Application of COM-B Model of Behaviour for Effective Municipal Solid Waste Management in India

Thesis submitted in partial fulfillment for the
Award of Degree

Doctor of Philosophy

By

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2025

Chapter -6

Conclusion

Municipal solid waste management is a critical challenge for growing cities of the world. It not only requires technical solutions but also an understanding of human behaviour. This study has attempted to analyse the barriers and enablers in municipal solid waste management, using the. Capability, Opportunity, Motivation, Behaviour (COM-B model) under behaviour change wheel (BCW) framework and theoretical domain framework (TDF), taking the examples of Varanasi and Indore for the purpose. By the use of this COM-B model, we are trying to diagnose the internal as well as external factors which oppose our target of 'segregation behaviour'. By using frequency table the study has identified specific influencing factor of waste management that gives an outcome of intervention function to change behaviour. The conclusion includes the key findings concerning to the research objectives, discussion for the implication of policy, proposals of actionable interventions and the broader significance of the study for urban waste management.

6.1 Summary of key findings.

Our analysis reveals contrasting results between Varanasi and Indore using COM-B model constructs that explore systematic barriers /gaps and enablers /strengths in Varanasi and Indore.

(a) Capability

Regarding physical capability, the construct is related to environmental context and resources as per TDF. Varanasi faces significant barriers due to insufficient infrastructure, such as the residents having a single bin system and low access, limiting

segregation options. In the results 73% of users say it is hard to access. The collection is non-reliable in the city. In contrast, Indore enjoys 6 diverse types of bins for segregation and they have high accessibility. For accessibility, people say it "easy', and rate high due to reliable door to door collection.

In Physical capability, the questions are related to knowledge and skill. In Varanasi, awareness and knowledge of segregating waste appear lacking. The response indicates that no educational workshops are organised, and people are unaware of the health impact. The waste workers are also untrained. In contrast, with very high awareness, Indore excels in segregation rate (around 83%), and most of the workers are trained and have knowledge of MSWM's advanced technology.

(b) Opportunity

In the physical opportunity that consists of the construct having environmental context and resources, Varanasi's infrastructure is found very deficient, with only 46% recycling facility, 64% lacking separate bins in public spaces, and 86% reporting no use of technology. Indore, on the contrast has a robust facility with 84% confirming to separate bins for segregation, 64% confirming to biogas plant and 85% confirming to use of technology for collection.

Regarding social opportunity, Varanasi is weak, with 80% of people saying their leaders vocationally promoted segregation and only 37% reporting any littering penalty. On the other hand, Indore has strong social support, with 76% of stakeholders reporting frequent promotion by leadership and 67% confirming to consistent penalties.

(c) Motivation

Automatic motivation involves the construction of behaviour regulation, reinforcement, and emotion. Varanasi seems to be struggling with habit formation, with 76% people saying that they do not segregating without reminders. Around 46% do not feel guilt for improper disposal. The city of Indore has a strong habit of segregation, with around 89% people committed for that and emotional driver feeling of guilt is 61%.

Reflective motivation is the construct of belief about consequence, reinforcement, and social role. In Varanasi, 39 % doubt their effort to improve cleanliness, while 84% feel, they are not involved in policy planning. Indore people are highly motivated, with 90% believing their impact makes changes and 68% people saying they get engaged in policy planning.

These findings confirm that various discrepancies such as infrastructure, awareness, and social norms hinder solid waste management in Varanasi. At the same time, the success of Indore is driven by well-developed capability, opportunity, and motivation, which align with its repetition as a model for better waste management in India.

6.2 Reflection on the research objectives

The primary objective of our study is to identify barriers and enablers in municipal solid waste management for Varanasi as well as Indore using the COM-B model, TDF and inclusion of a behaviour change wheel in the analysis. This has successfully been addressed by systematically mapping the data to the COM-B construct and TDF domain revealing specific Barriers. Various constructs reveal specific barriers (Varanasi, 70% people lack segregation and awareness) and enablers like habitual segregation, of 89% in Indore. The study highlights the critical role of behavioural factors in MSWM. Varanasi requires foundational improvements and Indore needs to sustain its strengths. The analysis shows that interventions are contextually relevant and address each city's unique socioeconomic profile.

6.3 Implication of policy and practices

The findings have significant implications for municipal solid waste policy and practice.

- Applying COM-B and theoretical domain framework provides a structure for understanding behaviour determinants in MSWM. This approach can be applied to other urban contexts, offering a replicable model for analysing and addressing waste management challenges.
- Varanasi's capability, opportunity, and motivation are necessary in a multi-faceted approach. The lack of infrastructure and low awareness suggests that investment in physical resources and education are critical to strengthening social norms through community engagement and enforcement, which can support behaviour change.
- Indore, the strong enabler, indicates that the model can be sustained through continued investment in education infrastructure and maintaining motivation strategies. It successfully offers lessons for other cities and demonstrates the effectiveness of a combined robust system with committee involvement.

6.4 Suggested interventions

To address the identified barriers and enablers, the following interventions are proposed to align with COM-B, BCW and TDF.

(a) Interventions for Varanasi (Table: 5.20)

Physical capabilities include the installation of multimodal bins of 3-6 types in all wards to address, adequate bins, and an optimised collection point to reduce the accessibility issues, mandatory usage of protective gears to waste workers and ensure daily door-to-door collection to improve reliability.

Psychological capability can be improved by launching visual workshops and school programs to educate residents on segregation and health targets. Training of waste workers on technology (such as composting) and distribution of policy guides in the local language to address and familiarise them with city policies are important.

Physical opportunity in Varanasi can be built through additional recycling plants, installing labelled bins in public places, establishing a maintenance team for infrastructure repair and developing a user-friendly collection app.

Social opportunity is the social influence that trains community leaders to promote segregation. Enforcement of visible fines for littering in public is important. Integration of waste management practices into religious/ cultural events, such as the Ganga cleanliness drive, may help. Use of local media to highlight success are required.

Automatic motivation may come from installation of signage and murals near bins to promote segregation. Small rewards like market coupons can be offered and run campaigns can be organised linking segregation to community pride and guilt to address emotional attachment.

Reflective motivation can be applied through sharing of past picture clubbing with before and after cleanliness drive to encounter the doubting impact. Introduction of tax rebates for recyclers, and formation of a resident committee with policymakers need to be implemented.

(b) Interventions for Indore

In terms of physical opportunity, there is a need to establish community composting facilities in neighbourhoods to provide accessible options for organic waste disposal. Implement policies that restrict organic waste disposal in regular trash streams, mandating composting or

alternative organic waste management methods. Introduce a tax rebate program offering financial incentives to households and businesses demonstrating proper waste segregation and reduction practices. Provide discounts on municipal services or tax credits for consistent compliance with waste management regulations.

6.5 Future research scope

- Future studies could evaluate the proposed intervention's effectiveness through longitudinal studies measuring changes in the segregation rate post-implementation.
- Investigate the role of technology, such as waste management apps, in enhancing the efficiency of MSW in both cities.
- Comparing additional cities to test the generalizability of COM-B and TDF framework in diverse urban contexts.

6.6 Broader significance

Effective municipal solid waste management is a persistent global challenge, and our study is about the role of human behaviour element in addressing it. Our study is a pioneer introduction of COM-B model of behaviour in municipal solid waste management domain. Although it is well defined appropriate diagnostic tool for behaviour, in health domain. Its potentials are unexplored in in the domain of waste management. Applying the comprehensive COM-B Model, BCW framework and TDF reveals that Varanasi faces barriers such as infrastructure and awareness that require foundational intervention. At the same time, Indore possesses enablers such as robust infrastructure and motivation, which make it as a role model. The findings of the study provide a replicable framework for analysing and improving MSWM in other urban

settings, emphasising the need for tailored behaviour-centric strategies as the cities across the world cope with increasing waste volume. The work highlights the transformative potential of behaviour in MSWM, and capability of personality and motivation to create a cleaner, healthier, and more sustainable environment.