

Access to Electricity for Rural Population in Madagascar: a Literature Review

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ABSTRACT

The rate of access to electricity in Madagascar in rural areas remains very low. In May 2014 [09], only 6,2% of Malagasy rural population had access to electricity. However the access to energy, especially electricity, is commonly considered as a prerequisite to economic and social development as all production activities require an energy input. The aim of this paper is to inventory and synthesize the barriers to the access to electricity in rural areas of Madagascar. To this end, a literature review on rural electricity and rural electrification projects has been carried out to identify the relevant problems and to cluster them. Mainly, online documents including report papers, conference papers and documents related to rural life have been referred to.

Keywords: Electricity access, Rural Electrification, Rural locality

1. INTRODUCTION

The Act N ° 98-032 reforming the electricity sector in Madagascar aims, on the one hand, to give an opportunity to new operators to operate in the electricity sector and, on the other hand, to assist the Malagasy government in financing the electric infrastructure of the country, to promote the effectiveness and the quality of the service offered to the users by competition. Thus private operators can intervene in the production, transport and distribution of electric power after obtaining an authorization and/or concession. This structure will also make other organizations and development partners to support the development of the electricity sector in the country.

Hence, electricity sector activities are broadened to include several actors. However, the rate of access to electricity in Madagascar, especially in rural areas, remains very low. In May 2014 [09], only 6,2% of Malagasy rural population had access to electricity. Yet the access to energy, especially electricity, is commonly considered as a prerequisite to economic and social development as all production activities require an energy input. The objective of this paper is to inventory and synthesize the barriers to the access to electricity for rural population in Madagascar.

2. METHODS

The following figure shows the method used

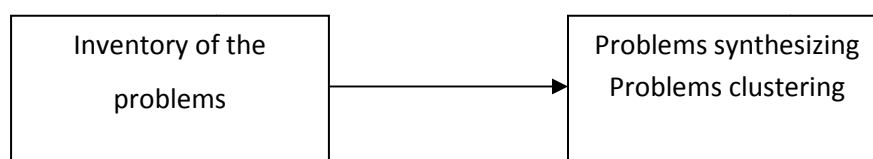


Figure N°1: Literature review process

Inventories of the problems were carried out. Then, they were synthesized and clustered in order to detect and show the root cause for each of them. Mainly, online documents including report papers, conference papers and documents related to rural life were referred to. But considering that the context is common in a developing country, especially in sub-Saharan Africa, the source of the documents has been broadened to the

international level, which is more relevant in this context.

3. FINDINGS

Some of the problems related to the low rate of access to electricity in rural areas are the result of past situations; some of them have not yet been resolved or still have effect now. Other ones are current problems, but the clustering is based on root causes and consequences. Figure 2 shows the main problem tree.

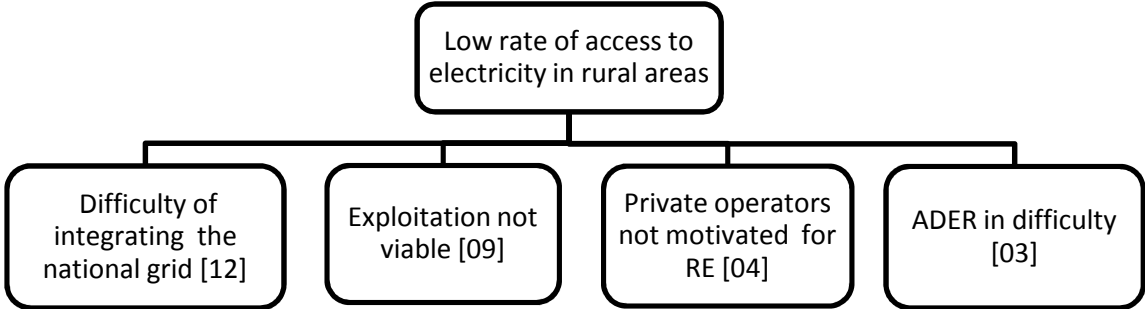


Figure 2: Problem tree

3.1. Difficulty of integrating to the national grid

Cost of the extension of the national grid relatively high

To ensure the electrification of a rural area, the first and common method consists of extending the national grid. In fact, in certain cases, the extension of the grid can prove to be the least expensive option.

However, when localities are very far from the national grid, the high cost associated with the expansion of the Medium Voltage transmission lines makes many of these projects impracticable [12]. As an illustration, a comparative study undertaken jointly by the International Energy Agency (IEA) and the club of African national agencies and structures in

charge of rural electrification (CLUB-ER) in July 2013 [14], has shown that when the distance between the locality to be electrified and the available Medium Voltage transmission lines is more than ten kilometers, the initial investment is relatively high compared to other methods and technologies.

JIRAMA deficiency

On the other hand, the JIRAMA (JIro sy RAno Malagasy), the national electricity company has been in a difficult situation for a long time now [01][09]. The situation of the JIRAMA has worsened more since 2009. During the crisis, the Government forced the JIRAMA to reduce its tariffs to safeguard the purchasing power of the population, and the competitiveness of the Malagasy private companies.

Mid-2014 JIRAMA fell into a situation of financial difficulty. Its equity became negative MGA 500 billion, the deficit for 2013 reached MGA 240 billion, the suppliers debts were more than MGA 300 billion [09].

This situation is partly due to the high resort to diesel for electricity production (about 67% of the installed power) to satisfy the growing demand. In fact, the JIRAMA and economic operators cooperated for the fast installation of these diesel solutions to face the urgency. Although the investments necessary to maintain and improve the performances of the distribution lines were not carried out, the requests for new customer connections were satisfied, which contributed to worsen the deficit of the JIRAMA.

Takings were not collected in time. Especially, the public administration invoices remained unpaid for too long. The frauds on the energy meters and illicit connections have also increased the deficit.

The tariffs applied by the JIRAMA are largely lower than the ceiling price. In addition to the problem of the inadequacy of the tariff calculation methods with the real conditions of JIRAMA activities, a periodic revision has not been applied. The real cost of average kWh is MGA 633 but the average selling tariff applied is MGA 382 [09].

In this context, JIRAMA is not able to deploy its infrastructures alone, especially to connect more rural areas to its grid. Even though, within the rural electrification projects carried out by the national agencies in charge of rural electrification (Agence de Developpement de l'Electrification Rurale, ADER) between 2005 and 2014 [09], the electrification of 31,25% of the villages (60 in 192) was performed by the extension of the JIRAMA grid. On the other

hand however, it increased the diesel production and consequently amplified the difficulty of the JIRAMA.

For the re-establishment of JIRAMA, the Project to Improve Governance and Operations in the Electricity Sector (PAGOSE) started in 2016.

3.2. Exploitation not viable [09]

The uncertainty regarding the viability of the exploitation is also a cause of the low rate of access to electricity according to two points of view: the return to the dark of the electrified localities and the amplification of dissuasion for new investments.

The achievements of the ADER since its beginning in 2005 are around 190 electrified villages (May 2014) [09]. The development of the equipment and the increase in the rate of access are remarkable, but the situation of the exploitation is bad, because 40% of the plants are stopped for various reasons, mainly related to breakdowns of the technical infrastructures and bankruptcy of operators.

Infrastructure failure

The lack of funds and the high investment risk of Rural Electrification (RE) lead investors to decrease their investment and therefore affect the quality of the project, especially the technical infrastructures and the project sustainability [01].

Bankruptcy of the operators

Mainly, the installation whose production is based on diesel easily falls into difficulty. Indeed, following the rise of oil prices, the production cost becomes relatively high and consequently the exploitation is stopped. Although Madagascar has many potential Renewable Energy (REn) sources [22], the

resort to diesel for electricity production is commonly due to the following reasons:

- Renewable technologies, adapted to the rural area populations, are very expensive [03].

- Knowledge and competencies of the local actors on energy in rural areas and RE are limited to the theoretical aspects [5]

- It takes a lot of time to deploy RE [07]

- The technology for the production, the assembly of components and the maintenance involved in the installation of RE technologies are locally nonexistent [03]

- The energy produced by RE is intermittent. For example, wind turbine performances depend on the wind speed [11]

Besides, the theft of material (cables, solar panels, turbines), the insolvency of the users, such as the public administration, also induce the bankruptcy of the operators [09].

3.3. Private operators not motivated in RE [04]

The Act N ° 98-032 reforming electricity sector in Madagascar aims, on the one hand, to give an opportunity to new operators to operate in the electricity sector and, on the other hand, to assist the Malagasy government in financing the electric infrastructure of the country, to promote the effectiveness and the quality of the service offered to the users by competition. Thus private operators can operate in the production, transport and distribution of electric power after obtaining an authorization and/or concession depending the power of system and the production technology used. Currently, there are several active operators. However, their motivation on RE is not relevant. This lack of motivation is due to two important reasons: (I) the non-profitability of the investments in

rural zones [04][06], and (II) the lack of funding for the new RE projects [01].

3.3.1. RE investments in rural areas not profitable

The financial logic of the operators leads them to invest mainly in the localities where the return on investment is sure, fast and significant. However, the situation in the localities not yet electrified does not correspond to those criteria. Indeed, it is generally noticed that the investments carried out in the localities not yet electrified are not and cannot be profitable.

The cost of the deployment is relatively high [02]

The solutions, such as grid extension and decentralized system to bring electricity to rural localities involve more investments [02]. The costs are generally raised due to the following facts:

- Difficulty of access to the localities for a certain period or even for a whole year because of a very limited road infrastructure which creates logistic problems for the implementation of RE projects. Possibly, the existence of natural obstacles (protected forests, surfaces, mountains, lakes, rivers, etc.) also complicates the layout of the power lines. That increases the project cost during the installation phases as well as during the operation [01][02].

- Certain regulations are very strict. Moreover, they are generally a copy of those of the industrialized countries (mainly European countries) even if the natural, economic or sociological environments are basically different [16]. To lower the capital cost and possibly the cost of exploitation, the adoption of new technical standards less constraining and better adapted to the rural context should be considered (for example lower height of

posts, quality and availability of service, etc.) [16].

- Dispersed localities and low density of the population [04][08] : Although the definition of the rural zone is necessarily fuzzy in the RE context, dispersions of the villages as well as a low density of population inside these villages are common for any rural zone . There is also a heterogeneous space configuration: in one side, some zones have more concentration of population as well as economic and administrative activities (public services, decentralized community, etc.), in contrast, there are agricultural zones with a low number of inhabitants. The dispersion of the villages involves an important requirement for installing Medium Voltage line for electricity transport and also requires numerous transformers.

Typically, the case of France [04] : “it is necessary for rural case and for the same number of inhabitants connected to use 18 times more surface, to build 7 times more lines and 4 times more transformers and to install 2 times more power” than the case of urban customers (Rene Massé, 2004).

Electricity, a public utility

The access to electricity is commonly considered as public utility. Consequently, the selling prices of electricity take account of this aspect, thus the profitability of the investments, calculated on the basis of these selling prices, would be also to reconcile with the concept of public utility.

Although the electricity sector is liberalized, historical events still have effects and traces. Especially, the Act 75-024 of October 17, 1975 granted the JIRAMA company a quasi-monopoly on the public electricity and water utilities, and also ordered the detention of the

services of Electricity by the Government which wanted to maintain socio-politic national balances in the whole country [04]. For instance [09], during the crisis of 2009, the Government forced the JIRAMA to reduce the tariffs to safeguard the purchasing power of the population, and the competitiveness of the companies.

Although provisions are in the course of setting-up, the concept of electricity being a public utility makes the RE projects not profitable.

Low electricity consumption [02]

The energy needs of rural localities are relatively low, except in the case of particular production requests (agricultural processing industries, sawmills, irrigation mills, decorticators, oil presses, etc.) or community activities (water pumping). The use of electricity is mainly for lighting.

Moreover, inside of the villages already electrified, the rate of connection is also low. The assumptions are that the households have a bad perception of the benefits of electricity and lack knowledge of the uses of electricity. Those can rise from a lack of demonstration of the use of electricity [02].

Rural household incomes are low, instable and seasonal [01]

Most rural inhabitants are farmers. They are vulnerable to shocks. An external shock like a bad crop, a cyclone, or an increase in energy prices, can suddenly reduce the revenue expected. Generally their annual revenue is concentrated in one period which occurs after the crop has been harvested. Rice is the main agricultural product produced in the country and generally farmers get one crop of rice a year after the rainy season.

This situation in rural areas makes the practice of an electricity price slightly higher than the one in urban localities impossible [02].

In addition, in Madagascar, the price of electricity is high compared to other energy sources for applications outside lighting. For example cooking a meal with electricity is 5 to 10 times more expensive than cooking with coal [07].

3.3.2. Lack of funding

Government scarce resources more allocated to urban localities

The scarce resources of the government are assigned to the urban zones. This urban tendency is a paradox commonly met in the developing countries whose economy depends mainly on the agricultural sector and thus on the rural areas [01].

Lack of commitment in favor of RE is one of the causes [02], as well as the JIRAMA recovery which ensures urban electricity. And finally, the political interest to target several people at low-cost is also one cause [01].

Subsidy

Only the subsidies allow the creation of the conditions of profitability in a commercial deal on rural electrification [04]. Indeed, historically, all programs of rural electrification were subsidized, including for countries that are now industrialized.

It is difficult to attract funds for electrification in rural areas. Even if JIRAMA has the experience to develop electricity supply in rural areas, this company is not able to handle it. Therefore, the RE will be developed out of the grid and will depend on the rural electrification financing mechanism. The rural electrification financing mechanism is based on FNE (Fond National de l'Electricité).

The FNE resulted from article 3 of the Act N ° 98-032 and was created by the Act N° 2002-001 of October 7, 2002. It is managed by the ADER and is intended to finance the programs of RE development. However, it still lacks methods of management which would be to fix by a decree thus compromises its credibility with international partners.

The FNE gets 1,25% of the sales with the consumers of more than 20 kWh/month by the JIRAMA. The government budget also contributes to the FNE. With the exception of these internal financings, the ADER is supported by international partners.

This proposed subsidy is needed to develop rural electrification. However, the FNE is not sufficient to finance all the projects and the 70% subsidy ceiling is not sufficient for most private operators involved in rural electrification. The FNE needs to be increased but JIRAMA is the primary funding opportunity for both governments and international agencies. This leads to a competition for funding with the FNE.

Bank loans not favorable [01]

Most private operators involved in rural electrification do not have the independent resources to finance the 30% left. Therefore, they need access to bank loans. But the interest rate attached to bank loans is quite high (between 15% to 25%) and is given for a short period (around 5 years on average but could be extended). Indeed, commercial banks do not have a lot of knowledge on rural electrification and thus increase the interest rates and decrease the period of the loans in order to reduce risks. Thus, these constraints lead to a decrease in the benefits and increase the risk supported by the operators in the long run.

3.4. ADER was in difficulty [9][03]

The Agence de Développement de l'Électrification Rurale (ADER) was created in 2002 by the decree n°2002-1550 and was operational in 2004. ADER is placed under the technical supervision of the Minister in charge of the Energy, under the budgetary supervision of the Minister in charge of the Budget and under the countable supervision of the Minister in charge of the public accounts. The ADER is the public national agency in charge of the rural electrification development. According to the decree n°2002-1550, the ADER aims to:

- promote the access to the services of the electricity and to support and back rural development initiatives and basic social services.

- promote and support the private sector to develop viable exploitation, under the concession and/or authorization regime, to serve the populations outside of the inter-connected grid and power production central, by technical support and financing of the investments and management of the customers.

The projects of rural electrification carried out by the ADER result either from a spontaneous application of a private operator or the decentralized community or from a call for tenders initiated by ADER. However, in the performance of its activities, the ADER was in difficulty concerning the insufficiency of resources especially human resources, funds and material resources, and regarding organizational instabilities as well as cumbersome administrative and legal procedures [9].

4. CONCLUSION

Through this literature review, we can infer that the cause of low rural electricity access is

firstly due to the difficulty of integration to the national grid, then the unviability of the exploitation. The low interest of private operators is also a main cause and finally the difficulty encountered by the public entity ADER in charge of rural electrification. In short, to increase the rate of access to electricity for rural populations, relevant solutions to those problems and their specific root cause should be carried out.

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