



Electricity generation from renewables in Madagascar: Opportunities and projections



Jean Philippe Praene^{a,*}, Mamy Harimisa Radanielina^b, Vanessa Rolande Rakotoson^a, Ando Ludovic Andriamamonjy^c, Frantz Sinama^a, Dominique Morau^a, Hery Tiana Rakotondramiarana^b

^a Laboratory of Physics and Mathematical Engineering for the Study of Energy, Environment and Building, 117 rue du General Ailleret, P.O. Box 97430 Le Tampon, Reunion, France

^b Institute for the Management of Energy (IME), University of Antananarivo, P.O. Box 566, Antananarivo 101, Madagascar

^c Department of Civil Engineering, Building Physics Section, KU Leuven, Kasteelpark Arenberg 40, P.O. Box 02447, BE-3001 Heverlee, Belgium

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ABSTRACT

Climate change is the greatest challenge of our time for development. Adaptation to this change combined with the reduction of greenhouse gas emissions can help to boost the economic transformation which stimulates growth, fills the energy gap and reduces poverty. This paper focuses on the potential of renewable energy sources (RES) for electricity generation in Madagascar which is a lower-income country. A large accessibility to electricity could be a driving force for the economic development of this fourth worldwide Island. The Electricity mix is currently heavily dependent to fossil fuel imports. Indeed, most of the electric demands are fulfilled by diesel power plants. An overview of the power situation and renewable energy potential of Madagascar is first presented, then different scenarios for the evolution its electricity mix are proposed.

1. Introduction

In the last two decades, the climate change mitigation has been more and more considered by national energy policy. Many papers discuss the form of energy production and its evolution, [1–3]. Most of papers highlighted the deployment of renewable energy systems for electricity in order to limit the dependence to fossil fuels, [4–8]. While the world energy needs grew by around 45% during the last decade [9], the availability of electricity, qualified as a noble energy, is critical for economic development especially for developing countries in sub-Saharan Africa countries such as Madagascar. However, energy consumption per inhabitant remains one of the lowest in the world, around 0.315 toe/year in this area [10], as the world average is around 1.6 toe/year. During the last two years Madagascar is ranked as the 188-th over 189 economies in terms of getting electricity, [11].

In 1999, the Malagasy government introduced a reform of the energy sector, including power, adopting Act No. 98-032 of January 20, 1999 [12], supported by the Decrees No. 2001-803 of September 19,

2001 and No. 2001-849 of September 26, 2001, which respectively establish the organization of the operation of the ORE¹ agency and the conditions power pricing in Madagascar.

Later, Act No. 2002-001 of October 7, 2002 [13], established the creation of the FNE,² followed by the ADER³ by Decree No. 2002-1550 of December 3, 2002. These reforms aim at restructuring the energy sector by developing new operational ways and by turning to other alternative energies, namely renewable energy sources (RES).

According to the energy inventory drawn up by the MEM⁴ [14] and the study report of the CREAM⁵ [15], wood energy has the highest share (92%) in the total energy supply in Madagascar, followed by fossil fuel (7%). Only less than 1% of this demand is supplied by other renewable energy sources. This high share of wood energy is explained by its accessibility and its low cost for the population. Madagascar has a low rate electricity access due to its high price and the insufficient quantity production. The national rate of electrification is only 4.7% only. In urban zones, such as Antananarivo, this value could reach up. In view of the geographic and climatic conditions in Madagascar, the

* Corresponding author.

E-mail addresses: praene@univ-reunion.fr (J.P. Praene).

¹ << Office de Régulation de l'Électricité >> or Office of Power Regulation.

² << Fonds National pour l'Électricité >> or National Fund for the Electricity.

³ << Agence de Développement de l'Électrification Rurale >> or Agency for the Development of Rural Electrification.

⁴ << Ministère de l'Énergie et des Mines >> or Ministry of Energy of Madagascar.

⁵ << Center de Recherche, d'Études et d'Appui à l'Analyse Économique à Madagascar >> or Research Center for study, support and economic analysis in Madagascar.

Nomenclature	
ORE	<< Office de Régulation de l'Electricité>> or Office of Power Regulation
FNE	<< Fonds National pour l'Electricité>> or National Fund for the Electricity
ADER	"Agence de Développement de l'Electrification Rurale" or Agency for the Development of Rural Electrification
RES	Renewable Energy Source
RETs	Renewable Energy Technologies
JIRAMA	"Jiro sy Rano Malagasy" or electricity and water provider company
OMAPI	<< Office MALgache de la Propriété Industrielle >> or malagasy office for industrial property rights
USAID	United States Agency for International Development
CIS	Construction, Implementation and Service
SHPs	Small Hydropower Plants
OTEC	Ocean Thermal Energy Conversion
GHG	greenhouse gaz
INSTAT	<< Institut National de la STATistique >> or National Institute of Statistics
GDP	Gross Domestic Product

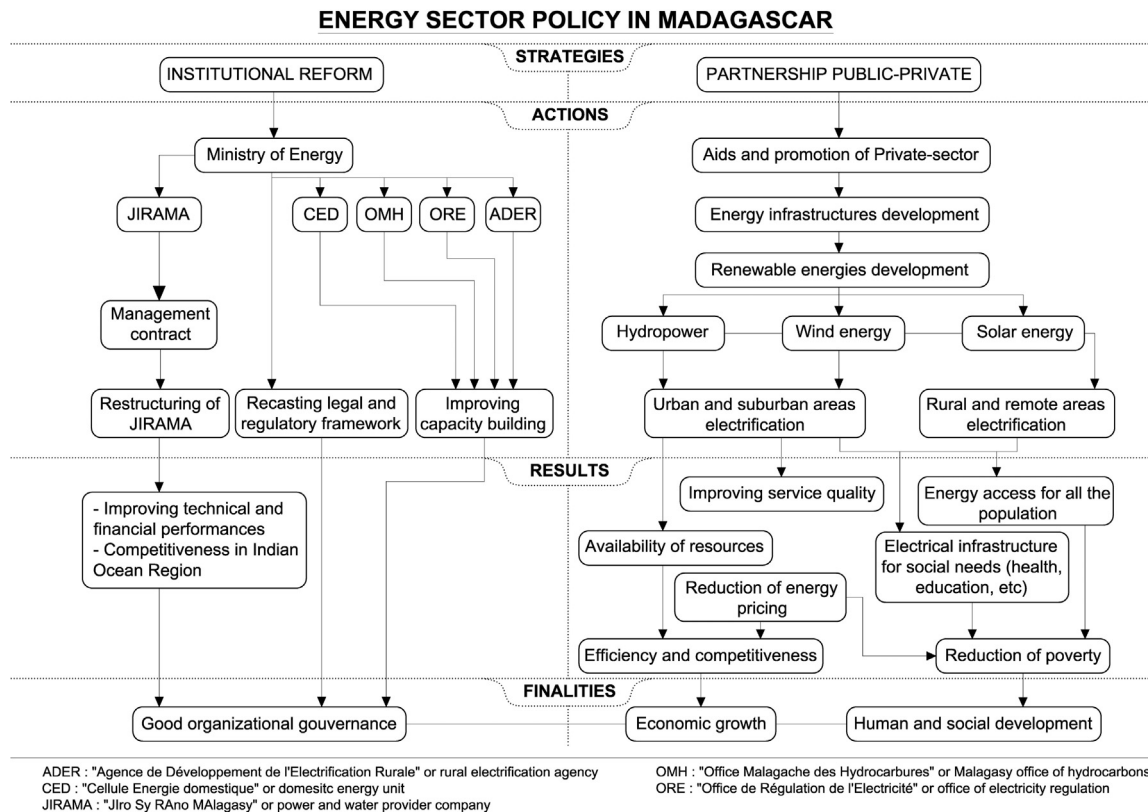


Fig. 1. Flowchart of the energy sector policy in Madagascar.

reality of development of renewable energy technologies (RETs) is complicated despite numerous research works carried out in this area.

Therefore, this paper aims at reviewing potential of RES in Madagascar and its perspective. The barriers of RES development are highlighted to evaluate the energy situation and to conceive challenges for the future. This analysis has been investigated through the first definition proposed by [16–18]. The discussion on the barriers in Madagascar will highlight the difficulty to turn from words to deeds.

2. Energy policy

2.1. Political strategies of energy sector development

With regard to the strategic orientation of the energy sector policy in Madagascar, several actions in relation with expected results have been considered to reach the finalities of good governance and economic and social development. Fig. 1 shows the energy sector policy organization in Madagascar.

As shown in Fig. 1, the energy sector policy is divided in two main strategies, namely: the institutional reform and public-private partner-

ship. On the one hand, the institutional reform highlights the restructuring of JIRAMA⁶ Company, the recasting legal and regulatory framework and the capacity building of the organizations attached to the Ministry of Energy. On the other hand, the related actions of public-private partnership involve the RES development such as hydropower, solar energy and wind energy for the global electrification both in rural and urban areas.

Thus, the expected results of the energy sector policy tend to improve technical and financial performances for inciting competitiveness especially in Indian Ocean region. These results should be reflected in the service quality mainly in urban areas which mostly suffer from electrical load shedding during peak demand periods. For rural and remote areas, the main result is the energy access for social needs especially health and education. These outcomes tend to substantially reduce poverty and contribute to the development of Madagascar.

⁶ << Jiro sy Rano Malagasy >> or electricity and water provider company.

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