



# 7<sup>th</sup> INTERNATIONAL WORKSHOP ADVANCES IN CLEANER PRODUCTION

“CLEANER PRODUCTION FOR ACHIEVING SUSTAINABLE DEVELOPMENT GOALS”

## Water and Energy Consumption in the Life Cycle of the Flush Devices and in the Gray Water Reuse

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### Abstract

This article aims to analyze, through the Life Cycle Assessment, three scenarios with different solutions for the availability of water on toilets of a classroom building of a University in Southern Brazil. In the first scenario, single-flush devices were used on all toilets of a campus building. In the second scenario, dual-flush devices were used and in the third scenario, the installation of dual-flush devices and a gray water reuse system from the washbasins in the toilets were analyzed. The objective was to quantify the environmental impacts in the three scenarios by comparing the use of single flush and water-saving devices and also the reuse of the gray water in terms of water consumption and energy consumption. Measurements of the available plumbing fixtures were done in two stages, with single-flush and dual-flush devices. The environmental impact assessment was carried out with the support of the SimaPro 8.3.0 software. The replacement of flush devices reduced water consumption in the operation stage of the toilets on 26.97%. The highest water and energy consumption occurred in scenario 1, due to the higher demand for water in the operation stage and higher energy expenditure for the pumping and treatment of the water. The gray water reuse in scenario 3 decreases the amount of water consumed in the toilets. The results showed that it is environmentally feasible to replace the single-flush with dual-flush devices in the campus toilets.

*Keywords:* Life Cycle Assessment. Flush devices. Water-saving systems.

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