

AN ANALYSIS OF PEOPLE'S BEHAVIOR TOWARDS MUNICIPAL SOLID WASTE DISPOSAL IN INDIA

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Abstract. Solid Waste Disposal is a serious concern in the present era of rapid population growth. The increased level of waste creates hazardous problems for humans, as well as animals. As per Haryana State Pollution Control Board report (2021), projected Waste Generation by Faridabad city in would be 962 TPD in 2025 which would rise to 1290 TPD by 2035 which makes Faridabad the highest waste producing city in the state. Previous studies on the solid waste disposal systems in Indian towns have focused on the social elements of trash disposal, such as domestic solid trash disposal in India, constituents of sustainability in solid trash disposal, living and working situation of dumpsite trash collectors etc. But, not much research has been conducted on analyzing the impact of human behavior elements on the waste disposal system, which might lead to a better knowledge of the elements that drive behavior change, which could be a key idea for improving the system's performance. In this study, a survey on Faridabad city's solid waste disposal system was undertaken with a select group of people in Faridabad city and for analysis, the authors used multivariate regression to anticipate the research model. The study's scope is confined to Faridabad residents and the solid waste Disposal problem, however, the proposed framework has substantial potential for implementation in other Indian cities as well as developing countries.

Key words: solid waste, disposal, ecological, behavior, municipal.

1. Introduction

Solid Waste Disposal is a serious concern for rapid growth of population (Basu and Punjabi, 2020). The increased level of waste creates hazardous problems for

humans, as well as animals (Abushammala *et al.*, 2021). Solid waste disposal is critical to the advancement of human health (Bhaduriya *et al.*, 2019). The term solid waste disposal mainly

refers to collecting, disposing, treating the waste effectively by municipalities (Elkhedr, 2016). Various different practices adopted by municipalities to manage the waste effectively like collect waste from door to door services, put the dustbins in a particular chowk of the area, the junior level workers take the responsibility for the cleaning the area, on daily basis (Bhaduriya *et al.*, 2019). In developing nations, trash recycling has been somewhat successful in reversing the detrimental effects of solid waste on the environment (Ezeudu and Ezeudu, 2019). Previously, a waste facility's assessment was solely focused on technical factors (Webler *et al.*, 1995), with no information regarding the applicability of system provided (Kasperson and Pijawka, 2022; Ławińska *et al.*, 2022). As a result, before developing a sustainable waste disposal system, a social assessment of citizens' behaviors is required (Fu *et al.*, 2020; Del *et al.*, 2020; Minoja and Romano, 2021; Velis *et al.*, 2021; Chaudhary *et al.*, 2021).

Consequently, the people of Faridabad were evaluated to determine their sociological status and to understand whether they were ready to adapt to a waste separation-based structure. Accordingly, the district administration could take further action to establish an appropriate sustainable waste disposal system in Faridabad.

Former studies on the solid trash Disposal method in Faridabad city and rest Indian cities have focused on societal state of waste supervision by domestic solid trash board in India (Gupta *et al.*, 1998), constituents of sustainability in solid trash disposal in Indian cities (Narayanan *et al.*, 2021), living and working situation of dumpsite trash collectors (Chikarmane, 2012), and a trial

study of PAC waste tracker in Bangalore city, India (Nagendra *et al.*, 2019) etc. But, not much research has been conducted on analysing the impact of human behavior elements on the waste disposal system, which might lead to a better knowledge of the elements that drive behavior change, which could be a key idea for improving the structure. The results of this study can be helpful as a starting point for establishing a long-term solid waste Disposal system in India, as well as many other developing countries.

2. Materials and Methods

Ajzen (1991) published The Theory of Planned Behavior, which is an updated and expanded version of Fishbein and Ajzen (1980)'s theory of rational action, is one of the most widely accepted ideas in behavior-based research (Ajzen, 2020; Conner, 2020). They depicted that Individual behaviour is influenced by elements viz. outlooks toward behaviour (peculiar defiance and individual demeanor), subjective standards (impact of significant others; perceived social pressure), and perceived behavioural control.

In terms of environmental behaviour, numerous studies have concluded that populaces are more tended to recycle if they are concerned about the environment (Ellen, 1994), but that individual behaviour will be consistent if he or she has a positive attitude toward environmental issues, where family, friends, neighbours, or colleagues may influence positive environmental behaviours (Minton and Rose, 1997).

Ecological concerns are overshadowed by idleness or a lack of attentiveness in guarding the environment (Blake, 1999), and actions, attitudes, and motivation for recycling are oriented toward individuals rather than communities (Werner and Makela, 1998), Household garbage recycling

is influenced by social, cultural, and structural factors (Chu and Chiu, 2003).

Furthermore, the authors (Rathor and Sarmah, 2021) conducted research in India, finding that outlooks, subjective standards, professed behavioral control, intentions, and situational factors strongly affected household waste separation behaviors. (Wang *et al.*, 2018) and (Zhang *et al.*, 2015) found that assertiveness, subjective norm, perceived behavioral control, and contentment with local facilities influence the intention and behavior of residents' participation in household waste separation in China. (Vicente-Molina *et al.*, 2018) distinguished recycling behavior based on gender perspective.

The behavior score is determined by some factors such as ecological awareness, legal impositions, government initiative and individual's habit. This study developed four key hypotheses based on previous studies and typical conditions in the case study area, with the relationship between the elements depicted in the prediction exemplary route in Fig. 1.

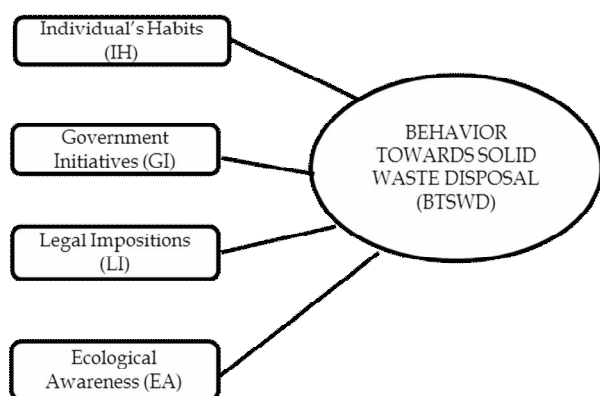


Fig. 1. Proposed Research Model (Source: Authors).

H₁: Individual's Habit has a significant impact on the people's behavior toward Municipal solid waste disposal.

H₂: Government's Initiatives have a significant impact on the people's

behavior toward Municipal solid waste disposal.

H₃: Legal Impositions have a significant impact on the people's behavior toward Municipal solid waste disposal.

H₄: Ecological Awareness has a significant impact on the people's Behavior toward Municipal solid waste disposal.

According to the HSPCB's annual report on solid waste management for the fiscal year 2018-19, just 17.5 percent (815.93 TPD) of Haryana's total solid waste (4,635.79 TPD) is successfully processed and recycled, while the remaining 78 percent (3,614.32 TPD) is transported to landfills. As per Haryana State Pollution Control Board Report (2021), projected Waste Generation by Faridabad city in would be 962 (TPD) in 2025 which would rise to 1290 TPD by 2035 which makes Faridabad the highest waste producing city in the state. Mismanagement of Public solid waste creates a slew of issues. Faridabad's local administration, which operates under an open trashing system (wholly trash is combined), is in search of answers to the city's trash issues (Singh and Satija, 2018). The Sample size is 400 individuals of Faridabad City. The sample size is calculated by Slovin's formula. The total population of Faridabad is 19, 44,196 based on latest estimation by government (as per Aadhar Unique Identification Authority of India Report, December 2020). The sample size came out 399.865 approximately 400.

For analysis, the authors used multivariate regression to anticipate the research model. Before proceeding regression analysis, the researchers conducted Cronbach's Alpha test and Exploratory Factor Analysis to limit the appropriate factors to lay into the research model. The research model is built on the findings of previous studies as well as the researchers' proposed study

hypotheses. As a result, the people's attitude toward solid waste disposal is the dependent variable. Individual Habit, Government Initiatives, Legal Impositions, and Ecological Awareness are independent factors. The study's scope is confined to Faridabad residents and the solid trash disposal problem; however, the findings and proposed framework concept show great promise for applicability in other Indian cities and emerging nations.

2.1 Proposed model (a new framework)

Starting with the results of the sociological evaluation, an enhanced outline is built as a key for a better trash disposal structure in Faridabad city. The concept of creation is based on peoples' behavior patterns in order for people to accept, comprehend, and implement the system in their daily lives.

3. Empirical Results

Waste disposal is a significant issue in many of our country's urban areas. Effective SWM is a major difficulty in communities that are already dealing with resource limitations, such as limited land space and a high population density. Thousands of tons of municipal solid garbage are generated daily due to the high population density.

There are a variety of factors that are directly or indirectly contributing to the massive amount of solid trash that is becoming one of the world's most serious environmental issues. Exponential population growth, indiscriminate natural resource extraction, economic and industrial development, rising per capita income, and consumerism are all major factors to this problem. The indiscriminate and unsustainable use of resources has had a negative impact on not only the environment but also on the economy.

3.1. Outcome of EFA and Regression Analysis

Cronbach's alpha test which is required to check the internal consistency and exploratory factor analysis (which is required to trace the relative factors among the selected variables) have been inferred to verify the appropriate variables that need to be included in the current research model. The value for factor loading cut-off is determined as 0.50. The results are displayed in Table 2 below.

In Table 3, there are independent variables which can impact the intention of people to follow waste disposal. These are Individual habit, Government Initiatives, Legal Impositions and Ecological Awareness. On these factors Multiple Regression analysis has been applied to check the impact and setup a research Model.

ANOVA results explain that the outcomes of estimating the model of research is significant at 5% level of significant. The value of R square is 85%, shows 85% of variation in behavior of people to follow waste disposal practices are due to the selected independent variables. With the result of above table 3, the following equation can be obtained. A model could be drawn that has been shown in Fig. 2.

$$BTSWD=0.667IH+0.459GI+0.397LI+0.557EA$$

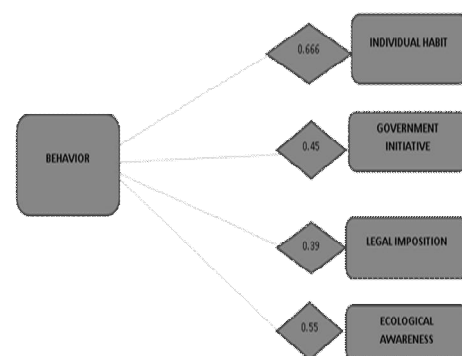


Fig. 2. Regression Coefficient's outcomes Estimation (Source: Authors).

Table 1. Variable Description in Research Model (Source: Authors).

Variables		Explanation
Individual's habit	ST 4	Garbage is littered, and foul odours are frequent in my neighborhoods.
	ST 8	I avoid sorting my trash since it is inconvenient and time consuming.
	ST 13	Littering is prevalent since everyone does it.
	ST 14	When I litter, I don't feel bad about it.
Legal impositions (LI)	ST 1	I convince my family to follow the waste disposal rules.
	ST 12	I follow the guidelines since my trash disposal activities are monitored via CCTV.
	ST 15	I follow the rules because I'm afraid of the consequences.
	ST 16	For me, the rule of socialization of waste disposal is unclear.
Government initiatives	ST 2	The government does not provide adequate public awareness, leaflets, or slogans regarding appropriate garbage disposal.
	ST 5	The government does not place enough focus on environmental education.
	ST 6	The government does not supply enough waste separation information.
	ST 9	Because the government does not supply enough staff to take trash to landfills, garbage has been piling up for days.
Ecological awareness	ST 7	Individual action should be taken to protect the environment.
	ST 10	More environmental programming should be broadcast on the radio, television, and other media.
	ST 11	Environmental education should be provided to children in schools.
	ST 12	Individual should be mindful towards utilization of resources.

Table 2. Exploratory factor analysis (EFA) (Source: Authors).

Variables		Cronbach Alpha	Factor Loading			
			1	2	3	4
Individual's Habit	ST 4	0.902	0.891			
	ST 8		0.868			
	ST 13		0.773			
	ST 14		0.656			
Government Initiatives	ST 1	0.884		0.866		
	ST 12			0.892		
	ST 15			0.780		
	ST 16			0.535		
Legal Impositions	ST 2	0.853			0.875	
	ST 5				0.798	
	ST 6				0.691	
	ST 9				0.545	
Ecological Awareness	ST 7	0.781				0.821
	ST 10					0.698
	ST 11					0.651
	ST 12					0.578

*** indicates significant at 5%

Table 3. Regression coefficient's Estimation (Source: Authors).

Variables	Beta	Sign
Individual's habit	0.667***	0.0004
Government initiatives	0.459***	0.0034
Legal impositions	0.397***	0.0487
Ecological awareness	0.557***	0.0084
N		400
Anova		0.0004***
R Square		85%

3.2. Impact of Individual's Habit on the people's Behavior toward Municipal solid waste disposal

The outcome of the analysis depicts that Individuals habits have a significant effect on people's Behavior toward Municipal solid waste disposal. The results are also steady with the earlier studies of (Aarts *et al.*, 1998; Knussen *et al.*, 2004; Verplanken, 2006; Bamberg *et al.*, 2003). It shows that role of Individual's habits relating to waste disposal plays a significant role towards development of his Behavior toward Municipal solid waste disposal. The research gives a sign that individual habits such as littering the garbage, non-sorting of trash have an impact on their behaviour related to solid waste disposal. Improvement in individual's habit of sorting the trash, non-littering would lead to improvement in their behaviour towards solid waste disposal.

3.3. Impact of Government initiatives on the people's Behavior toward Municipal solid waste disposal

The Study revealed that Government initiatives have significant impact on people's Behavior toward Municipal solid waste disposal. Thus research makes it clear that if government makes sincere efforts to make people aware about appropriate method of garbage disposal, garbage segregation, and have more staff to collect and take trash to landfills, waste processing units then that would lead to better behaviour of people's towards Toward Municipal solid waste disposal. The results are also steady with the earlier studies (Chattopadhyay *et al.*, 2007; Srivastava *et al.*, 2014; Kinnaman, 2010).

3.4. Impact of Legal Impositions on the people's Behavior towards Municipal solid waste disposal

The study has also shown the significant impact of Legal Imposition on the

people's Behavior toward Municipal solid waste disposal. This variable's result is also consistent with the earlier researches as (Vilas, 2015; Singh, 2020). In Indian scenario we have seen that people's behaviour depends a lot on legal impositions, fear of being caught, being watched on CCTV and fear of penalties and fines.

3.5. Impact of Ecological Awareness on the people's Behavior toward Municipal solid waste disposal

The variable Ecological Awareness has also found positive impact on people's Behavior toward Municipal solid waste disposal because when a person is more aware about the hazardous impact of garbage on ecological environment, it improves their behaviour towards Municipal solid waste disposal. In the earlier studies (Al-Najede, 1990; Janmaimool *et al.*, 2019; Sultana *et al.*, 2017) same association have been seen.

4. Conclusion

This study investigates main problem areas relating to waste disposal system in Faridabad city of India and examined people's behavior of Faridabad city to determine their social state toward current municipal solid waste disposal system and level of willingness for better waste disposal system. The result indicates that human behaviour is an important aspect for better solid waste disposal system.

The proposed model of the study has found the factors that have significant impact on people's behavior towards municipal solid waste disposal system through multivariate regression analysis. The factors which are identified through present research are named as Individual's Habit, Government's Initiatives, Legal impositions and

Ecological awareness. These factors have key elements which should be paid more attention in order to improve the system's performance and make positive changes in the behavior of people.

If the other municipalities also concentrate on the identified factors in the present study and follow the proper line of action based on key elements defined under each factor, then they can have better Municipal waste disposal system.

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