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ScienceDirect

Energy Procedia 138 (2017) 592–597

Energy

Procedia

www.elsevier.com/locate/procedia

2017 International Conference on Alternative Energy in Developing Countries and Emerging Economies
2017 AEDCEE, 25-26 May 2017, Bangkok, Thailand

Climate Change observations into Hydropower in Mozambique

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Abstract

Hydropower is a renewable energy that expected to be affected by persistent climate change in Mozambique. Variability of climate e.g. temperature and precipitation will contributors to future shortage of energy from renewable energy production especially for hydropower and biomass. This research reviews the impacts of climate change on the productions of hydropower in Mozambique. Furthermore, a statistical methods using regressions analysis was used to evaluate the future climate scenario. The result showed that the average temperature in first 10 years was 25.4°C and last 10 years was 26.3°C; this means that the gradient of temperature was 0.88°C. The temperature was increasing significant especial the between October-March in rainy season and coincident is summer season. Also the result showed that climate change will cause increased variability of precipitation and create drought which is pre-conditions problems for decreasing hydroelectric generation in Mozambique. With frequency drought, flood combining with trend of precipitations, Mozambique is one of the most vulnerable countries of climate change. It was concluded that Mozambique hydropower productions will have to face challenging future.

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Peer-review under responsibility of the scientific committee of the 2017 International Conference on Alternative Energy in Developing Countries and Emerging Economies.

Keywords: Climate change; hydropower; renewable energy; Mozambique

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1. Introduction

Mozambique is located along of the coast of the Indian Ocean. The country suffers from poverty and weak infrastructure. For these reasons, Mozambique is considered one of the most vulnerable countries in terms of climate change. Richard and Randall appoint that temperature and evapotranspiration be projected to increase along the Zambezi valley and in contrast way rainfall projected to decrease. The impact of this whether phenomenon will vary depending on specific region and province inside of the country. UNDP and World Bank climate change studies suggest that droughts and flood hazards will increase over more than half of the globe, in particular in tropical Africa area, where Mozambique is located [1-3].

The climate conditions may decrease perspective of advantage of hydropower project and development of the country. The future climate projections show that average temperature rise up to 4.6 °C between 2010-2090 [2-3]; therefore evaporations will increase in big reservoir such Cahora Bassa, Umbeluzi Massingir reservoir which will decline water level consequently. Such decline will affect the energy production and future planning for expansion which reflects on the energy invoice in the country [1-5].

According to Gilberto and Peter the electrification rate and new connections of electricity has increased in recent years up to 15%. Still, the demand is high and increasing e.g. (population and growing of industries) in the country and the government will need to find solution and one option is establish new hydropower projects. INE predict that population will increase up to 46 Million at 2040 (figure 1).

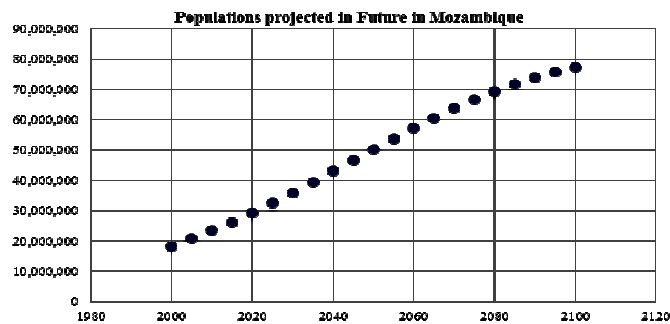


Fig. 1. Projections of populations in Mozambique

1.1. Historic climate profile in Mozambique

The climate in Mozambique is semi-arid, subtropical in the south, and tropical in the north. Usually affected by seasonal air circulation of the Indian Ocean, characterized by one rainy and one dry season during full year. Southern generally is drier place than the north and has most strongly variability in temperature and precipitation, the rainfall start from October to March. The annual average precipitation is 1032 mm. Rainfall varies between 1400 mm/year near the Zambezi basing to 300 mm/year in the lowlands of the southern interior, the mountainous areas can be 2000 mm of precipitations.

The variability of climate in Mozambique already affecting negatively in energy sector especial in Hydropower. studies shown evidence that temperatures have increased by 0.6°C from 1960 to 2006 and 0.13°C per decade and precipitation decreased at 2.5 mm per decade. In this period rain seasons start so later, and dry period take longer time. Since 1950, the extreme weather events happening, including drought, heavy flooding events and cyclones, has increased[2, 4].

The climate change scenario in Southern African projected using GCMs models in IPCC report show the temperature will increasing between 1 to 2.8°C until 2060s and 1.4 to 4.6°C in 2090s while the precipitations decreasing [1-2].

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