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The nature of urban household water demand and consumption in Makhado Local Municipality: A case study of Makhado Newtown

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Abstract

Water crisis has become a norm worldwide as many countries are entering an era of severe water shortage. Water plays a vital role within households though urban water authorities and water planners are struggling to satisfy the growing urban water demands and at the same time failing to achieve sustainable urban water systems. Water consumption was guided by a Calculation by Grag 2011. In order to get a wider overview of the actual consumption, a survey using metre water records was done for three months and compared with other urban worldwide standards in order to identify if there is any gap.

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Keywords: Population growth; Water consumption; Water demand; Water distribution; Water supply

1. Introduction

Background of the study

The demand for water among industries and agriculture worldwide is increasing significantly due to population growth and economic development. Water plays a vital role within households though urban water authorities and water planners are struggling to satisfy the growing urban water demands and at the same time failing to achieve sustainable urban water systems. The world population is expected to increase from 6.6 billion currently to 8 billion by 2030 and over 9 billion by 2050 (Zhang, 2008). Totsuka *et al.*, (2004) pointed out that one of the most common approaches of controlling water demand to cope with inadequate water resources is the use of intermittent supplies by physical cut-off for most of the day and limiting the consumer's ability to collect water. In South Asia it is

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estimated that at least 350 million people receive service only for period of a few hours daily and nearly all Indian cities are reported to operate intermittent systems (Vairavamoorthy *et al.*, 2008).

There are several factors that affect the residential household's water demand. Some of these factors are income of households, price of water, household size, age and sex composition of the family members and weather variables like temperature and precipitation (Arbueset *et al.*, 2003). Families with children could be expected to use more water as children require frequent sanitations, outdoor uses by children and teenagers might be higher, while retired people might have saving and disciplined water use behaviours (Nauges and Thomas, 2000). However, Lyman (1992) found that retired people tend to spend more time at home and do more gardening, which is associated with more water use.

According to the U.S Geological Survey 2015, a female should uses 273.07 litres a day, a male should uses 164 litres a day, a child should uses 161.21 litres and a retired person should uses 401.38 litres a day but in India households with a high income are said to consume 250-600 litres a day per person whereas low income households consume 40 litres a day per person (Mohandas, 2013). However, according to the World Health Organization 2010, a person needs 50 to 100 litres of water per day to ensure that most basic needs are met and which can only be personnel hygiene and cooking. In Africa most people get 20 litres of water a day which is the same quantity of water when having a shower for 1.5 minutes. In Germany water consumption per person amounts to 121 litres which is enough for body hygiene, laundry, drinking, toilet and cooking. In general many people in the world exist on 10 litres of water a day which is just enough for one toilet flush (Safe drinking water foundation, 2015).

According to the Human Development Report, 2006 on average water use ranges from 200-300 litres a person a day in most countries whereas in countries like Mozambique use less than 10 litres a person a day. People lacking access to improved water in developing countries consume far less, partly because they have to carry it over long distances and water is heavy. The Human Development Report, 2006 further pointed out that 884 million people in the world live more than 1 kilometre from a water source whereas according to WHO, the water source has to be within 1,000 metres of the home and collection time should not exceed 30 minutes.

Amarasinghe *et al* (2006) study shows that demand for water in India is projected to surpass its availability in some regions of the country demand already exceeds supply. The study further showed that current consumption in the country is approximately 581 trillion litres, with irrigation requirements accounting for most of the water use followed by domestic use. The rapid increases in population, urbanization and industrialisation have led to a significant increase in water consumption. In the next decade the demand for water is expected to grow by 20% whereby industrial requirements are projected to double from 23.2 trillion litres to 47 trillion litres.

In India the design of water supply systems has been done using certain standards. Currently the standard used is BIS.1172.1993 which was reaffirmed in 1998. A community with a population of 20 000 to 100 000 should get 100 to 150 litres per head per day and a community with a population over 100 000 should get 150-200 litres per head per day. This study will use the standard set by the constitution of South Africa of 50 litres a day per person, and will also consider the standard set by India, BIS.1172.1993 of 150 litres a day per head as the study is looking at urban areas and urban areas tend to use more water because of their life style and technology.

A study carried in California USA confirmed that there was an increase of income and water consumption increased by 3% (Safe Water Drinking Foundation, 2015) whereas Zhou *et al.*, (2000) also found a positive correlation between income and water consumption. Millock and Nauges (2010) also established that the families with high income consumed more water in terms of showering and bathing and they also found that these families own more than one dishwasher.

Safe water drinking foundation, 2001 found that in Canada a person uses 335 litres a day, Americans use 380 litres a day per person, Israel consumes 280 litres per person a day and Palestine consumes only 60 litres a day per person. Countries like Canada are using ten to twenty more water than is necessary to meet their human needs. In

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