

Climatic and spatial variability of potential rainwater savings for a large coastal city

ABSTRACT

Majority of the investigations on rainwater harvesting focused on sizing and potential water savings including studies proposing different methods of estimating rainwater tank outcomes. Several studies used monthly rainfall data to estimate rainwater tank outcomes. However, quantification using daily rainfall data will be much more accurate compared to using monthly rainfall data. A vast majority of works using daily rainfall data used daily water balance model for analysis. Again most of the studies using daily water balance model used historical rainfall data, calculated water savings for many years and then presented an average of all the calculated years' total outcome(s). 'Raintank Analyser' is a tool, which uses the same methodology and widely used; used by the South Australian policy makers for producing relevant design charts. In contrast, eTank, a daily water balance model was developed to produce potential rainwater savings, augmented townwater supply, tank overflow, reliability and payback period for three distinct climate conditions (dry, average and wet years). This paper presents comparison of eTank calculated potential water savings with those calculated by 'Raintank Analyser' under similar conditions for a rainfall station in central Adelaide. In general, 'Raintank Analyser' produced water savings are very close to the eTank calculated water savings in average year. However, through the eTank produced potential water savings in dry and wet years, it is found that significant climatic variations exist. Magnitudes of climatic variations under different scenario are presented. Again, to assess spatial variability, three more rainfall stations from different regions of Adelaide metropolitan were selected. eTank was used to calculate potential water savings in three climatic conditions (dry, average and wet years) for various combinations of roof and tank sizes. Again it is found that depending input variable conditions (tank size, roof area and climate) significant spatial variations exist within some of the regions. Also, it is found that potential water savings not only depends on total rainfall amount of a particular area, but also on other input conditions; i.e. under similar conditions an area with lower annual rainfall may provide higher water savings due to rainfall pattern.

Keyword: Rainwater tank; Daily water balance; Water savings; eTank; Raintank Analyser