PREFACE

Waste management requires systematic collection, transportation, treatment, and disposal. Different wastes require different treatment methods. Segregating waste at the source before collection becomes crucial for effective municipal solid waste management. Without segregation into wet (organic waste) and dry (recyclables and inert) categories at the source or household level, the municipal solid waste management (MSWM) system fails. Many Indian and global cities face this issue. Mixed waste contaminates recyclables and hinders composting and biomethanation, increasing landfill volumes and reducing resource recovery. Individual non-segregation is a fundamental barrier. Addressing this challenge requires people's capability, opportunity, and motivation to adopt segregation behaviour, our study's target behaviour.

After reviewing various behaviour models, the COM-B (capability, opportunity, motivation, and behaviour) model is selected to diagnose specific barriers. The behaviour change wheel (BCW) framework uses the COM-B model to recommend tailored intervention functions like education, enablement, persuasion, and environmental restructuring. These functions aid systematic barrier-to-enabler conversion. The thesis explores the use of COM-B diagnosis and behaviour change interventions to promote source segregation as a pathway to effective municipal solid waste management. It begins with a contextual overview of municipal solid waste and its management in both Indian and global scenarios, highlighting the technical and social (behavioural) aspects. Behaviour change models and frameworks such as the COM-B model, Behaviour Change Wheel (BCW), along with Theoretical Domains Framework (TDF) are described as significant tools to diagnose behaviours and design effective interventions. A review of the literature examines theories and studies that have engaged with the technical dimensions of waste management, social and behavioural perspectives, public perceptions, and the implications for public health, while also tracing the history of integrating socio-technical dimensions in achieving effective MSWM. The study synthesises theories and frameworks on municipal solid waste management, focusing on the waste management hierarchy and the scope for technical and behavioural integration. It further outlines a framework to diagnose

barriers and enablers while streamlining waste management flows at the city level, emphasising the utilisation of existing models to identify gaps and devise suitable intervention functions. The research employs a mixed-methods design, combining quantitative and qualitative approaches to explore the enablers and barriers to adopting waste segregation at source. Behaviours are analysed using the COM-B model and BCW, with the inclusion of TDF for greater precision, alongside comparative case studies, interviews, and narrative research. In the study, two areas are investigated: Indore and Varanasi. For each city, the analysis considered the demographic significance, technical, social, and behavioural aspects of waste management, and applied the COM-B model with BCW and TDF to design intervention functions for behaviour change. A comparative analysis of physical and chemical parameters, as well as technical and policy settings, is undertaken, and both cities are compared through the COM-B framework to determine relative enablers and barriers. Thus, the thesis concludes with a summary of key findings, reflections on the research objectives, and analysis of policy and practice implications. It recommends targeted interventions for Indore and Varanasi while identifying the broader significance and future scope for applying behavioural and socio-technical integration to waste management systems