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Using Life Cycle Assessment in Potable Water Treatment Plant: A Colombian Case Study

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Abstract : There is a total of 1027 municipal development plants in Colombia, 70% of municipalities had Potable Water Treatment Plants (PWTPs) in urban areas and 20% in rural areas. These PWTPs are typically supplied by surface waters (mainly rivers) and resort to gravity, pumping and/or mixed systems to get the water from the catchment point, where the first stage of the potable water process takes place. Subsequently, a series of conventional methods are applied, consisting in a more or less standardized sequence of physicochemical and, sometimes, biological treatment processes which vary depending on the quality of the water that enters the plant. These processes require energy and chemical supplies in order to guarantee an adequate product for human consumption. Therefore, in this paper, we applied the environmental methodology of Life Cycle Assessment (LCA) to evaluate the environmental loads of a potable water treatment plant (PWTP) located in northeastern Colombia following international guidelines of ISO 14040. The different stages of the potable water process, from the catchment point through pumping to the distribution network, were thoroughly assessed. The functional unit was defined as 1 m^3 of water treated. The data were analyzed through the database Ecoinvent v.3.01, and modeled and processed in the software LCA-Data Manager. The results allowed determining that in the plant, the largest impact was caused by Clarifloc (82%), followed by Chlorine gas (13%) and power consumption (4%). In this context, the company involved in the sustainability of the potable water service should ideally reduce these environmental loads during the potable water process. A strategy could be the use of Clarifloc can be reduced by applying coadjuvants or other coagulant agents. Also, the preservation of the hydric source that supplies the treatment plant constitutes an important factor, since its deterioration confers unfavorable features to the water that is to be treated. By concluding, treatment processes and techniques, bioclimatic conditions and culturally driven consumption behavior vary from region to region. Furthermore, changes in treatment processes and techniques are likely to affect the environment during all stages of a plant's operation cycle.

Keywords : climate change, environmental impact, life cycle assessment, treated water
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