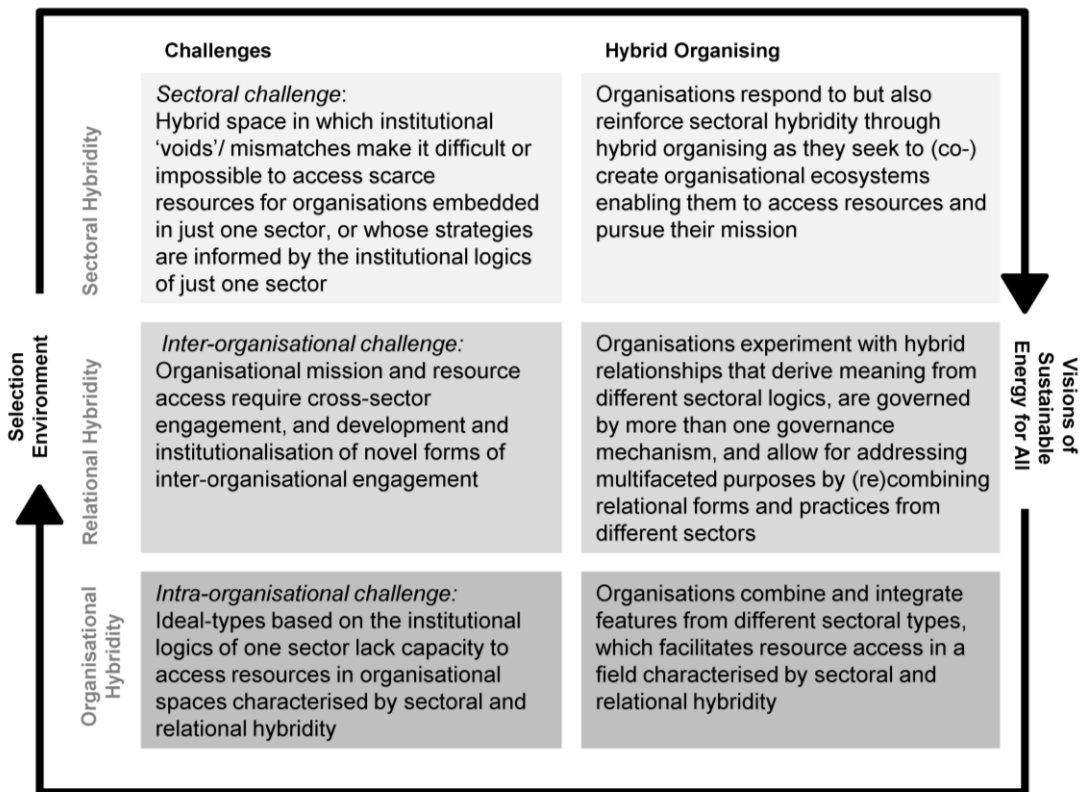
Figure 6-1: Hybrid organising for pathway creation (Source Author)

6.4 Visual Network Research: From Structure to Embedded Agency

When the analytical focus of the study shifted from the individual P4SEs to the implications of the partnership paradigm for local renewable energy organisations, a conceptual and related methodological research gap was identified. This gap arose from the fragmented nature of previous research on organisational networks and inter-organisational embeddedness and led to the articulation of a third *methodological* research question, which is addressed in this section.[92]

6.4.1 Methodological Research Problem

While the first phase of the research revealed important insights into how different kinds of P4SEs can enable (or hinder) local renewable energy organisations to

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92 This is set out in the discussion of connectionist/structuralist approaches and related methods in Chapter 4.

contribute to the diffusion and adoption of off-grid RETs (as discussed in Section 6.2 above), the data collected through unstructured interviews and participant observation did not lend themselves to a systematic analysis of how these organisations navigate the various partnerships of which they are part. Interviews conducted in the first phase further indicated that the heterogeneity of actors and relationships that constitute the networks of local organisations render them too complex to be captured in a conventional network survey. Moreover, it appeared essential to devise a data-collection tool that could assist participants in the process of recalling entire organisational networks.

Neither the structuralist tradition of social network analysis in organisation studies nor the qualitative connectionist approaches of relational sociology seemed to offer methods for a *simultaneous investigation of the content of different kinds of interdependent relationships and their configuration in entire organisational networks*. An extensive search for such a method led to the discovery of visual network research. While this small, specialist field proved to be rich in novel approaches, methods and techniques developed for different disciplines, it also lacked consolidation. A detailed review of various methods and tools informed the development of a systematic typology of visual methods for qualitative and mixed-methods network research of particular relevance to studies on inter-organisational embeddedness and organisational networks: participatory network mapping, the network map interview and the visual network survey.[93]

Following this methodological work, a visual network survey was developed; this combined elements of a conventional network survey with visual features and open-ended questions.[94] Given the amount of qualitative data already collected on the organisations under study, a more systematic and semi-standardised approach was deemed to complement the research undertaken in the first phase of fieldwork in the best possible way. A digital data-collection tool appeared attractive to the senior engineers and technicians who took part in the study, most of whom were male. Networking with researchers from other disciplines who have used visual methods in network research made it possible to test specialist software for the structured collection of qualitative data on ego-centred (personal) networks (Gamper, Schönhuth, & Kronenwett, 2012). It also led to a longer-term collaboration with the co-author of Chapter 4.

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93 See Chapter 4.

94 The survey is described in Chapter 4; the related questionnaire is included in Appendix D.

6.4.2 Researching Embedded Agency

While the main contribution of Chapter 4 is methodological in nature and relates to the three methods for visual network research presented in the article, the visual network survey that was created based on this work was also of pivotal importance in enabling the research on hybrid organising discussed in the previous section. A structured network-mapping exercise opened up novel avenues for an explorative yet systematic investigation of the *relational embeddedness* of organisations that operate in a dynamic organisational field characterised by various (and often hybrid) forms of inter-organisational engagement. Compared to the answers given in the in-depth interviews that had been conducted in the first phase of this research, responses to the open questions that had been included in the survey were more focused, and lend themselves to comparative analysis within and between networks. Through a reconstruction and visualisation of organisational networks from an insider perspective, the visual survey not only assisted research participants in recalling their entire portfolio of partnerships, but also stimulated detailed accounts of how they used different partnerships in strategic ways.[95]

What started as an investigation of the inter-organisational embeddedness of local renewable organisations, and of how they were affected by the various partnerships created in the wake of the 'sustainable energy paradigm' (Chapter 2), soon expanded into an enquiry into their *embedded agency*. It turned out that local organisations were by no means just passive subjects to partnerships' established international 'partners', but that they themselves initiated and pursued various forms of partnerships in strategic attempts to build organisational ecosystems that could support their cause. These findings not only opened up new avenues for theorising hybrid organising as a cross-level phenomenon, but also testified to the potential of visual methods in enabling a more agentic and process-oriented form of network research.

6.4.3 Analysing Visual Network Surveys

While the development of the visual network survey as a tool for data collection had benefited from an extensive literature review conducted for Chapter 4, and from support offered by the creators of the software tool (Gamper et al., 2012), the analysis of the data collected using this tool required the development of a novel method. Given the focus of the software on a structuralist-oriented analysis, and the

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95 For examples, see Footnotes 86 and 89 above.

fact that qualitative data obtained in the first phase of the study were to be included in the analysis, none of the methods described in the literature appeared appropriate (Herz, Peters, & Truschkat, 2015; Hogan, Carrasco, & Wellman, 2007). Therefore, a tailored three-step design was developed, which involved the use of QDA software along with structured case records and the creation of novel analytical maps that facilitated a systematic analysis of complex patterns of multiplex relationships by overlaying and comparing different sets of relations.[96] As well as the typology, this novel approach to data analysis in visual network research attracted much attention from researchers working with visual methods in qualitative network research.[97]

6.5 Reflections on Limitations

No study is without limitations, and in-depth micro-studies of organisational phenomena are prone to issues around access, sampling and generalisability. While some of the limitations of this research have already been addressed in the preceding chapters, this section discusses key limitations relating to the study's overarching *research design* and *conceptual framework*.

6.5.1 Extended Case Method and Encompassing Sampling Strategy

The research examined pathway creation for sustainable energy as a function of varying manifestations of P4SEs. The explorative thrust of the study led to the collection of data on various partnerships, on the organisations involved in them, and on the contexts in which they operate. However, the amount and richness of the data collected depended on opportunities for participant observation and follow-up.[98] As a result, the data collected during fieldwork varied in depth and detail across cases; this limitation had to be taken into account when selecting cases for analysis. In some instances, confidentiality agreements made it difficult to include

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96 This is described in Chapter 4. For an example of a layered network map, see Appendix E.

97 This claim is based on feedback obtained following a talk at the XXXV Sunbelt Social Network Conference, International Network for Social Network Analysis (26 June 2015) and subsequent correspondence.

98 The fieldwork was conducted in the dry season as this facilitated working in remote areas. However, because most local renewable energy organisations are very busy at this time of the year, it was close-to-impossible to schedule appointments more than a week ahead, and opportunities for participant observation often arose on an ad hoc basis.

material in articles intended for publication.[99] In order to avoid 'cherry picking' cases, which can severely limit the quality of inferences (Barbour, 2014), the implications of emerging findings for other instances that were not included in the analysis for a given paper were considered. Data that could inform rival explanations helped to assess the robustness and scope of the findings. As noted in Chapters 2, 3 and 5, theoretical propositions derived from a small number of case studies aim at internal generalisability – that is, the capacity to explain what has been researched – and not at formal generalisability (Easterby-Smith, Thorpe, & Jackson, 2015). Comparative analysis and prior research findings may suggest some degree of transferability, but theory-testing research would be required to confirm (or refute) such assumptions. While the context of rural Central America may be seen as to some extent typical of lower-middle-income countries characterised by high inequality and the prevalence of rural poverty, and some of the observations and findings correspond to those reported from studies in other contexts (Mulugetta, 2008; Sovacool & Drupady, 2012; Terrapon-Pfaff, Dienst, König, & Ortiz, 2014), caution must be used as this transferability is always easier to assume than to prove. Moreover, the P4SEs investigated in this research were of a particular type as they, by definition, involved local renewable energy organisations and aimed at the transfer, diffusion and adoption of off-grid RETs in rural contexts.

Another limitation arose from the temporally bounded context of the doctoral study, and its cross-sectional rather than longitudinal research design. As an extended case study on pathway creation, this research started with an enquiry into the '*here and now*', extended through the analysis of retrospective accounts of past developments and of anticipated futures (Burawoy, 2009; Garud & Gehman, 2012). However, such accounts are likely to be shaped by perceptions of the present. Considering that processes such as partnership development, technology adoption, sustainable development and pathway creation all evolve over time, this is an important limitation to acknowledge. It is now planned to conduct a follow-up study with two organisations, with the aim of tracing the development of at least three P4SEs, and of the organisations themselves, over a longer period of time.

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99 This problem also affected the presentation of the typology of partnership strategies in Section 6.2.4 above. Given that partnerships pursuing a 'Joint Endeavour' strategy tend to adapt to the very specific contexts in which they operate, they are more difficult to anonymise. Therefore, the previous chapters include relatively little material on such partnerships, making it difficult to provide evidence for this strategy without introducing any new material.

6.5.2 Framework

The conceptual framework of the study implied limitations arising from its *focus on inter-organisational relationships*; the ways in which it *reconstructed the selection environment* of off-grid RETs in rural areas, and *evaluated the sustainability of RET interventions*; and its relatively *open conceptualisation* of P4SEs.

First, the study focused on relationships between organisations and did not take into account more specifically *personal relationships* between individual members of organisations. Given that inter-organisational relationships evolve along trajectories of interactions between such individuals, this restriction is not without problems (Oerlemans et al., 2007; Sorenson & Rogan, 2014). Moreover, prior ethnographic research on technical assistance in international development cooperation has suggested that personal relationships can shape outcomes in important ways (Grammig, 2012; Mosse, 2005). However, a multi-level analysis of interpersonal and inter-organisational relationships was beyond the scope of this study. Arguably, the small size of the local renewable energy organisations on which this study focused made this decision appear less problematic. Nevertheless, research aiming at differentiating the effects of (and interactions between) interpersonal and inter-organisational relations in P4SEs could make a fascinating topic for future investigations, and could also contribute to a better understanding of the scope and transferability of the findings generated by this study.

Second, the study prioritised an examination of the quality or content of *relationships* over an examination of their structural configuration in networks. The research involved a qualitative investigation of partnership configurations and organisational networks, but no attempt was made to reconstruct the structure of the entire inter-organisational network of organisations involved in the transfer, diffusion and adoption of off-grid RETs in Central America. As a result, the overall structural embeddedness of organisations and partnerships could not be assessed.

Third, while an analysis of grey literature and expert interviews[100] assisted the researcher in developing an understanding of the hybrid context of P4SEs, the study did not aim at in-depth analysis of the wider energy systems of El Salvador, Honduras and Nicaragua. This was partly because of the highly politicised context and alleged corruption, and partly because expert interviews suggested that the few policies of particular relevance to off-grid RETs were only partially implemented. In line with its constructivist approach (Berger & Luckmann, 1979), the research

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100 An overview of the interviews conducted for this study is included in Appendix B.

therefore aimed at an inter-subjective reconstruction of the *perceived selection environment*, which was then extended and contrasted with published accounts (Apergis & Payne, 2011; de Leon Barido, Diego Ponce, Johnston, Moncada, Callaway, & Kammen, 2015; Dolezal, Majano, Ochs, & Palencia, 2013; Gent, 2014; Gent & Tomei, 2015; Meza, 2014; Rebane & Barham, 2011; Tomei & Gent, 2015). A similarly pragmatic approach was adopted with a view to evaluating the (potential) sustainability of the work of P4SEs. Data were collected and triangulated on the expectations of different actors regarding the long-term prospects of individual systems, the likelihood of their contributing to market development, and their anticipated contributions to local development. Moreover, the research was based on the assumption that partnerships that would inhibit rather than expand the capacities of local organisations, and that provided incentives for opportunist practices at the expense of potential beneficiaries, were unlikely to achieve sustainable energy for all in the long term.

Fourth, the relatively open *working definition of P4SEs*[101] adopted in this research can be seen as both a strength and a weakness of the study. On one hand, this approach enabled an innovative exploration of partnerships as hybrid forms of organising, rather than as an expression of value, an instrumental means, or a very specific form of inter-organisational engagement. On the other hand, it made it more difficult to relate the findings of this research to ongoing debates on 'partnerships for sustainable development', which tend to be defined in a much narrower way (Glasbergen, 2007; van Huijstee, Francken, & Leroy, 2007). An exploration of how these two bodies of literature can be linked both conceptually and empirically remains a subject for future research. A systematic review of the opportunities and limitations of different cross-sector partnerships identified in the literature on low-carbon development within the framework of cross-level hybridity could advance our understanding of both partnerships and hybrid organising.

Finally, it is important to note that this research was limited to partnerships involving local organisations, and that sought to promote the transfer, diffusion and adoption of off-grid technologies in poor rural areas. Further research is needed to clarify the extent to which the findings arrived at in this study may also apply to P4SEs that seek changes in policy, attend to the energy needs of urban populations or aim at the diffusion of other low-carbon technologies. Based on the research presented here, it appears likely that partnerships that promote RETs to businesses or that are

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101 The definition was: 'configurations of relationships between two or more organisations aiming at a sustainable (i.e. self-sustained) adoption of off-grid RETs in a specific rural context'.

involved in large-scale infrastructure projects face different sets of (inter-) organisational challenges.

6.6 Contributions to the Literature

The findings from this study make contributions to the current literature in four areas of research.

Through an extended case study of *P4SEs* involving local organisations, the research adds to the literature on international development assistance for off-grid renewable energy (Bhattacharyya, 2013; Sovacool & Drupady, 2012; Terrapon-Pfaff et al., 2014), and on multi-stakeholder P4SEs more specifically (Chaurey, Krithika, Palit, Rakesh, & Sovacool, 2012; El Fadel, Rachid, El-Samra, Bou Boutros, & Hashisho, 2013; Fernández-Baldor, Hueso, & Boni, 2012; Forsyth, 2012; Morsink, Hofman, & Lovett, 2011; Pinkse & Kolk, 2012; Sovacool, 2013). The study introduces a *relational framework* that shifts the analytical focus from contingency factors to the actors involved and their relationships. The usefulness of this approach is demonstrated by the study's principal findings on how the *composition and configuration of P4SEs*, the *quality and strength of relationships between partners*, and the *alignment between incentives for partners and partnership visions* can determine their potential for impact.

The study introduces a *framework for mapping the complex knowledge challenges* associated with development assistance for off-grid renewable energy. Drawing on work by Ashman (2001), Elbers (2012), Ellersiek (2011) and Lister (2000), it provides novel insights into *knowledge–power dynamics* in North–South P4SEs through a micro-analysis of how such dynamics underlie and obstruct the effectiveness of capacity-building in partnerships. Finally, a *typology of three distinct partnership strategies* extends a previous classification of cross-sector partnerships based on governance mechanisms (Forsyth, 2010), and shows how underlying partnership rationales and views on path dependency correspond to distinct partnership relations and configurations, shape partnership practice and related power dynamics, and translate into distinct opportunities and limitations for the transfer, diffusion and adoption of off-grid RETs.

The study further brings into dialogue two bodies of literature on hybrid types and forms of organisations through an empirical investigation of *hybrid organising as a cross-level phenomenon.* Based on a comparative analysis of the organisational networks and strategies of hybrid renewable energy organisations, it proposes the

concepts of *sectoral, relational and organisational hybridity*. Drawing on work on the 'nested' embeddedness of organisations (Dacin, Ventresca, & Beal, 1999; Hagedoorn, 2006), it develops a *framework for tracing interactive 'nested' effects of hybridity across levels* – which, it is hoped, will provide a base for future research on hybrid organising, at a time when interest in this topic appears to be building (Battilana & Lee, 2014; Jay, 2013).

The study also extends prior theorising on path(way) creation as an (inter-)organisational process (Bassanini & Dosi, 2001; Garud & Karnøe, 2001, 2003; Garud et al., 2010; van de Ven & Garud, 1989). It presents novel insights into how local renewable energy organisations *adopt hybrid operational models, and use hybrid relationships, to address the (inter-)organisational challenges of pathway creation in a selection environment characterised by sectoral hybridity*. These findings, and the *proposed framework for hybrid organising as a cross-level phenomenon*, confirm and connect with recent work in economic sociology on the emergence of organisation and markets (Padgett & Powell, 2012), and with ongoing research and related debates on market building in BoP contexts (Kandachar & Halme, 2008; Kolk & van den Buuse, 2012; London & Hart, 2011; Mair, Marti, & Ventresca, 2012). The theoretical extension proposed in this study is limited to a context characterised by sectoral hybridity, and excludes the intra-organisational (i.e. personal) level. However, given that ever more organisational fields appear to be subject to a blurring of sectoral boundaries (Eikenberry & Kluver, 2004; Evers, 2005; Selsky & Parker, 2005), it may still be seen as having a potential for future research into path(way) creation in other fields.

Finally, the study makes a contribution to a nascent literature on qualitative network research. It introduces a novel *typology of three visual methods for qualitative and mixed-methods network research* (participatory network mapping, the network map interview and the visual network survey) based on an extensive review of the English- and German-language literature (Hogan et al., 2007; Hollstein & Pfeffer, 2010; McCarty, Molina, Aguilar, & Rota, 2007; Schönhuth & Gamper, 2013). The study demonstrates how a *visual network survey* enables a *simultaneous investigation of the content of different kinds of interdependent relationships and their configuration in entire organisational networks*. It illustrates how visual network research: (a) can narrow the gap between 'connectionist' and 'structuralist' approaches to investigating multiplex relationships and interdependencies between different kinds of inter-organisational relationships (Borgatti & Foster, 2003; Jack, 2010); and (b) enables a more agency- and process-oriented form of network research (Emirbayer & Goodwin, 1994). Based on a discussion of the potential role

of different kinds of network maps in processes of data collection and data analysis, the study identifies *critical design issues* to be considered by researchers planning to use methods for visual network research in their future work.

6.7 Policy Implications

Besides their contribution to academic literature, the findings of this study can be seen as having a number of important implications for future practice.

Perhaps the most important issue that emerges from this study is that our understanding of the practices and relationships that constitute P4SEs needs to transcend a view of such partnerships as an end in itself. The findings of this research clearly indicate that partnership configuration, and the quality of inter-organisational relationships constituting such partnerships, matter – and that the potential and limitations of P4SEs depend at least partly on whether they are *organised* in a way that is appropriate to the tasks they are meant to perform. For the transfer of technological hardware, or the implementation of predetermined demonstration projects, short-term market relationships may suffice. However, the (co-)creation or adaptation of new technologies, or the sustainable adoption of RETs in remote rural areas, is likely to require enduring forms of collaboration. Moreover, the findings presented in Chapter 2 suggest that partnerships aiming at the former (i.e. the transfer of hardware and implementation of predetermined demonstration projects) may not contribute (or may even obstruct) the development of the latter. Therefore, the design of P4SEs should not only take into account the needs and potential contributions of partner organisations and 'beneficiaries' of their work, but also involve a clear articulation of the objectives of a partnership as a whole, and of how these align with the needs and goals of the organisations involved. The typology of partnership strategies presented in Section 6.2.4 lends itself to serving as a sensitising device for an evaluation of the opportunities of different kinds of P4SEs to achieve sustainable outcomes, and their limitations in doing so.

Second, the findings of this study suggest that more attention should be paid to inter-organisational learning in P4SEs and how this is affected by knowledge–power dynamics in partnerships (Ellersiek, 2011). To this end, the study proposes a mapping tool for a participatory assessment of knowledge challenges, how these are addressed by partners, and the ways in which power asymmetries between partners may affect partnership performance (Chapter 3). The findings of case studies included in this study further point to a need for all partners of P4SEs to

identify explicit learning objectives for themselves as well as for their partnerships. Given the 'wickedness' of many of the problems associated with development assistance for off-grid RETs, sustainable solutions are unlikely to be achieved by 'experts' who consider themselves as 'knowledge senders only'.

Third, the findings of this research testify to the limitations of short-term RET projects. Project partnerships may bridge particular resource deficits, knowledge gaps and institutional voids temporarily, but – due to their limited scope and duration – are unlikely to close them permanently. Therefore, policy-makers should take care not to lose sight of the 'bigger picture' when planning RET initiatives, and should consider working towards more long-term organisational and sectoral development goals. This could also help them to address trade-offs between efficient project implementation and the long-term effectiveness of such interventions.

Fourth, the study provides evidence for the important role of – and multiple (inter-)organisational challenges faced by – hybrid renewable energy organisations. If P4SEs aim at long-term impact, they need to consider how these organisations can be supported in (rather than prevented from) building organisational ecosystems that help them to strengthen emergent pathways to sustainable energy. While demonstration projects may be an integral part of the mixed-finance model of some (e.g. GAMMA in Chapter 5), they can also destroy markets created by others (e.g. Case 2 in Chapter 2). As international donor organisations and governmental agencies provide critical resources and influence their partners' needs for such resources, they should consider the implications of their activities for the development and growth of these organisations. This has become all the more important in the context of market-oriented development assistance, and the increasingly common but nonetheless problematic assumption that the long-term (financial) sustainability of RET interventions can be achieved only through the creation of BoP markets for RETs and related energy services. The findings of this study confirm research by others in that the search for viable business models for 'sustainable energy' is far from over (Kolk & van den Buuse, 2012), and in some marginalised contexts may never be a realistic prospect.

6.8 Conclusion

This thesis provides a unique exploration of the (inter-)organisational challenges faced by organisations promoting the adoption of off-grid RETs in marginalised rural areas in Central America. It offers novel insights into the opportunities and

limitations of inter-organisational partnerships involving local organisations for the development of pathways to sustainable energy, and proposes an extension to relational theories of path(way) creation for contexts characterised by a blurring of sectoral boundaries. The empirical findings of this research highlight the complexity of pathway creation as an (inter-)organisational process, but also testify to the commitment and creativity of organisations that pursue a vision of sustainable energy for all. An investigation of the relational embeddedness of local organisations reveals that local organisations, while often presented as 'decision-takers' and implementing 'partners', develop innovative organisational forms that enable them to navigate strategically an emerging organisational field shaped by various kinds of partnerships.

While the study confirms that universal models for the diffusion of off-grid RETs in poor rural contexts are unlikely to be successful, it goes some way towards enhancing our understanding of how P4SEs can be designed in a way that increases their potential for achieving this aim. Following the recent adoption of 'access to affordable and clean energy' as the seventh of 17 new Sustainable Development Goals, the momentum behind a global initiative towards 'Sustainable Energy for All' appears likely to grow. The announcement in September 2015 of the creation of the UN Sustainable Energy for All Partnership further suggests that the multi-stakeholder partnerships of the 'sustainable energy paradigm' are here to stay. It remains to be seen, however, how far P4SEs will go in achieving this goal. Much will depend on whether partnership will be informed by insights into the (inter-)organisational challenges of pathway creation – enabling "learning *as* sustainability" (Stagl, 2007, p. 58, emphasis added) – or will be seen simply as a vehicle for the delivery of preconceived development interventions.

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Appendices

Appendix A: Contact Email, Project Information Sheet and Consent Forms

The following sections present the project information sheet, contact emails and consent forms used during fieldwork. All documents are available in English and Spanish.

A1. Contact Email (English Version)

Dear CONTACT,

Let me first introduce myself. I am Lena Kruckenberg, a researcher from the University of Leeds in England. [PREVIOUS CONTACT suggested to contact you, as] I am presently conducting a research project on renewable energy technology adoption and market development in El Salvador and neighbouring countries. The research is intended to contribute to a better understanding of the ways in which different types of organisations (such as international organisations, firms, government agencies, NGOs) contribute to the sustainable deployment of renewable energy technologies in the region. I am particularly interested in processes of inter-organisational collaboration and learning between partners, investors, contractors and regulators.

I am writing to invite you and your organisation to participate in this study. I feel that your work is particularly important, and that this research project would greatly benefit from your involvement and expertise. Please find attached a short overview of the project for your information (ATTACH INFORMATION SHEET). I am particularly interested in your work in the area of TECHNOLOGY/your project in REGION.

I hope that you will be able to accept my invitation. In case you are interested, I would kindly ask if you would be available for a short meeting to discuss the project and possibilities for your involvement in this study. Such meeting would also give you the opportunity to ask questions and to find out more about the background of this research. I am in PLACE from DATE-DATE. It would be a great honour to meet you.

I look forward to hearing from you.

Yours sincerely,

A2. Project Information Sheet (English Version)

Lena Kruckenberg - http://www.see.leeds.ac.uk/people/l.kruckenberg
Sustainability Research Institute & Centre for International Business
University of Leeds, United Kingdom
Email: eeljk@leeds.ac.uk; Telephone: 0044 7551938297

UNIVERSITY OF LEEDS

Research project on organisational alliances and inter-organisational networks in the field of renewable energy technologies

Information Sheet (*available in English and Spanish*)

You are being invited to take part in a research study conducted by Lena Kruckenberg, a doctoral researcher from the University in Leeds (United Kingdom). Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully.

What is the purpose of the study?
This research project investigates renewable energy technology adoption and market development through organisations in Central America. It will help to better understand the role of different types of organisations in renewable energy projects across the region. How do organisations such as international organisations, firms, government agencies, community organisations, development agencies, and NGOs work together – as partners, suppliers and contractors? How do people working in these organisations learn about renewable energy technologies and make decisions about their deployment? What are the main technological, financial and practical barriers? What are the conditions that foster implementation? This research is intended to contribute to a better understanding as to the possibilities and limitations of renewable energy projects and self-sustained low carbon development in Central America.

Why have you been invited to participate?
You are invited to participate in this research as a member of an organisation active in this field. Your work is particularly important and this research project would greatly benefit from your involvement and expertise. It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a participation consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason. All you need to do is to send an email to Lena Kruckenberg's email address or call her telephone number stated below.

What will happen if you take part?
The data of this study will be based on interviews and observations on the work of organisations in this field. As a participant in this study, you will be asked to do 1-3 interviews with the researcher. In these interviews, participants will be asked questions about their experiences of working with renewable energy technologies in Central America. Most of these questions will be about the organisations you have worked for and worked with. In these interviews, you will be asked questions about your organisation and its contacts to other organisations. If you do not wish to answer any particular question, you are free to decline.
Some interviews will include a network questionnaire. This questionnaire will be used to draw a network map which will show how your organisation is connected with other organisations. You will be provided with a copy of the network map and all interview related resources at request. Interviews will take about 45 minutes to 2 hours and may be conducted in English, Spanish or German (whatever is convenient for you). Interviews in Spanish might be conducted with the support of a local research assistant. You will be asked to give your permission for the interview to be voice recorded. Interviews can be conducted as group interviews, for example, if you wish to conduct the interview with your colleagues.

The researcher may also ask you if she can observe your work in ongoing projects, for example by attending project meetings, a field trip or a workshop. In these contexts, you may be asked for access to some project

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Lena Kruckenberg - http://www.see.leeds.ac.uk/people/l.kruckenberg
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UNIVERSITY OF LEEDS

related documents such as regular project reports. Please be assured that every effort will be made to not interfere with or delay work participants may be engaged in, or to intrude in any private matters.
If you are interested, the researcher may offer you to film some project related meetings and events. This might be a useful resource for you as well as for the researcher. The researcher will not broadcast the recording or show it in public except for academic research and teaching purposes. If a public broadcast is intended, you will be asked to sign a separate release form.

Will your taking part in this study be kept confidential?
All interviews, documents and observations will be anonymised (using pseudonyms such as *person A1* in *organisation A*). No private names will be linked with the research material or any publications. Data will be kept confidential, as there have been cases of other studies in which anonymity was unintentionally compromised. Please be assured that you will be consulted prior to the publication of this research, if there is any reason that there could be a problem.

What are the possible benefits of taking part?
It is expected that this research will advance our understanding as to how to achieve a more sustainable deployment of renewable energy technologies in the region. However, there are no immediate or material benefits to participating in this research. Potential benefits may arise for some participants in the sense that this project offers them an opportunity to reflect upon and discuss their work. Interview related resources, such as the network map or pictures might be useful, too.
Provided that they have been requested, short summary reports of the results of this research (2-10 pages) will be issued. These summaries will be tailored to the participating organisations that requested them.

What will happen to the results of the research study?
The research for this study will be used in a dissertation for a doctorate in social sciences. Some of the results of this study will be presented in academic workshops and conferences, and published in academic journals and books. You will be asked for your permission to the use of the data of this study in academic follow-up studies.

Who is organising and funding the research?
The researcher of this study is a doctoral candidate based at the University of Leeds in England. She is supervised by Professor Andy Gouldson in the School of Earth and Environment and Dr Hinrich Voss, Leeds University Business School. The research project is funded by a research scholarship from the University of Leeds and a travel bursary granted by the British Centre for Climate Change Economics and Policy.

Who has reviewed the study?
The research project has been approved by the University Research Ethics Committee, University of Leeds.

Contact for Further Information
For further information please contact the researcher Lena Kruckenberg (contact details above) or, if you prefer an alternative contact, Jennifer Blaikie, Senior Research Ethics Administrator (j.m.blaikie@leeds.ac.uk; Research & Innovation Service, University of Leeds, Leeds, LS2 9LJ, United Kingdom).

Thank you for taking the time to read this information sheet.

Leeds, 02.01.2014

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A3. Consent Forms (English Version)

Lena Kruckenberg - http://www.see.leeds.ac.uk/people/l.kruckenberg
Sustainability Research Institute & Centre for International Business
University of Leeds, United Kingdom
Email: eeljk@leeds.ac.uk; Telephone: 0044 7551938297

UNIVERSITY OF LEEDS

Research project on organisational alliances in the field of renewable energy technologies

Empowering partnerships: How alliances in the field of renewable energy technologies contribute to low-carbon development in Central America

Consent Form: Organisation   **Please tick box**

I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.

I understand that the participation of my organisation is voluntary and that all members of my organisation are free to withdraw at any time, without giving reason.

I understand that all responses and observations will be kept confidential and that no names (including those of the organisation and individual members) will be linked with the research material.

As head/director/executive of this organisation, I give permission to the researcher Lena Kruckenberg and potential academic collaborators to have access to data collected in this organisation. I agree for the data collected to be archived and used in future research.

I agree to this research taking place in my organisation.

Comments:

_____   _____   _____

Name of the Organisation and   Date   Signature
 Representative

_____   _____   _____

Name of Researcher   Date   Signature

Once two copies of this document have been signed by all parties, one copy will be given to the participant and one copy will be filed by the researcher in a secure location. If you have questions about your rights in the study, please do not hesitate to contact Lena Kruckenberg (contact details above).

Lena Kruckenberg
Sustainability Research Institute & Centre for International Business
University of Leeds, United Kingdom
Email: eeljk@leeds.ac.uk; Telephone: 0044 7551938297

UNIVERSITY OF LEEDS

Research project on organisational alliances in the field of renewable energy technologies

Empowering partnerships: How alliances in the field of renewable energy technologies contribute to low-carbon development in Central America

Participant Consent Form

Please tick boxes

I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.

I confirm that my participation is voluntary.

I understand that I am free to withdraw at any time, and without giving reason.

I understand that all responses and observations will be kept confidential and that my name will not be linked with the research material or appear in the reports that result from this research.

I give permission to the researcher Lena Kruckenberg and potential academic collaborators to have access to anonymised responses and observational notes.

I agree for the data collected to be archived and used in future research.

I agree to take part in the above research project.

	Yes	No
I agree to the interview / focus group / consultation being audio recorded	☐	☐
I agree to the use of anonymised quotes in publications	☐	☐

A free copy of all audio recordings will be provided at request.

_____   _____   _____
Name of Participant   Date   Signature

_____   _____   _____
Name of Researcher   Date   Signature

*Please add any other relevant **comments overleaf**. Once two copies of this document have been signed by all parties, one copy will be given to the participant and one copy will be filed by the researcher in a secure location. If you have questions about your rights in the study, please do not hesitate to contact Lena Kruckenberg (contact details above).*

Appendix B: Overview of Data Collection

It was decided not to include information on where individual interviews and observations were conducted as this information could reveal the identity of organisations that participated in this research.

B1. Anonymised Overview of First Phase of Fieldwork in Chronological Order

Informal conversations and observations (e.g. when conducting desk research in the office of a renewable energy organisation) were recorded in a fieldwork diary.

ID Code[102]	Interview/Observation[103]	Data[104]	Date
I-01	*Interview* with director of Central American renewable energy agency (ORG-01)	AR, WF	30.01.2013
O-01	*Observation:* Day at the office of Central American renewable energy agency (ORG-01)	WF	04.02.2013
FD	Informal meeting with local administrator of international renewable energy NGO (ORG-02)	WF	05.02.2013
O-02	*Observation:* Meeting between programme director of donor agency, government official and RET NGO on project site in remote rural area, discussion of project follow-up and repairs (ORG-01, ORG-03, ORG-04)	WF, P	06.02.2013
O-03	*Observation:* Celebration of project completion (with renewable energy organisations, end-users, donor agency, farmers association and high-level public officials in attendance), informal conversations during visits to demonstration sites (*omitted*)	WF, P	07.02.2013

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[102] ID Codes relate to interviews (I-01 – I-51), observations (O-01 – O-23), visual network surveys (V-01 – V08) and entries in fieldwork diary (FD).

[103] Anonymised ID of organisations involved in brackets (ORG-01, ORG-02,…).

[104] Types of data listed in the table: AF – audio-recoded fieldnotes, AR – audio recordings, P – pictures, VNS – visual network survey (digital), WF – written fieldnotes.

O-04	*Observation:* Project meeting (early stage) between donor agency, renewable energy organisation and cooperative (ORG-01, ORG-05, ORG-06)	AR, WF, P	08.02.2013
FD	Desk work at office of Central American renewable energy agency (ORG-01)	WF	11.02.-15.02. 2013
I-02	*Interview:* Follow-up interview with director of renewable energy agency (ORG-01)	AR, WF	14.02.2013
O-05	*Observation:* Project work at office of Central American renewable energy agency (ORG-01)	WF	18.02.2013
O-06	*Observation:* Project meeting between donor agency, renewable energy organisation and beneficiary (local charity) (ORG-01, ORG-07, ORG-09)	WF, P	19.02.2013
I-03	*Interview* with expert for development of civil society in Central America (ORG-09)	WF, AR,	19.02.2013
FD	Informal conversations at Central American renewable energy agency (ORG-01)	WF	20.02.2013
O-07	*Observation:* Representatives of donor agency visiting project site (under construction) meeting project manager, end-users, and renewable energy organisation (ORG-01, ORG-10, ORG-11)	WF, P	21.02.2013
I-04	*Interview:* Follow-up with director of Central American renewable energy agency (ORG-01)	WF, AR	22.02.2013
I-05	*Interview* with director of renewable energy organisation (ORG-12)	WF, AR	25.02.2013
FD	Desk work at office of Central American renewable energy agency (ORG-01)	WF	26.02.-27.02. 2013
I-06	*Interview* with project manager at Central American renewable energy agency (ORG-01)	WF, AR	28.02.2013
I-07	*Interview* with another project manager at Central American renewable energy agency (ORG-01)	WF, AR	01.03.2013
FD	Informal meeting with administrator of international renewable energy NGO (ORG-02)	WF	03.03.2013

FD	Desk work in office of renewable energy NGO (ORG-02)	WF	04.03.2013
O-08	*Observation:* Meeting between director and programme manager of international renewable energy NGO and director of development NGO (networking event) (ORG-02, ORG-13)	WF, AF	05.03.2013
O-09	*Observation:* Meeting between director and programme manager of international renewable energy NGO and owner-manager of renewable energy organisation (discussion of potential partnership) (ORG-02, ORG-14)	WF, AF	05.03.2013
O-10	*Observation:* Visit of international renewable energy NGO to local partner organisation (renewable energy organisation) based in remote location: Arrival and briefings (ORG-02, ORG-15)	WF, AF, P	06.03.2013
O-11	*Observation:* Visit of international renewable energy NGO to local partner (renewable energy organisation): Trip to project sites, meeting with end-users and other partner organisations (ORG-02, ORG-15, ORG-16)	WF, AF, P	07.03.2013
I-08	*Interview* with technician working for local renewable energy organisation (ORG-15)	WF	07.03.2013
O-12	*Observation* and facilitation of partnership meeting between programme manager of international renewable energy NGO and director of local renewable energy NGO (ORG-02, ORG-15)	WF, AR	11.03.2013
O-13	*Observation:* Meeting between international renewable energy NGO and another local partner organisation (renewable energy organisation), joint visit to rural project sites; conversations with beneficiaries (ORG-02, ORG-17)	WF, P	12.03.2013 & 13.03.2013
O-14	*Observation:* Lunch meeting between representatives of international renewable energy NGO and local renewable energy expert (ORG-02; ORG-18)	WF	13.03.2013

O-15	*Observation:* Meeting between project manager of local renewable energy organisation and public officials (municipality level) (ORG-15, ORG-19)	WF	14.03.2013
I-09	*Interview* with project manager of renewable energy organisation (ORG-15)	AR	14.03.2013
I-10	*Interview* with director of renewable energy organisation (ORG-17)	AR, WF	14.03.2013
I-11	*Interview* with director and programme manager of international renewable energy NGO (ORG-02)	AR, WF	14.03.2013
I-12	*Interview* with government official and expert for small-scale applications in rural settings (ORG-20)	WF	15.03.2013
I-13	*Interview* with high-level government official in Ministry of Energy (ORG-03)	AR, WF	15.03.2013
I-14	*Interview* with manager of local renewable energy organisation (ORG-05)	AR	15.03.2013
I-15	*Interview* with director of national green development NGO (ORG-21)	AR, WF	18.03.2013
I-16	*Interview* with local administrator of international sustainable development NGO (ORG-22)	AR, WF	19.03.2013
I-17	*Interview*: Follow-up interview with local administrator of international renewable energy NGO (ORG-02)	AR, WF	19.03.2013
I-18	*Interview* with international expert for solar technologies in development contexts (ORG-23)	WF	20.03.2013
O-16	*Observation*: Visit to rural training centre for renewable energy technicians (ORG-23, ORG-24)	WF, AF, P	20.03.2013
FD	Informal conversation with director of renewable energy organisation (ORG-24)	WF, AF	20.03.2013
O-17	*Observation* of two-day workshop for young renewable energy technicians (ORG-23, ORG-24, ORG-25, ORG-26)	WF, AF, P, AR	21.03.2013-22.03.2013
I-20	*Interview* with project manager of renewable energy organisation (ORG-27)	WF, AR	27.03.2013

I-21	*Interview* with programme coordinator of bilateral development organisation (ORG-28)	WF, AR	02.04.2013
I-22	*Interview* with owner-manager of renewable energy organisation (ORG-14)	WF, AR	03.04.2013
I-23	*Interview* with owner-manager of RET firm (supplier) (ORG-29)	WF, AR	03.04.2013
I-24	*Interview* with local project manager of bi-lateral development and sustainable energy initiative (ORG-25)	WF, AR	04.04.2013
I-25	*Interview* with representative of renewable energy programme at Central American university (ORG-23, ORG-30)	WF, AR	05.04.2013
I-26	*Interview* with director of national association of renewable energy organisations (ORG-31)	WF, AR	05.04.2013
I-27	*Interview* with renewable energy expert at Central American agency (ORG-01)	WF, AR	08.04.2013
I-28	*Interview* with senior expert for renewable energy technologies at Central American university (ORG-01, ORG-32)	WF, AR	09.04.2013
I-29	*Interview* with senior policy consultant (ORG-09)	WF	09.04.2013
I-30	*Interview:* Follow-up with director of Central American renewable energy agency (ORG-01)	WF, AR	10.04.2013

B2. Anonymised Overview of Second Phase of Fieldwork in Chronological Order

ID Code[105]	Interview/Observation	Data[106]	Date
I-31	*Interview*: Follow-up with director of Central American renewable energy agency (ORG-01)	WF	14.01.2014

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[105] ID Codes relate to interviews (I-01 – I-51), observations (O-01 – O-23), visual network surveys (V-01 – V08) and entries in fieldwork diary (FD).

[106] Types of data listed in the table: AF – audio-recoded fieldnotes, AR – audio recordings, P – pictures, VNS – visual network survey (digital), WF – written fieldnotes.

FD	Meeting with expert for solar technologies in development contexts (ORG-23)	WF	20.01.2014
I-32	*Interview*: Follow-up with director of local renewable energy organisation (ORG-24)	WF	21.01.2014
V-01	*Visual Network Survey* with owner-manager of renewable energy organisation (ORG-14)	VNS, AR	22.01.2014
I-33	*Interview*: Follow-up interview with expert for solar technologies in development contexts (ORG-23)	AR, WF	24.01.2014
O-18	*Observation*: RET workshop of renewable energy organisation (ORG-27)	WF, AF	24.01.-28.01. 2014
V-02	*Visual Network Survey* with director of renewable energy organisation (ORG-17)	VNS, AR, WF	30.01.2014
O-19	*Observation*: Meeting between energy committee and end-users in remote rural community (ORG-25)	WF, AF, P	31.01.2014
O-20	*Observation*: Informal conversations with end-users in rural community	WF, AF	31.01.2014-02.02.2014
I-34	*Interview* with young RET technician (ORG-25)	WF, AR	02.02.2014
FD	Follow-up meeting with local project manager of bi-lateral development and sustainable energy initiative (ORG-25)	WF	02.02.2014
O-21	*Observation*: Observation and informal conversations with members of rural RET cooperative, conversations with end-users (ORG-33)	WF	03.02.2014-06.02.2014
I-35	*Interview* with senior academic expert and activist for diffusion of solar technologies (ORG-23)	WF, AR	05.02.2014
O-22	*Observation*: Visit to remote project site with project manager and technician of renewable energy organisation. Meeting with local end-users setting up energy committee (ORG-04)	WF, AF, AR	10.02.2014
O-23	*Observation*: Meeting with manager of local renewable energy organisation and senior academic at local university, inspection of demonstration system (ORG-11, ORG-34)	WF, AF	21.02.2014

V-03	*Visual Network Survey* with manager of renewable energy organisation (ORG-11)	VNS, AR	21.02.2014
V-04	*Visual Network Survey* with director of renewable energy organisation (ORG-24)	VNS, AR	24.04.2014
FD	Follow-up meeting with project manager of renewable energy organisation (ORG-15)	WF	24.02.2014
V-05	*Visual Network Survey* with local administrator of international renewable energy for sustainable development NGO (ORG-22)	VNS, AR	25.02.2014
I-36	*Interview*: Follow-up interview with owner-manager of RET supplier (ORG-29)	AR, WF	26.02.2014
I-37	*Interview*: Follow-up interview with high-level government official in Ministry of Energy (ORG-03)	AR, WF	27.02.2014
I-38	*Interview* with senior expert on renewable energy technologies in Ministry for Energy (ORG-35)	AR, WF, AF	28.02.2014
V-06	*Visual Network Survey* with senior project manager of renewable energy organisation (ORG-04)	VNS, AR	28.02.2014
I-39	*Interview*: Follow-up interview with administrator of national association of renewable energy organisations (ORG-31)	WF, AF	28.02.2014
V-07	*Visual Network Survey* with senior project manager of renewable energy organisation (ORG-27)	AR, VNS	01.03.2014
I-40	*Interview*: Follow-up interview with programme coordinator of bilateral development organisation (ORG-28)	AR, WF	04.03.2014
I-41	*Interview* with local project coordinator of international renewable energy NGO (ORG-36)	AR, WF	04.03.2014
I-42	*Interview* with director of development NGO and expert on local RET movement (ORG-13)	AR, WF	05.03.2014
I-43	*Interview*: Follow-up interview with director of national green development NGO (ORG-21)	AR, WF	05.03.2014

FD	Informal meeting with aid worker (technician) employed by bilateral agency (ORG-28)	WF	05.03.2014
I-44	*Interview*: Follow-up interview with senior academic expert and activist for diffusion of solar technologies (ORG-23, ORG-30)	WF	07.03.2014
V-08	*Visual Network Survey* with director of renewable energy umbrella organisation (ORG-23)	VNS, AR	08.03.2014
I-45	*Interview* with programme manager of international development organisation (ORG-37)	AR, WF	10.03.2014
I-46	*Interview* with project staff of Central American renewable energy NGO (ORG-38)	AF	10.03.2014
I-47	*Interview* with young RET technician and entrepreneur setting up business (ORG-26)	AR, WF	11.03.2014
I-48	*Interview* with government officials working on RET programmes (ORG-35)	AR, WF	11.03.2014
I-49	*Interview* with engineer and senior programme manager in bilateral development agency (ORG-28)	WF, AF	11.03.2014
I-50	*Interview:* Follow-up interview with senior project manager of renewable energy organisation (ORG-27)	AR, AF	12.03.2014
I-51	*Interview* with renewable energy expert at national university (ORG-39)	AR, WF	12.03.2014

Appendix C: Question Bank (English Version)

The following question bank (also available in Spanish) was used for preparing in-depth interviews. The vast majority of interviews were conducted in Spanish.

Organisational Level

- What kind of organisation is ORGANISATION[107]? (Firm, NGO, governmental organisation, inter-governmental organisation…)
- In your view, what is the core idea of your organisation?
- What do you think are your organisation's main goals?
- How do you achieve these goals?
- Can you briefly describe your business model/operational model/how you work?
- How many years has ORGANISATION been active?
- What is the history of the organisation? How did it get involved with RETs?
- What is the size of the organisation?
- Who are its members?
- What defines membership?
- What is the current situation of the organisation?
- Where do you have offices?
- Do you serve a particular (geographical) region?
- How many people work in this organisation?
- How long do employees normally stay? Do you have many long-term employees?
- What is ORGANISATION's main source of income?
- What is your annual turnover/budget?
- What types of renewable energy technologies do you promote?
- What is the organisational structure of ORGANISATION? Would it be possible for you to sketch an organisational chart of your organisation?
- Who makes the decisions in your organisation? How?
- What do you see as the biggest achievement of your organisation?
- In your view, what is the particular expertise of your organisation?
- In renewable energy technology projects, what is the key contribution of ORGANISATION?
- Can you give me an overview of your current projects?
- How do you set prices for goods and services?
- How important is the long-term viability of renewable energy technologies?

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[107] Placeholder for name of the respective organisation.

- Do you monitor and evaluate the outcomes of past projects? Who is involved in this?
- In projects in which ORGANISATION is responsible for the long-term maintenance of a system, what do you do?
- Where do you see ORGANISATION in 5 years time? What are your hopes for the future?

Personal Level

- What is your current role in this organisation?
- When did you start working in this position?
- What are your main activities and responsibilities?
- What kinds of training have you received for this position?
- Have you worked for other organisations in this sector?
- Can you imagine working for another organisation in this field in future?
- Do you work in a team? (Please explain)
- Do you work with persons from other organisations?
- What are your main contacts in the renewable energy sector?
- Is there anyone who you think I should talk to?

Inter-organisational Level

- Does your organisation work or maintain relationships with other organisations? In what ways?
- The renewable energy technologies you work with, where do they come from? Who are the main suppliers? How are they selected?
- Who are your main contractors? How are they selected?
- Who are your costumers?
- Does ORGANISATION have any competitors? (Please explain.)
- What are your main financial sources (banks, investors)?
- I have learnt that ORGANISATION works with a number of different organisations. Based on the internet and some project documents, I have prepared some lists of renewable energy alliances, associations, initiatives, networks and projects ORGANISATION seems to be involved in. These lists might be incomplete or out-of-date. Would you mind having a look at this list? Is anything incorrect or missing?
- Can you please tell me more about these alliances/associations/initiatives/ networks/projects. Are you personally involved in any of these?
- In your view, what is the role of your organisation in each of these alliances/associations/initiatives/networks/projects?
- What are the main goals of the alliances/associations/initiatives/networks/ projects?

Appendices

- Can you describe the tasks and responsibilities of the other organisations involved? (Who decides about the technology? Where does the money come from? Who deals with the end user? Who works with the local administration? Who provides follow-up servicing?)
- What is the history of these involvements? How long has ORGANISATION been working with these organisations?
- Do you know why ORGANISATION decided to become part in these alliances/associations/initiatives/networks/projects?
- In the alliances/associations/initiatives/networks/projects you were involved in, did ORGANISATION give or receive resources from other organisations, such as material, funds, expertise, skills and training? Please explain.
- In your experience, does ORGANISATION benefit from these alliances/associations/initiatives/networks/projects? How?
- How do the other organisations benefit from ORGANISATION's involvement? Can you give me some examples?
- Do technology end-users benefit from your involvement? How?
- Who is responsible for maintenance?
- How do you decide if a project was successful or not?
- What are the expectations of other organisations when it comes to ORGANISATION's work?
- Do you think that ORGANISATION meets these expectations? What is your experience?
- You have been involved in a great number of renewable energy projects. Can you give me some examples of particularly successful collaborations?
- In your view, what made this collaboration so successful?
- Can you think of a particularly negative experience of working with another organisation? What happened?
- Do you think that ORGANISATION has learnt from these experiences? In what sense?
- Can you rely on the organisations you are working with? Examples? Exceptions?
- Do you think that ORGANISATION's way of working with other organisations has changed over time? How?
- Do you trust the organisations you work with or do you think some of them mostly take advantage? Can you give me some examples?
- Do you use contracts when working with other organisations? Please describe your approach.
- Some people say that personal relationships and trust are more important than contracts. Do you agree? What is your experience?

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- How can you make sure that other organisations treat you fairly? How do you protect yourself?
- In any of the current projects you have mentioned before, have you experienced problems with other organisations?
- If yes, of what kind? What did you do about them?
- What do you do if you detect poor performance? How do you resolve disagreements?
- Imagine that one of the other organisation experiences some unexpected difficulties in delivering on their contract. How do you react?
- Can you think of an example where the performance of one organisation has made a huge difference to the outcome of an entire project?
- How do you reward good performance in partnerships?
- Do you have any particular criteria for the selection of organisations you work with? If yes, which are they?
- Do you think the reputation of the organisation is important in the selection process? Or is it more about the personal reputation of the people involved?
- How important are personal contacts?

Network Level

- In documents from the internet I have come across some more organisations working in renewable energy technologies in this region. Please have a look at this list. Can you please tell which organisations you know?
- Is there an organisation missing here?
- Could you please indicate your relationship with the identified organisations? (e.g. previous work experience, joint projects or training sessions, contractors, competitors, common membership in associations,…)
- Which organisations are particularly influential, and why?
- To your knowledge, which of these organisations work together successfully?
- What makes them successful?
- Are there any organisations that will never collaborate? Why?
- Which organisations are doing a great job?
- Which organisations are known for their poor performance?
- Why do some organisations choose to work with other organisations known to perform poorly?

Technology and Context

- In your view, what are the main barriers for the successful adoption of renewable energy technologies in El Salvador/Honduras/Nicaragua?

- Do you think that these problems can be overcome? If yes, how? If no, why?
- In your view, how important are programmes run by international organisations for the advancement of renewable technologies in this region?
- In your opinion, what is the role of government policy for the proliferation of renewable technologies?
- In your experience, what is the level of government involvement in renewable energy projects?
- Where/what is the most important market for renewable energy technologies in this region?
- What is the role of training and education for the advancement of renewable technologies in Central America (university programmes, training of local technicians, awareness raising programmes in schools etc.)?
- What renewable energy technologies are sensible technologies for El Salvador/ Honduras/Nicaragua?
- Which technologies are less appropriate? Why?
- How has the renewable energy technologies sector changed since 2000?
- In your opinion, what is the most important problem that must be solved in order to advance the adoption of renewable energy technologies in this region?
- Is there any kind of organisation missing that could facilitate the adoption of renewable energy technologies?
- What resources or expertise are needed more of?
- In your view, what is the future for renewable energy technologies in El Salvador/Honduras/Nicaragua?

End-Users

- What did you expect when you heard about TECHNOLOGY[108] for the first time?
- Does the technology work?
- Can you tell me more about your experience of using this TECHNOLOGY?
- Do you like it? Does the TECHNOLOGY meet your expectations?
- Do you think it is useful? How? Why?
- Do you have any problems using your TECHNOLOGY?
- What would you like to see improved?
- How much did you pay for your TECHNOLOGY?
- How much do you pay now?
- Do you think the technology was worth the investment?
- How much will you have to pay in future?

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[108] Placeholder for specific technology such as 'solar panel'.

- How did your learn how to use this technology?
- Do you have to buy replacement parts (such as a new battery)?
- Will you be able to do this?
- Do you service the technology yourself?
- What do you do if the technology stops working?
- When the technology was installed, did you feel that you were part in the project installing it? Or was it installed for you?
- Who decided to install this particular TECHNOLOGY? Why was it chosen?
- Do you think you/they picked the right technology? Or would you have preferred something else (examples)?
- Do you think they did a good job when installing the technology?
- Do you think other firms/organisations are better in working with TECHNOLOGY? Have you heard about any?
- What do you think they do better?
- Do you think that renewable energy technology will improve your business/ peoples' lives in this area? Why?
- If the technology (e.g. battery) fails, what will happen to it? Will it be repaired, returned, sold...?
- There have been cases of TECHNOLOGY that failed after a rather short period of time. Do you know about similar cases? Why did these systems fail? What is your experience? How did you react?

Appendix D: Visual Network Survey – Show Cards (English Version)

The visual network survey was developed and conducted using the software VennMaker. The data collection process is described in Chapter 4. At each step of the visual network survey, research participants were given show cards (also available in Spanish), which facilitated the interview process. The show cards also allow for tracing the interview schedule, which started with the name-generating question:

- **Can you please name all organisations your organisation has worked with in the past three years?** Such organisations may include…

CARD A: Types of Organisations

💼   **1. Firm/Business organisation:** including suppliers, customers, consultants, subcontractors…

👥   **2. NGO:** including community organisations, farmers associations, groups of beneficiaries…

🏛   **3. Governmental organisation**: including government ministries, municipalities, mayor's offices…

🌐   **4. International organisation:** including development agencies, development banks, SICA,…

📖   **5. University**, think tank, research organisation…

🔗   **6. Association**: such as Renovables or ANPPER …

💲   **7. Bank/financial organisation**: including banks, microfinance organisations, other financial organisations…

   8. Other type organisation: please name

☆   **What kind of organisation is … ?**

CARD B: Characteristics of Organisations

I. What is the size of the organisation?

    a. **Small:** just a few employees (up to 10)
    b. **Medium:** 10 to 50 employees
    c. **Large:** 50 – 250 employees
    d. **Very large:** more than 250 employees

II. Where does this organisation work?

    1. **Local:** Organisation only works locally/in the local community
    2. **County:** works in the wider area/county
    3. **Country:** works In different locations all over the country
    4. **Central America:** works in the Central America region
    5. **International:** works internationally/all over the world

III. In your view, what is the main expertise/competence of this organisation? What are they good at?

    1. **Technological expertise**/engineering expertise
    2. **Experience** in working with renewable energy technologies
    3. **Administration** and project management
    4. **Business and finance**
    5. **Local development**
    6. **International development** and aid
    7. **Government** and regulation
    8. **Other:** Please name

IV. How important is this organisation for the success of your organisation?

    a. Very important
    b. Important
    c. A little important
    d. Unimportant

V. Why is this organisation important for the success of your organisation? Please explain.

VI. Does this organisation follow a vision similar to the one of your organisation? Or is its vision rather different? Please explain.

CARD C: Working Relationships between Organisations

If you think about the relationship between your organisation and this organisation, how would you describe this relationship?

1. **Market relationship**: **delivery of goods and services for money** *(black line)*
   - Your organisation just buys from/sells to this organisation. Beyond this there is no/little contact. Maybe you will buy from/sell to them again, maybe not.
   - It is important for you that they are reliable business partners and deliver on their contracts. Otherwise you are not very interested in them….

2. **Networking: exchange of information and experience** *(dashed black line)*
   - Your organisation exchanges experiences and information with this organisation.
   - You know about the work and experience of this organisation to some extent.
   - When you meet members of this organisation you take this opportunity to talk to them, and you exchange ideas and plans.

3. **Coordination: exchange of information/experience & coordination of efforts** *(grey line)*
   - Your and the other organisation exchange experiences /ideas /plans etc.
   - Your organisation has worked together with this organisation on one or more occasions.
   - You know about the capacities and limitations of this organisation.
   - When you work on the same project you coordinate your tasks and responsibilities.
   - If you have a problem working with them, you are confident that you will be able to sort out who is responsible and that you will find a solution

4. **Collaboration: exchange information/resources, coordination of efforts, mutual support, joint problem solving, working towards a common end that neither organisation is likely to achieve on its own** (*thick grey line*)
   - The two organisations exchange information/experience/plans on a regular basis. You know the organisation and its members quite well – the way they work, their strengths and weaknesses
   - Your organisation and the other organisation give/receive advice from one another and you would help each other out when necessary.
   - When you work together, you coordinate your tasks and responsibilities. If there are any problems you solve them together.
   - You rely on them for delivering certain tasks/goods/services you could not deliver yourself in the same way.
   - The success of this organisation is important for your organisation.
   - You hope to work with this organisation in future and/or you plan projects with them.

5. **Other: Please state**

CARD D: INTERVIEWER QUESTIONS I

Network Map A: Follow-up Questions

- Which organisations are doing a *great job*?

- Can you tell me more about the *relationship of your organisation* with these organisations?

- Do you trust the organisations you work with or do you think some of them mostly take advantage? Can you give me some examples?

- Which organisations are *difficult or challenging* to work with? Why?

- Where do you get your technologies from? Could you please point out your *main suppliers*? Are there all on the map? (If not, we can still add them.)

- Are there any other organisations that are *important when it comes to the technological aspect* of your work?

- What is your organisation's main *source of income*? Can you please show me which organisations are important in this regard?

- In the past three years, which organisations have provided you with
    - o Grants
    - o Credits
    - o Other Capital?

- In the past three years, *have you competed* with any of these organisations (for example you submitted competing proposals for a project or grant)? If yes, could you please point them out to me?

Do you have any other comments on this map?

CARD E: Relationships between (partner-)organisations

At the moment this map only shows relationship between your organisation and other organisations.

However, given that this is a small market, I guess that most of the organisations on your list also have contact with one another.

- [ ] To your knowledge, which of these organisations work together successfully? What makes them successful?

- [ ] Are there any organisations that will never collaborate? Why?

- [ ] According to your opinion, which organisations should work together, but don't?

Sometimes relationships between partner organisations can be helpful - for example if such relationships open up new opportunities for your organisations - but they can also make things more complicated or difficult, for example when one works with two organisations that cannot agree on anything or compete with one another.

Looking at all the organisations that are part of your network, are there any relationships between these organisations that are important for your organisation? Please point them out to me and explain.

CARD F: Flows of knowledge and learning

1. If you think about the knowledge and learning, how would you describe the relationship between your organisation and this organisation?

Please have a quick look at the following examples. Which is the most appropriate description?

A. RECEIVE:
My organisation has learnt something from the other organisation and in this way increased its knowledge/know-how/capacity in one or more of the following fields (please pick one or more from the list below)
(green line)

B. SUPPLY:
My organisation provided training to/ shared knowledge with the other organisation increasing the know-how/ expertise/capacity of the other organisation in one or more of the following fields (please pick one or more from the list below)   *(blue line)*

C. EXCHANGE:
Receive and supply as stated above. (Sharing or trading knowledge?)
(black line)

D. DEVELOP:
Together with the other organisation, my organisation has developed new know-how and expertise in one or more of the following fields (please pick one or more from the list below)
(red line)

2. What kind of knowledge was received/supplied/ exchanged/developed?

   1. Technological/engineering expertise

   2. Experience in working with renewable energy technologies

   3. Administration and project management

   4. Business and finance

   5. Local development

   6. International development and aid

   7. Government and regulation

   8. Other: *Please name*

CARD G: INTERVIEWER QUESTIONS II

Network Map B: Follow-up Questions

- Which is the *organisation you have learnt from the most*? Why? What did you learn? Why was this important for your organisation?

- Are there other *organisations you found to be particularly* helpful? Please explain.

- What organisation *would you like to learn more from*? Why haven't you been able to learn more from them?

- Which organisation *has learnt the most from you*? How/why did this happen?

- What organisation *could learn a lot more* from your organisation? Why haven't they done so already?

- *Innovation:* You mentioned earlier that together with this organisation your organisation has developed new know-how and expertise. Can you tell me more about this?

- Are there *other ways that you could use these relationships to learn and improve* your organisation?

Do you have any other comments on this map?

Appendix E: Analytical Network Maps

Figures E1 – E4 illustrate the analytical network maps of the organisational networks of ALPHA, BETA, GAMMA and DELTA created for the research presented in Chapters 4 and 5. A set of transparencies of E1 (included in the back of the thesis) illustrates the layered quality of the digital maps, and allows for examining layers of different sets of relationships and knowledge flows.
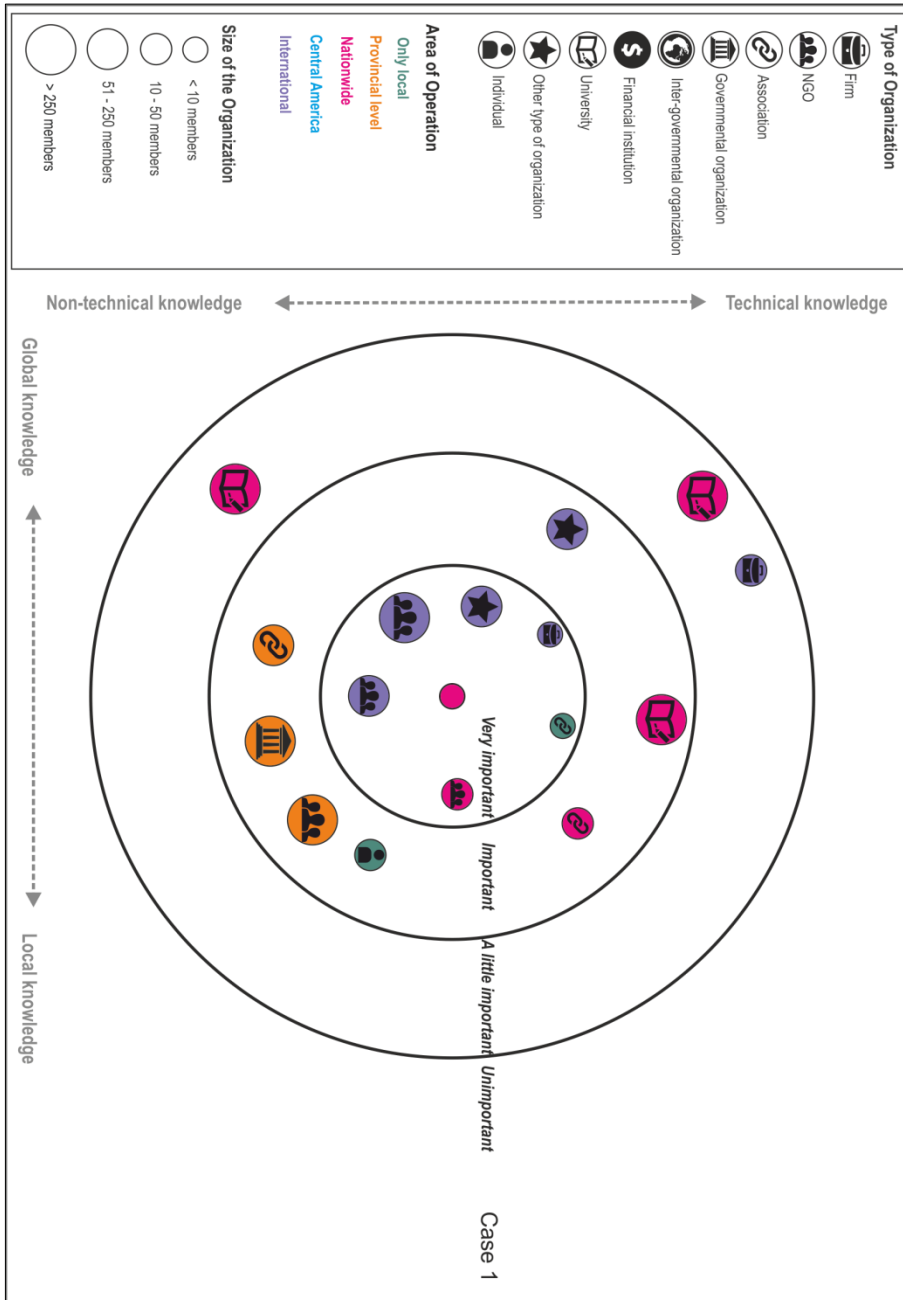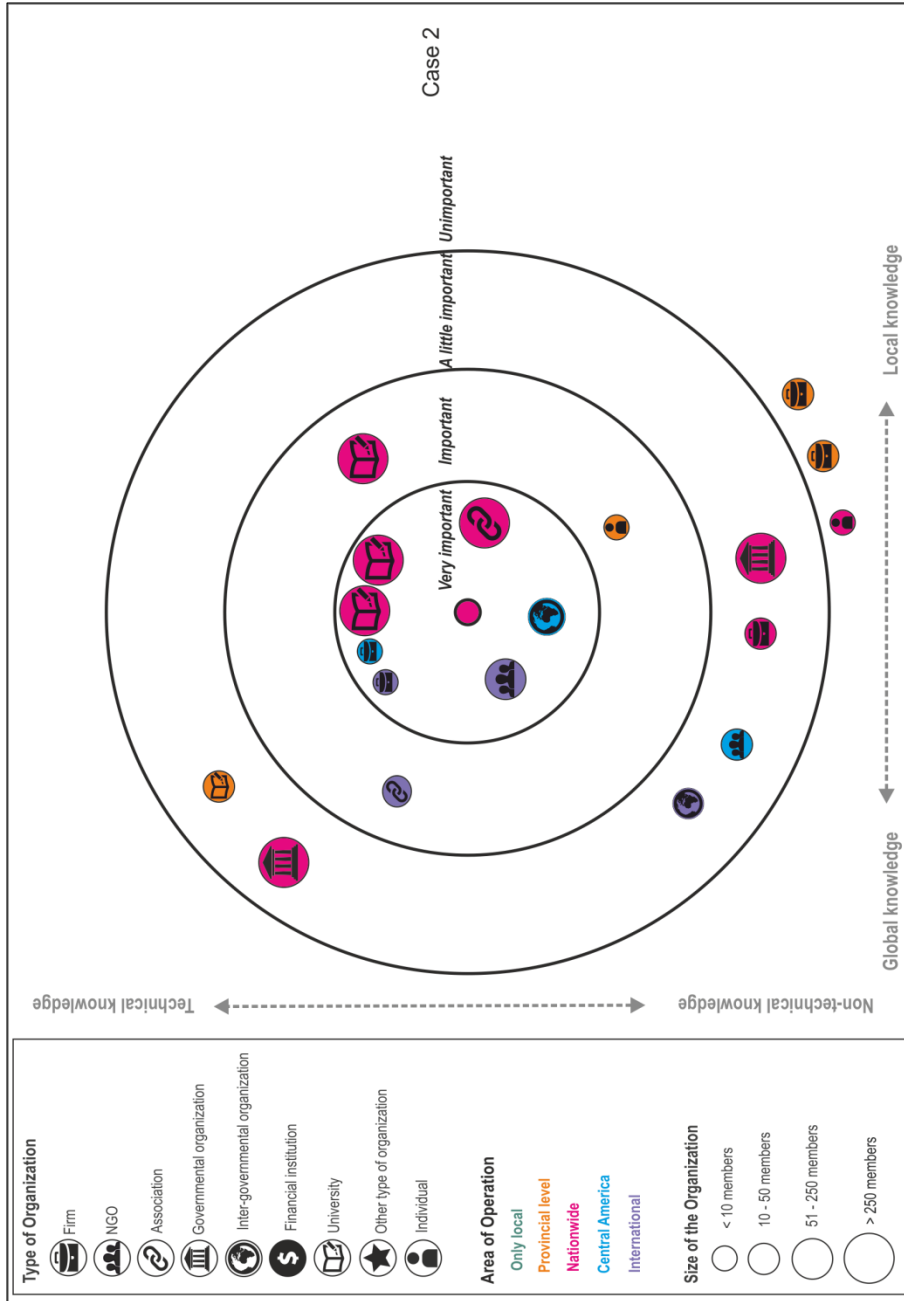

Figure E1: Organisational Network of ALPHA
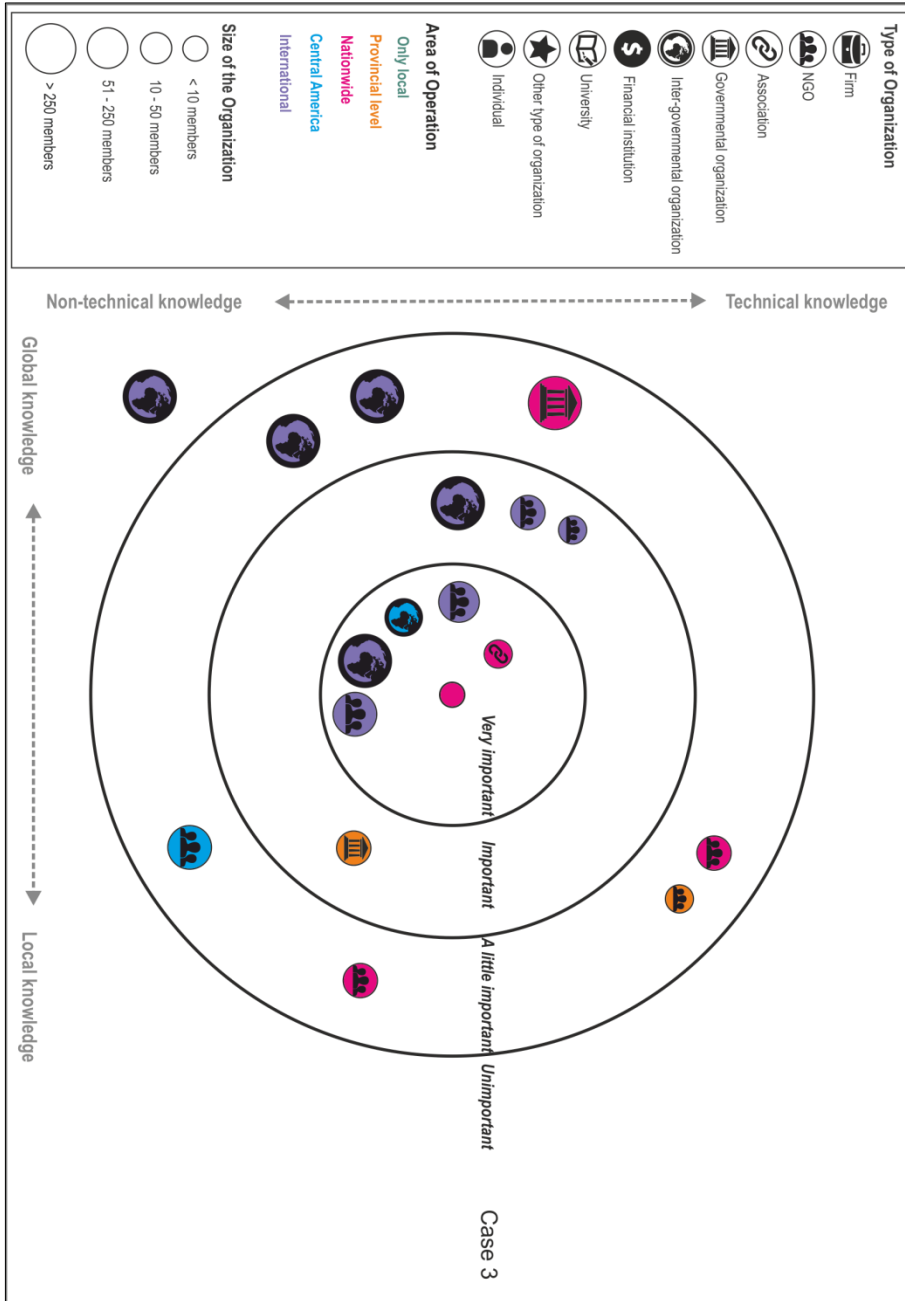
Figure E2: Organisational Network of BETA
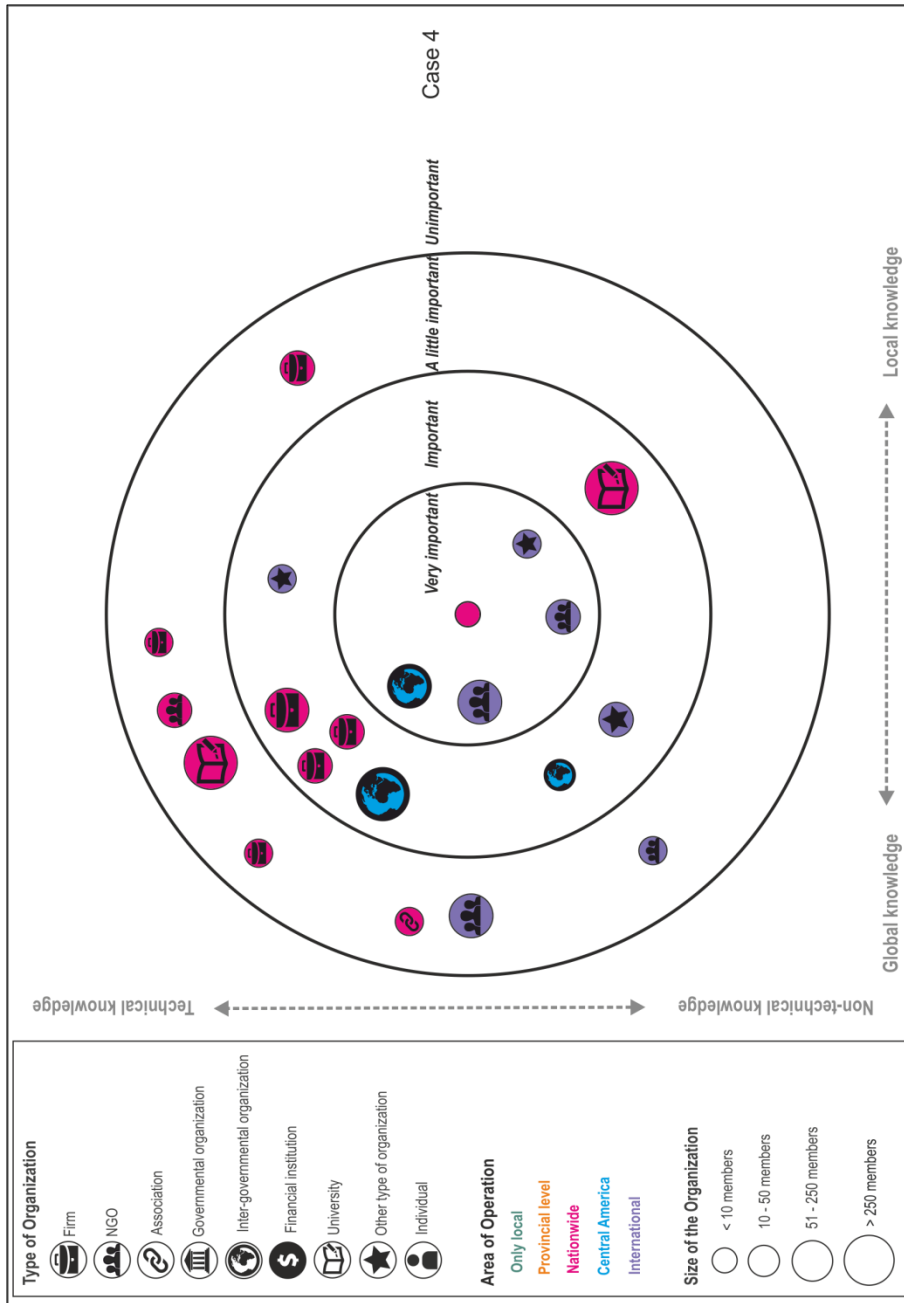
Figure E3: Organisational Network of GAMMA

Figure E4: Organisational Network of DELTA