



Electrifying the ‘eighth continent’: exploring the role of climate finance and its impact on energy justice and equality in Madagascar’s planned energy transition

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Abstract

Developing country case studies have thus far been under-represented in conceptual models attempting to theorize energy transitions. This paper explores the role of climate finance in the process of Madagascar’s planned transition to renewable energy sources as envisioned in the country’s New Energy Policy in order to demonstrate the different experience in developing countries when compared to hegemonic transition narratives. Drawing upon qualitative interviews with energy finance providers and focus groups in recently electrified rural communities, this paper reveals that Madagascar’s transition is dependent on the financial resources mobilized by the government’s technical and financial partners. Climate finance emerges as a critical lever to implement environmental legislation. The interview findings were correlated with census data to evaluate how current financing strategies are directly connected to energy justice issues, namely the equality in access to affordable and clean energy. Through an analysis of projected energy finance flows and key financiers’ financing strategies, this paper exposes a shift from grant-based climate finance to financial instruments with clear return profiles, such as concessional loans and private capital, and finds that the choice of financial instrument impacts the provision of complementary social services in rural electrification schemes. Grants are linked to higher investments into complementary social services, while private financiers focus on innovation and scale. Purely private financed electrification projects were found to negatively impact social cohesion by increasing the inequality in access to energy. This study concludes that if only commercially viable energy projects were to be financed going forward, up to 19 million Madagascans might be excluded from future electrification efforts. Consequently, this paper urges researchers to consider social justice implications when evaluating climate finance strategies.

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1 Introduction

Madagascar as a country has resigned. The people just can't do it anymore. If you look at the numbers, you can see that income per capita has been decreasing for over 40 years. Meanwhile, the elites have accumulated more and more wealth by robbing the country of its resources. The country is broken and I do not see how it can be fixed.

Such is the assessment that a director of a political foundation shares over dinner. The numbers look sombre: 92% of Madagascans live off under USD 2 per day (African Development Bank Group 2014). GDP per capita—at USD 433 in 2018—has been decreasing since the 1970s (tradingeconomics.com 2019). The 'Big Island' holds the lonely title of being the only country in the world—that has not experienced civil war—where net GDP per capita was lower in 2010 than in 1960 (Osborne et al. 2016). After a coup d'état in 2009, many technical and financial partners (PTF)¹ left Madagascar, which resulted in a reduction of the national budget by 60–70% according to development professionals.

Zooming in on the energy sector, Madagascar's story does not look any more uplifting: In 2015, the World Bank's Ease of Doing Business' index ranked Madagascar last in the world in terms of getting access to electricity (World Bank Group 2016). Equally, at less than 50 kWh of electricity consumed annually per capita (USAID 2016) and a rural electrification rate of around 5% (Castalia 2015), the Indian Ocean nation consistently comes in at the very bottom of any comparative statistic of the world's energy landscape. The public utility Jiro sy rano malagasy (JIRAMA), bankrupt for decades, exclusively distributes power and manages transmission lines in urban and peri-urban areas (Praene et al. 2017). Approximately two thirds of the population, however, live in the countryside, often in remote villages that are further isolated by the lack of transport infrastructure (CIA 2017). Publicly accessible data by the Electricity Regulation Office confirms the near absence of a national grid (ORE 2017, see Appendix 1).

Researchers and practitioners alike have long established causality between low energy access rates and the consistent lack of economic opportunities (Banerjee et al. 2008; Sokona et al. 2012; International Energy Agency 2014; Africa Progress Panel 2015; International Renewable Energy Agency 2015). Madagascar's energy sector has therefore become a strategic priority for the government in its effort to spur socioeconomic development. With the objective to lead the country out of its seemingly perpetual crisis, a sweeping reform of the energy sector has become critical. In 2015, this historic moment seemed to have finally arrived. Madagascar passed its New Energy Policy (NPE), which aims to increase the installed capacity of around 300 MW² in 2017 by 2500 MW by 2030, thereby increasing the electrification rate from 15 to 70%. Another goal is the large-scale expansion of renewable energy sources (RES), which are to supply 85% of the electricity mix in 2030. The potential

¹ 'Les partenaires techniques et financiers' (PTF) is a French expression used to describe the technical and financial partners that support the Madagascar government in achieving its development goals.

² Average estimate of staff of Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ)

undoubtedly exists: Technical studies show that currently, the ‘eighth continent’³ uses merely 2% of its theoretical hydropower capacity, has the most favourable conditions for wind energy in Africa, and boasts an annual 2800 h of sunshine per year, more than double the amount of Germany (USAID 2016). Off-grid PV systems have replaced hydro as the most economical source of energy in Madagascar (Szabó et al. 2013). Leveraging these enormous potentials would allow Madagascar to leapfrog conventional paths of energy development and bypass fossil fuel consumption. This would constitute a large-scale energy transition in one of the world’s economically poorest nations and could theoretically set a precedent for other countries in the developing world.

The funding gap to implement the NPE amounts to USD 13 billion, which is to be mobilized by the PTF and the private sector (MEEH 2015). Such external funds ‘designed to address the climate challenge’ are commonly referred to as climate finance and have become ‘the core currency in the political debate concerning the accountability of developed nations to developing nations’ (Zadek 2011). Understanding how climate finance is perceived and used in the process of Madagascar’s planned energy transition potentially unveils dynamics that help accelerate similar transitions in other developing countries in sub-Saharan Africa and beyond.

This study aims (i) to understand how national implementing agencies envision Madagascar’s energy transition towards a renewable supply of electricity as defined in the NPE, (ii) to decipher the different financing strategies deployed by financiers active in the energy sector, and (iii) to investigate whether the choice of financial instrument used to electrify a country has potential impacts on social equality that have previously gone unnoticed. This paper first contextualizes the research by elucidating current funding challenges of rural energy transitions in a developing context. Second, research design and findings are presented. Third, the results from the analysis of climate finance flows and its potential implications on energy justice and social equality in rural Madagascar are discussed.

2 Energy transitions in the developing world

Sub-Saharan Africa’s energy landscape is uniquely underdeveloped (Banerjee et al. 2008). More than two thirds of Africans, i.e. 620 million people, lack access to electricity, which puts a brake on socioeconomic development (Africa Progress Panel 2015). The connection between energy access and economic growth has been studied excessively and is not necessarily straightforward (Wolde-Rufael 2009; Ozturk 2010; Cook 2011). Yet, due to the social benefits associated with (successful) energy access programmes, namely increased levels of education and advantageous effects on public health, rural electrification schemes have become a fixture in the global development agenda (Williams et al. 2015). An emerging consensus in the field is the opinion that decentralized, renewable energy systems are the most sustainable and cost-effective way to electrify rural areas with dispersed populations (Chakrabarti and Chakrabarti 2002; Urmee et al. 2009; Zerriffi and Wilson 2010; Szabó et al. 2013). The case for large-scale investments into renewables in sub-Saharan Africa is fortified by the growing acceptance of the fact that climate change mitigation and development are inextricably linked (Shakya 2017).

³ Madagascar is sometimes referred to as the ‘Eighth Continent’ due to its unique levels of biodiversity and endemism. It is estimated that 83% of plants, 86% of macroinvertebrates, and 84% of land vertebrates are endemic (Goodman and Benstead 2005).

This gives African countries with low electrification rates a comparable advantage in the global race to decarbonize our national economies (Sokona et al. 2012): It is estimated that over 50% of Africa's new electricity resources from here to 2040 will be renewable, if the necessary capital can be mobilized (International Energy Agency 2014).

Such a 'change in one energy state of an energy system to another one in terms of quantity, structure of end-use and supply, and quality of energy' is commonly referred to as an energy transition (Sokona et al. 2012). In academia, energy transitions are understood to be interdisciplinary, quasi-evolutionary processes that comprise a plethora of different actors and institutions (Fouquet 2010; Hildyard 2016). Historically, energy transitions have been slow and stretched over decades—or even centuries—due to the sheer scale of the change required (Fouquet 2009; Fouquet 2010; Fouquet and Pearson 2012). The looming threat of rapid and potentially nonlinear changes to the global climate (Lenton et al. 2008), however, requires upcoming energy transitions to happen on much shorter timescales than ever before. Yet, energy transition research frequently relies on historic case studies that originate almost exclusively in the developed world and thus provide a skewed representation of reality, which urgently needs to be enhanced with research in developing contexts (Berkhout et al. 2010; Romijn et al. 2010; Sengers and Raven 2014; Ramos-Mejía et al. 2017).

Marcotullio and Schulz (2007) observe that transitions in so-called non-rapid developing countries like Madagascar happen sooner (at lower levels of income), in a more simultaneous fashion (different energy carriers overlapping), more efficiently (in terms of energy intensity), and at lower environmental cost. In this process, energy policy emerges as a critical tool to manage increasingly complex and multidimensional transition processes. We can deduce that while the complexity of energy transitions is higher, so are the opportunities for the developing world to electrify their countries using RES, thereby leapfrogging conventional paths of setting up energy systems reliant on fossil fuels (Marcotullio and Schulz 2007). In practice, successful case studies of sustainable rural electrification through RES remain hard to find. Rural electrification schemes often fall short of their desired development benefits due to the failure to understand local needs and social settings and the consequent 'lack of complementary services and supporting resources including infrastructure, financial services and information' (Matinga and Annegarn 2013). Current barriers include high tariffs, low income levels, electricity theft, mismanaged utilities, low institutional capacities, and—most notably—the lack of human and financial capital (Cook 2011; Ahlborg and Hammar 2014).

2.1 Financing energy transitions

The resources used to '[reduce] emissions, and [enhance] sinks of greenhouse gases and [reduce the] vulnerability of, and [maintain] and [increase] the resilience of, human and ecological systems to negative climate change impacts' are commonly referred to as climate finance (UNFCCC 2014). The dimensions, types, and delivery mechanisms of these resources have been subject to fierce debate in international climate negotiations. The Copenhagen Accord states that USD 100 billion per year shall be mobilized by 2020 by developed countries (UNFCCC 2009). Yet, the Green Climate Fund (GCF) remains chronically underfunded with total announced pledges of USD 10.2 billion (GCF 2019b).

While the agreed-upon figures seem straightforward, actual climate finance flows and the definition of what constitutes them are not. A main prerequisite for any financial assistance to be counted as climate finance is that the mobilized resources are 'new and additional' (UN 1992), i.e. exclusive of already existing funds and Official Development Aid (ODA) flows

(Ballesteros and Moncel 2010). The Organisation for Economic Cooperation and Development (OECD) has developed so-called Rio markers to classify and track the climate change objectives of development aid flows in order to avoid double counting (OECD 2016). In reality however, countries use various methodologies and definitions that complicate the differentiation between the two forms of development assistance (Stadelmann et al. 2011). Independent studies find that as much as three quarters of projects labeled as having a climate change objective might not actually have one (Weikmans et al. 2017). Practitioners confirmed under Chatham House rules that all ODA in the renewable energy sector today is practically being counted as climate finance and that it is common practice among governments to change and re-assign Rio markers as they see fit. The UNFCCC's Standing Committee on Finance attests that '[t]he UNFCCC does not have a definition of climate finance' resulting in an overall, highly uncertain estimate of total global climate finance of USD 340 to 650 billion per year (UNFCCC 2014; Buchner et al. 2015). In order to avoid excluding critical financial flows from the analysis at hand, this study uses the term 'climate finance' equally broadly to refer to all funds invested into renewable energy in Madagascar by external actors.

Traditionally, debates on how to finance development have focused on two specific instruments: loans and grants. The generally accepted narrative is that loans increase financial discipline, fiscal revenues, and investment rates while promoting (economic) efficiency as they have clear repayment terms and horizons (Odedokun 2003; Bulow and Rogoff 2005; Cohen et al. 2007). Critics, however, argue that in a development context, loans might gradually build up an unsustainable debt burden in the world's economically poorer countries (Cook 2011). Grants, on the other hand, are perceived to disincentivise budgetary discipline and have empirically been linked to lower tax receipts and domestic revenues (Clements et al. 2004; Gupta et al. 2004). In 2014, 44–51% of climate fund contributions and ODA were disbursed in the form of grants (UNFCCC 2014).

Financial innovation in the private sector has contributed significantly to the success of large-scale energy transitions in the past (Pathania and Bose 2014). Increasingly, ODA is used as a mere catalyst to mobilize private sector investments, which are growing quickly in emerging markets (Bandura 2017). Even though a number of new players, such as institutional investors, sovereign wealth funds, or other emerging economies' export-import banks have started to invest into sub-Saharan African infrastructure, not all projects offer rates of return that make them attractive to the private sector. Hence, (government) grants are needed to make said projects economically viable (Gravito et al. 2017).

Hall et al. (2016) posit that understanding financial institutions and the instruments they use is key to understanding energy transitions and find that a market-based approach runs the risk of creating a funding gap for small-scale schemes (Hall et al. 2016). In 2019, the Green Climate Fund financed two rural electrification projects, both in sub-Saharan Africa. The 'Yeelen Rural Electrification Project in Burkina Faso' aims to work with private operators to install 100 solar minigrids through a results-based capital grant that is supposed to cover 40.5% of total project cost. The project furthermore foresees improving regulatory frameworks to channel more private sector capital towards renewable energy-based rural electrification projects (GCF 2018). The 'Mali solar rural electrification project' will use a concessional loan to finance 71% of total project cost arguing that said concessional loan is the only means to offer the generated electricity at a tariff that lies within the benefitting communities' ability to pay. The project achieves a 24 to 51% reduction in the average electricity tariffs generally applied in rural areas by private sector minigrad operators (GCF 2019a). The Burkinabé example is a testament to the fact that current electrification schemes increasingly use climate finance to

mobilize private sector capital. The Malian example supports Hall's thesis of purely private sector financed solutions potentially excluding small-scale rural electrification projects.

Studies investigating the potential repercussions that different forms of financing could have on the equality of energy access in the developing world are scarce. Yet, more and more research is being undertaken in the field of energy justice, which investigates the nexus between energy generation and delivery, and justice, equity, and fairness (Monyei et al. 2018). More specifically, energy justice is defined as 'a right to the level of energy required to attain a minimum of wellbeing' (Islar et al. 2017). If used as an analytical tool, the lens of energy justice can help understand how certain values are built into energy systems (Sovacool and Dworkin 2015). This study investigates whether these values can already be determined when analysing how the energy system in question is financed. It therefore uses climate finance as an investigative lens to unveil how financing strategies and energy justice are interlinked in Madagascar's planned energy transition. The findings, however, are relevant not only to Madagascar but to most, if not all, least-developed countries (LDCs) aiming to decarbonize their economies.

3 Research design

Echoing well-known calls for increased interdisciplinary research in the global environmental change sciences field (Castree et al. 2014), which are particularly strong in energy transition research (Verbong and Loorbach 2012), this study's research design aimed to be interdisciplinary, participative, and applied. The researcher employed a mixed methods approach, focusing on qualitative interviews that were complemented by quantitative analyses. The author started the research process with a document analysis of the NPE, *LOI N° 98002*, in order to inform the design of the interview guides. Further legal documents analysed are the *DECRET n°2015 – 592* and the *LOI N°2014 – 020* to understand the Malagasy definitions of urban and rural settlements. The critical part of this research is based on 15 semi-structured, qualitative interviews that were conducted in Madagascar within a 2-month timeframe. Interviewees consisted of technical experts, energy specialists, and program directors and managers working in the Madagascar energy sector. The organizations active in the energy sector were clustered into six groups: national implementing agencies, UN or UN-associated institutions, multi-/bilateral political partners, development finance institutions, NGOs, and private sector companies. A minimum of two participants per group were recruited on the basis of their technical expertise, seniority in their positions, and ease of accessibility. In total, the researcher interviewed four representatives of national implementing agencies, three from the private sector, and two from each of the remaining clusters. A full list of the participating institutions can be found in Appendix 2. The semi-structured interviews were based on interview guides that explored three areas: implementation strategies for the NPE, theories of change for the Madagascar energy sector, and financing strategies. International financiers were also asked about the role of climate finance in the planned transitions. All interviews were conducted in French, and only GIZ and KfW representatives were interviewed in German. They lasted between 30 and 75 min and were either audio recorded and transcribed or transcribed on the basis of notes.

The interview findings were complemented with case studies in three rural communities that have been electrified with the three financial instruments most commonly used for rural

electrification projects in Madagascar: the Mangamila community through national subsidies, the market village Mahatalaky through grants, and the fishing village Andovodoranto through private capital. During the community visits, the researcher used semi-structured and unstructured interviews, focus groups, and ethnographic observations to explore the effects of rural electrification projects on the ground. Through semi-structured interviews the researcher investigated when the communities were electrified and how electrification impacted the lives of community members, their socioeconomic backgrounds, and attitudes towards renewable energy. All interviews and focus groups were conducted in Malagasy and translated by a local community member. The researcher relied on the local guide to select the community members willing to participate. A full list of the participating institutions, as well as an overview over the methods used, can be found in Appendix 2. The interviews lasted between 30 and 45 min and were transcribed on the basis of notes (please refer to Appendix 3 for detailed descriptions of the case studies).

The researcher used iterative coding techniques to identify those sections of the interview and focus group writeups that contained relevant information to answer the research questions. He then compiled research question-specific guides, which were coded again to distil common themes. The analysis of these common themes within the frame of the six participant clusters allowed to derive the conclusions on different financing strategies employed in the energy sector as discussed in the next chapter. The stakeholder maps presented in Section 4.4 are based on a methodology used by GIZ for managing development projects (GTZ 2009). The source data for the quantitative analysis of expected project finance flows was also collected by GIZ but raises no claim to completeness.

4 Findings

4.1 Implementing the NPE

Madagascar's NPE was adopted in 2015 and is considered a visionary and long overdue piece of legislation with ambitious goals. All national stakeholders interviewed unanimously confirmed that the lack of financial resources was the biggest obstacle to implementing the NPE: USD 13 billion are to be raised by the PTF and private financiers to finance the desired transition. To date, the NPE lacks a clear implementation plan (see MEEH 2015, p. 124f). A closer review of the legal document *LOI N° 98002* that constitutes the NPE reveals that the proposed action plan is fuzzy, even conflicting in some parts. The NPE aims to increase the installed capacity eightfold within 15 years, predominantly through grid extension, a natural monopoly of JIRAMA, which to date exclusively serves Madagascar's urban centres. Electrifying Madagascar through grid extension in urban and peri-urban areas, however, could be counterproductive in a country where most of the population live in rural areas. This discrepancy eludes the NPE; its only uncontested goal being the large-scale deployment of RES.

As such, the policy blissfully ignores the larger narrative of the energy transition underway in Madagascar as, of course, not only renewable energy projects are being commissioned by the government. Interviewees hinted at the presidency still granting large crude oil, diesel, and coal concessions to powerful foreign investors that will produce hundreds of megawatts of grey energy. The decisions of the president to cover the baseload with fossil fuels were criticized as working against the NPE, particularly with the country's large potential for

hydropower. Perceived corruption also influences the dynamics in Madagascar's energy sector. Many international donors, for example, have stopped working with public utility JIRAMA after the utility's fiduciary management practices were called into question. As the principle buyer of grid-connected electricity, JIRAMA presents an exorbitant counterparty risk, seen as 'the root of the problem' of the electricity sector (representative of national agency) as it impedes any private investment without risk guarantees. In 2017, the World Bank was the only external agency that actively works with JIRAMA to build capacity from within the organization.

4.2 The perspective of national stakeholders

National stakeholders described the general lack of financial resources as the biggest obstacle to implementing the NPE: 'The implementation of our energy policy is a function of the financing we receive', summarizes a sector lead at the Energy Ministry (MEEH). The day-to-day reality is dire in a country where public institutions are critically underfunded and end customers live in extreme economic poverty: The Agency of Rural Electrification Development (ADER) does not have enough budget to subsidize rural electrification projects. Interviewees from both ADER and MEEH reported that they do not have the resources to monitor their projects. The private sector experiences similar financial hardships: In-country research found that by 2015, 17 out of 47 private RES concessionaries in Madagascar had gone out of business. This was primarily due to the reliance on diesel generators to power minigrids in the early 2000s. Pressured by the IMF, Madagascar discontinued diesel fuel subsidies in 2012 and many operators were not able to pass on the increase in fuel costs to their rural customers and went bankrupt (Castalia 2015). All interviewees in the communities visited confirmed that the fuel costs for diesel generators still far exceed household income and are primarily used by small businesses. Various projects (for example by GIZ) exist that aim to hybridize diesel minigrids with solar panels in order to reduce operating costs.

In the hope to scale up their electrification efforts through (foreign) direct investment, national agencies have turned to the private sector in recent years. ADER adopted area-based rather than site-specific tenders for rural electrification concessions in 2015 in order to increase their potential market size; MEEH representatives mentioned the preparation of a new PPP law together with MFB. The interview partner from GIZ reports that part of their mandate is the creation of structures that increase private sector involvement in the energy sector. GIZ supports the relevant Ministries with the design of IPPs and PPP models, particularly BOT concessions, and has furthermore advised the government on how to include key regulation on unbundling and (partial) electricity market liberalization in the new Electricity Law (*LOI N°2017-020 portant Code de l'Electricité à Madagascar*) that entered into force in 2018. The GIZ representative furthermore confirmed that the 'impulse for privatisation' came from national stakeholders who hope that the private sector can provide turnkey solutions, which stand in contrast to the cumbersome bureaucracy sometimes associated with the PTF.

The PTF remain trusted partners of the government. The study participant from ADER commented: 'We always ask our partners how to do things', which suggests a strong dependency on the side of Madagascan institutions, a view confirmed by a story shared by the interviewee from the National Bureau for Climate Change Coordination: 'To access a fund you need to prepare a document. For that, you need to hire a consultant. In almost 100% of the cases you need an international consultant who costs twenty times the money of a national consultant. Once you have the document in your hands, you still haven't done anything on the

ground, not even mounted a single pylon.’ The interviews with national implementing agencies confirmed the precarious state of Madagascar’s energy sector: Financial resources and human resources with the necessary expertise are scarce: A strong dependence on external aid and a perceived loss of agency are the consequence.

Appendix 4 summarizes the quantitative information collected during the interview process, data mainly provided by GIZ and ADER: expected rural electrification projects and their financing structures between 2017 and 2020. For a total investment of EUR 125 million (USD 140 million at time of analysis), 37 MW capacity of renewable energy is foreseen to be installed in rural areas by 2020. Even though the researcher does not claim that this list is exhaustive, it does shine a light on the progress of the current transition: The NPE foresees an additional capacity of 2500 MW to be installed by 2030, 85% of which coming from renewable sources. Assuming a linear distribution of that capacity over the years, one would expect to see approximately 140 MW of capacity to be installed every year.

4.3 ‘Finding the right balance’

The overall issue is to find the right balance between subsidies and investments. If there are too many subsidies, operators have no ownership, they don’t care, after two years your grid stops working. [Too little subsidies constitute an] ethical problem: Do you subsidise a project at 100% and then let the operators earn money for 20 years when they haven’t invested a single cent?

Representative of the United Nations Industrial Development Organisation (UNIDO)

Indeed, financing strategies in the Madagascan energy sector are centred around the question of ‘finding the right balance’. Various financiers echoed the dilemma mentioned by the representative from UNIDO: A low proportion of subsidies leaves room for more projects to receive government support overall but these might not be realized as developers have difficulties mobilizing the necessary funds. If subsidies are too high, no perceived ownership on the sides of the private operators might lead to the abandonment of projects or bad maintenance. It is a common pattern that projects, once they are up and running, are badly maintained or cannot be paid for by the villagers. Often, the staff trained to take care of the project move to cities to find better paying jobs leaving the project abandoned (see Mangamila case study, Appendix 3, Hirmer and Cruickshank 2014).

An argument for elevated subsidy levels are the electricity prices expected from 100% private financed projects: They would be far too high for the rural population who are not used to cost-reflective tariffs, since JIRAMA has sold electricity at a loss for decades. Thirty percent of respondents from international organizations mentioned that in order for a project to be profitable for private investors, certain minimum consumption levels have to be reached. This could either be a so-called anchor customer guaranteeing a certain consumption or a minimum number of grid connections by the rural population. Estimates for the latter range from 1000 to 10,000 customers, averaging at around 4700. A document analysis of the *DECRET N°2015 – 592* and the *LOI N°2014 – 020* (see Appendix 5) shows that in Madagascar, cities are defined as settlements with over 5000 inhabitants. Following the same definition, the UN estimates that the 2012 urbanization rate of 37% will climb to 50% by 2036. Due to the lack of more granular census data, the researcher assumes that only ‘cities’ with over 5000 inhabitants surpass the threshold mentioned by interviewees, i.e. the minimum number of connections for

a privately financed project to be commercially viable. The UN estimates Madagascar's population to have climbed to 35.96 million by 2030. At a linearly extrapolated urbanization rate, 46.75% of Madagascans, or 16.8 million people, will live in cities by 2030. If it was entirely left to the private sector to electrify the country, this would leave 19.1 million of rural Madagascans potentially excluded from future electrification efforts.⁴

Indeed, the optimum level of subsidies was probably the most intensely debated topic in the interviews. In 2017, subsidies were fixed at 70% by law, which is very close to the lived reality where subsidy levels range from 55 to 75%. This might change rapidly in the coming years. With both GIZ and World Bank claiming that the optimal level of subsidies is zero and NGOs Le Groupe de Recherche et d'Echanges Technologiques (Le GRET) and Fondem reporting a gradual decline in subsidies over the last years, this study observes a clear decline in the planned future subsidy levels for electrification projects. The EU's replacement of its Energy Facility II (EFII)—maximum subsidy level 75%—by ElectriFI—maximum subsidy level 30%—is an illustrative example of this trend. The NGO Fondation Energies pour le Monde (Fondem) described this 'ultra-liberalisation of the electricity sector' as too much of a private approach for organizations with a social mission, which would refrain from applying for funding from such programmes in the future. Interviewees from NGOs and even the EU itself expressed considerable doubts that market-based programmes, such as ElectriFI, will ever be able to finance projects in LDCs like Madagascar.

4.4 Rural electrification projects visited

4.4.1 Mangamila

The first community visit to Mangamila illustrates the extreme resource shortages Madagascar's national institutions are subjected to. Mangamila was electrified after a private operator successfully won the site-specific tender administered by ADER, which also manages the multiple stakeholders involved. In 2007, a 60-kW small hydropower station started operating at 3 km from the village. The operator soon consumed most of the energy for his own business and clashed with the local population. In 2014, he uninstalled most of the equipment and left town. Given ADER's lack of resources for monitoring, it took the agency several years to realize what happened. The Mangamila project was funded by GIZ. The stakeholder map (Fig. 1) demonstrates that ADER functioned as the sole connector between the donor, the operator, the population (through the mayor), and other national implementers who have to authorize and approve the project ('veto players'). During the community visit, the ADER representative mentioned that the agency was so underfunded that they could not even pay the travel costs for their engineers to visit electrification projects. At the time of the visit in July 2017, their annual budget for the year 2017 still had not been approved.

⁴ This calculation does not consider the potential increases in disposable incomes within the rural population that a successful electrification might entail and which might lower the minimum threshold of connections significantly.

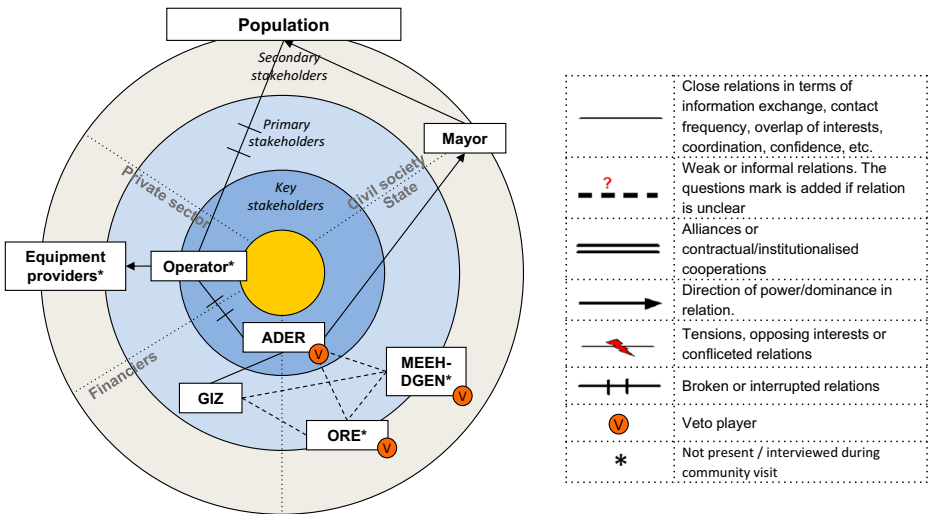


Fig. 1 Stakeholder map of Mangamila

4.4.2 Mahatalaky

Mahatalaky was electrified through the project Best Options for Rural Energies and Access to Light and Electricity (BOREALE). Launched in 2012, the EUR 2.5 million project electrified seven rural communities in the Anosy region, one of Madagascar’s economically poorest with a rural electrification rate of 0.78% (see Appendix 6, INSTAT 2013). Mahatalaky was one of the pilot projects that became operational in 2015. BOREALE was financed through the European Union’s EFII and implemented through the French NGO Fondem. The EU’s subsidies amount to 70% of total project cost; the rest of the entirely public capital was mobilized through other foundations and grants. The EFII-sponsored projects in Madagascar rely on NGOs to coordinate the multiple stakeholders involved, as the stakeholder map (Fig. 2) demonstrates. The map reveals a complex network of interrelated actors centred around project implementer Fondem. Fondem manages the private sector companies that built and operate the station, the financiers comprising as well as all the different levels of (local) government involved. Its alliance with the EU, a trusted PTF, stabilizes the relations with the political stakeholders involved. It also collaborates with the local NGO Kiomba that is tasked with ensuring the buy-in of the local population through the provision of complementary services in the form of trainings, awareness raising, sensitisation campaigns, and socioeconomic community studies.

4.4.3 Andovodoranto

The electrification project in the fishing village Andovodoranto is a proof of concept created by a joint venture between Electricité de Madagascar (EDM) and Sagem Communications (Sagemcom). EDM/Sagemcom equip telecom towers with solar panels, thereby simultaneously providing electricity and network coverage to remote communities. The project was financed by holding company Groupe Axian. The stakeholder map (Fig. 3) visualizes the intricate linkages between the private sector players that govern

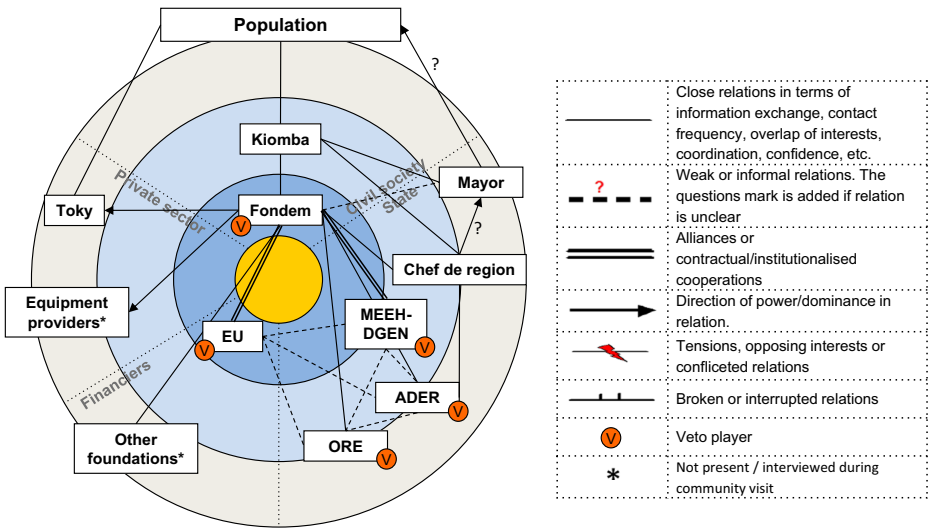


Fig. 2 Stakeholder map of Mahatalaky

the project. As the central key player, EDM/Sagemcom manage a tightly knit network of private sector actors. At best, national authorities play a peripheral role as their only task consists in approving the various project components. The stakeholder map visually demonstrates the disconnect between project owners and civil society stakeholders who are excluded from the project design. Yet, EDM/Sagemcom claimed that the mayor was the last instance to approve the commencement of the project in his community. Roughly half of Andovoranto was connected to the grid, which cannot extend beyond a 2-km radius around the telecom tower due to potential voltage drops and profitability issues. This has resulted in critical social infrastructure, such as the local health centre and school, being excluded from the scheme. Electrifying only those households fortunate

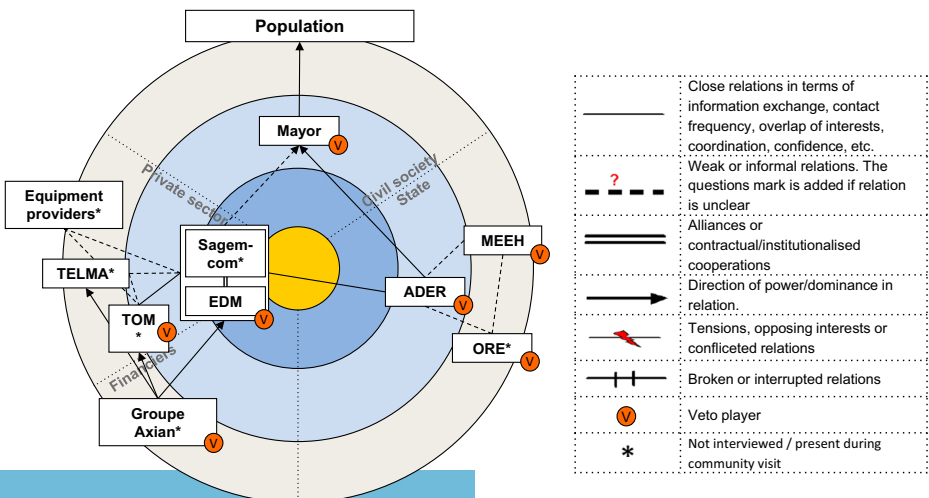


Fig. 3 Stakeholder map of Andovoranto

enough to be close to the telecom tower without consulting the remainder of the population risks increasing economic inequalities in Andovodoranto, thereby negatively affecting social cohesion. The villagers interviewed expressed their discontent about living in a community where not all members could enjoy the perks of having access to electricity.

4.4.4 Community visits compared

In summary, the community visits unveil the following dynamics: The visit to Mangamila illustrates the state of cash-stripped ADER, an agency unable to fulfil its own mandate due to the extreme budgetary pressures it is facing. Mangamila's plight stands as one example for national institutions' need for external support to successfully manage Madagascar's planned electrification. External support can come in two forms: grants, as it was the case in Mahatalaky or from private financiers like in Andovodoranto. Fondem's strategy in Mahatalaky is exemplary for many NGOs' subsidy-based development assistance: They work closely with local stakeholders to ensure a socially just design of rural electrification projects which often includes complementary services, such as educational campaigns, trainings, and impact studies. Single communities are accompanied for years: a resource-intensive and often lengthy process. The private financiers in Andovodoranto rather focused on scale planning to electrify over 100 communities through a single programme. Such an approach requires standardized procedures and a programme design that is driven by commercial considerations rather than the principle of equality of energy access: Critical social infrastructure and lower-income households might not benefit from an electrification like this.

5 Discussion

The following section highlights this paper's main findings. Firstly, this paper finds that climate finance has become a critical resource to implement energy transitions in development contexts. Secondly, as an external resource, climate finance is inextricably linked to power structures, which need to be critically investigated when conceiving financing strategies. Thirdly, this paper observes an increasing usage of private capital to finance RES projects, which often lack critical investments into social infrastructure commonplace in grant-based schemes. This creates—fourthly and lastly—new forms of social exclusion that should be avoided at all cost, as energy transitions in the developing world need to integrate the principle of energy justice in order to succeed.

5.1 Climate finance as a question of survival

The NPE defines the financing gap of USD 13 billion as the main roadblock standing in the way of a successful implementation. Yet, this research reveals that apart from the current lack of finance, there exist a whole set of interrelated, mutually reinforcing barriers to a successful electrification, such as low institutional capacity, lack of human capital and technical knowledge, corruption, and a dysfunctional utility. Climate finance therefore becomes more than merely a financing tool; it emerges as a critical lever to implement energy policy. Smith et al. (2005) find that '[i]n order to meet ones' goals and exercise agency, one is dependent upon other actors for resources (e.g. for finance, legitimate authority, and knowledge)' and conclude

that ‘resources become a source of strategic power’ (Smith et al. 2005). This justifies analysing Madagascar’s planned energy transition through the lens of resource access. Ramos-Mejía et al. (2017) argue that in informal institutional contexts, actors succumb to the ‘Faustian bargain’ (Wood 2003 in Ramos-Mejía et al. 2017) of deploying suitable survival strategies while continuously postponing decisions that ensure their long-term well-being. The national stakeholders MEEH, ADER, and JIRAMA find themselves in a state of permanent budgetary pressures, if not bankruptcy. In this context, access to resources equals institutional survival, and in turn, the search for climate finance becomes a question of survival, too.

5.2 Leapfrogging to a new electricity infrastructure

The Madagascan government exhibited a strong degree of dependency on external resources and expertise. A planned and deliberate transition brought about by external resources needs to be actively managed (Berkhout et al. 2004). Parag and Janda (2010) and Janda and Parag (2013) identify a category of middle agents in technological transitions that dispose of the necessary resources to act as enablers, aggregators, and mediators. Often, the ‘middle out’ is associated with a specific ‘system of professions’ (Abbott 1988). The PTF in Madagascar embody such a system of professions: They dispose of a clear, socially accepted professional code: the principles for international development formulated in the 2005 Paris Declaration on Aid Effectiveness and the 2008 Accra Agenda for Action (DAC 2008). In summary, these documents state that developing countries have the right to determine their own development policies which are to be implemented with existing fiduciary and procurement systems (‘ownership’). These are to be implemented via inclusive partnerships and need to have a measurable impact on the countries’ development.

Madagascar has experienced a coup d’état less than a decade ago and its political landscape has been characterized by political intrigues, scheming, and deadlocks ever since. Transparency International’s Corruption Perceptions Index ranks Madagascar 152 out of 180 countries (Transparency International 2018). Current institutions are personalized and contested (Ramos-Mejía et al. 2017), which led PTF like UNIDO, GIZ, KfW, and the EU to consequently re-design their energy programmes with the underlying objective to reduce their dependency on public utility JIRAMA. They systematically focused on rural electrification through RES to work parallel to JIRAMA’s centralized grid extension efforts.

In this context, ‘leapfrogging’, i.e. the electrification of Madagascar’s rural areas through RES, could be understood as external actors bypassing system structures established by the Madagascan state and at least partially undermining the principles of ownership and inclusive partnerships. Climate finance largely consists of foreign investment that sidesteps the local banking system to finance development, as the procurement and fiduciary systems used are often those set up by donors and investors. This article argues that in countries characterized by similar levels of informality, leapfrogging emerges as the obvious alternative for external intervention rather than a remote possibility. The message that this form of intervention sends to the affected countries, however, needs further investigation: Is the bypassing of dysfunctional structures rather than their incremental improvement in line with good practice in international development? Or might it be counterproductive to the mandates of development agencies? A closer look at the resources used to finance these developments might help answer this question.

5.3 The ultra-liberalization paradigm

In Madagascar, subsidies are still the predominant financing instrument for rural electrification projects, usually amounting to 55–75% of project costs. This research observes a shift from grant-based finance to financial instruments with clear return profiles in Madagascar, namely private capital. The increasingly global awareness that we are running out of time to prevent fatal climate change has necessitated the search for new actors to provide capital and achieve scale. In this process, the private sector has rapidly gained importance in the development sphere. This research has shown that private capital is associated with quicker project implementation timeframes due to different payback horizons and required economies of scale in order for projects to become commercially viable. Andovoranto was EDM/Sagemcom's trial run of an innovative business model that synergistically provides telecom and electricity infrastructure to remote communities with a potential for scale that is out of reach for NGO-led community projects: While Fondem electrified nine communities in 10 years, EDM aims to electrify 100 within three. With more than 18,000 officially registered communities in Madagascar (see Appendix 5), scalable solutions are essential for a timely transition. Yet, the comparison of Mahatalaky, completely financed by subsidies, with Andovoranto, completely financed by private capital, shows that Fondem's approach included certain complementary services necessary for the less educated parts of the population to understand the potential uses of electricity (Cook 2011). EDM/Sagemcom's privately financed electrification project in Andovoranto does not only exclude complementary services but also critical social infrastructure. This suggests that privately financed projects run the risk of not realizing crucial social and developmental benefits usually expected of rural electrification programmes.

In a nutshell, the financing strategies in Madagascar's energy sector increasingly make use of public finance in order to catalyse private investment. What Fondem called the 'ultra-liberalisation of the electricity sector' of the rural electrification sector stands in stark contrast to the notion of electricity as a public good, which study participants from the EU and the World Bank, for example, have emphasized as key to their mandates.

5.4 Trilemmata of exclusion

Privately financed development projects furthermore run the risk of creating *trilemmata of exclusion* for the economically poorest parts of the population in least-developed countries like Madagascar. First and foremost, LDCs are increasingly being marginalized in the global competition to obtain climate finance: Managers at the NGOs Fondem and Le GRET opined that market-based funding mechanisms make it harder for LDCs to create projects that are attractive to international and regional climate finance providers. The GCF, originally mandated to provide financing to those countries without the means to obtain it elsewhere, is increasingly employing a 'banker's logic', according to a GIZ representative, providing funding exclusively to the least risky projects that can offer secure and predictable returns. New funding mechanisms disbursing climate finance are often designed for large, emerging economies that can quickly achieve scale, according to an EU energy specialist. As emissions reductions are calculated against an estimated baseline, countries with low electricity consumption like Madagascar, that also has a relatively large portion of hydropower in their electricity mix, are disadvantaged from the beginning, as they do not have the chance to realize emissions savings at similar scales, according to the interviewee from UNIDO.

Secondly, these dynamics turn in-country actors with a clear social vision away from applying for funding, as confirmed by both Le GRET and Fondem. As private capital plays an increasingly important role in electrifying LDCs, a convincing business case becomes the centrepiece of a successful application for funding. In this case, firms need both a critical number of connections and minimum income levels to even consider launching an electrification project, which implies that only the richest and most populous areas will be electrified in the short to medium term. Interviewees have confirmed that current electrification efforts predominantly focus on the former Antsiranana province (now divided into the regions of Diana and Sava), the ‘Vanilla coast’, as disposable incomes in the North are significantly higher than in other parts of the country (see Appendix 6). This study finds that privatized electrification strategies run the risk of excluding up to 53% of Madagascar’s population, or 19 million rural Madagascans, from energy access.

Thirdly, the expected reduction in capital subsidies would mean that the economically poorest villages in the region, or at a micro-scale, even the economically poorer villagers in a village (see Andovodoranto case study) will stay excluded from the benefits of electrification, which might have disastrous consequences for social cohesion in a post-conflict society like Madagascar, which is still characterized by a deep political divide since the coup d’état in 2009 and frequent outbreaks of mob justice whenever this delicate truce is disturbed.

5.5 Limitations and implications

The representativeness of this study’s findings is limited by the restricted universal generalizability and subjectivity of findings obtained from qualitative interviews, the limited time in the field, the prevailing conditions in Madagascar that often required the researcher to be pragmatic and flexible during the data collection process, and the researcher’s own whiteness and resultant perceived association with those agencies providing development aid.

Yet, this research article does unveil novel dynamics that add to the academic discourse surrounding sustainability transitions in contexts of poverty. For further research, it is recommended to carry out more case studies investigating sustainability transitions in developing and poverty contexts, and to particularly focus on the role of external resources in countries where limited national budgets impede successful energy policy design and implementation. Researchers should strive to achieve more clarity about overall financing trends in ODA and climate finance flows. The potential correlation between financing strategies, project design, and impacts on the population on the ground should be further investigated in order to be able to mitigate potentially negative effects on social cohesion when financing development in the energy sector. Energy justice dimensions should not only be considered when directly researching energy issues but also when researching the financing used to fund energy projects.

The practical recommendations brought forward in this paper include the promotion of climate finance literacy, i.e. in-country trainings and awareness raising about the technicalities of the application procedures to climate funds and other climate finance providers to be organized by current climate finance providers. Furthermore, the researcher suggests developing integrated national electrification strategies that combine multiple electrification pathways, each linked to an explicit financing strategy that synergistically increases the effectiveness of the desired trajectories. Examples include ‘grid extension’ through concessional loans, ‘scalable innovation’ using private capital and risk guarantees, or grant-based ‘social mission’ programmes. The different pathways could be cross-subsidized in order to maintain a balance between those projects that generate revenues and those that do not.

6 Conclusion

This paper investigates the role of climate finance in accelerating Madagascar's prospective energy transition, and the potential impacts different financing strategies might have on the equality of energy access and energy justice. A mixed methods approach was employed combining qualitative research methods in the form of semi-structured interviews with climate finance providers and focus groups in rural communities with legal document analysis and a quantitative analysis of expected rural electrification project finance.

This paper finds that climate finance is a critical resource for countries with challenged national budgets like Madagascar to implement environmental legislation and energy policy. The fact that it is mainly mobilized by external agencies, however, necessitates the critical investigation of power structures, which this new form of development assistance is inextricably linked to, when evaluating financing strategies. This study finds that the choice of financial instrument directly influences the design of rural electrification projects on the ground and therefore potentially has significant impacts on energy justice: Grant-based electrification projects are more likely to entail a clear social vision, such as the provision of critical complementary services, which create more awareness of the developmental and practical benefits of electrification among the local population. The investigated project financed by private capital lacked this social dimension but impressed with innovation and scale instead. On an international level, climate finance providers increasingly replace grant-based support schemes with private capital. However, such an approach risks creating trilemmata of exclusion for the economically poorest parts of rural populations from future electrification efforts. This study finds that up to 53% of rural Madagascans, or 19 million people, might be excluded from electrification efforts by 2030, if only privately financed projects were to be implemented. A potential solution could be to devise a set of specific electrification strategies for different beneficiary groups that incorporate the advantages of the financial instruments employed, such as a 'scalable innovation' pathway using private capital, or grant-based 'social mission' programmes.

This paper recommends investigating more energy transitions in the developing world in order to demonstrate the different experiences developing countries might have compared to hegemonic transition narratives. This paper finds that the values built into an energy system can be derived from the way it is financed. Hence, researchers are urged to analyse climate finance flows in the energy sector from a less technical and more holistic perspective in order to ensure that future energy transitions do not leave anybody without power.

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