

# Assessment of Human Liquid Waste Management Technologies for Sustainable Sanitation and Environmental Health in Rural India

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To achieve the sustainable development goal (SDG), treating hazardous chemicals in Human liquid waste (HLW) is crucial. Progress in sustainable sanitation is marked by waste management technologies, recognized as a factor in SDG 6.2. The Government of India (GOI) is focusing on implementing sustainable liquid waste management and sanitation practices. However, it is relatively easier to introduce such programmes in urban areas, whereas rural areas face unique challenges due to many variables that hinder the eradication of open defecation. The research aimed to investigate HLW management methods and assess the sanitation level via 700 family interviews performed in about 117 villages across eight districts in India. The survey found that 73.17% of sanitation facilities are accessible, from which 37% of sanitation systems being used, 51% being unused, and 12% being partly utilised. The assessment evaluated the sustainability aspects of the research, including technical, environmental, socio-cultural, institutional, and economic factors. The findings revealed that 35% of cases experienced non-utilizing of sanitation facilities due to the water scarcity. Additionally, 29% of cases reported mismanagement in the construction of LW treatment technologies for those heavy metals found in the water, 17% lacked septic tanks, and pits, 19% required behavioural changes, and 38% had *E. coli* (biological hazard) contamination in nearby water sources. The research suggested that while applying LW treatment technologies, it is important to consider many factors such as geographical location, soil type, water table, and distance from water sources. This research provides a unique and novel contribution to knowledge in terms of assimilating people's perspectives and the reality of sanitation systems in rural settings of developing countries.