

Quality assessment and primary uses of harvested rainwater in Kleinmond, South Africa

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ABSTRACT

With an insightful policy, rainwater harvesting (RWH) can be promoted as a core adaptation strategy for achieving global water security, reaching the Millennium Development Goals (MDGs) and sustaining water resources. The microbial and chemical quality of RWH samples collected from tanks in a sustainable housing development in Kleinmond, South Africa, were monitored. Results indicated that the tank water quality was within all the chemical standards (cations and anions) analysed for potable water. However, the counts of the indicator organisms, for example, total coliforms and *Escherichia coli*, exceeded the guidelines stipulated by the Department of Water Affairs and Forestry (1996). The microbial analysis results thus indicate that the tank water was not fit for potable use without treatment. A social research project was then conducted to describe, amongst others, the condition of the tank and the users' knowledge of the RWH system. In addition, demographic data, viz., gender, household size and employment status, etc., were gathered in order to provide a socio-economic background description of the study population. Data were gathered by means of face-to-face interviews with 68 respondents. Generally, RWH was used for washing clothes and for cleaning inside and outside the houses. This study noted that without acceptance and necessary training to maintain and use the tank optimally, it is possible that social development projects, such as the one in Kleinmond, will not be sustainable.

Keywords: domestic rainwater harvesting; microbial and chemical quality; social perception; acceptance

INTRODUCTION

The Department of Water Affairs (DWA) aims to provide all South African citizens with access to basic water and sanitation services by 2014. The provision of potable water to rural communities has been recommended as a priority by the Department for achieving this goal. Rainwater harvesting (RWH) has been earmarked as a short-term intervention to provide water, especially to dispersed settlement areas (DWA, 2009), and in the 2011/12 financial year the DWA installed 8 068 RWH tanks in 8 provinces. Of these tanks, 6 308 were installed to provide access to a water supply and 1 760 tanks were installed for food production (DWA, 2012). However, possible health risks associated with the consumption of harvested rainwater remain one of the major obstacles hampering the large-scale implementation of RWH systems, as microbial and chemical contaminants have previously been detected in rainwater tanks (Spinks et al., 2006; Sazakli et al., 2007; Lee et al., 2010; Ahmed et al., 2012; Huston et al., 2012). A study in Greece, for example, detected total coliforms, *E. coli* and enterococci in 80.3%, 40.9% and 28.8% of the 156 harvested rainwater samples, respectively (Sazakli et al., 2007). Spinks et al. (2006) found that 90%, 32.7% and 73.5% of 49 samples, collected and analysed in Australia, were contaminated with total coliforms, *E. coli* and faecal streptococci, respectively. Other

bacterial pathogens isolated and identified from harvested rainwater samples included *Campylobacter* spp., *Salmonella* spp., *Cryptosporidium parvum* and *Giardia lamblia* (Abo-Shehadeh et al., 2004; Ahmed et al., 2008; Ahmed et al., 2010; Ahmed et al., 2012). The primary aim of this study was thus to assess the microbial and chemical quality of harvested rainwater collected from the tanks connected to houses in the Kleinmond Housing Scheme situated in Kleinmond, Western Cape, South Africa. It is, however, important to realise that RWH can only be implemented when people are willing to use it. An additional aim of the study was thus to develop a better understanding of public perceptions, including the degree of acceptance of RWH, and the way in which the harvested rainwater is put to use. More specifically, quantitative and qualitative data were collected in order to describe the following: (i) condition of the tanks; (ii) users' knowledge of the RWH system, including its operation and maintenance; (iii) whether the user would be willing to pay for repairs should the tank break; (iv) perceived benefits and risks associated with RWH; (v) level of satisfaction with RWH; (vi) views on municipal water; and (vii) the purposes for which the rainwater is utilised.

MATERIALS AND METHODS

Microbial and chemical quality analysis

Sample site

The Kleinmond Housing Scheme (Western Cape, South Africa), initiated in 2010 by the Council for Scientific and

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