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Significance of direct and indirect impacts of climate change on groundwater resources in the Olifants River basin: A review

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Abstract

This paper considers the extent and usefulness of reviewing existing literature on the significance of direct and indirect impacts of climate change on groundwater resources with emphasis on examples from the Olifants River basin. Here, the existing literature were extensively reviewed, with discussions centered mainly on the impacts of climate change on groundwater resources and challenges in modelling climate change impacts on groundwater resources. Since in the hydrological cycle, the hydrological components such as evaporation, temperature, precipitation, and groundwater, are the major drivers of the present and future climate, a detailed discussion is done on the impact of climate change on these hydrological components to determine to what extent the hydrological cycle has already been affected as a result of climate change. The uncertainties, constraints and limitations in climate change research have also been reviewed. In addition to the research gaps discussed here, the emphasis on the need of extensive climate change research on the continent, especially as climate change impacts on groundwater, is discussed. Overall, the importance of conducting further research in climate change, understanding the significance of the impact of climate change on water resources such as groundwater, and taking actions to effectively meet the adaptation needs of the people, emerge as an important theme in this review.

Keywords

Climate change, Olifants River basin, water resources, groundwater recharge, aquifer, hydrological modelling, climate modelling.

1.0 Introduction

The significance of the potential impact of climate change on water resources, as viewed by many scientists, is obvious (IPCC, 2014). Yet, lack of adaptation measures, (Schilling, et al., 2012), clearly shows that climate change impacts problems are not of immediate importance and therefore do not capture a lot of attention from policy makers in Africa. Neither are these issues featuring highly on priority lists of most African Governments. Quite often, most of these policy makers are busy with more pressing issues which are either of immediate needs to their people or themselves. Such issues may include but not limited to: poverty alleviation, service delivery, political survival, and many others. Generally, in Africa, there seems to be a complete overlook or lack of understanding of the impact of climate change on the continent's resources such as water resources (Madzwamuse, 2010), (Have, 2008). Yet, the report by

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