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Empowering communities – the role of intermediary organisations in community renewable energy projects in Indonesia

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ABSTRACT

Community Renewable Energy (CRE) has been defying conventional energy systems for decades, though only recently it started to feature in academic and institutional discourses. Despite its new appeal, the literature on the impacts and factors influencing CRE projects is still scarce and builds mostly on studies in Europe and North America. In developing countries, where electricity access is low and energy poverty is prevalent, CRE can offer interesting opportunities for rural electrification and added benefits. The objective of this study is to assess the impacts of community-owned renewable energy projects and identify the internal and external drivers and barriers to their success. An exploratory case-study approach was used for collecting data, through interviews and observations, in two community micro-hydro projects in Indonesia. The results showed positive socio-economic impacts that exceed electrification benefits, and the reported success of community energy projects can be traced back to a combination of community-level as well as external factors. Yet, particularly important is the role of the intermediary organisation (Ibeka) in building communities' ownership, enhancing (technical, entrepreneurial and managerial) capacities, transferring knowledge and technology, establishing innovative financing models and shaping policy. Such organisations are critical in bridging external and internal factors and thus represent a key element in integrating the proposed analytical frameworks.

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Introduction

In the developing world, around 1.3 billion people still live without electricity (IEA 2014). The most affected in these countries are the rural poor, who see their developmental possibilities seriously undermined due to the lack of access to reliable and clean electricity. In many African and South Asian countries, a centralised approach of extending the electricity grid is unfeasible and the cost is prohibitive (Foley 1992, Barnes and Floor 1996). Besides, even when households are connected to the grid, the power supply is often unreliable (Elias and Victor 2005). This has largely justified a decentralised approach to rural electrification based on off-grid systems, for which renewable energy technologies (RETs), like solar PV or mini-hydro, are particularly suitable (Hoffman and High-Pippert 2005). However, the top-down government and donor-based models traditionally used to finance and implement these RETs systems have had limited success (Sovacool 2013a).

Furthermore, although necessary, electricity access in itself may not be sufficient to achieve developmental goals for the poorest segments of society. Indeed, very few studies "show a cause–effect

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relationship between modern energy access and sustained economic growth" (Elias and Victor 2005, p. 19), and bringing electricity to a rural village does not automatically bring development. The premise that rural electrification causes development has been the root cause of many planning mistakes and poor investment decisions, with large subsidies and development aid being channelled in the past to grand rural electrification programmes, grid extension and fuel subsidies. Such electrification strategies have, in many cases, depleted central governments' finances and almost bankrupted utilities (Foley 1992, Barnes and Floor 1996, Elias and Victor 2005), whilst leaving the poor underserved. Although there is an obvious connection between the two, other factors need to be in place for people to benefit from – and be able to afford – the services that electricity provides (Foley 1992). Barnes and Floor (1996, p. 511) had argued years ago that there is a need for a more diversified approach to rural electrification, "a demand-driven strategy that emphasizes multiple fuels, multiple borrowers, sometimes smaller projects, greater local participation, and higher local investment". The authors neither criticise large, well-managed projects nor promote small and poorly managed ones. Rather, they argue that the key aspects are the promotion of more local participation and investment, and of electricity services adapted to the existing demand. Between these two extremes – small individual systems on the one hand, and large schemes, on the other – community-based systems were often neglected in rural electrification initiatives (Barnes and Floor 1996).

In effect, the idea of grassroots and decentralised community energy production has been advocated since the 1960s and 1970s, mostly as a result of the advent of, and the potential offered by, RETs. The concept of community energy is somewhat a nebulous one (Rezaei and Dowlatabadi 2015). Indeed, what makes a project a "community" endeavour is not clearly defined and is debated in the literature (Walker and Cass 2007). Yet, there seems to be some consensus that community energy projects are entirely different from the dominant, top-down (utility-owned or government-led) ones (Warren and McFadyen 2010). One key difference is that the community should somehow have a stake in the project and collectively benefit from it. Community energy initiatives are generally more responsive to local needs and values and have more transparent governance structures (Hoffman and High-Pippert 2005). Indeed, cooperatives, local NGOs and communities have a better understanding of local challenges and thus should be empowered to make decisions about technology use as well as to take responsibility for investment, operation and maintenance of the systems (Barnes and Floor 1996).

Yet, even through decentralised RETs, the provision of electricity will not address development and raise living standards unless it empowers and generates income for the community (Chaurey *et al.* 2004). From a financial point of view, Kirubi *et al.* (2009) have shown that community-led energy projects can be successful in recovering most costs and thus can be financially sustainable. The authors highlight the potential of group-based mini-grids, initiated and managed as common property resources, but stress the need for further research concerning the real impacts, as well as the factors that drive community participation, and the success of such projects.

In this paper, we take a closer look into what influences a Community Renewable Energy (CRE) project's "success" where such success is mostly needed, the global South. Given the different understandings of CRE projects and the range of ownership configurations, determining the success of any such project is an inherently challenging task. Defining success is dependent on what were the rationales, motivations and the goals of implementing the project in the first place, and these are, of course, related to the wider context the project is being deployed.

Despite the growing body of literature on CRE in recent years, the few empirical studies that exist have focused on a handful of countries, mostly in the developed world. Indeed, as the extensive literature conducted by Klein and Coffey (2016) shows, most studies on community energy have focused on the UK and other European countries, with few other cases in the U.S. and Australia: little is known about CRE in developing countries, how it is conceptualised and what models have been used to deploy community-based energy projects. Addressing this lacuna is important because the factors which influence energy provision and electricity access vary significantly between developed countries, which are fully electrified, and developing countries, where electricity

access is not a given. Thus, the barriers and drivers of community-led initiatives for energy production in developing countries may be quite different, which points to the need for focused research if they are to be properly understood and contextualised. Hence, this study has a threefold aim: (1) to address the lack of studies focusing on CRE in developing countries (2) by using a, literature-derived, inclusive framework for analysis which (3) allows for examining the factors affecting the successful implementation of such projects.

When do CREs succeed?

Whilst technology is their essence, failure of CRE projects is not primarily due to the "innovation of the technologies, but more to do with the complexity of the funding, installation, legal and operational arrangements that need to be put in place" (Walker 2011, p. 5). For instance, a community in Germany mentioned uncertainty regarding the financing of the project as particularly problematic, and reported considerable waiting time and lack of assurance by funding bodies (Wüste and Schmuck 2012). Interviewees further pointed scarce support from policy-makers and administrative bodies as hindering factors (Wüste and Schmuck 2012). Communities also face more immediate difficulties, given that setting up a CRE initiative requires a combination of skills, key individuals and champions, resources, as well as the aforementioned external actors' support (or, at least, permissiveness). After starting, the challenge is then to survive and continue to operate, which demands more people and voluntary activity, skills, resilience and a steady resource base (Seyfang and Smith 2007).

From the above, it follows that in order for CRE projects to succeed, different sets of factors need to be in place: some are "external" to the project itself, relating to the region- or country-wide conditions where the CRE is implemented, while others are "internal", and perhaps more specific to the community in question. Thus, in this study, we opt for an integrative approach, which takes both levels into account. Since a definite set of factors that can make CRE projects succeed is still missing, we first present a framework for analysing CRE projects' success, which combines both "external" and "internal" factors that were identified in previous studies (Hicks and Ison 2011 and Middlemiss and Parrish 2010, respectively). We then use this dual framework to analyse the data collected for two case studies in rural communities in Java and Sumba islands, Indonesia. It is worth noting that although the two frameworks used were developed and tested for developed world countries, there is nothing in principle precluding their usage in studying developing countries' CREs as well. As a matter of fact, employing them for analysing our two Indonesian case studies serves also as a first test of their potential (and limitations) in assessing the factors influencing the success of a developing country CRE. In the concluding section, we discuss the factors that influence the outcome of these projects.

Factors enhancing the success of CRE projects

External factors

To assess the external-level factors that can help us understand the outcome of community-owned RE projects, we use the STEEP framework, which was proposed by Hicks and Ison (2011) in their study of CRE projects in the U.S. and Scotland. STEEP considers the role played by Social, Technical, Economic, Environmental and Policy factors, which we introduce and discuss in the following sub-sections.

Social factors

The level of community involvement is crucial for the success of CRE projects and *more* local ownership brings *greater* community benefit and development (Hicks and Ison 2011). Local ownership removes the classical dichotomy between "givers" (donors, governments) and "takers" (consumers) that has led many projects to fail because people do not feel responsible for the technology

(Sovacool 2013b). Cooperatives are one of the most successful forms of community ownership, and adopting this model can be a key contribution to success. In this vein, a country's experience with cooperatives can be an important success driver of electricity cooperative-type schemes as it has been demonstrated in Denmark (Stamford 2004). The literature shows that experience with electricity cooperatives in developing countries varies, but generally, these initiatives have been more successful where intermediary organisations assist with the planning and implementation processes (Holland *et al.* 2001), a point also supported by Hicks and Ison's (2011) and Hargreaves *et al.*'s (2013) studies of CRE projects in Scotland and the U.S., and the UK, respectively.

Gender empowerment, by targeting women during planning and implementation phases, has also been shown to be an important success factor, because women tend to be those who benefit the most from electricity access (Sovacool 2013b).

Technical factors

Appropriate technology is a determining factor in the outcome of any CRE. This appropriateness partly reaches into the social domain: the technology should be accepted by the community, fit with the culture and the local conditions, suit the community's particular needs and uses (Kirubi 2009) and should not have unintended social and environmental side effects (Biswas *et al.* 2001). Besides the need for a social fit, the technology adopted should be financially sustainable and affordable (Biswas *et al.* 2001). Furthermore, to be successful, the selected RET should match the community's needs in scale and quality (Sovacool 2012), (i.e. the mini-grid should not be undersized), it should cover the community's current electricity needs and the supply has to be reliable (Kirubi 2009). Another technology-related aspect is the existence of a domestic or regional manufacturing base of RETs. This may make the project more affordable, and it may also mean that technical know-how is available for maintenance and repair during the project's lifetime and therefore the community is not locked in a technology that no one knows how to fix. More important is the creation of opportunities for technical capacity building in rural areas, giving autonomy to the community and creating a platform for nurturing and sharing technical skills (Holland *et al.* 2001). In Sovacool's (2013b) study, all six successful programmes assessed in the Asia-Pacific region had some degree of technical capacity building, while none of the failed programmes had managed to build capacity in a meaningful way.

Economic factors

Because CRE is generally not seen as an attractive investment for private sector investors wanting to maximise their return (Holland *et al.* 2001), CRE implementation may require some stimulation through market push, like subsidies and grants, and market pull mechanisms, such as feed-in-tariffs (Burer and Wüstenhagen 2009). According to Sovacool (2013b), all successful programmes studied in the Asia-Pacific region offered financial assistance – in the form of micro-credit, low-interest loans or the leasing – for CRE technology, thus allowing the programmes to overcome the first cost hurdle of purchasing the systems. Urmee *et al.* (2009) emphasise "smart" subsidies, such as public–private partnerships or others, which help the project take off, but assume some kind of contribution from all users. This reinforces the importance of community ownership and commitment, which can be fostered through monetary (e.g. cash, savings, and collateral) as well as non-monetary (such as time, labour, land or materials) contributions to the project (Sovacool 2012). A mixed-finance approach seems to be most effective, and successful programmes tend to share costs between different actors: government and intergovernmental institutions, private sector participants, and the communities themselves (Sovacool 2012).

The CRE projects need to be financially sustainable, which means operational cost recovery. Thus, another important success factor is income generation which allows users to pay the tariffs. Income generation is enhanced when communities are able to sell their electricity surplus to the national or

regional grid, which depends on proximity to the grid as well as to interconnection agreements with the utility or electricity distributor, such as feed-in-tariffs (FiT), net metering schemes or power purchase agreements.

Thus, effective CRE projects are the ones which combine energy services with income-generating activities, training and employment (Sovacool 2012) and therefore a reasonable amount of the budget should be allocated to training and capacity building (Retnanestri 2007).

Environmental factors

Climate change could arguably be an environmental driver for widespread deployment of CRE in rural areas, decreasing the need to use polluting diesel generators and kerosene for lighting, not to mention the wider environmental benefits of reducing fuel wood consumption in rural areas and thus decreasing deforestation rates.

Policy factors

A key factor for CRE success is a stable and consistent institutional and regulatory environment. It is common to see contradictory policies, where oil subsidies and grid extension plans undermine the incentive for rural communities to purchase, for example, solar home systems (Sovacool 2013b). In their take-off phase, projects will "benefit greatly from favorable legal intervention, the integration or harmonization of policies, the creation or alteration of some institutions, and the development of well-targeted incentives" (Sovacool 2013b, p. 398). The institutional support and policy integration should happen at three levels. First, at *the national level*, which may require lifting legal restrictions on independent generation and sale of electricity, flexibility in tariffs or setting targets for grid extension so rural communities would know if and when the grid will reach their area. Second, at *the local* level, through the work of community-based organisations or electrification cooperatives supported by local or national NGOs. Finally, at the *intermediary level* which creates the link between the national and local levels, making sure that policies and projects match the needs of communities, owners and suppliers. These intermediaries may be NGOs, government bodies or private concession holders contracted by governments, performing a number of different roles: guidance on policy formulation, rural electrification strategy and grid coverage, creation of support networks to help communities, support to manufacturers, facilitating financing, preparing simple technical guidelines, assisting in community planning or identification of training requirements (Dauselt 2001).

Institutional diversity and the existence of a proper coordinating or regulatory agency, with a strong mandate and clear responsibilities (Sovacool 2013b), capable of handling the various institutions at different levels (Urmee *et al.* 2009), are also important factors. Policy incentives and economic instruments such as Feed-in-tariffs (FiT), net metering schemes or power purchase agreements, have also been shown to provide a safe and stable policy environment for investing in RE at all scales. The FiT has been particularly successful, both in developing and in developed countries and has been broadly considered a "superior policy approach for promoting RETs" (Lesser and Su 2008).

Internal-level factors/community capacities

While CRE projects are influenced by the aforementioned wider institutional arrangements, specific contextual factors seem to play a key role in explaining why projects succeed in some places and not in others (Walker 2011). Thus, Rogers *et al.* (2012, p. 211) argue that the development of CRE projects is "contingent upon individuals' desire and ability to engage". Indeed, all other things – social, technical, economic, and policy factors – being equal, the success of the project may also depend on specific community idiosyncrasies.

The most recent of the few analytical frameworks that discuss the link between community capacity and grassroots renewable energy initiatives is the one proposed by Middlemiss and

Parrish (2010). The authors argue that "initiatives for sustainability are strongly affected by both the capacity of the individuals or group leading the initiative, and the nature of the community which the initiative addresses" (p. 7559). The appeal of Middlemiss and Parrish (2010) framework for our analysis lies on their emphasis on the "duality of agency and structure" at the *community* level: going beyond mere voluntarism, their approach is based on "a version of practice theory where *agency is embedded in social structures*—structures that provide both the context of, and the means for, transformative action" (p. 7561, our emphasis). Thus, and drawing on an extensive literature review on areas such as practice theory by Shove (2003) and transitions theory by Seyfang and Smith (2007), they proposed a framework focusing on communities' capacity for change, which they define as "the ability of the community in question and its members to make changes by drawing on the resources available to them individually and collectively" (Middlemiss and Parrish 2010, p. 7561). In their analysis of community-based organisations, the authors identified four important structural elements, or "capacities", namely:

- *Cultural*, relating to the legitimacy of sustainability objectives considering a community's values and history;
- *Organisational*, referring to the values of the organisations (such as cooperatives) that are active within a community and the support they provide to collective action;
- *Infrastructural*, that is the potential offered by the specific facilities or infrastructures available in the community, provided by government, business and community groups;
- *Personal*, the members' resources (skills, values, motivation) placed at the disposal of the community initiative.

The different capacities held by a community influence its ability to take responsibility for the initiative or project in question, and a better understanding of them can help those involved – including external organisations such as NGOs – to assess shortcomings and identify which existing capacities can help overcome any limitations. The authors do not claim that all these capacities need to be present to ensure success, yet if one of them is missing or diminished, this reduces the community's ability to take on responsibility for the outcome of the project (Middlemiss and Parrish 2010). Their study showed that previous experiences in collaborative efforts, such as natural resource management or a community member's familiarity with cooperatives (*personal* capacity), can help build institutional partnerships with internal and external organisations (*organisational* capacity). This can then trigger improvements in *infrastructural* capacity needed to deploy the project. A cooperative culture, an orientation towards the collective and to the preservation of the environment (*cultural* capacity), can also be a powerful driver of change and an assurance that the project's benefits and profits (if they exist) are cooperatively distributed, a point also stressed in Hoffman and High-Pipper's (2010) analysis of participants in community energy initiatives in Minnesota, U.S. As these authors claim, participants are drawn – and continue to be engaged – into such schemes through personal networks, and "are motivated by an appeal to the notion of community, rather than personal, benefit", as well as a connection to and an appreciation of place' (p. 7572). Rogers *et al.* (2012) reached somewhat similar conclusions in their study of CRE projects in the UK, where the capacity to act and the perception of agency by community members turned out to be pivotal. Their interview results revealed the importance of significant individuals, namely their personal qualities (such as experience, social connections) and motivations, which relates directly to personal capacity as defined by Middlemiss and Parrish (2010). These "significant individuals" are, of course, what other research has labelled as the (usually informal) "community leaders", i.e. "people who are either well known in their communities and/or very active" (Martiskainen 2017, p. 84), and their "Being visible in the community helps with niche building in a sense that visions can be voiced to a wider group of people [..] while active engagement ensures better reach for organisations such as intermediaries and funding bodies" (Martiskainen 2017). Motivations to engage in these projects were also related – or inspired by – a shared notion of rural sustainability, place attachment and

a sense of community, which can be seen as expressions of cultural capacity. The creation of local partnerships and ability to access resources (organisational capacity) were also key enabling factors, which the authors linked with the existence of public and local sources of funding and other forms of institutional support (Rogers *et al.* 2012).

Rogers *et al.* (2012) illustrate the interconnectedness of a community's immediate context with broader factors that we identified earlier (namely social, economic and institutional). Indeed, the right combination of STEEP factors can nurture certain community capacities leading to the success of a CRE project, which can then foster a sense of empowerment and engagement, further enhancing community capacity for change. On the other hand, through community capacity, the successful demonstration of CRE projects can turn these communities into "flagship projects" (Wüste and Schmuck 2012), thus triggering improvements in the country's policy and economic framework (such as the creation of a FiT policy, removal of oil subsidies or facilitating access to CRE finance), which can then foster other CRE projects (Sovacool 2013b). What this suggests is that external and community-level factors reinforce and influence each other and hence should be assessed in a comprehensive manner. Park (2012) is a case in point offering a detailed analysis of how successful community energy project's applications in the UK are dependent not only on the existence of objective capacities on behalf of the applicant but also on these capacities' (right) correspondence to the donors'/planners'/permitting agencies' agenda and priorities.

Table 1 offers an overview of the factors identified as conducive to successful CRE in the aforementioned literature review (and include new ones derived from the study, which will be presented in the findings section). The fact that this framework stems from the insights of research undertaken primarily in developed countries – as well as for a multitude of renewable energy community projects – begs the question to which extent these factors are appropriate/relevant for non-Western/developing countries. In order to examine this, in the next section, we utilise this analytical framework for assessing two community-owned energy projects in rural Indonesia, a micro-hydro one on West Java and a micro-hydro and hybrid (wind-solar) one on East Sumba.

Case study: Indonesia and Ibeka

We decided to use Indonesia as a case study since it is representative of the challenges that many other Asian countries are facing – it has a growing population, booming economic growth, increased industrialisation and, consequently, increasing energy demands (Damuri and Atje 2012). This puts

Table 1. Factors identified as promoting the successful implementation of a CRE Project.

External/STEEP factors	Internal/Community factors
Social	*Cultural*
• Community involvement/ownership	CRE is legitimised under the light of the community's values and history
• Community's experience with cooperatives	
• Existence of intermediate orgs	
• Promoting gender empowerment	
Technical	*Organisational*
• Use of (socially and technically) appropriate technology	Existence of organisations active in the community, which can support CRE development
• Local manufacturing base	
Economic	
• Availability of financial assistance	
• Generating income/jobs for the community	*Infrastructural*
• Cost sharing between actors	Existence of infrastructures within the community which are conducive to CRE development
• Operational cost recovery	
Environmental	
• Improve local environmental conditions	
Policy	*Personal*
• Stable and consistent institutional and regulatory environment, at local, intermediary and national levels	Individuals within the community posses resources and/or capacities conducive to CRE development.
• Existence of coordinating/regulatory agency	
• Policy incentives (FiT)	

immense strain on the country's electricity infrastructure, depletes its domestic fossil fuel reserves, increases electricity prices and compromises any serious climate change mitigation efforts. Despite the growth in the energy and electricity sector, Indonesia has currently an electrification rate of 73%, which means that some 63 million Indonesians, primarily those living in rural areas, remain without access to electricity (UN 2013). On the other hand, the country's regulatory framework concerning the electricity sector is rather complex, with many institutional stakeholders and numerous agencies (Damuri and Atje 2012), which frequently overlap and seldom cooperate (Schmidt *et al.* 2013). Three main types of actors are involved in the country's electricity production: The National Electric Company (PLN), which operates most power plants and is also responsible for almost all the transmission and distribution of electricity); Independent power producers (IPPs) who generate electricity from *in situ* renewable energy sources, which generally they must sell to PLN at rates set by power purchase contracts or in line with the national feed-in-tariff (Damuri and Atje 2012); and, finally, Cooperatives (besides PLN, only rural cooperatives are allowed to generate and distribute electricity (Schmidt *et al.* 2013).

Considering Indonesia's multiple, often contradicting, dilemmas – energy poverty, energy security and climate change (Ardiansyah *et al.* 2012, Gunningham 2013) – and the challenges of its territory spreading over 17,000 islands with different physical and climate conditions, a decentralised renewable energy approach to rural electrification is clearly the way forward. Especially considering its vast potential in solar, geothermal and especially hydro energy – with an estimated 75 Gigawatts, of which only 7% has been tapped (Damuri and Atje 2012). Yet, and despite Indonesia's relatively long history of renewable energy projects in rural areas, participatory development and community-based management are uncommon (as indeed in most countries) and most projects tended to fail (Dauselt 2001). In a pattern repeated all too often, as soon as technical problems arise – such as a solar PV system that stops working – the communities' financial commitments stop (as villagers do not want to pay for a malfunctioning energy system that they cannot fix) and trust in the project is lost.

Despite all the challenges and failed experiments, there are some very positive examples of community-based RE mini-grids in Indonesia, using mostly mini-hydro, which serve as an inspiration to most of Southeast Asia and beyond. These CREs have been led mostly by private and non-profit actors, such as Ibeka, and international initiatives, such as Energizing Development (EnDev) or RewiRE (Schmidt *et al.* 2013). The work of Ibeka (the acronym stands for People Centered Economic and Business Institute, in English) in the implementation of CRE projects – but especially in empowering rural communities, building knowledge on community mini-hydro since the 1970s and shaping policy – has been recognised worldwide. Thus, in this study, we take a closer look at these successful practices, with the aim to examine which role the facilitating macro- (external) and micro- (internal) level factors we identified in the literature review have played in CRE's success.

Methodology

Given that, to date, few empirical studies have been conducted on the topic and our aim to understand how community-owned renewable energy projects are implemented, an exploratory case-study approach was deemed to be appropriate. The choice of projects was done in consultation with Ibeka, according to criteria that would allow an in-depth understanding of Ibeka's approach and a comparison between different projects – in order to draw more general conclusions. This yielded two cases, Cinta Mekar in West Java and Kamanggih in East Sumba Islands (see Figure 1).

Cinta Mekar and Kamanggih are in many ways comparable and representative of Ibeka's projects, while are also sufficiently different to allow instructive comparisons. Table 2 provides an overview of the main characteristics of these two projects.

Java and Sumba islands have important cultural, religious, socio-economic and climatic differences, as well as different development and electrification ratios that provide some interesting comparison points. Cinta Mekar is located in West Java, the most developed and densely populated area in the Indonesian archipelago with an electrification rate of roughly 80% (Schmidt *et al.* 2013). On the

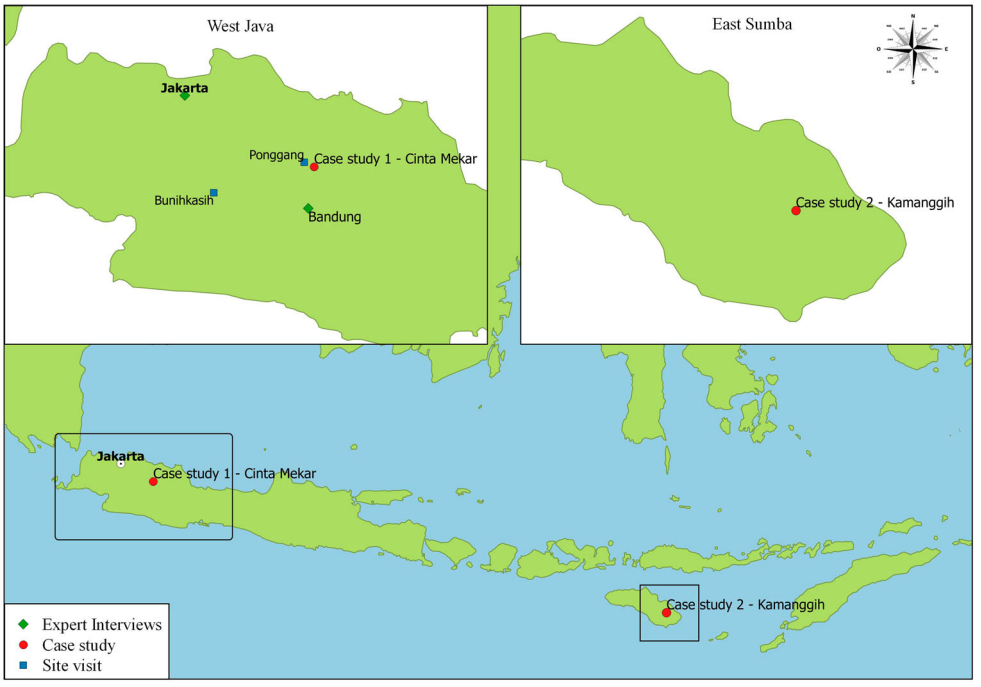

Figure 1. Location of case studies and site visits.

other hand, in East Sumba, electrification ratio is still low and until Ibeka's intervention, Kamanggih (as many other villages in the area) had no electricity access.

The data were collected by the first author, during fieldwork on these two sites and in short visits to other projects in different development stages (allowing a broader understanding of the approach and challenges of each site), between February and March 2015, mainly through 26 semi-structured interviews. These data were triangulated with other methods as shown in Table 3. The documents and the transcribed interview material were analysed against the two frameworks described

Table 2. Characteristics of the two case studies.

	Cinta Mekar	Kamanggih
Started operation	2004	2011
Village size	646 households/4 hamlets	305 households/6 hamlets
Access to main road	2 km	30 km
Religion	Muslim	Catholic/Marapu
Water and sanitation	Running water and toilets	No running water, water pump; no toilets
Electricity (on\off-grid)	On-grid since the 1950s (>120 households were not connected prior to project)	No access until Ibeka project. Off-Grid in 2011, become on-Grid in 2013 (10% of households, remain off-grid)
Technology	Micro-hydro	Micro-hydro and hybrid (wind and solar)
Power capacity	120 kW	37 kW
Cost	$225,000 ($75,000 × 3)	$360,000
Financing model	Public–private partnership (Private investor; donors)	Foreign donor (Hivos) for MHP project and Indonesian bank for wind project
Partners\Donors	HIBS, UNESCAP, Ibeka	Hivos, Ibeka, Petramina; BM Bank
Community ownership	50%	100%
Cooperative	Yes	Yes
Income generation – Electricity sales	>$2000\month	$1500\month
Stakeholders	Ibeka, UNESCAP, HIBS, Mekar Sari cooperative, PLN, MEMR	Hivos, Ibeka, PLN, Indonesian Bank, Kamanggih cooperative
Local availability of technology\support	Yes (1 hour away in Bandung; Ibeka basecamp nearby)	No (no workshops or MHP suppliers nearby; Wind turbines imported from Japan)

Table 3. Data collection methods, subjects and output formats.

Method (Location)	Research Item\Subjects	Format
Stakeholder interviews (Jakarta, Cinta Mekar, Kamanggih)	Village leaders, women groups, electricity users, NGO management and field staff, Technical consultants, Power plant operators, Government officials	Notes; Audio recordings
Observation (Jakarta, Cinta Mekar, Kamanggih, Bunih Kasih and Pongang)	Daily life in village and at NGO's office NGO field operations	Photographs; field summary sheets
Expert interviews (Jakarta and Bandung)	Research institutes MHP experts and training facility (HYCOM) Hydro Business Association	Notes; Audio recordings
Document Analysis	Village cooperative data, powerhouse records Project reports and papers	Reports; Excel files

earlier, fitting it in the categories of factors reviewed in the literature whenever suitable or creating new ones when necessary.

Findings

Before moving into establishing which factors are thought to have contributed to the success of its CRE project, it is important to clarify what "success" stands for. This is not a straightforward task, because if one considers the two project's different circumstances, defining project success is challenging and depends on the issues it tries to address, as well as the context in which the specific project is implemented. While most of Cinta Mekar has been electrified for decades, Kamanggih had no electricity until 3 years ago. In effect, on- and off-grid projects depart from different baseline conditions, so the goals and therefore the impacts in the communities can be somewhat different. Table 4 summarises the key impacts in both case studies. The rating is a qualitative assessment of the magnitude of the projects' impacts in each case study. Some ratings are more objective and were drawn from documents and hard data, such as the "Increased Village Revenue", and as shown in Table 2, the income generation through electricity sales is higher in Cinta Mekar. Others like "Improved Health Care and Decrease in respiratory and breathing problems" were derived from observations and interviews (such as the reported information collected with health centre employees and villagers). Since in Cinta Mekar – unlike Kamanggih – most villagers had not been relying on fuelwood for cooking and kerosene for lighting for some years, there were no significant impacts from the project as far as this aspect is concerned. That explains why the impacts in terms of "Savings in kerosene" and "Avoided deforestation", reported in Table 4, were of a higher magnitude in Kammanggih – after being connected to the grid, many villagers acquired electrical appliances for boiling water and cooking, reducing the need for fuelwood, and also mitigating outdoor and indoor pollution. On the same note, "Reduction in fossil fuel consumption" (used to power diesel generators) was bigger in Kammanggih than in Cinta Mekar, the later being connected to the grid for a longer time and thus largely relieved from generators' detrimental impacts.

In Cinta Mekar, the project allowed subsidising electrification of some of the most deprived households that still lacked electricity access, as well as adult training and children's scholarships, as reported by one of the families visited. Due to the cheaper costs of production of mini-hydro and the stability of this source, both communities benefit from affordable and reliable electricity supply, particularly Kammanggih that no longer needs to rely on the large diesel generators – which are now mainly a back-up source.

An important common outcome in both case studies is the fact that both communities seemed to have assimilated Ibeka's principles of community development, namely that electricity provision is not a goal in itself, but rather the means for socio-economic improvement. The funds collected by the cooperatives through electricity sales are being used to give small loans and start new productive activities, thus creating new jobs. Besides the income it generates, owning an energy project seemed to have given these communities a sense of empowerment, achievement and pride, with positive

Table 4. Project impacts.

		Cinta Mekar	Kamanggih
Economic	Increased village revenue	✓✓	✓
	Small loans for new productive activities	✓✓	✓
	Job creation	✓✓	✓
	Savings on kerosene	✓	✓✓
Social	Funding of projects in nearby villages	⃠	✓✓
	Electrification of poor households	✓	✓✓
	Affordable and reliable electricity	✓	✓✓
	Improved health care	✓✓	✓✓
	Decrease in respiratory and breathing problems	⃠	✓✓
	Scholarships for children of poor families	✓✓	✓
	Adults skills training	✓✓	✓✓
	Improved management and organisational skills	✓✓	✓✓
	Increased community capacity	✓✓	✓✓
	Women empowerment	✓✓	✓✓
Environment	Reduction in fossil fuel consumption	✓	✓✓
	Avoided deforestation	✓	✓✓
	Reduced indoor and outdoor air pollution	⃠	✓✓

spillover effects beyond energy production. These effects seem to be trickling down to neighbouring villages. In Cinta Mekar, for example, the cooperative reported receiving frequent contacts from other villages asking for guidance on how to start a project. Also, the cooperative leader had engaged with women outside Cinta Mekar prompting them to take an active role, to request support from Ibeka and local government and start their own energy cooperative. In Kamanggih, interviewees stated that the cooperative has granted small loans to nearby villages to implement a solar water pump and other small infrastructural improvements. For Ibeka and stakeholders, a successful CRE goes beyond electricity provision and brings empowerment and increased capacity to the community. By being autonomous in managing its own power plant and by reaping its (direct and indirect) economic benefits, the community is capable of generating socio-economic development that in turn allows the project to sustain in the future.

> I define success if the facility is sustainable, can be operated and maintained by the local community. They are successful because there is self-reliance among the people. (Ibeka Director)

> The people know them, they hear Micro hydro and they say Ibeka, because they develop so many projects and they are mostly a success. 100% is impossible, but most are (Director, Ministry of Energy and Mineral Resources)

Thus, different actors in the Indonesian energy sector, including the villagers interviewed, seem to have a seemingly homogenous understanding of what is a successful CRE project. The question is then to uncover what factors explain this success and what obstacles may threaten it.

Drivers and barriers

Community-level factors

Despite the differences, our analysis suggests that it is possible to draw common aspects and thus identify some cross-cutting factors or capacities that can drive (or hinder, if absent) the success of micro-hydro projects. Table 5 illustrates the presence or absence of these capacities – Personal, Organisational, Cultural and Infrastructural – as per Middlemiss and Parrish (2010). In all projects visited, the communities took the first step in contacting Ibeka (or another organisation or governmental body, which then referred them to Ibeka). Such initiative suggests the local communities' willingness and motivation to engage, a pre-condition also set by Ibeka for undertaking a new project, suggesting organisational capacities. Despite the usual village politics, overall, there has been widespread support for the project and collaboration to achieve the cooperative's goals. The existing personal capacities from villagers to mobilise interests, create partnerships and pool resources also seem to be an important driver. The Head of the Cinta Mekar cooperative, for example, mobilises women's

Table 5. Community capacities' (internal factors) influence on CREs implementation.

	Cinta Mekar	Kamanggih
Personal		
Key individuals – strong informal leaders	+	+
Competent and trusted MHP operators	+	+
Members' capacity to assess needs and set priorities	+	+
Organisational		
Community initiative (take the lead)	+	+
Widespread support and creation of cooperative	+	+
Mobilisation capacity, especially from women	+	+
Cultural		
Tradition of communal work	+	+
Collective values (union, honesty, cohesiveness)	+	+
Infrastructural (resources)		
Proximity\Connection to electricity grid	+	+
Access and communications	+	–
	Proximity to cities and MHP centre	Remote, poorly communicated
Proximity to Ibeka\staff's presence	+ !	+ !

Notes: +: Factor is present/has positive effect.
!: Challenging factor.
–: Factor is missing/has negative effect.

groups and coordinates with the government's Rural Development Program, so the two move in parallel and complement each other. This has enabled cooperative members to get bigger loans, since the cooperative stands as collateral, guaranteeing that the villagers will meet their financial responsibilities.

The existence (or emergence) of strong leaders is another common feature. These are usually referred to as informal leaders (as opposed to the formal village leader who often does not have the community's trust and support). For Ibeka, finding and empowering these key persons is critical for any project to succeed, especially the micro-hydro power plant operators, chosen by the community.

> The operators are innovators in their community, usually have lived in the city. These are our internal activators. We, as external activators, have to improve their characteristics. (Ibeka Founder)

> I have a training in mechanics. Many people wanted to become operator, but the community values honesty, and other personal qualities besides technical capacity. (Cinta Mekar MHP operator)

Another distinctive common feature is a strong tradition – that runs deep across Indonesia – of communal work, especially in rice farming. This cultural facet of rural communities was disappearing in recent years, yet it has been revived by Ibeka in the process of building community capacity.

> … hardwork, union, harmony and consistency in the community. These things were not seen before the cooperative, there were no groups working together anymore. (Villager Cinta Mekar)

In the realm of infrastructural capacities, the ability to connect to the national grid has allowed these communities to reap financial benefits of existing policy instruments (feed-in-tariffs). Although there are specific community factors that contribute to the project's success, there are certainly others which can hamper it. In Cinta Mekar, whilst the proximity with Ibeka's facilities and frequent presence of staff were important drivers, it seems that it has also created some dependencies, making it increasingly difficult for the NGO to retract from the project as it usually does. Similarly, the permanent presence of an Ibeka's staff person in Kamanggih (who is also a village native), may challenge the village's ability to stand on its own in the future. Nevertheless, for the moment, it is a source of invaluable support for a rather underdeveloped area.

All in all, having the community taking the lead and gathering consensus are the key factors. The organisational, technical or managerial capacities may not even be evident at first, but Ibeka believes that these capacities can be fostered and that it is always possible to find critical individuals who can drive change, a premise shared by expert interviewees.

> All villages have internal activators. As long as you know how to activate them and know the culture. We, as the external activators, have to improve their characteristics. (Ibeka founder)

> They [Ibeka] stay there, they always monitor and evaluate. They see the community, not just the project. That's why most of their projects are successful. Not just in construction, but in operation, management and uses of energy. (Director MEMR)

It is worth noting that some of the capacities identified here (such as organisational or infrastructural ones) could arguably be perceived as being external to the community. The important thing is to recognise that success is, among other things, dependent on the villagers' motivation to engage and their capacity to act as a collective. Drawing a clear line between these two sets of factors is challenging and perhaps unnecessary. Internal capacities and external factors should interrelate, as emphasised by Rogers *et al.* (2012), and perhaps even overlap. This interconnectedness may indeed be a key element for success.

External drivers

The data collected were set against the factors found in the literature and summarised in Table 6, according to the STEEP framework. The table also includes other factors that emerged from the data.

On the social sphere, providing ownership was mentioned by most stakeholders as the most important factor in ensuring the successful outcome of CRE projects and a distinctive feature of Ibeka's projects.

> First success factor: increase the role of the community, the involvement and ownership of the community towards the project, which is something that is taken into high consideration when Ibeka implements a project. (METI)

Ibeka has gone further and is implementing a variation in their social business model, by giving the community progressive ownership, to ensure that villagers can handle the responsibility that comes with managing large sums of money and repay the loan quicker:

> community will get their full shares after the break-even point. If they had 50% of the shares at the beginning it would be hard to recover the investment for the loan (…) we also educate them in managing money. (Ibeka Program official)

Ownership is built by providing equity and legal rights over the project, and by involving community right from the project's construction to its operation and management (thus also providing a more psychological sense of ownership). The capacities built during this process are considered an important driver by Ibeka staff and other expert interviewees. The cooperative model – with a long tradition in Indonesia – seems to be successful in addressing the legal, financial and technical aspects of a CRE and is always suggested as a management model, despite traditionally also being associated with corruption practices. Due to scarce resources, the creation of partnerships with other organisations – public or private – can drive a CRE project, though the experiences have not always been positive and Ibeka claims that it is hard to find partners that share its philosophy.

As shown in Table 6, targeting women is another factor that has the potential to contribute to a successful project, and Cinta Mekar is a case in point. According to two women cooperative officers interviewed, all of the cooperative's 250 active members (i.e. paying fees and attending meetings) – out of a nominal total of 450 – are women. The cooperative leader – an elderly and respected woman in the community – has been critical in involving women in the village, prompting them to participate in the cooperative's governance, liaising with Ibeka, UNESCAP and the local governments about diverse programmes. In Kamanggih, women also seem to be particularly involved in driving the cooperative and have assumed new roles in the community. The healthcare worker is a good example of that leadership. Often holding the cooperative meetings in her home, she has also started informative sessions on health care, nutrition and contraception. Taking advantage of that momentum, other

Table 6. External (STEEP) factors influence on CREs implementation.

	Cinta Mekar	Kamanggih
Social		
Community ownership	+	+
Community Participation\contributions	+	+
Tradition\Experience with cooperatives[a]	+	+
Target women\gender empowerment	+	+
Strong intermediary organisation	+	+
↻ Building community capability	+	+
↻ Creation of partnerships	+	+
Technical		
Social fit of technology	+	+
Appropriate scale and reliability of technology	+	+[b]
Community training\capacity building (maintenance and operation)	+	+
Domestic\local production of technology[a]	+	–
Availability of technical support	+	+[b]
Grid proximity (for connecting project)	+	+
Economical		
Access to funding (private investors\donor agencies)	+	+
Cost sharing between different institutions and actors	+	+
Innovative financing (Social business\Public–Private Partnerships)	+	NA
↻ Difficulty in securing private investors[a]	–	NA
↻ Dependency on donor agencies[a]	–	–
↻ Funding only for construction phase[a]	–	–
↻ High initial capital cost of MHP[a]	–	–[b]
↻ Low operating costs of MHP	+	+
↻ Increase in fuel prices[a]	+	+
Direct economic benefits – income from electricity sales (on-grid)[a]	+	+[b]
Indirect economic benefits – productive uses and job creation	+	+[b]
Affordability for community	+	+[b]
Operational cost recovery	+	+[b]
↻ Financial sustainability (beyond operational cost recovery)	+	+[b]
Policy[a]		
↻ Restructuring and privatisation of electricity sector	+	+
Mandatory grid connection to IPPs and small power producers	+	+
Policy incentives and economic instruments (PPA, FiT)	+	+
Lack of coordination in the government	–	–
↻ Centralisation and Bureaucracy	–	–
Week policy framework and Contradictory policies	–	–
↻Lack of policies to attract private investment	–	–
↻ Corruption	–	–

[a]General factor in Indonesia.
[b]Does not apply to wind project.
Notes: NA: Does not apply.
+: Factor is present/has positive effect.
↻: New/variation of existing factor.
–: Factor is absent/has negative effect.

opportunities have resulted from this new-found collaboration and women have started to hold evening training sessions on crafts that some sell in nearby markets in the weekends.

For many interviewees, the technical and social spheres cannot be addressed separately, but this interdependence can be both a driver and a potential barrier to success:

> If the technological part is not done properly … there is no hope for the social part. (MHP expert)

> MHP is a rather complex technology, because we also need to manage the people. (…) 70% is village development and 30% technology. (HYCOM)

Although lack of technical capacity can undermine the community's trust and jeopardise the project, the social and infrastructural combinations in a mini-hydro project offer more opportunities for community participation than other RETs, such as solar PV, and thus it may help foster ownership. Thus, the social fit of the technology is another key element (see Table 6).

> Hydro is also beneficial from a social perspective because it helps build relationships, you cannot develop hydro with 10 people, you need more (Ibeka Program official)

Reliability and stable electricity supply are important factors to ensure a smooth operation, as well as a domestic\local production, to facilitate sourcing spare parts and get technical support. In villages like Kamanggih that has not been the case, given how far and poorly connected it is to Java. This problem gets considerably more challenging for the local wind project that uses technology imported from Japan, a fact that can threaten the project's sustainability. Another key technical factor to ensure the success of a project is building the capacity of villagers to manage and maintain the mini-hydro facility. Ibeka provides training to villagers (usually nominated by the community) on the daily operation of the power plant. Ibeka is only called in when there are major problems or broken parts that the cooperative cannot replace.

Access to private and donor sources of funding, cost sharing between institutions and trying innovative solutions such as a social business model like the 5Ps approach (Pro-Poor Public–Private Partnership) used in Cinta Mekar are considered important economic drivers. Yet, as recognised by Ibeka, it is challenging to put these social business models in practice, especially in small-scale projects with low revenue from the Feed-in-tariff (FiT):

> A Project like Cinta Mekar is very small, it's not attractive for private investors. (Ibeka Director)

> In Indonesia, below 1.5MW it is difficult to make a social business. (Ibeka founder)

Indeed, attracting private investment and the excessive dependency on international donor agencies were pointed out as key barriers. The fact that most donor funding is earmarked for the construction phase poses a challenge to financing the preparatory stages of community development, training and capacity building, so critical in Ibeka's model.

Although construction costs can be high, MHP has low operating costs compared to other technologies. This, together with the recent increase in fuel prices (though still subsidised and below international prices), makes MHP a cost-competitive electrification option and thus constitute important drivers for community-owned MHP.

The creation of (direct and indirect) economic benefits for the communities is also critical, namely the generation of income through electricity sales. Yet, for Ibeka, the key for success is the creation of new productive activities, which will ensure not only the affordability of electricity and covering the project's operational costs, but more importantly, will guarantee financial sustainability. This entails the generation of enough savings to allow the cooperative to cover its current costs, but also extraordinary ones such as fixing broken equipment, as well as providing soft loans targeted at income-generating activities for members.

> The last factor is whether the project's sustainability, in terms of cash flow. You can't have a technology working without considering the business aspect. (METI)

> Create more businesses is an important success driver. If they cannot pay the tariff it means that income generating activities need to be integrated in the project, so they will have more income and more availability to pay the tariff. (Ibeka Program Director)

In Cinta Mekar, with the support of Ibeka, the local women assessed their needs and assets and decided to undertake banana flour production, which will then be sold to companies. At the time of the research, the facility was being finalised and Ibeka was already making contacts to market the product. There are also good examples of business initiatives supported by the cooperative, such as a small enterprise that manufactures medical bags for export. These endeavours are not only the outcome of a successful CRE project, they are also the catalyst for its long-term success, since the existence of income-generating activities guarantees that villagers are able to pay the electricity fees, thus contributing to the financial sustainability of the project.

CRE projects require a very different policy framework. Indonesia – like most countries – is still adapting its policies to facilitate electricity production at the community level, a process that

started in 2002 and was influenced by Ibeka. Back then, the restructuring and privatisation of the electricity sector ended PLN's monopoly, mandating the company to buy all electricity produced by IPPs and permitting rural cooperatives to deliver electricity to end-users as well. Policy instruments like the FiT bring the direct benefit of selling electricity, yet it is not problem-free. Thus, some interviewees do not consider it an essential condition for project success, reiterating that it only applies to on-grid projects, and even then it has a number of challenges since often it has not been applied fairly.

> Grid connectedness is not necessarily a requirement for success. Off and on grid projects are very different. (METI)

> though we have the regulation from the ministry about the FiT, it depends on the manager of the regional PLN. (…) the bad person tries to negotiate the price and we know of corruption cases. (Ibeka Program official)

The high number of institutional actors and lack of coordination in the government were highlighted as obstacles, and the recently created METI (Indonesian Renewable Energy Society) also seems to be struggling in its role as a Coordinating Agency.

> there are 5 ministries making hydro-power projects and many departments involved, they work separately. They try to share information but it's somehow chaotic (HYCOM)

> There are many divisions, sometimes it's quite cumbersome to bridge the communication, for example in the Ministry of Energy and Mineral Resources the different Directorates don't work well together.(METI)

Corruption at all levels, the centralisation of power and excessive bureaucracy – not exclusive to the energy sector – were mentioned many times as critical barriers to CRE projects. And as policy catches up with these new forms of decentralised electricity production, some key contradictions remain (such as the high fuel subsidies while Indonesia is already a net importer of oil and has ample renewable energy potential), as shown in Table 6. This results in a weak policy framework that also does little to attract more private investment into RE in general and to CRE in particular.

> … fuel subsidies are still a big barrier to MHP development (Bandung Hydro Association)

> Policy is not that strong. Maybe for on-grid, but for the community based no … many RE policies do not work in Indonesia (IESR)

The Policy drivers and barriers summarised in Table 6 are mostly structural issues, which affect all RE projects in Indonesia. But it is worth remembering Ibeka's role in triggering the policy changes mentioned above and that Cinta Mekar was, in effect, the first CRE project that benefited from the FiT. Before that, other projects producing electricity had been unable to legally supply villagers or sell its production to the grid. Cinta Mekar illustrates the proposition by Wüste and Schmuck (2012) that successful CRE projects can actually trigger improvements in the country's policy framework, which will, in turn, create conditions for more community projects. Indeed, as pointed by Hicks and Ison (2011, p. 253) a "country's policy context can be a barrier or enabler for CRE projects, however CRE projects can also become an enabler for better renewable energy policy".

Finally, it is worth pointing out the consensus revealed by the 10 external stakeholders interviewed (energy experts, Ibeka's and Government's representatives) when asked to identify the three most important factors driving the success of the projects: *Building Community Capacity*, *Social Fit of the technology* and *Financial Sustainability*. As for the villagers, the key driver for success is quite simply Ibeka: whilst acknowledging their communal effort, all villagers emphasised the role of the NGO in the outcome of the projects.

Discussion

This study aimed to address the lack of studies focusing on CRE in developing countries by using a, literature-derived, inclusive framework for analysis which allows for examining the factors affecting the successful implementation of such projects. To this extent, our findings contribute to the body of knowledge on community-owned energy in developing countries – thus helping to fill the gap

in the literature that has focused almost exclusively in Northern Europe and North America – while providing a more comprehensive overview of the range of factors influencing the outcome of such projects. We find that community-level factors play a critical role in the outcome of projects and, because community processes do not happen in a void, success in community energy projects only happens if the forces outside and inside the community are properly leveraged.

Our findings suggest that the bridging of macro-level/external factors and micro-level/internal ones needs the catalysing involvement of a meso-level actor. This is not surprising since CREs are unconventional enterprises that do not fit within the boundaries of traditional energy and electrification systems, but lie somewhere in between large-scale corporate/state projects and stand-alone systems. Hence, in order to thrive, community projects – particularly in developing countries – need someone to fill in the existing gaps and bring the outer drivers closer to the community. Indeed, a strong and active intermediary organisation had been one of the drivers identified by Sovacool (2012), which he referred to as "resilient project champions", while Hargreaves *et al.*'s (2013) analysis of community energy projects in the UK identified "a recent shift towards a fourth major role being played by community energy intermediaries – that of brokering and managing partnerships with actors outside the community energy sector" (p. 878). In the projects we studied, this role is played by Ibeka. Despite our analysis showing that, for both projects, all the facilitating – external and internal – factors identified in the relevant literature had been present, it is quite telling that in the minds of villagers, i.e. the actual users and beneficiaries of the projects, the key driver for success has been "Ibeka".

Yet, the "Ibeka" factor should not be perceived as the benevolent, external *actor* who gives away favours on the affected communities. Rather, it stands for the *processes* that this particular actor catalysed thus securing the projects' success: in the words of the non-local stakeholders, building community capacity, ensuring the social fit of the technology and securing the project's financial sustainability. Thus, in our case studies, we find that the success of CRE projects has a lot to do with their implementation process – lasting around 2 years – that fosters community ownership of the project. That does not happen simply by giving the projects to the communities (donors and NGOs have long given away RETs to villages in developing countries (Sovacool 2012), but they seldom provided *ownership*). Building ownership starts at the preparation stage – the most important step. Providing the equity, income and responsibility that come with owning an energy facility would not make sense if the community was not prepared to handle it. In effect, from what could be observed, Ibeka's projects check all forms of ownership suggested by Hicks and Ison (2011) – process, legal, economic and technical ones – and that seems to be a determining factor in their outcome.

During this process, the NGO develops a relationship with the community through key individuals in the village, tapping into their different skills and capacities. Not all the capabilities need to be there, as acknowledged by Middlemiss and Parrish (2010), nor they need to be immediately evident as Ibeka's staff recognised. But understanding the need for those different capacities – personal, organisational, infrastructural and cultural – helps to identify shortcomings and ways in which the capacities that do exist can help overcome existing limitations.

For Ibeka, mini-hydro is instrumental in creating the involvement and commitment needed to foster ownership. The organisation was, in many ways, the seed that allowed micro-hydro technology to flourish in Indonesia and is still a key actor in knowledge production and dissemination. The NGO was involved in starting what many interviewees referred to as a "movement" for community empowerment through the use of "appropriate technology", fostering manufacturing in local workshops throughout the country to increase communities' autonomy and self-reliance. This desire for community self-sufficiency was also recently identified by Rezaei and Dowlatabadi (2015) as a primary driver for the community to engage with energy projects in First Nations communities in Canada.

In the economic sphere, and acknowledging the problems of relying excessively on international grant donations, Ibeka has been trying new financing models, in particular, a social business

approach that brings together the community and private sector actors as equal business partners (the 5Ps approach – Pro-Poor Public–Private Partnership). As expected, this is proving to be a difficult task. Financial challenges, especially for off-grid projects, will continue because without the FiT, they are not attractive for private investors. To address this barrier, Ibeka's is advocating the creation of a trust fund (replenished mostly by government money) to implement CRE projects in rural areas, which, Ibeka argues, would be a better use of the national budget than the current spending on rural electrification projects that have mostly failed. No less important for success is ensuring the projects' financial sustainability. And this is only possible by fostering the villagers' personal, organisational and entrepreneurial capacities to create income-generating activities that ensure that the energy project will sustain without external assistance.

However, such a far-reaching performance does not come without its problems. Ibeka's prominent role in communities and extended presence (often becoming permanent) may be creating some dependencies and threatening the very autonomy and self-reliance that it tries so hard to create. projects' research has voiced similar concerns over the intermediaries' involvement in grassroots energy projects. Although having an engaged intermediary is a hugely facilitating factor for these projects' success through "aggregation and learning", "establishing an institutional infrastructure", "framing and coordinating local project activities" and "brokering and coordinating partnerships with [outside] actors" (Hargreaves *et al.* 2013), it is worth noting that

> when external professionals are involved in capacity-building, communities may feel pressure to rely on such external aids which often impose top-down agendas [..] when capacity-building is seen as a precursor to participation or taking action, it would impede wider participation by communities with poor resources. (Park 2012, p. 391)

Another question that arises is whether such comprehensive model is replicable and if it can be applied throughout Indonesia. This is even more problematic in the face of the very poor monitoring and evaluation systems in place in Indonesia. Lack of detailed monitoring, evaluation and reporting was also identified as the barriers for Ibeka's work. Without readily available information about the status of projects, their exact impacts, key characteristics and, most importantly, what drives and obstructs their success, it is hard for Ibeka to improve their processes and for others to apply their model. Moreover, it reinforces the importance of having comprehensive models or frameworks, derived from detailed data analysis, which can potentially be tested and implemented by other actors and communities seeking to build their RE projects.

Before concluding, it is appropriate to consider to what extent our findings are generalisable to other contexts. Starting with the relevance of macro/external and micro/internal facilitating factors, the fact that the inclusive framework we used fitted remarkably well (albeit being derived from CRE projects in developed countries) suggests that we do have the methodological tools for assessing the performance of CRE in developing countries as well. That said, discrepancies do exist. For instances, environmental drivers (as encountered in the reviewed literature and without dwelling into the different meanings that "environment" may have in northern and southern countries) hardly played any role in the projects studied in Indonesia. Yet, climate change and the reduction of a community's GHG emissions have been identified as key motivating factors for communities to engage in RE production in Europe and the U.S. (Walker 2008, Hicks and Ison 2011). Likewise, some drivers seem to be specific to the technology used (micro-hydro), while others relate to particular, sociocultural aspects of Indonesian society such as collective values and a tradition of communal work embodied in rural cooperatives. Due to their differences, it is natural that different factors carry more weight in different countries. Thus, more research is needed to establish the relative influence of each factor, and for doing so, we should also study CRE initiatives which failed to materialise/be sustained.

Nevertheless, there seems to be one factor which is a make-or-break pre-condition for the successful implementation in a *developing* country: the existence of facilitating, meso-level organisations. The reason for that is that, in general, the macro/external-level factors are less permissive and micro/

internal-level ones are less powerful in developing countries than in developed ones, thus the presence of an intermediating entity is all the more important in the former case. Ibeka is a case in point. Indeed, critical changes in the Indonesian electricity sector in the last decade were influenced by this organisation, which is constantly advocating for better policies and calling out corruption cases in the sector. Arguably, it seems that Ibeka's community projects have succeeded not because of, but despite the existing policy and institutional framework, which remains rather weak and full of paradoxes. This is particularly problematic for CRE projects in general because they tend to fall between most governments' funding mechanisms and existing policies (Rogers *et al.* 212). As Devine-Wright (2005) points out, applying institutional arrangements designed for a centralised energy system to decentralised RETs projects is detrimental and will prevent the evolution of the system, which is why Ibeka has been trying to shape Indonesian policy to better accommodate the specificities of community projects. As the Greek philosopher Aristotle argued many centuries ago in his *Nicomachean Ethics* "it is possible to fail in many ways [..], while to succeed is possible only in one way". Our findings suggest that, as far as CRE in a developing country is concerned, this unique way is contingent with the existence of meso-level organisations.

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No potential conflict of interest was reported by the authors.

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