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Effectiveness of rainwater harvesting systems for Australian capital cities

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ABSTRACT

The aim of this doctoral research is to assess the water-saving potential and financial viability of a rainwater harvesting (RWH) system under different climatic conditions.

A python-based program has been developed considering daily water balance principle to estimate water savings and reliability of a RWH system. This study considers all the capital cities of Australia to examine viability of the proposed RWH system. Australia is a large continent with highly variable rainfall, hence there is a greater need to assess and identify the potential of RWH at a large spatial extent to achieve efficient use of the unevenly distributed rainfall. The steps in this research are presented in Figure 1. Ten different tank sizes are considered (1, 3, 5, 10, 15, 20, 30, 50, 75 and 100 kL). The study shows that the reliability of RWH systems for toilet and laundry use is high (80-100%). However, the reliability for irrigation use is quite low. Reliability is defined as the percentage of days in a year when the water demand can be satisfied by the proposed RWH system. For combined water use (toilet, laundry and irrigation), Adelaide has the lowest reliability (38-49%), while Hobart has the highest (61-77%). In most cases, the benefit-to-cost ratio values of the RWH systems are below one as the current mains water price is too low. This study is expected to help the Federal Government of Australia to update RWH policy and subsidy levels considering climate sensitive inputs as provided in this study. Two journal papers have been published based on this research, and another three journal articles will be written. The research will be completed by June 2022.

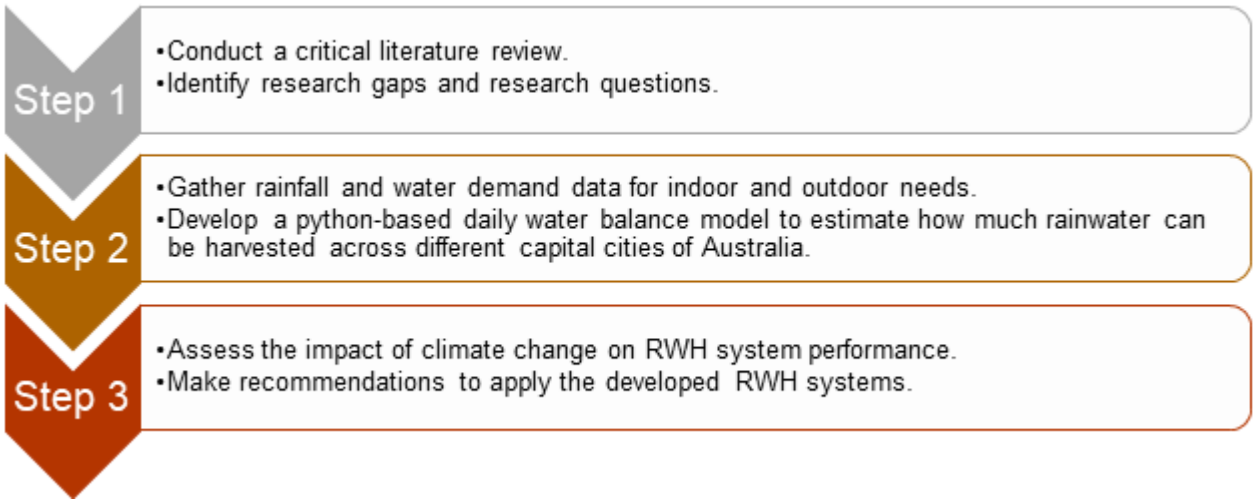

Figure 1. Principal steps in the proposed RWH research