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Case Study of Application of the Polluter Pays Principle, on a Digital Platform for the Management of Sanitary and Biomedical Waste Generated at the Household Level

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Abstract

The generation of household-level sanitary and clinical waste has grown significantly due to population growth, changing consumer habits, and rising living standards. Mismanagement of such waste poses critical threats to human health and the environment, with urban areas facing amplified challenges due to limited living space and inadequate disposal options. Addressing this, Sisili Hanaro Encare launched Sri Lanka's first door-to-door hazardous waste management program in 2023, targeting household-level waste across Colombo, Gampaha, Galle, Kalutara, and Kandy districts. The program, serving 3,238 customers, offers comprehensive waste management services, including collection, transportation, and advanced incineration-based disposal, operating under the polluter-pays principle with fees determined by waste volume. QR-coded bags and a digital platform enhance tracking and operational efficiency. A survey conducted in collaboration with the students from the University of Sri Jayewardenepura assessed the program's effectiveness using a geographically diverse sample of 60 households. Participants included 36% housewives, 34% private employees, 22% government employees, 5% retirees, and 3% self-employed individuals. Key waste categories included baby diapers (57%), adult diapers (17%), and sanitary napkins (19%), with 7% of households generating biomedical waste, such as insulin-related remnants. Before adopting the Encare program, 47% practiced open burning, 20% buried waste, and 28% relied on local authorities. Despite awareness of health (88%) and environmental (85%) risks, indirect disposal costs averaged Rs. 837.5 monthly, arising from practices like fly-tipping and fuel for open burning. Motivations for joining the Encare program included hassle-free services (43%), eco-friendly practices (27%), and confidence in proper waste disposal (13%). The survey found 90% of respondents satisfied with the program's costs and value, with 92% praising its efficiency and 100% recommending it. Additionally, 98% preferred male staff for waste collection. The program demonstrated significant environmental benefits, notably reducing air pollution by 40,000 Air Emission Factor ($\mu\text{g TEQ/t}$), as per UNEP's dioxin toolkit, by shifting from open burning to advanced incineration. These findings highlight the program's effectiveness in addressing public health and environmental concerns while ensuring high customer satisfaction. Encare's scalable model offers a promising solution to urban waste management challenges, emphasizing its potential to transform hazardous household waste disposal practices in Sri Lanka.

Keywords: *Infectious, Volume base, Incineration, Willingness to Pay, Digital platform, Realtime tracking, Extended Producer Responsibility.*