

# Investigating water meter performance in developing countries: A case study of Kampala, Uganda

Harrison E Mutikanga<sup>1,2,4</sup>, Saroj K Sharma<sup>1</sup> and Kalanithy Vairavamoorthy<sup>1,2,3</sup>

<sup>1</sup>UNESCO-IHE Institute for Water Education, Westvest 7, 2611 AX Delft, The Netherlands

<sup>2</sup>Delft University of Technology, Stevinweg 1, 2628 CN, Delft, The Netherlands

<sup>3</sup>University of South Florida, 4202 East Fowler Avenue, CGS 101, Tampa, Florida, USA

<sup>4</sup>National Water and Sewerage Corporation, Plot 39 Jinja Road, Kampala, Uganda

## Abstract

High levels of water losses in distribution systems are the main challenge that water utilities in developing countries currently face. The water meter is an essential tool for both the utility and the customers to measure and monitor consumption. When metering is inefficient and coupled with low tariffs, the financial sustainability of utilities is at stake. Apparent water losses caused by metering inefficiencies can be reduced by assessing meters' performance and identifying the main causes of inefficiency. This paper examines the performance of 3 meter models, on the basis of failure records for a developing world water utility in Kampala city, Uganda. The influence of sub-metering on meter accuracy is also examined. The results indicate a high meter failure rate (6.6%/year) in Kampala. Over 75% of failures were observed in the volumetric (oscillating-piston) meter types with the main cause of meter failure being particulates in water. The study also indicates an average reduction in revenue water registration of 18% due to sub-metering. The reduction was not because of water use efficiency but due to the combined effect of the metering errors of the sub-meters. This clearly implies that when properties are sub-metered, customers should be charged proportionately based on master meter readings, for accurate water accountability. The findings of this study will be useful for both utility managers and meter manufacturers who work in the water industry, especially in developing countries, to make appropriate metering and sub-metering decisions.

**Keywords:** Developing countries, meter performance, sub-metering, water utilities