

# An improved area-based guideline for domestic water demand estimation in South Africa

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## Abstract

Increased infrastructural development and potable water consumption have highlighted the importance of accurate water-demand estimates for effective municipal water services infrastructure planning and design. In the light of evolving water consumption trends, the current guideline for municipal water demand estimation, published in 1983, needs to be revised. This study investigated, using regression analyses, the combined effect of various socio-economic and climatic parameters on municipal water consumption with the objective of determining the dominant influencing parameters and suggesting a new guideline for water-demand estimation. To this end, an initial database comprising more than  $2.5 \times 10^6$  metered water consumption records extracted from 48 municipal treasury databases, which are located within 5 out of the 7 South African water regions was analysed. Each of the 48 municipal treasury databases spanned a period of at least 12 months. The final amalgamated database, after rigorous cleaning and filtering, comprised 1 091 685 consumption records. Single variable and stepwise multiple variable regression analyses were utilised. Results show that stand area, stand value and geographical location are the dominant parameters influencing municipal water consumption, with stand area and stand value positively correlated to water consumption. In suggesting a new municipal water-demand estimation guideline, these three parameters were considered. Stand value, however, fell away as a reliable parameter for estimating water consumption because of the inconsistent basis for predicting stand values due to the constant fluctuations in the value of property, and municipal valuations that often become outdated. Inland and coastal geographical locations exhibited different consumption patterns, with coastal stands of the same stand area and stand value consistently consuming less water than inland stands. These should therefore be treated separately in any design guideline. Stand area then became the best parameter on which to base water-demand estimations. A single guideline curve is therefore proposed which gives various confidence limits for estimating water demand in South Africa, based on stand area.

**Keywords:** domestic water demand estimation, area-based guideline