

Waste Management and Resource Circulation

Abstract Book

**Proceeding of the International Symposium on
Sustainable Waste Management (ISSWM-2023)
22nd – 24th September 2023**

Edited by

Rahul Baidya

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Department of Mechanical Engineering
Institute of Engineering & Management Kolkata
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Preface

Sustainable development requires a multipronged approach. The reduction of GHG emission is one of the major areas which needs to be focused on. With it, resource recirculation has to be increased. Management of different waste streams is a major challenge across the globe, thus, there is a need for effective waste management and implementation of circular economy strategies, primarily in the developing countries. Developing countries, with their rapid and uncontrolled increase in urbanization and industrialization, have complicated the waste management scenario. The mixed economy in developing countries further increases the difficulties in implementing sustainable practices for disposal of different waste streams and resource circulation methodology. To promote sustainable development, waste management has evolved into material flow management in many developed countries. The wastes are generated from diverse sources including household, service sector, industries (hazardous and non-hazardous waste), markets, construction activities, medical facilities etc. The waste streams from different sources requires different processing for effective resource recovery. Municipal solid waste (MSW) is the most complex waste stream compared to more homogeneous waste streams resulting from industrial or agricultural activities. The municipalities in most of the developing nations are focused on collection rather than utilization, thus leading to landfilling without energy or resource recirculation.

Globally, 2.01 billion tonnes of municipal solid waste are generated and around 400 million tonnes of hazardous waste are generated annually. This enormous quantity of waste requires proper utilization or disposal through a sustainable methodology. The waste must be looked upon as a source of resource recovery rather than a burden as numerous possibilities exist for recovering the value from the products. In India, the six waste management rules and different Ministry of Environment, Forest and Climate Change (MOEF&CC) guidelines specify the ways to dispose and treat waste streams. India generates around 277 million tonnes of municipal solid waste (MSW) comprising domestic household waste, service sector and market waste. India also generates around 7.2 million tonnes of hazardous waste and 30 million tonnes of non-hazardous industrial waste (excluding power plant waste and mining waste) and 0.18 million tonnes of biomedical waste annually. Different types of waste streams have distinctly different handling protocols, treatment possibilities, and disposal alternatives. The recovery of resource and energy are the two means that can turn waste into a valuable asset. As waste management system develops through introduction of advanced technologies, different markets for waste treatment outputs (material, energy and nutrients) are coming to the existence; with it waste management planning has become more complex than ever. The traditional consideration of waste as pollution has progressively shifted towards a new perspective, in which it is regarded as a resource that could make societies more sustainable. Thus, the closed cycle waste management system not only contributes to environmental protection, but also pays off economically.

Waste management is tangible when the generation of waste and harmful substances is minimised, the reused (using materials repeatedly), recycled (using materials to make new products) or recovered (producing energy from waste) materials are maximised, and disposal of waste is minimised in order to preserve resources for the future. Sustainable development is

central to improving the quality of human life in the planet. Waste management is an integral part of the “Sustainable Development Goals” laid out by the United Nations in 2015. Challenges to managing waste towards attaining circular economic growth remain in the context of developing countries. International Symposium on Sustainable Waste Management (ISSWM-2023) is an initiative undertaken to provide an opportunity for sharing ideas and insights among researchers and practitioners of this field of study. We aim to focus on the entire gamut of sustainable practises across different domains of waste management; from design and planning principles to implementation strategies.

We would like to take this opportunity to thank everyone who associated themselves with the success of the symposium. We thank the authors for contributing papers and delivering talks. We are indebted to the experts from academia for delivering expert talks and chairing the sessions. Special thanks to the scientific committee for their hard but fair reviews of the papers. The participants and organizing committee members, without whom the event would not have seen the light of day, deserve our gratitude.

Dr. Rahul Baidya
Ishita De

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Assessment of Sanitation and Health Facilities of the Informal Workers Based on SaniFOAM and Fuzzy AHP model: A Case Study of In-house Secondary Transfer Station in Khulna City

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Abstract

Effective sanitation solution includes changing behavior, providing facilities, and addressing sanitation demands. Inadequate hygiene harms economic and social well-being as well as productivity. Khulna City, the 3rd largest in Bangladesh, has 81 Secondary Transfer Stations. Among them, only 7 are In-house Secondary Transfer Stations where close to a hundred fifty informal workers work as waste collectors. Local Governments and different NGOs provided some sanitation facilities, but those barely meet the needs. This study attempts to evaluate the sanitation and health facilities of these informal workers based on the Customer Satisfaction Score (CSAT), a customer-based tool for measuring and analyzing customer satisfaction, where the gap between awareness and demands of the informal workers is assessed. In this study, for conducting survey in a technical manner, the whole survey system has been categorized in terms of physicality, consistency, awareness, assurance, and empathy through SaniFOAM approach. In addition, the Fuzzy Analytical Hierarchy Process (AHP) model has also been performed to validate the results of this study. In CSAT approach, for matrix calculation Very Bad, Bad, Maybe, Good, and Very Good measures respectively 1,3,5,7, and 9 as other researchers have done in their literature. With applying this scoring system, analysis of the CSAT found that 42.86% of workers had to handle waste by hand while collecting waste as the inhabitant does not contain waste properly. 89.29% of respondents complained that while handling waste, they cut themselves at least once a month. Although they use tube well or filtered water in the house, the lack of a safe water source while working make 89.47% of worker drink unsafe or open-source water. Even though there are difficulties in accessing latrines during working hours, the findings from Fuzzy AHP reveals that 78% of workers are not sure if a latrine facility is needed in the area or not. Most of them are elderly personnel and working for more than 20 years and are habituated to the current system. The analysis of this study offers a clearer understanding of sanitation facilities needed for the informal workers which will be beneficial for effective municipal service planning and management of future In-house Transfer Station constructions.

Keyword: Waste handling; Drinking water; Health hazard; Latrine facility