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Low-income housing residents' challenges with their government install solar water heaters: A case of South Africa

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Abstract

This paper investigate the challenges faced by the occupants' of low-income housing with their government installed solar water heaters in South Africa, Tshwane Metropolitan Municipality. The paper primarily investigates the challenges faced by the housing occupants since the solar heaters were installed in their low income houses. The data used in this paper were derived from both primary and secondary sources. The primary data was obtained through the survey method, while the secondary data was derived from the review of literature. The primary data for the study was collected through a structured questionnaire survey distributed to a sample of low-income households in a metropolitan municipality in South Africa. The household survey revealed that the low-income housing residents' occupants' faces challenges with regards to the leakage of the solar heaters and the noise from the heaters whenever the hot water taps are opened. The study gives an insightful view of the importance of using solar water heaters in energy conservation and lessening electricity financial constraints on the low-income households. The study adds to the knowledge on low income housing solar water heating in South Africa, with specific emphasis on the challenges faced by the occupants'. Further, findings from the study could be used for the development of sustainable structures in order to give access to energy and hot water to the poor and providing a better path to the improvement of life and empowerment through alternative energy usage in low-income households' in South Africa.

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Keywors: Housing occupants; Low-income housing; Solar Water Heaters; South Africa

1. Introduction

The earth has witnessed an exceptional growth in the human population and in the size of the global economy, with the population quadrupling to 7 billion and global economic output, expressed as gross domestic product (GDP), increasing about 20-fold [1] in the past 100 years. This significance change has

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been accompanied by fundamental changes in the scale, intensity and character of society's relationship with the natural world [2]. This fundamental changes in scale and intensity has come with a negative consequence which can only be rectified by the collective sustainable responsibilities of the estimated 7 billion people. For instance, around the world, cities account for two thirds of global energy demand, 60% of water consumption, and 70% of greenhouse gas emissions (GHG), which is a result of the increased demand for energy [3]. There is considerable scientific evidence that the increase in atmospheric concentrations of GHGs due to human-induced (antropogenic) GHG emissions is having a noticeable effect on climate leading to global warming. The only solution to global warming as recommended by numerous scholars and researchers is the adaptation of innovative sustainable technologies which will help cities meet the growing demands. Prime amongst this technologies is the adaptation of renewable solar water heating systems. Renewable Energy Technologies (RETs) offer a potential solution to the challenge of meeting our energy demand while simultaneously limiting the impact energy consumption has on the environment [4] [5].

Moving to renewable energy resources is necessary not only to fight climate change, but also to find a solution to ever-dwindling and increasingly expensive fossil fuels. Estimates suggest that in the year 2020, more than 50 percent of worldwide investments in the power plant market will be for the expansion of renewable energy resources like water, sun, and wind energy. Hence, in support of the infrastructure drive in renewable power generation projects on the African continent, Siemens International has established its Wind Power Center of Competence for Africa and the Middle East in South Africa. Whilst South Africa has very good solar and wind resources the total adaptation of renewable energy technologies has been slow to take off [6]. Edkins et al. [6] informed that more than 90% of South Africa's electricity is generated from the burning of coal. Currently, the South African state-owned electricity generation utility (Eskom), has 27 operational stations in South Africa that make up 40.7 GW of the country's capacity. Additional capacity is from imports and Independent Power Producers (IPPs), resulting in a total capacity of about 43.5 GW, which aims to supply the forecasted peak demand of 36 GW (over 220 TWh). The South African government drive towards the adaptation of Solar Water Heating (SWH) is driven by high expectations for the impact of solar water heating technology to address the country's electricity challenge, mitigate greenhouse gas emissions (which is not a priority), create employment and alleviate poverty [7] [8], which are the major emphasis.

Solar Water Heaters (SWHs) is a RET that uses thermal energy from the sun for the purposes of heating a property's hot water supply. SWHs can function in both residential and commercial applications, but are most cost-effective in properties that use larger amounts of hot water. SWH use solar radiation for heating water. The provision of hot water using SWH technologies in South Africa has the benefit of providing quality local government infrastructure services, saving low-income households money over the long term and mitigating GHG emissions associated with fossil fuel usage amongst others. Therefore, the aim of the present study is to investigate the challenges faced by the occupants' of low-income housing with their government installed solar water heaters in the Tshwane Metropolitan Municipality of South Africa. The paper primarily investigates the challenges faced by the housing occupants since the solar heaters were installed in their low income houses. The study gives an insightful view of the importance of using solar water heaters in energy conservation and lessening electricity financial constraints on the low-income households. The study adds to the knowledge on low income housing occupants in South Africa, with specific emphasis on the usage of solar water heaters and the challenges encountered by the housing occupants. Further, findings from the study could be used for the development of sustainable structures in order to give access to energy and hot water to the poor and providing a better path to the improvement of life and empowerment through alternative energy usage in low-income households' in South Africa.