Chapter-5A

Results and Discussion

Introduction

This chapter present major finding from collected data. The chapter has three main sections. The first section aims to provide profile of study area (I) i.e. Indore about demography, its significance, technical and social / behavioral aspect of waste management & best practices in city. Making it benchmark or role model of waste management for other cities. While section discuss about the study area (II) i.e. is Varanasi, its demography, significance as well as technical and social / behavioral aspect of waste management. The behavioral aspect of both study are diagnosed through COM-B model, BCW framework and inclusion of TDF make refined selection of intervention to tackle barrier identified. The finally section is comparative study to between two tier II cities having nearly similar number of wards and demography. Though this comparative study we are trying to answer why there is existence of behavioural gap in profiles between Indore and Varanasi.

5.1 Background of study Area-I (Indore city)

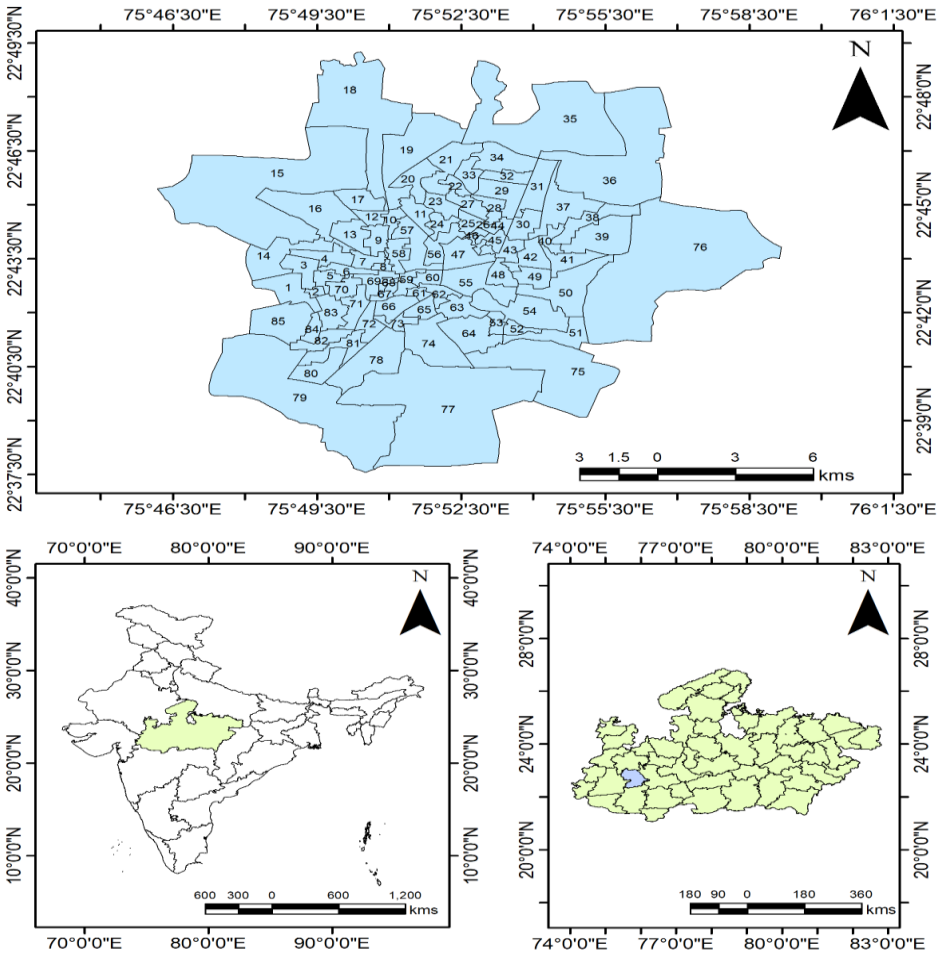

Figure 5.1 : Ward map of study area I – Indore.

5.1.1 Indore

Indore is the largest city of Madhya Pradesh in terms of its population. As per Census records, population of Indore city in 2011 is 19, 64,086 and the population of Indore metropolitan region is 21, 95,974 after inclusion of 29 villages. The City is administered by Indore Municipal Corporation (IMC) for provision of civic facilities and is spread over a geographic area of 276 km2 **(**Fig. 5.1). In year 2014, on date 20th November Government of Madhya Pradesh merged 29 villages into IMC limits, thus increasing the jurisdiction of IMC. IMC area is divided in 19 administrative zones & 85 wards. It provides essential civic amenities to its rapidly growing urban population.

Figure 5.2: Conditions of Indore city before 2016.

Before 2016, the MSWM system in Indore encountered numerous significant obstacles. The urban governing apparatus was hindered by unmotivated personnel and inadequate infrastructure (Fig. 5.2.). Public confidence in the municipal corporation was weak, and citizen engagement in trash management initiatives was scant. Significantly, there was an absence of a door-to-door waste collection system, and no recognised framework for controlling plastic waste. The absence of coordination and insufficient equipment significantly obstructed efficient trash disposal and environmental sanitation throughout the city.

Figure 5.3: Current existing condition of Indore.

5.1.2 Current Existing MSWM profile of Indore

Post-2016, Indore experienced a significant transition in solid waste management, propelled by strategic planning and strong community involvement. The city implemented a systematic and organised framework for garbage collection and segregation at the residential level. At now, citywide door-to-door collection is implemented, guaranteeing complete source

segregation. The city has evolved from a two-bin to a six-bin system, facilitating the categorisation of garbage into wet waste, plastic dry waste, non-plastic dry waste, household hazardous waste, sanitary waste, and electronic waste **(**Fig. 5.3). Public participation is now integral to this framework, establishing source segregation as the foundation of the city's municipal solid waste management policy.

(a) Waste generation

As per data from IMC (2023), Indore generates approximately 1,192 tons of solid waste per day. The detailed composition of waste is as follows:

Table 5.1: Quantity & types of waste generated in Indore

Waste generation profile	
Total	Approx. 1200 TPD
Dry	Approx. 650 TPD
Wet	Approx. 550 TPD
Wet %	Approx. 45%

Source: Based on IMC data, compiled by author.

Total Waste generation in TPD = Approx. 1,192 it further shorted into six categories (Table 5.1)

I. Quantity of wet waste generated is 692 TPD

II. Quantity of dry waste generated is 483 TPD (Non Plastic – 304 TPD & Plastic – 179 TPD)

III. Quantity of Sanitary waste generated is 11.5 TPD

IV. Quantity of Domestic Hazardous waste generated is 3.4 TPD

V. Quantity of Electronic waste generated is 2.1 TPD

VI. Quantity of Inert in TPD = 31 TPD

This detailed categorization highlights the city's systematic approach to waste auditing and data-driven policy implementation.

(b) Collection &Segregation

A Transformation wave came in 2016 with the introduction of a fully integrated solid waste management that include collection and segregation system. Indore started from 2 bin system and now being upgraded to a six-bin source segregation model, comprising:

- Wet Waste
- Dry Waste (Plastic)
- Dry Waste (Non-Plastic)
- Domestic Hazardous Waste
- Sanitary Waste
- Electronic Waste

This initiative was complemented by 100% door-to-door waste collection, ensuring real-time handling of all waste streams. The active involvement of citizens became the soul of this reform, marking a paradigm shift in civic behaviour and institutional coordination.

(c) Transportation and Logistics

The city deployed an expansive logistics network comprising:

- 600+ household collection vehicles
- 148 sweeping/litter bin vehicles
- 8 meat waste vehicles
- 74 bulk waste carriers
- 36 garden waste vehicles
- 6 mobile composting vehicles

All vehicles are integrated into a Vehicle Tracking and Monitoring System (VTMS), enabling route optimization, real-time tracking, and performance evaluation. Processing and Treatment Infrastructure

(d) Treatment method

(i) Wet Waste: Bio-CNG Plant at Devguradiya

A major highlight of Indore's waste-to-energy strategy is its centralized Bio-CNG plant at Devguradiya. This facility:

- Has a processing capacity of 550 TPD.
- Generates 18,000 kg of bio-CNG per day.
- Operates on a PPP model with Indo Enviro Integrated Solutions Ltd.
- Produces 96% pure methane, sufficient to run ~400 city buses daily.
- Reduces carbon emissions by 1.3 lakh tons annually.
- Generates an annual revenue of ₹2.5 crore for the IMC.

The plant utilizes advanced technologies such as hammer mill technology, Continuous Stirred Tank Reactors (CSTRs), and Pressure Swing Adsorption (VPSA) to ensure high methane yield.

(ii) Dry Waste: Centralized MRFs

The city operates centralized Material Recovery Facilities (MRFs) with combined capacities of 600 TPD. These facilities process plastic and non-plastic dry waste through automated segregation lines.

(e) Treatment of Other Waste Streams

- **Sanitary Waste**: Incinerated by Hoswin Incineration Pvt. Ltd. (Capacity: 20 TPD)

- **Domestic Hazardous Waste**: Treated by Pithampur Industrial Waste Ltd. (Capacity: 55 TPD)
- **Electronic Waste**: Recycled by Unique Eco Recycle (Capacity: 16 TPD)

(f) Landfill Redevelopment and Urban Greening

A landmark achievement was the 100% biomining of legacy waste at the Devguradiya dumpsite in 2020. The reclaimed land has been transformed into a City Forest, with the plantation of 1.5 lakh trees, contributing to ecological restoration and carbon sequestration.

(g) Community Engagement

A key pillar of Indore's success in MSWM has been its commitment to social integration and behavioral change of community. Continuous Information, Education, and Communication (IEC) campaigns, along with Behaviour Change Communication (BCC) strategies, have fostered a strong sense of ownership among community individuals. The involvement of senior government officials, political leaders, and civil society has amplified this impact. Indore has developed 14 public service jingles to promote cleanliness, and the adoption of the 311 mobile app has enabled a rapid grievance redressal mechanism with an impressive 98.8% resolution rate.

5.1.3 Application of COM-B model of Behaviour in Study area-(I) Indore

Study area – (I) Indore.

The household survey questionnaire has been designed and implemented to apply the COM-B model, focusing on capability, opportunity, and motivation factors influencing waste segregation and disposal behaviour. The responses provide insights into behavioural determinants specific to city. Based on this analysis, interventions have been generated to address the identified enablers and barriers. These interventions aim to enhance citizen participation and ensure more effective municipal solid waste management in rapidly growing urban contexts.

Table 5.2: Demographic details of Indore

	Variables		Indore
Demographic	**Age**		AVG-36
	Gender	Male	316
		Female	135
	Education	Primary	6
		High School	39
		Intermediate	77
		Graduation	116
		Post-Graduation	213
	Occupation	Job	216
		Business	42
		Student	146
		Retired	15
		others	32
	Income (monthly)	Less Than 10000	88
		10000-25000	148
		25000-50000	121
		More Than 50000	94
	Number of wards	85	

Source: Based on personal survey, 2024.

INDORE (I)

Demographic Details

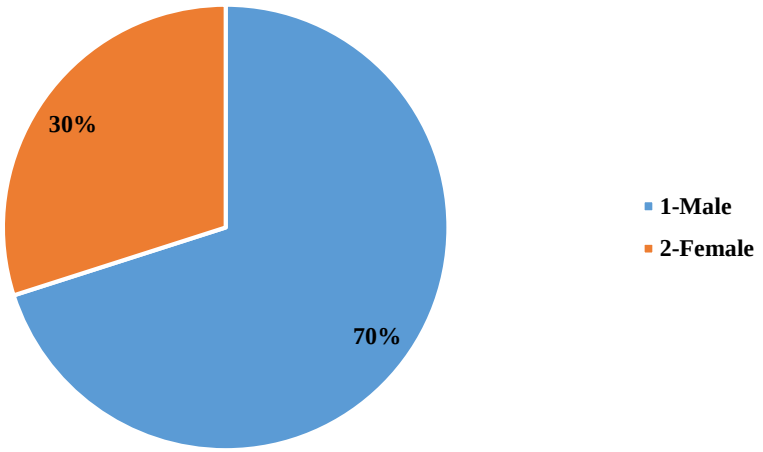

Figure 5.4: Gender of respondents

The study shows that 30% of the participants were female and 70% were male, with an average age of 36. We found most of the females working and highly qualified (Fig. 5.4).

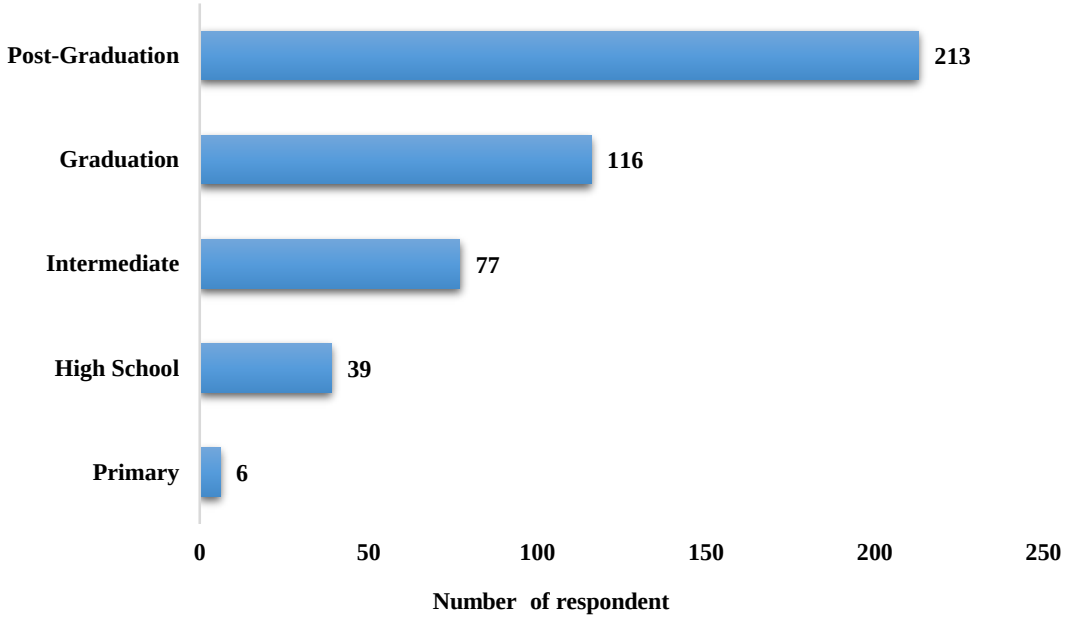

Figure 5.5: Educational qualification of Respondents.

More than 70% of respondents have higher qualifications, out of which approx. 50 % are post-graduation, as reported in the study, followed by graduation, intermediate and high school (Table 5.2). The high literacy rate in Indore reflects that its residents are well-educated and aware. The people are accountable for the citizens' role and responsibility towards the city (Fig. 5.5).

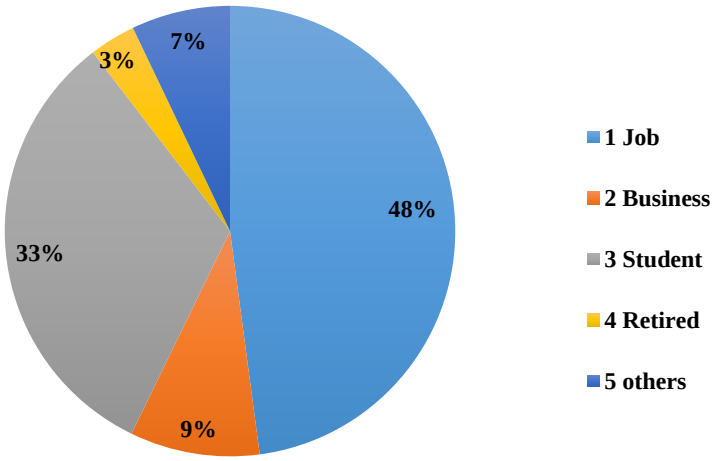

Figure 5.6: Occupation of respondents.

In the study, we observed that 48% of the respondents were in job, 33% were students, 9% were people in business, and 4% were retired personnel. Indore is a developed town surrounded by small towns, leading to significant influxes/migration of people from the rural area to Indore for education, jobs, and other purposes. So, we found that most people migrated from nearby regions or surrounding areas in our studies (Fig. 5.6).

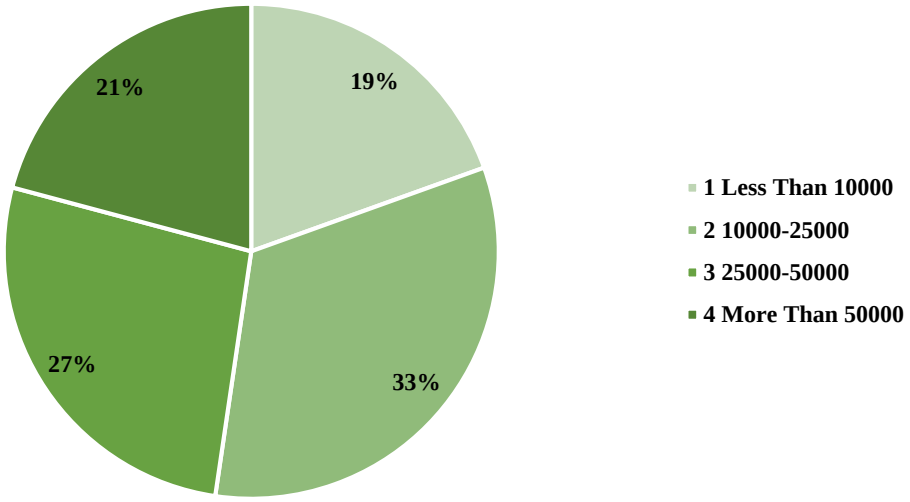

Figure 5.7: Income Level of respondents.

Our study's income level is in the following categories: less than 10000, 10 to 25000, 25 to 50000, and more than 50000. We found in the study that most people belong to the middle class with an average income of 25000 to 50000 because people have higher education, so they earn some amount. The next category is 10000 to 25000, ranging up to 27%, while categories less than 10000 and above 50000 remain around 20% each. Due to the reasonable salaries and payrolls of the people we observed, people are more likely to pay for waste management services consistently (Fig. 5.7).

Now, moving to the question of our main study is the application of the COM-B model, which has variables of capability opportunity in the following series.

Capability (C)

- **Physical Capability (IPC)**

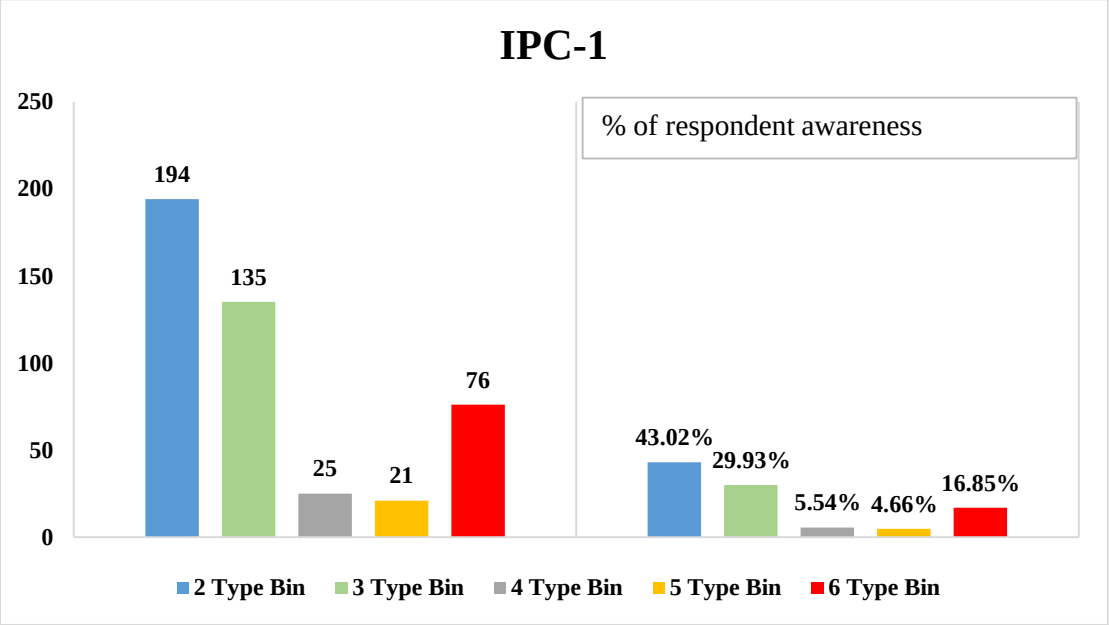

Figure 5.8: Awareness about waste bins to respondents.

In our study, we found awareness of the type of bins, where we can see none of the respondents have answered about the existence of a single bin / one bin concept rather than they responded between 2 to 6 bins and the categories in which they can segregate. 43% of the respondents said they could separate in 2 bins, followed by 30% said three bins, 16% said six bins, and the rest 5% accepted they know four-bin segregation and five-bin segregation. This graph shows a high level of awareness among citizens regarding the separation of waste in different categorical bins, and we can notice that 100% of the respondents know at least two bin separations, which is a mandatory concern for waste management (Fig. 5.8).

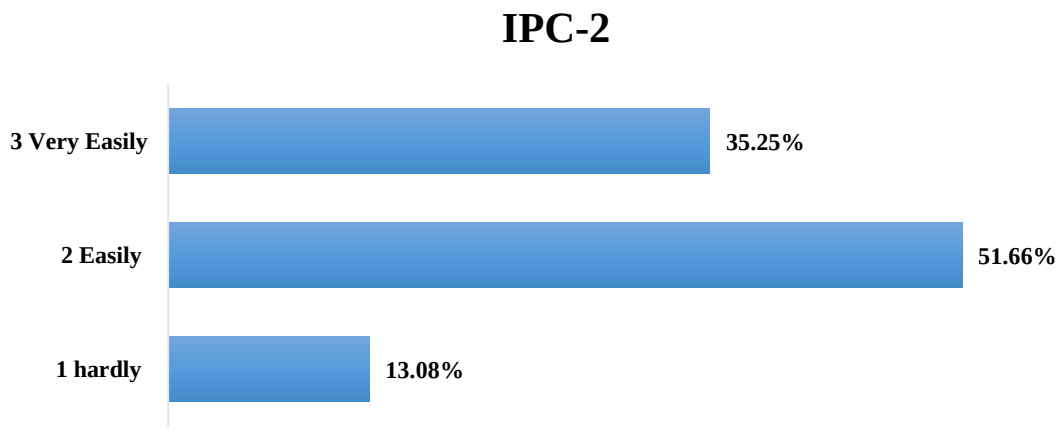

Figure 5.9: Accessibility to bins.

Our study shows that access to the waste bin is easy, where 85% or more respondents said it is easily or very easily accessible. During the fieldwork, we also noticed that every nook and corner of the city is installed with three-bin systems. i.e. biodegradable waste green bin, non-biodegradable waste blue bin and hazardous waste yellow bins. The accessibility shows proper waste disposal, ensuring low littering and sanitation in the city. Due to high accessibility, we found low violations of waste disposal matter reported in Indore (Fig. 5.9).

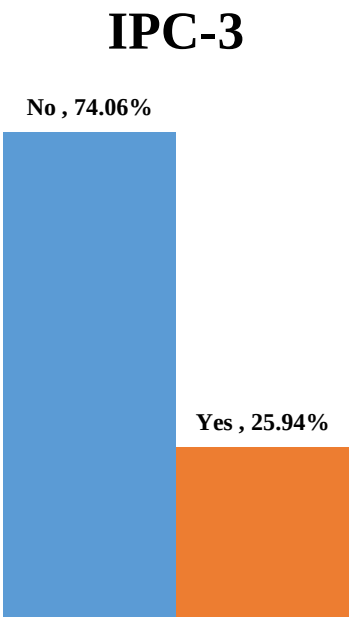

Figure 5.10: Physical barriers during waste disposal.

In our study, we found that for physical barriers, 75% of respondents said there are no physical barriers to waste disposal in bins, like distance or safety, because there are no community bins in most wards of Indore. IMC eliminated Stray animals like dogs and cows from the city, and they have robust door-to-door collection facilities. The garbage collector comes to the doorstep and ensures proper segregated waste collection. Few respondents 25% observe barriers in disposal because some of the respondents are job seekers or in any profession where they usually go outside early in the morning and return late at night due to lack of time they suffer. Community bins are unavailable whenever they get time to dispose of waste, making them feel inconvenient. Hence, few hire service personnel or take help from a neighbour to dispose of their waste to cope with this challenge (Fig. 5.10).

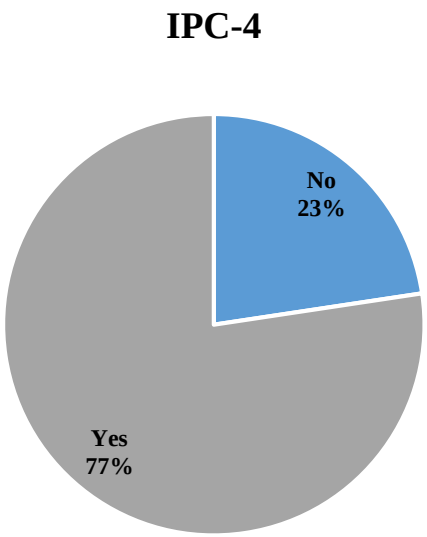

Figure 5.11: Use of safety gear by waste workers.

In our study, we found that approx. 80% of the respondents say that the waste workers have the PPE kit or are equipped with proper personal gear like gloves, masks and other equipment to handle the waste scientifically and appropriately to ensure the workers are less vulnerable to communicable diseases that are very common to the waste pickers and other waste handlers. Waste workers are prone to many communicable diseases, as reported by many researchers.

The IMC demonstrates its commitment by actively safeguarding the health and well-being of the public and the waste workers who face the highest exposure to waste (Fig. 5.11.).

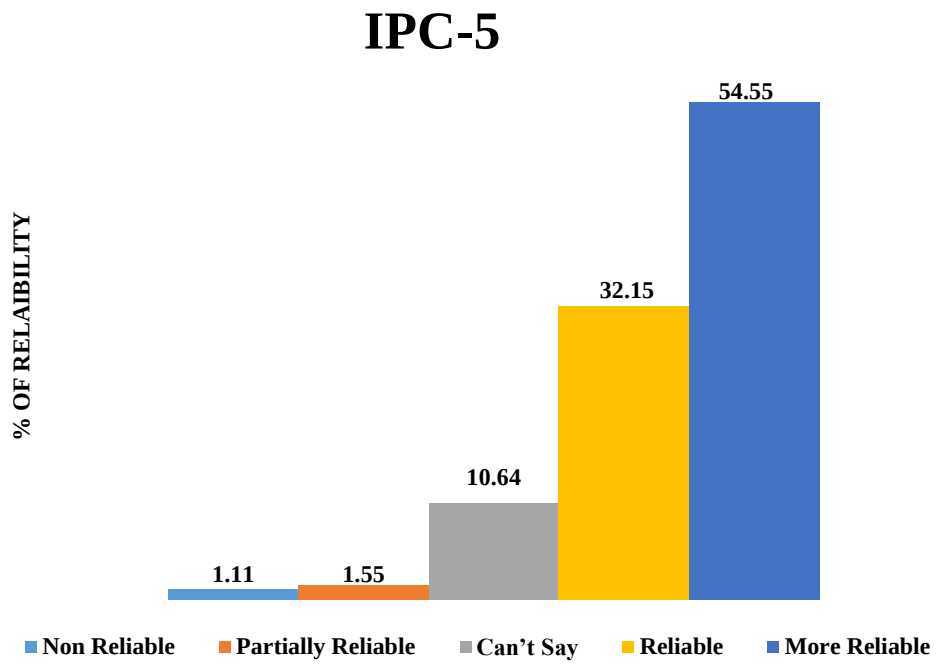

Figure 5.12: Frequency and reliability in door-to-door waste collection.

In our study, we found that the reliability of door-to-door waste collection services is prominent in Indore, where 85% or more respondents claim it to be reliable. It is rated five stars by 50% of the respondents and is highly reliable, while 32% rated it as reliable. The strong confidence of the people in their municipality has gained trust over time due to the provision of good services and fruitful results, i.e. consistently ranking No. 1 "seven times" in a row in Swachta Sarvekshan since 2016 (a sanitation ranking of cities conducted every year by the government of India). In society, very few people say it is partially or non-reliable. People show greater support and concern for the city's cleanliness campaign, which reflects the core goal of the Swachh Bharat Mission (SBM). Trust makes sense where people and IMC stand with a common goal of cleanliness in the city. We observe strong public participation and trust among people in their municipality and cooperate with them, leading to sustainable waste management in the city (Fig. 5.12).

- **Psychological Capability (IPSC)**

Psychological capability encompasses skill, knowledge and cognitive processes for specific behaviour.

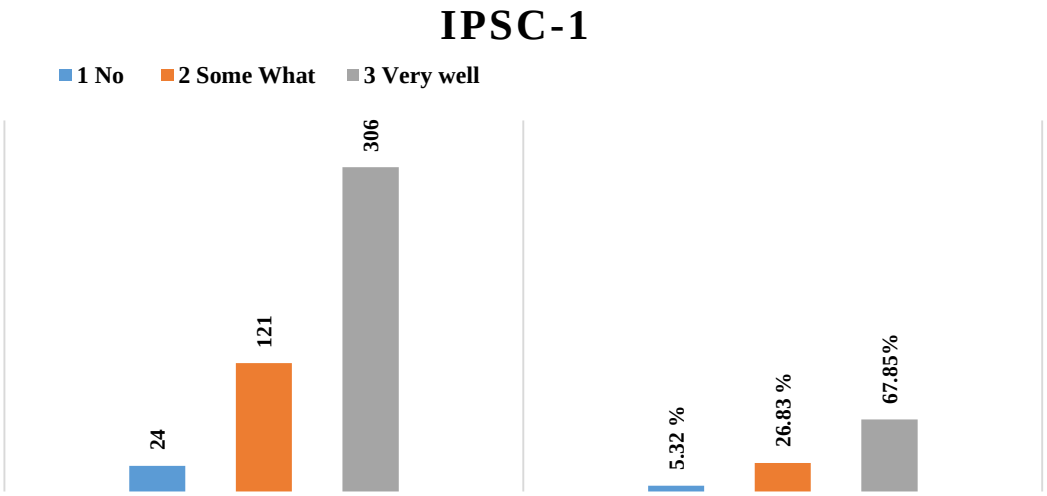

Figure 5.13: Waste segregating behaviour of the respondents.

According to our study, about 95% of participants reported waste segregation awareness, and 67% claimed to know it 'very well'. While 26% agree to know somewhat, meaning at least in 2 or more categories as per previous results, most of Indore's public know 3-4 category separation. However, the waste is segregated into six levels. 5% say they 'do not know' their number is negligible. Indore city shows a high awareness of segregation, which may be due to education and responsible citizen behaviour. Hence, public involvement and participation with the municipal corporation leads to effective waste management (Fig. 5.13).

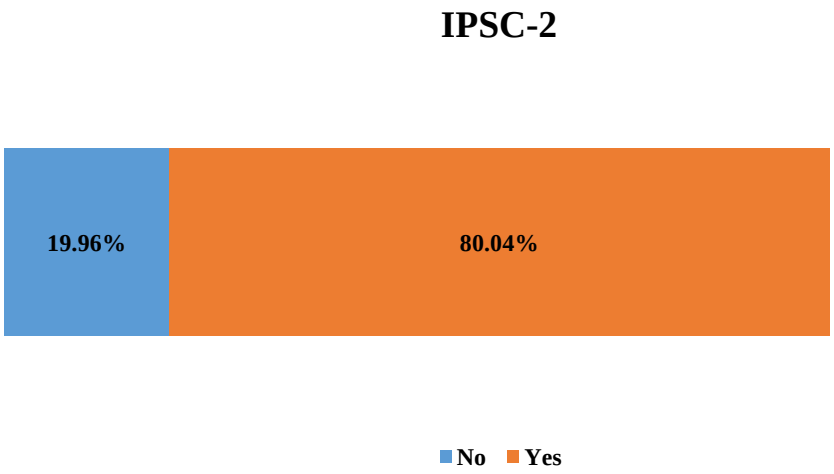

Figure 5.14: Workshop/school programs to educate residents.

Our study reveals that 80% of the respondents say there are frequent workshops and education programs specially focused on source separation that take place under the guidance of Indore Municipal Corporation throughout the year, placing camps in different wards and outreach programs. There is a high level of awareness and commitment among the people and the service-provider municipal corporations that come together to make a city clean and hygienic. Indore sets the benchmark and acts as a role model for other cities and city residents to learn from them and achieve milestones of cleanliness for their city, too (Fig. 5.14).

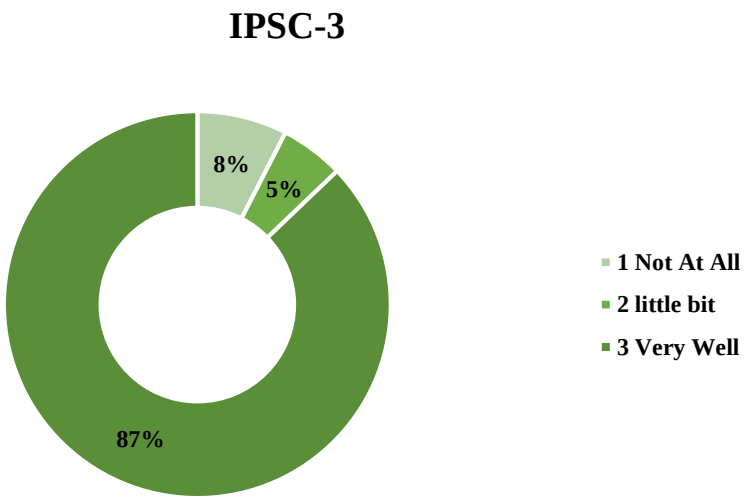

Figure 5.15: Health impact of MSW on respondents.

Healthy living depends significantly on the quality of the surroundings we inhabit. The responsibility for cleaning and tidying the city is directly related to sanitation in society. Our survey reveals that around 90% of Indore residents know the health and consequences of improper waste disposal. In fact, through proper waste management, they can connect the issues related to waste and health vulnerability. The OPD rates have drastically decreased in the city by more than 50%, as reported by the health centre since 2016, clearly depicting the correlation between cleanliness and health (Fig. 5.15).

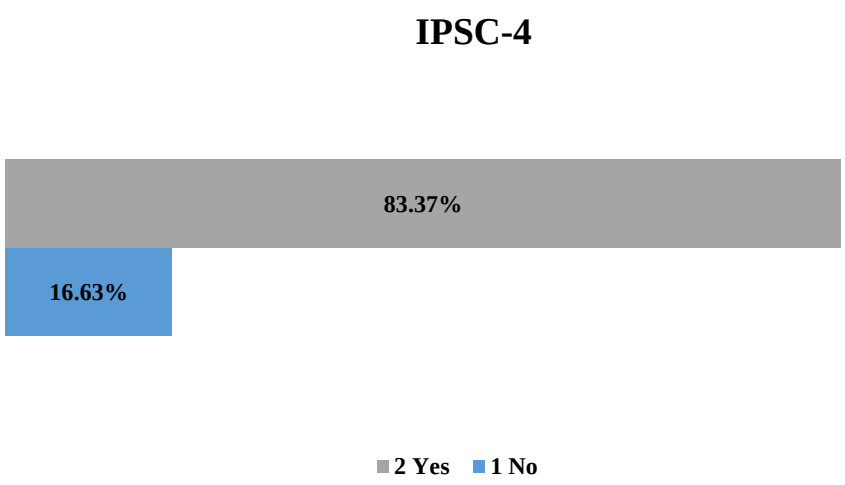

Figure 5.16: Individual trained for composting.

Our study found that people show confidence that they are well-trained in composting and other waste management techniques. More than 80% agree with this statement. IMC continuously works with the individual to increase their awareness and knowledge to handle biodegradable waste in their capacities. Source segregation enables the use of waste for composting at home or within welfare societies, promoting a decentralised approach to waste management (Fig. 5.16).

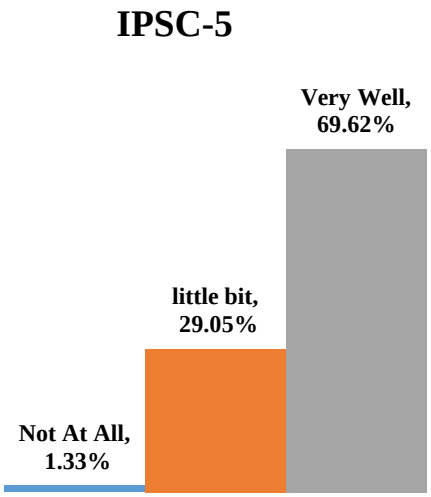

Figure 5.17: Awareness of the city's MSWM policy.

Our results show that 70% of the respondents know the city's MSW policies. The findings indicate that 70% of respondents are familiar with the city's MSW policies, which can be attributed to the active engagement of residents through public meetings and post-implementation feedback mechanisms. Few individuals reported they know "little bit" about it because they might not participate in the meetings due to time limitations or other reasons. Policy awareness makes an individual act according to the city guidelines, ensuring effective municipal solid waste management. Many researchers have reported that effective municipal solid waste management is possible through strong communication between local government /urban local bodies and the public (Fig. 5.17).

- **Physical Opportunity (IPO)**

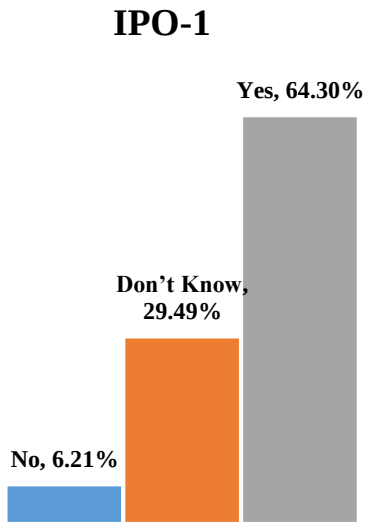

Figure 5.18: Availability of recycling facilities

Our study reveals that there is spare availability of recycling facilities in Indore. In our survey, 65% of respondents said they were well aware of the recycling facility and had enough landfills to manage their waste volumes. Approx. 30 % expressed that they do not know. Our field observation observed an extensive and specialised MRF facility near Devgarudia. IMC claims to have bio-mined all the legacy waste in landfills or dump yards, but now, no landfill is available. As per their claim, they completely process all MSW generated in the city via different treatment facilities. Thanks to effective restoration and infrastructure development, the reclaimed landfill site now serves as a playground (Fig. 5.18).

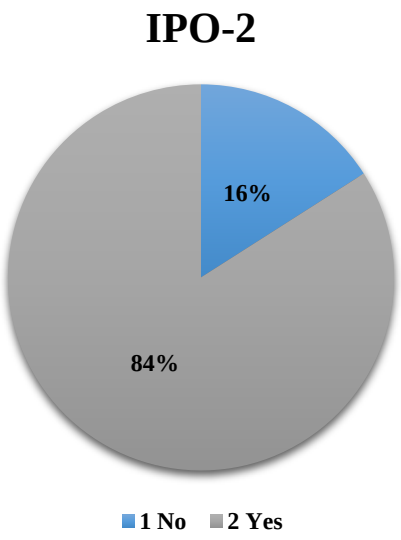

Figure 5.19: Availability of separate bins for waste disposal.

The study reveals that 85% of the respondents said three separate bins are available. i.e. green bin for biodegradable, blue bin for non-biodegradable and yellow bin for hazardous waste. In our field survey observation, no community bins are available as there is a robust door-to-door collection system, and the city is declared "bin free". Ensuring that infrastructural conditions support behaviour in disposing of waste in a segregated manner (Fig. 5.19).

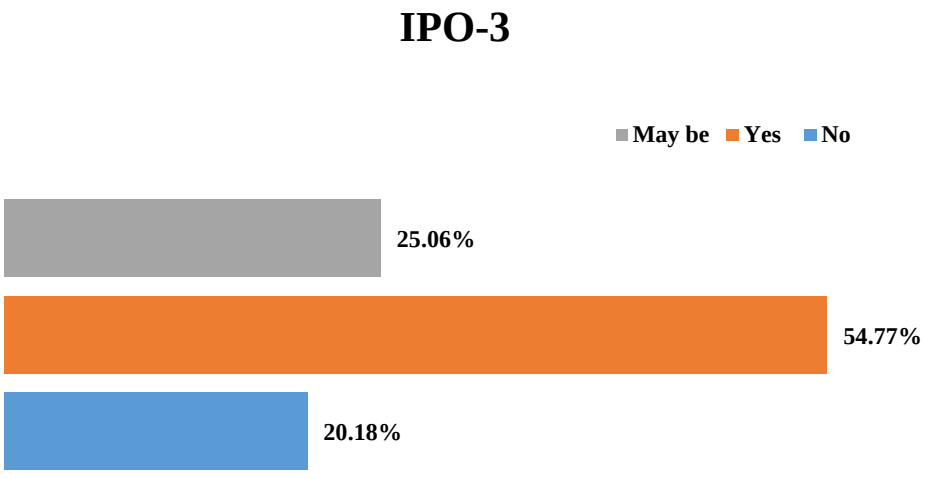

Figure 5.20: Prompt repair of broken bins.

Our study found that about 80% accept that broken bins will be repaired soon. 55% of people confidently agreed to quick repair and replacement of damaged bins, while a few, around 25%, feebly agreed, and a chunk of 20% disagreed too and agreed that the changes happen but not promptly. We can observe that 80% of people agree there is change, which is the trust or reputation of the local government (IMC). Prompt repair and infrastructure maintenance gave the public confidence to act according to the municipality's guidelines and attain pro-environmental behaviour (Fig. 5.20).

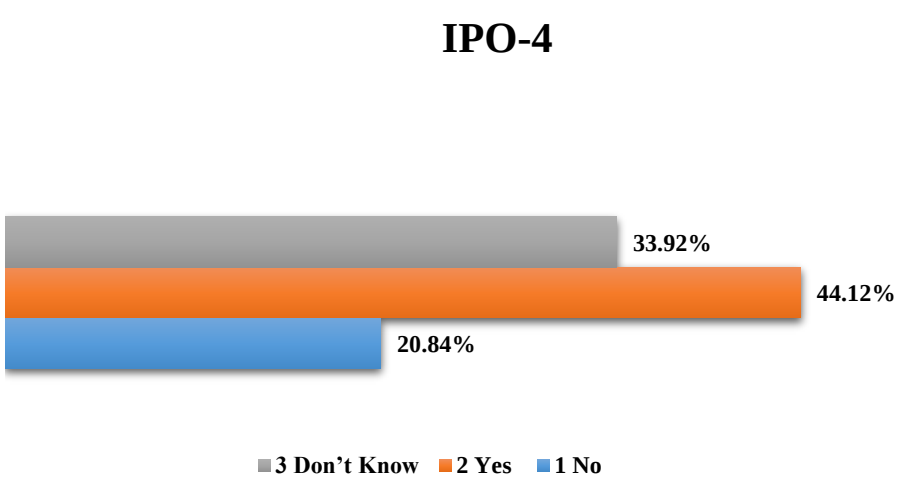

Figure 5.21: Composting facility accessible to households.

Our study reveals that accessibility to Composting facilities to each household, very few respondents, less than 50%, agreed with this statement. They do not have the facility to do composting, although they have the idea or knowledge of how to make compost. Decentralised treatment is mainly the focus of new MSWM guidelines in 2016. To spread this concept, IMC can promote composting at home through a decentralised management plan. Instead, they may provide composter bins or inoculants like bokashi powder to start composting at home. In our field observation, we found many homes are doing composting in their open space, and a few welfare societies were planning to start in-house composting facilities (Fig. 5.21).

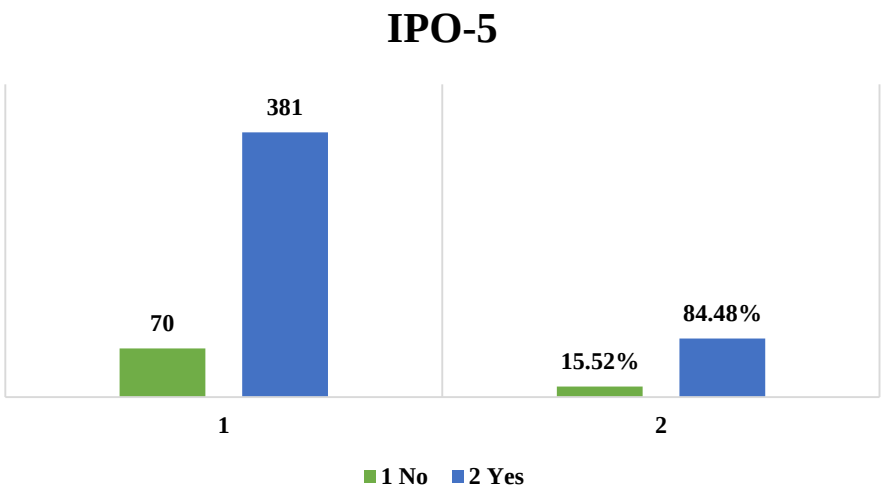

Figure 5.22: Usage of any apps in MSWM.

Our finding shows that citizens are well aware of and use the Application / Technology incorporated in MSWM, such as the 311 app. It is frequently used to readdress the mechanism of MSWM. 85% of the respondents, 381 individuals, ensured that they use this app and justify that it enhances their productivity. The app efficiently locates the bins, MSW vehicles, and disposal points and ensures quick action on complaints using the app in Indore. The app makes it easy to track if areas remain uncovered or attended to and can be monitored and reached. It acts as a strengthening tool for the citizens to ensure cleanness (Fig. 5.22).

- **Social Opportunity (ISO)**

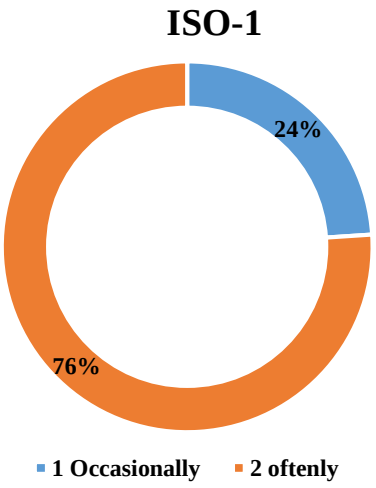

Figure 5.23: Promotion of segregation of MSW via community leader.

Our survey finding reveals that 76% of the individuals agree that their local leader or community head promotes the segregation policy of an MSW regularly in their speeches. Preaching or teaching in the Temple, Church or mosque depicts their leader making their messages on the importance of cleanliness because these people are inspirational to the local public, and their words have a higher impact in their wards. This strategy of involving community leaders is impactful in making society clean and sustainable. Thus, community leaders can ensure significant public participation and public involvement (Fig. 5.23).

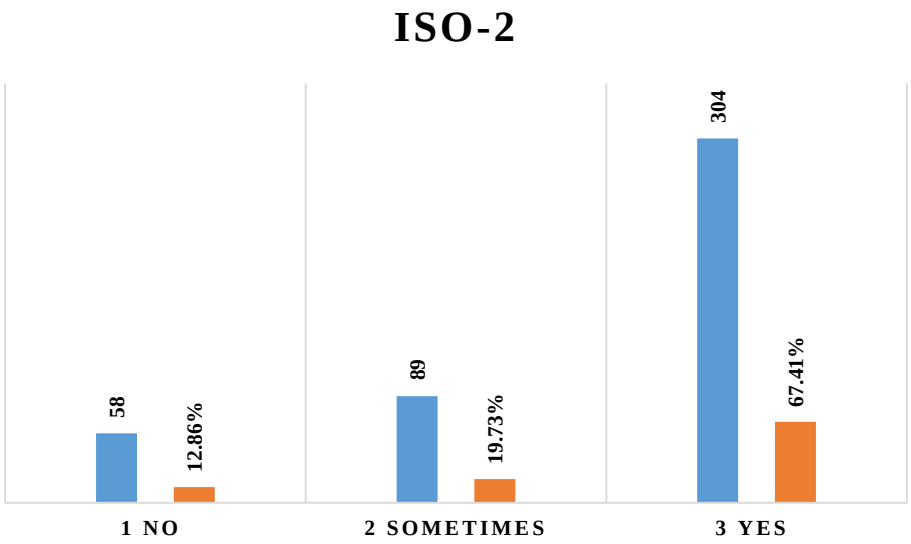

Figure 5.24: Imposition of penalties on non-segregation.

Punishment is a tool used for psychological purposes to change behaviour as it makes people realise their wrongdoing may result in physical or financial issues. 70% of people agree that the penalties are imposed on violation of MSW rules, specifically for the behaviour of non-segregation and littering in public. While 20% say it happens sometimes, only 10% said it never happened (Fig. 5.24). The strict rules may result in the maintenance of discipline in society concerning MSW policy and rules. It not only undermines the wrongdoer but also gives a lesson to the neighbour or colleagues connected to him/her.

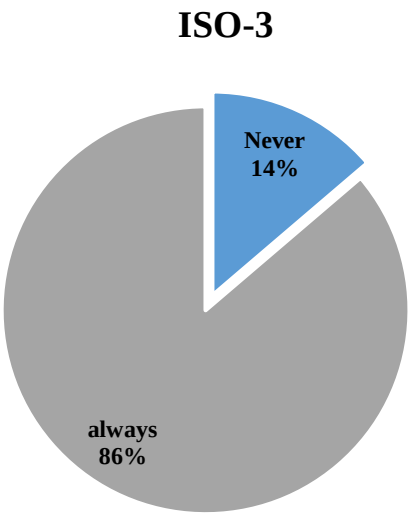

Figure 5.25: Incorporation of MSWM practises in a cultural or religious event.

Our study reveals that 86% said the cultural or religious event incorporates MSWM practices. It also reveals that people take the chunk of waste generated in these ceremonies/functions seriously and that it needs to be taken care of. As we know, India is a country of festivals and home to various cultures, sects, and religions. Hence, every fortnight, a function or celebration goes on, and there are different ceremonies, including festivals, marriage ceremonies, and much more. As we observed in our field survey, it symbolises the public's awareness and the organisers' responsibility to ensure priority to waste management. We were reported that before any function/ceremonies, we take permission from Indore Municipal Corporation. Being informed well before the ceremony ensures that vehicles are allotted and deployed, the required bins are installed and picked up, and transport services are available. The waste was picked up after the ceremony ended, and the service was available 24 hours (Fig. 5.25).

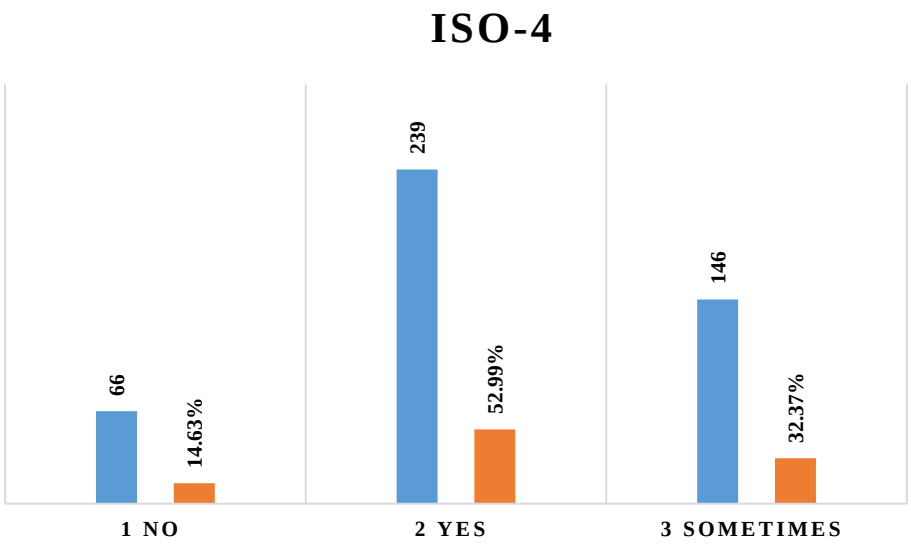

Figure 5.26: Reporting against neighbour for violation of MSW rules.

Our survey findings say that more than 50% of the respondents, around 240 individuals, reported a violation of the MSW rules by their neighbour, and 30% said they sometimes complained, making it positive that 80% of individuals performed the act. Respondents revealed that they never hesitated to report the neighbour for a violation of MSW rules because they are very concerned for their health; this depicts the pro-environmental behaviour of residents of Indore. It shows non-tolerance of public because they keep cleanliness at top priority (Fig. 5.26).

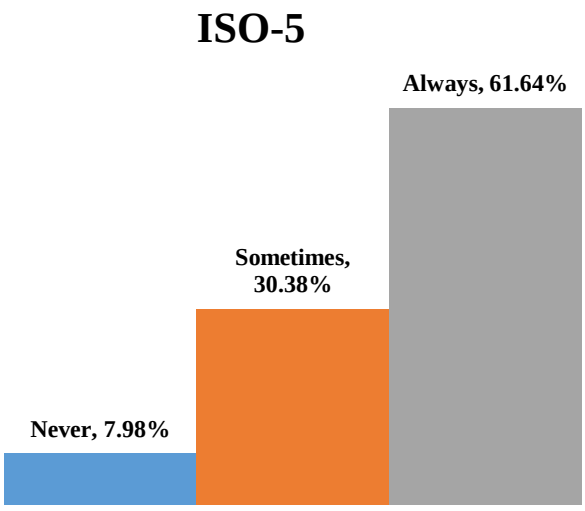

Figure 5.27: Media keeps track of MSWM practices.

Media and mass communication are the fourth pillars of society because they help spread information, shape opinions, and hold leaders accountable. It is key in spreading information, increasing awareness of MSWM, and promoting pro-environmental behaviour. In our survey, we found that 60% of the people say the media always highlights the issue of which management makes the people alert and governance body update on compliances. While 30% sometimes say media highlights, if we see the coverage it is 90% believe that the issue will be covered; hence, the people feel empowered and capable of reporting to the ULBs (Fig. 5.27).

- **Automatic Motivation (IAM)**

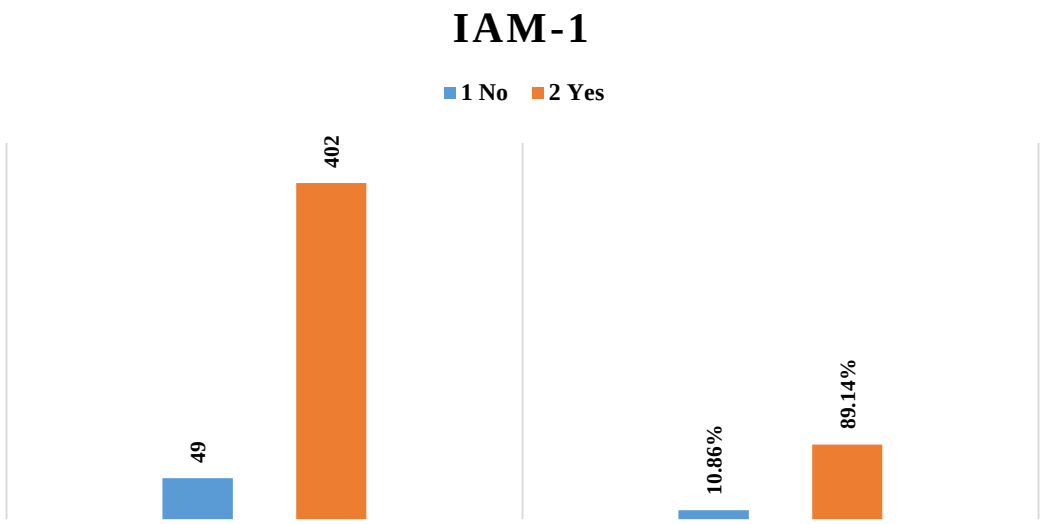

Figure 5.28: Habitual segregation by residents.

Our survey reveals that 90% of household individuals claim habitual segregation. We found highly motivated behaviour due to the support of Indore Municipal Corporation; citizens feel responsible for executing their Civic rights. Motivation results from good capability and high opportunity to engage in "segregation behaviour" because the people of Indore feel proud of being number one in the Swachhata Sarvekshan survey of sanitation done every year. They have consistently ranked 7 times since 2016, becoming a key or core motivator for them. As we know, segregation is a key step toward sustainable waste management, and the city is

established as a role model for other Indian cities to compare and learn from Indore to attain similar status (Fig. 5.28).

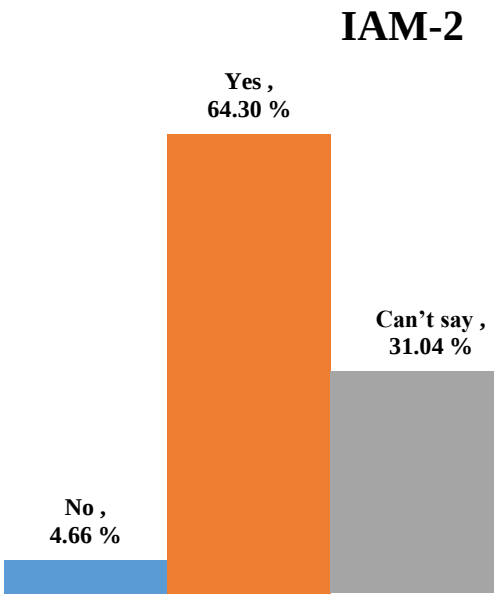

Figure 5.29: Clean Streets perceived as a social norm.

Our survey addresses the perseverance of social norms in Indore. It reveals approx. 65% of people say "yes" to clean Streets as a social norm. Therefore, they act accordingly. Their actions are being translated into the cleanest city consecutively for 7 Times in a row since 2016 in Swachh Sarvekshan. In field observation, we have noticed that street sweeping happens every day. Three bins are placed at each nook and corner of the road at equal distances of around 50 m, properly labelled. These litter bins are only for walkers or passengers on the road. Residents or shopkeepers around the road are monitored and debarred from dumping their waste into the litter bins installed near roads because they already avail themselves of door-to-door collection services. Usually, this helps to make the road and street clean and dust-free (Fig. 5.29).

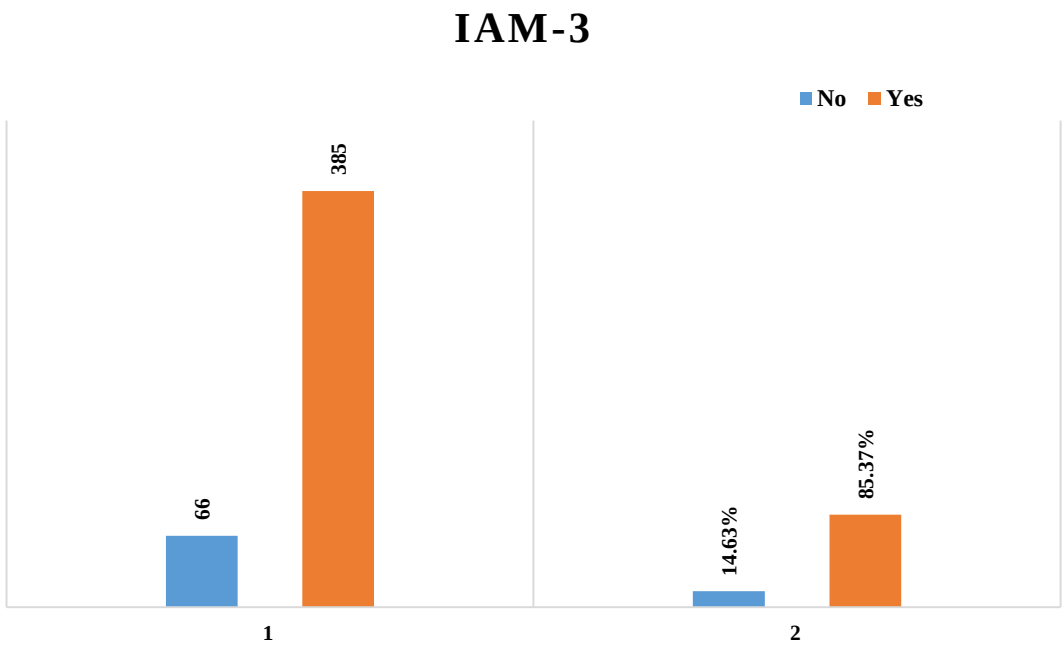

Figure 5.30: Signage/art to nudge residents toward proper disposal.

More than 85% of the people in our survey have agreed that there are signage posters, advertisements, wall paintings and different nudge hoardings explaining the importance of waste management, the role of citizens and the pride moment for Indore to be the cleanest city of the country. Apart from this, 14 jingles were made by renowned singers so that residents of Indore would be aware of them, morally boost, and appreciate their act of segregation. The song develops new enthusiasm and motivates them. Public participation is the key to the success of Swachh Indore (Fig. 5.30).

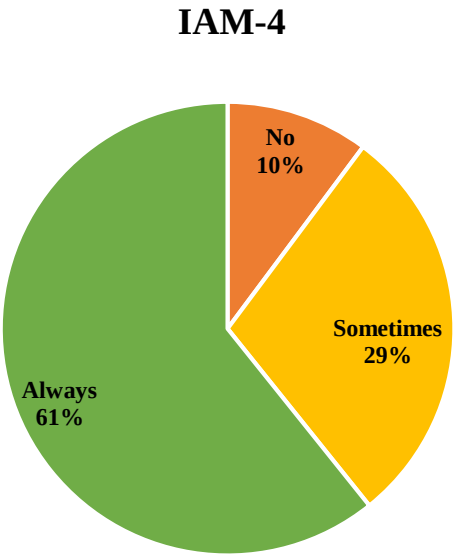

Figure 5.31: Feeling guilt/shame for non-segregation behaviour.

In the survey, when we asked about guilt or shame for non-segregation behaviour, we found that more than 60% of respondents replied that they feel guilty for such behaviour. In comparison, 30% said they sometimes feel guilty, showing an attitude of self-improvement for wrongdoing. They feel a moral or social responsibility to do segregation. Only 10% of people remain nodding their heads (Fig. 5.31).

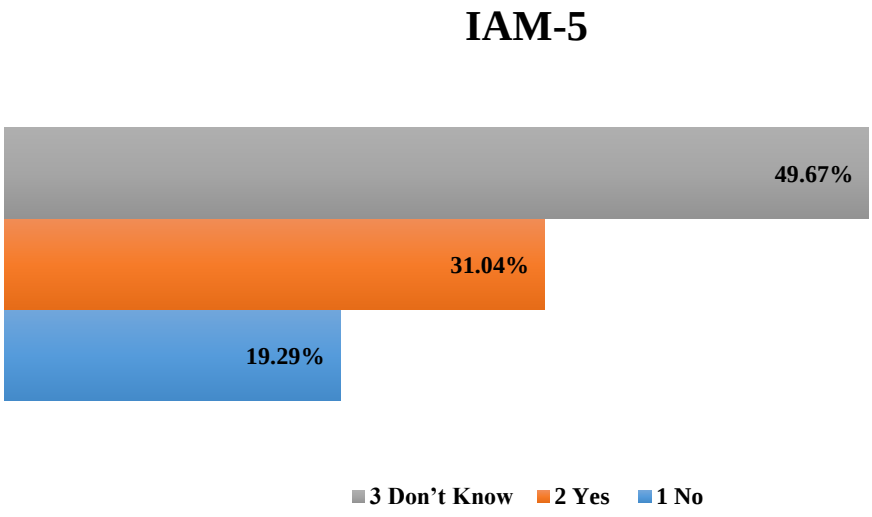

Figure 5.32: Immediate rewards for using green practices.

Our study found that 70% of the people were unaware or non-recipients of any immediate award of segregation. At the same time, 30% confirmed that they got rewards and recognition. This shows a unanimous or unconditional distribution of reward or recognition to citizens. Through Field observation and discussion with the people, we learned that there are some occasional functions where these awards are distributed, the person is recognised, and their efforts are popularised through publication in the press and media. There should be a consistent reward or recognition function or ceremony weekly or monthly to address the champions or the leader making the change. This would motivate and ensure the sustainability of a city's ranking (Fig. 5.32).

- **Reflective Motivation (IRM)**

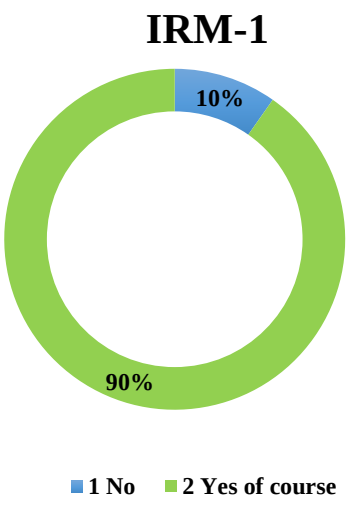

Figure 5.33: Do residents believe their efforts improve Indore's cleanliness.

In our study, we found that residents believe their effort is being translated into the cleanliness of Indore. The finding says 90% agree that their contribution has changed the picture of Indore. The Indore shows the strong messaging system, people feeling right to believe first, and much more. Citizen participation is more often appreciated or motivated. Residents have believed and trusted the local government, and the actions set an example for the other towns/cities to learn.

Society means individuals cooperate and work toward a common goal that can lead to effective waste management and sanitation in the city (Fig. 5.33).

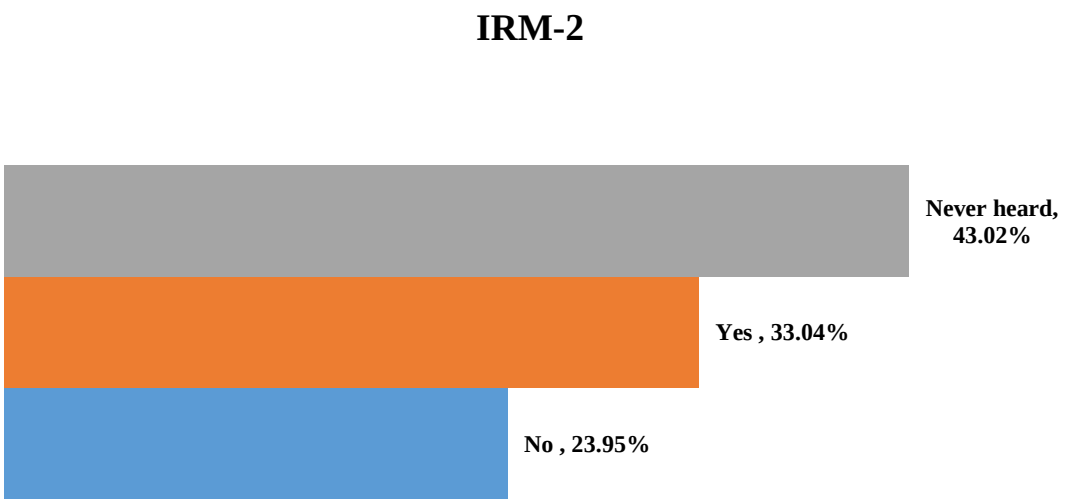

Figure 5.34. Tax rebate / financial incentive for segregation behaviour.

Our study reveals that taxes or incentives are being denied or unavailed in more than 50% of the respondents. They said they do not get any incentive for segregation. Only 30% agreed they received some incentive or reward for their work. Being human, people have expectations or a desire for appreciation for their accomplished tasks. Society's commitment needs to be appreciated and recognised for long-term support. The tax rebate or incentivisation can be a tool for long-lasting results, as we predicted in our survey through public opinion. We have noted that people segregate for pride and cleanliness; some are concerned with their health. In Western society, some other best practices make it tedious to be supported by some incentive in the form of green credits or compost (Fig. 5.34).

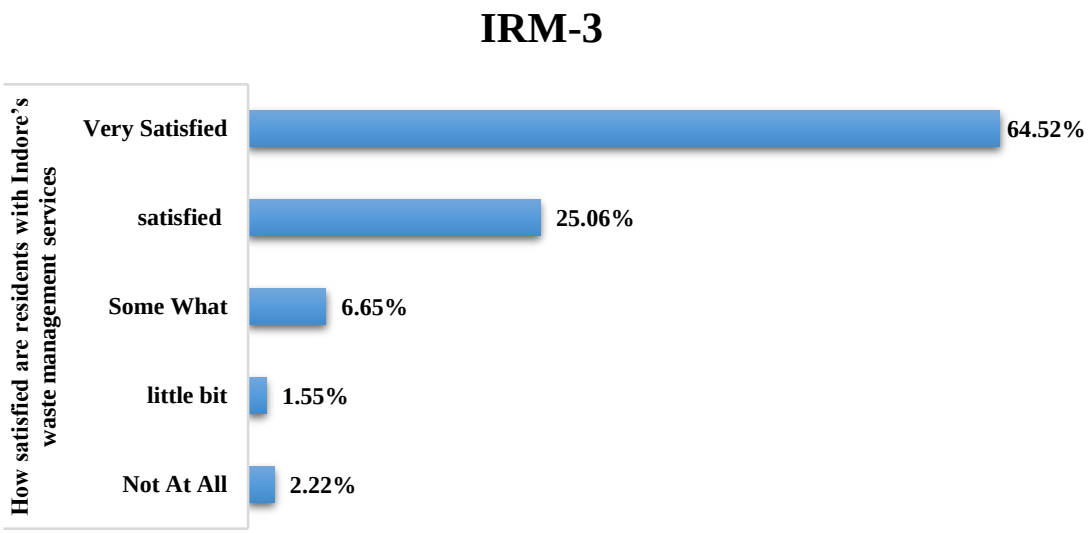

Figure 5.35: Level of Satisfaction with MSWM services of IMC.

Our study reveals the level of satisfaction with the MSWM services of IMC overall: 90% of respondents have proudly said that they are satisfied with the service, and we can see the result too that has been translated in Indore position in the country, i.e. Indore has been nominated 7 times in a row as the cleanest city. If we take an average of all the ratings individuals give, it is an aggregate of 4.1 out of 5, which is a good sign of the service facilities provided (Fig. 5.35).

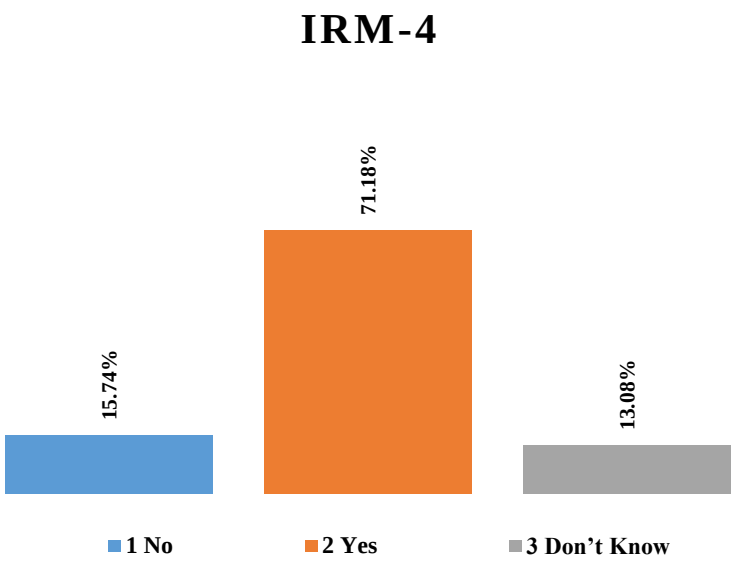

Figure 5.36: long-term environmental benefits emphasised in MSW campaigns.

Our study reveals that more than 70 % of people believe that the MSWM campaign has a message that shows the future vision of the Indore municipal corporation, which is working for long-term environmental benefits. The slogan is reducing OPD cases and achieving the best air quality index since they became the leader in waste management services. The highly educated society in Indore can easily connect with the campaigns and policies to be eco-friendly and resource conservation (Fig. 5.36).

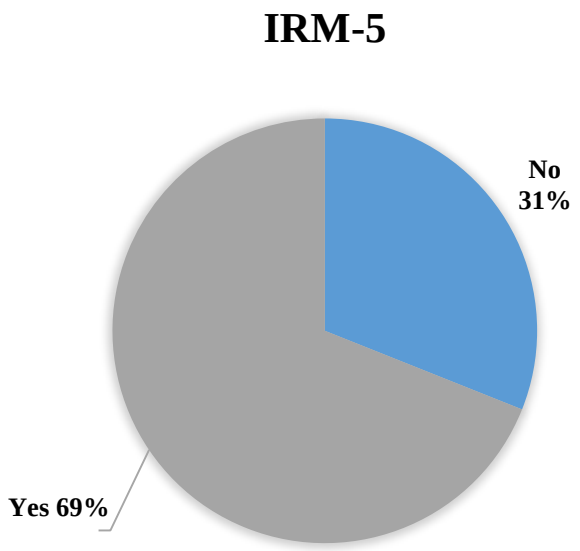

Figure 5.37: Participation of residents in Policy making.

Our study discusses the involvement or community participation in policymaking and finds that 70% agree they are stakeholders in preparing public policy. This shows the inclusiveness of the governance, where the official meets with the beneficiary to get feedback and suggestions to resolve the challenges. Policymaking should involve public involvement; otherwise, it can hinder society's cooperation in legislation. This ensures social acceptance and accountability (Fig. 5.37).

5.1.4 Identification of enabler and barrier in effective municipal solid waste management & Mapping of COM-B, TDF for Indore.

After Analysis of COM-B data enabler and barrier are identified & Mapping of COM-B, TDF for Indore is done below (Table 5.3, 5.4, and 5.5).

5.1.5 Selection of appropriate intervention function by APEASE criteria. (APEASE criteria is added to appendix-II)

After analysis, a list of suggested interventions are drafted and finally appropriate interventions are selected through APEASE criteria for Indore. **(**Table 5.6, 5.7)

Table 5.3: Identification of enabler and barrier in effective municipal solid waste management & Mapping of COM-B, TDF with intervention function for Indore.

COM-B Component	TDF domain	Barrier	Enabler	Intervention function
Physical Capability	Environmental Context and Resources (ECR)		**Enablers**: Diverse bins: 43.02% (2-type), 29.93% (3-type), and 16.85% (6-type). - 51.66% Find points "easily accessible," 35.25% "very easily." 77.38% of workers have gear. 54.55% rate collection "more reliable."	
Psychological Capability	Knowledge (K), Skills (S)		**Enablers**: - 67.85% "very well" aware of segregation. 80.04% report workshops. 87.14% know health impacts. 83.37% of workers trained. 69.62% "very well" familiar with policies.	
Physical Opportunity	Environmental Context and Resources (ECR)	More the 56% have No composting access.	**Enablers**: 64.30% confirm sufficient plants. 84.04% have separate bins. 54.77% confirm repair system. 84.48% use apps.	• Environmental restructuring • Enablement • restriction
Social Opportunity	Social Influences		**Enablers**: 76.05% say leaders promote "oftenly."	

			67.41% confirm penalties. 86.25% say events "always" include practices. 52.99% encouraged to report violations. 61.64% say media "always" highlights initiatives.	
Automatic motivation	Behavioural Regulation, (BR) Reinforcement (R), Emotion (E)		**Enablers**: 89.14% segregate habitually. 64.30% see clean streets as a norm. 85.37% have signage/art. 31.04% receive rewards. 60.75% "always" feel guilt/shame.	
Reflective motivation	Beliefs about Consequences (BC), Reinforcement (R), Social / Professional Role (SR)	More than 66 % Reports no tax rebates.	**Enablers**: 90.24% believe efforts help. 64.52% are "very satisfied." 71.18% see benefits emphasized. 68.96% are involved in planning.	• Incentivization • Persuasion • Education • coercion

Source: Based on personal survey

Note:

% less than 50 is termed as '**barrier**'.
% more than 50 is termed as '**enabler**'.

Table 5.4: COM-B intervention matrix for Indore city.

	Education	Persuasion	Incentivisation	Coercion	Training	Restriction	Environmental restructuring	Modelling	Enablement
physical capability									
psychological capability	**X**								**X**
physical opportunity						**X**	**X**		
social opportunity									
automatic motivation									
reflective motivation	**X**	**X**	**X**	**X**					

Source: Based on personal data

Table 5.5: COM-B intervention – policy and guideline matrix for Indore city.

	Education	Persuasion	Incentivisation	Coercion	Training	Restriction	Environmental restructuring	Modelling	Enablement
Communications and marketing	X	X	X	X					
Creating and disseminating guidelines	X	X	X	X					X
Using fiscal measures			X	X					X
Enacting regulations	X	X	X	X					X
Enacting legislation	X	X	X	X					X
Using environmental and social planning						X	X		X
Providing a service	X	X	X	X					X

Source: Based on personal data.

Table 5.6: Selection of appropriate intervention function by APEASE criteria.

COM-B components	BCW intervention function	Possible interventions	Selection of appropriate intervention through APEASE criteria
Physical Opportunity	**Environmental Restructuring**	Establish community composting facilities in neighbourhoods to provide accessible options for organic waste disposal.	Yes
		Distribute home composting bins to households, enabling on-site composting and reducing reliance on centralized systems.	Yes
	Enablement	Provide composting kits (e.g., bins, starters) along with educational materials to facilitate the composting process for residents.	No
		Organize training sessions or workshops to teach practical composting techniques, empowering individuals to adopt this practice.	No (already exist)
	Restriction	Implement policies that restrict the disposal of organic waste in regular trash streams, mandating composting or alternative organic waste management methods	Yes
	Incentivisation	Introduce a tax rebate program offering financial incentives to households and businesses that demonstrate proper waste segregation and reduction practices.	Yes
		Provide discounts on municipal services or tax credits for consistent compliance with waste management regulations.	Yes
Reflective motivation	**Education**	Conduct public awareness campaigns to inform residents about the tax rebate program, including eligibility criteria and benefits	No
		Distribute resources (e.g., flyers, online guides) explaining how to participate and the environmental impact of waste management.	No
	Persuasion	Use media campaigns, social media, and community events to persuade residents of the importance of waste management and the personal benefits of tax rebates.	No
		Engage local leaders and influencers to promote the program and encourage widespread participation.	No
	Coercion	Implement fines or penalties for non-compliance with waste management regulations, complementing the incentive program to ensure adherence (though this is less directly tied to addressing the lack of rebates).	No

Source: Based on personal survey.

Table 5.7: Final suggested interventions for Indore city.

COM-B components	BCW intervention function	Possible interventions	Selection of appropriate intervention through APEASE criteria
Physical Opportunity	**Environmental Restructuring**	Establish community composting facilities in neighbourhoods to provide accessible options for organic waste disposal.	Yes
		Distribute home composting bins to households, enabling on-site composting and reducing reliance on centralized systems.	Yes
	Restriction	Implement policies that restrict the disposal of organic waste in regular trash streams, mandating composting or alternative organic waste management methods	Yes
	Incentivisation	Introduce a tax rebate program offering financial incentives to households and businesses that demonstrate proper waste segregation and reduction practices.	Yes
		Provide discounts on municipal services or tax credits for consistent compliance with waste management regulations.	Yes

Source: Based on personal survey.

Chapter-5B

5.2 Study Area -II (Varanasi)

Background

Varanasi, one of the country's oldest cities. Varanasi, the name of the city formed by combination of two rivers Varuna and Assi is home to several temples and Ghats. Kashi Vishwanath corridor and Rudraksha convention centre are the two new constructions, contributing to the flocking of many tourists to the city. With the influx of a large number of people and its existing population, much pressure is increasing on the cities' municipal bodies to manage waste generated at incessant levels. Solid waste management play a very important role in cultural, social and economic perspective of the city.

In Swachh Survekshan's 2022 ranking, Varanasi, the electoral constituency of the honourable Prime Minister, stood at the 21st position, which is considered a progressive improvement as it climbed nine ladders from the previous year. Varanasi is one of the rapidly growing cities in the state of Uttar Pradesh and attracts not only national but international tourists at a large scale. However still a contemplative discussion and efforts are required in the field of waste management at government as well as citizen’s level to ensure cleanliness in the city for its development and progress.

5.2.1 Demography

According to the 2011 Census, Varanasi has a total population of 1198491. The population of this region makes up 0.115% of all Indians. As per current scenario the population is about and it is estimated to be 1968198 in 2025 (CSWAP, 2021).Varanasi is divided into 05 zones and 14 subzones and total number of wards is 90 (fig 5.38).With a population close to 1.8 million, Varanasi generates roughly 1012 Tonnes per day (TPD) of municipal solid waste, that is collected and transported along other streams of waste including construction and demolition

waste (HWM Plan, 2018) Currently Solid waste management in Varanasi city is being managed by Varanasi Nagar Nigam / Varanasi Municipal Corporation (VMC).

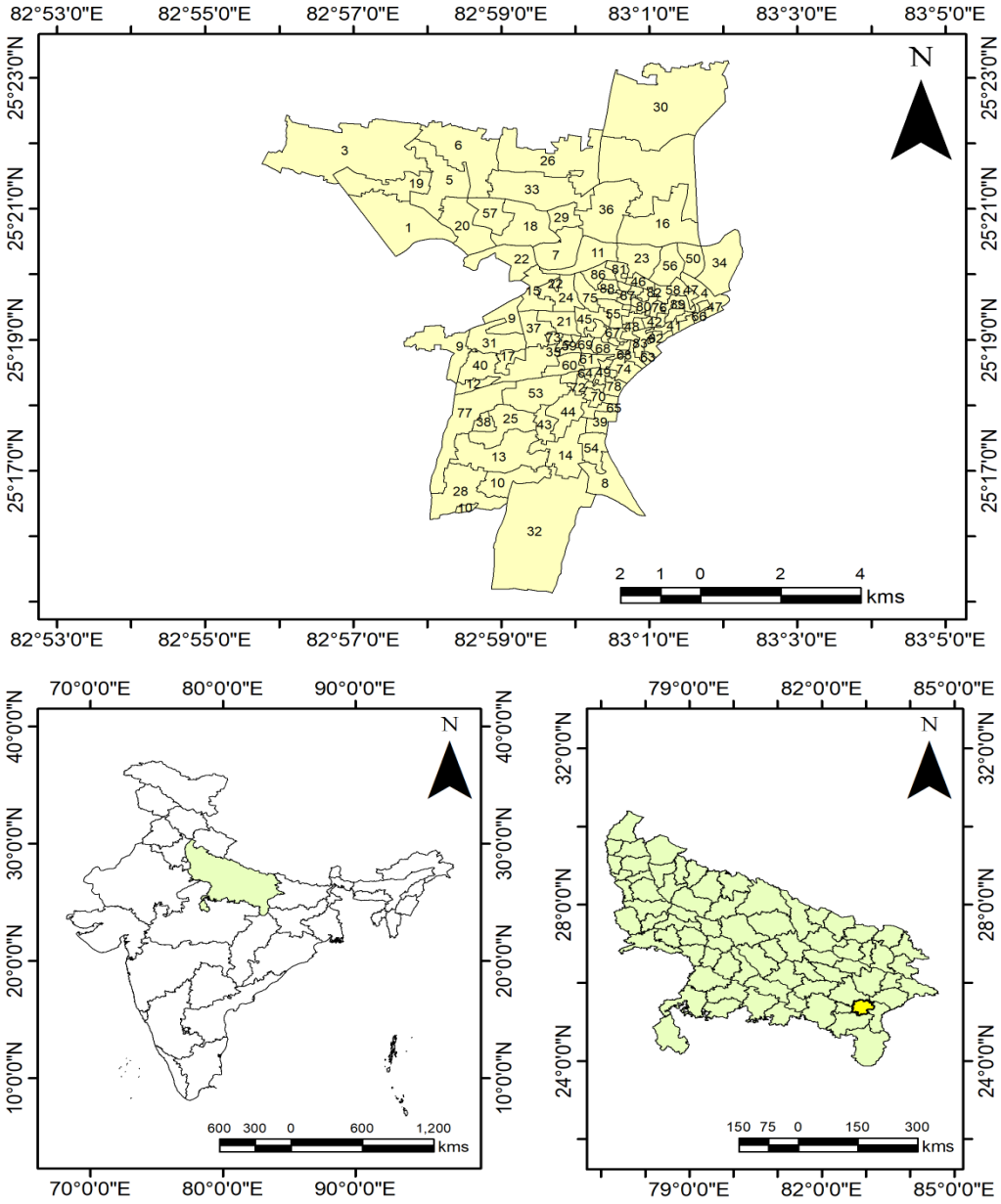

Figure 5.38: Profile of study area –ii (Varanasi).

5.2.2 Overview of Varanasi and Its Cultural and Religious Significance

Varanasi, known as India's spiritual centre, embodies Indian culture. Some of the world's oldest continuously inhabited communities date back to the 11th century B.C. Over the years,

Varanasi has become a cultural, religious, and educational magnet attracting tourists, students, and pilgrims from around the world. Varanasi is historically significant. Kashi, the city's original name, means "the city of light," reflecting its spiritual and intellectual brilliance. Since Hindu legend says Lord Shiva founded Varanasi, Hindus revere it. Due to this celestial bond, Varanasi is spiritual in every way (Srivastava et al., 2020). The city's significance goes beyond Hinduism. Varanasi also pleases Buddhists and Jains. Gautama Buddha's first speech following enlightenment, which started the Wheel of Dharma, was at Sarnath near Varanasi. This significant point in Buddhist history makes Sarnath a pilgrimage place. The city is very important to Jainism because pilgrims visit several Jain temples and historical sites.

Varanasi's character is shaped by the Ganga, which flows gracefully down its eastern border. Millions consider the river a holy place, not just geography. Hindus believe Ganga descended from heaven to purify the planet. After death, many Hindus deposit their ashes in the Ganges River to achieve moksha, or freedom from rebirth, and bathe in it to wash away their sins. The Ganges dominate Varanasi's culture and lifestyle. Thousands of people visit its banks everyday for ablutions, prayers, and offerings. Riverbanks with multiple ghats host this (Mishra, 2015)

5.2.3 Challenges and Opportunities

While Varanasi's cultural and religious significance is undeniable, the city faces several challenges, particularly in terms of waste management and environmental conservation. The influx of tourists and the continuous religious activities generate substantial waste, which, if not managed properly, can lead to pollution and degradation of the very sites that hold such immense cultural value. Efforts are being made to address these challenges. The government and various non-governmental organizations are working to improve waste management practices, promote environmental awareness, and develop sustainable tourism strategies (Trombadore et al., 2020).

5.2.4 MSWM profile of study area-II (Varanasi)

(a) Generation and Composition of MSW:

Varanasi, a prominent tourist and religious destination, generates a significant amount of municipal solid waste (MSW) daily. The waste generated comes from various sources including households, markets, commercial establishments, hotels, hospitals, and small-scale industries. Additionally, the floating population of tourists and pilgrims significantly contributes to waste generation. Local residents generate solid waste at a rate of approximately 0.59 kg/capita/day. The total quantity of waste generated in Varanasi is about 1250 metric tons (MT) per day. Of this, around 950 MT per day is collected, which constitutes approximately 76% of the total waste generated. The composition of waste in Varanasi includes a high percentage of biodegradable, compostable, and recyclable materials. This is largely due to the substantial amounts of religious offerings (such as flower waste) and vegetable waste, along with a significant quantity of plastic waste. The composition of waste in Varanasi includes a high percentage of biodegradable, compostable, and recyclable materials.

Waste can also be categorized based on physical characteristics, such as organics, paper, plastic, glass, metal, cloth, and other residual wastes. In Varanasi, waste characterization reveals that 51.25% of the waste is biodegradable, 15.30% is recyclable, and 33.45% falls under the other waste category (Fig. 5.39). Within the recyclable category, the breakdown is as follows: paper (32.80%), polythene (25.60%), plastic (7.30%), glass (5.70%), metal (5.80%), and other materials (22.80%).

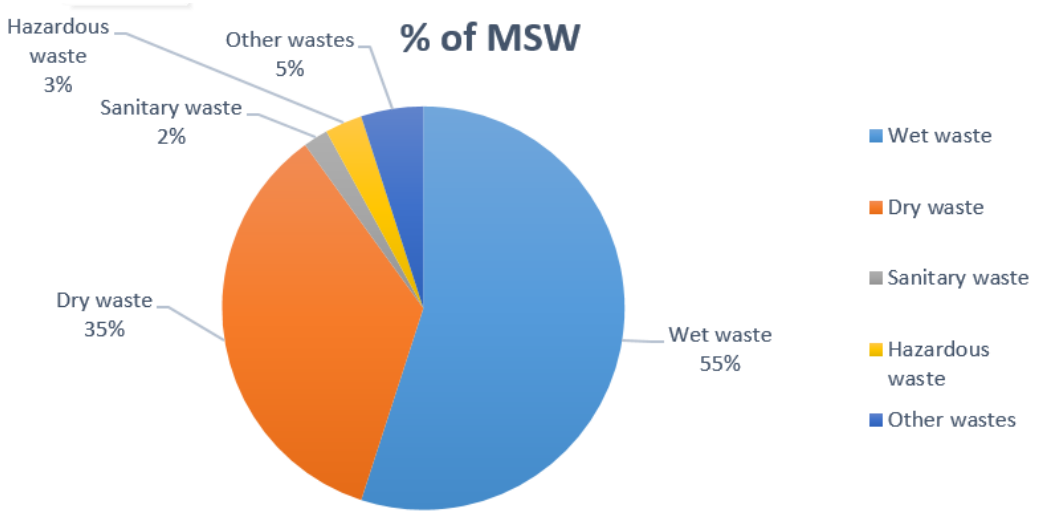

Figure 5.39: Composition of Municipal solid waste.

(b) Collection & transportation: The Varanasi Municipal Corporation collection vehicles and equipment necessary for efficient door-to-door collection. According to municipal reports, the fleet size is adequate to cover the entire city, but the gaps are irregular collection schedules and missed pickups. Additionally, the available vehicles are often old, outdated and prone to breakdowns, further hampering collection efforts (Table 5.8).

Table 5.8: Fleet size of Varanasi Municipal Corporation.

S.No.	Vehicle Type	No. of Vehicle
1	Hopper	107
2	Tractor	19
3	E- Kart Toto	16
4	J.C. B	03
5	Dumper	09
6	Dumper Placer	10
7	Compacter	08
8	Hook Loader	01
9	Water Sprinkler	04
10	Mistgun	01
11	Water Tanker	01
	TOTAL	**179**

Source: Based on VMC data**,** compiled by author.

(c) Secondary Storage Facilities: There is a lack of proper storage facilities for generated waste at the community level. Due to mix collection the amount of waste is huge above storage capacity. The total storage capacity is approx. 500 TPD which is adequately half of the generation amount (Table: 5.9). Many location do not have designated areas where collected waste can be temporarily stored before being transported to processing or disposal sites. This leads to waste being piled up in open areas, contributing to unsanitary conditions and environmental pollution.

Table 5.9: Secondary storage capacity of Varanasi Municipal Corporation.

Operated by VMC		
S.No	**Location**	**Capacity (Ton)**
1	Aurangabad	30
2	Golgadda	36
3	Reori talab	24
4	Hartirath	48
5	Sankuldhara	12
	Total	150
Operated by Varanasi best solution Pvt.		
6	Tehsil	2
7	Vidhyapeeth	100
8	Shivpur	120
9	Senpur	6
10	Beniya	30
11	Shivala	60
12	Pitrakund	12
13	Machodari	24
14	Aaedhe	120
	Total	474

Source: Based on VMC data**,** compiled by author.

(d)Treatment and disposal

Most often mixed waste reaches the treatment or processing plant. Segregation happen manually and mechanical via trommels. Dry waste is discarded for landfill or some with combustible potential is converted into RDF (Refuse derived fuel). While Biodegradable, and compostable materials make up the majority of the waste produced. This is because the city produces a lot of vegetable and religious garbage in addition to a lot of plastic waste. Nearly 41.95% of the waste is primarily organic in nature (SWM plan, 2019).Varanasi in Uttar Pradesh, display decentralised and centralised model. The waste is collected in few wards, the

waste is segregated into biodegradable and non-biodegradable categories. In Varanasi city there are three Waste to Energy plants operates on Decentralised Method based on DRYCO-AD™ technology and one Waste to compost plant (Karsada) that operates on Centralised method (Fig. 5.40).

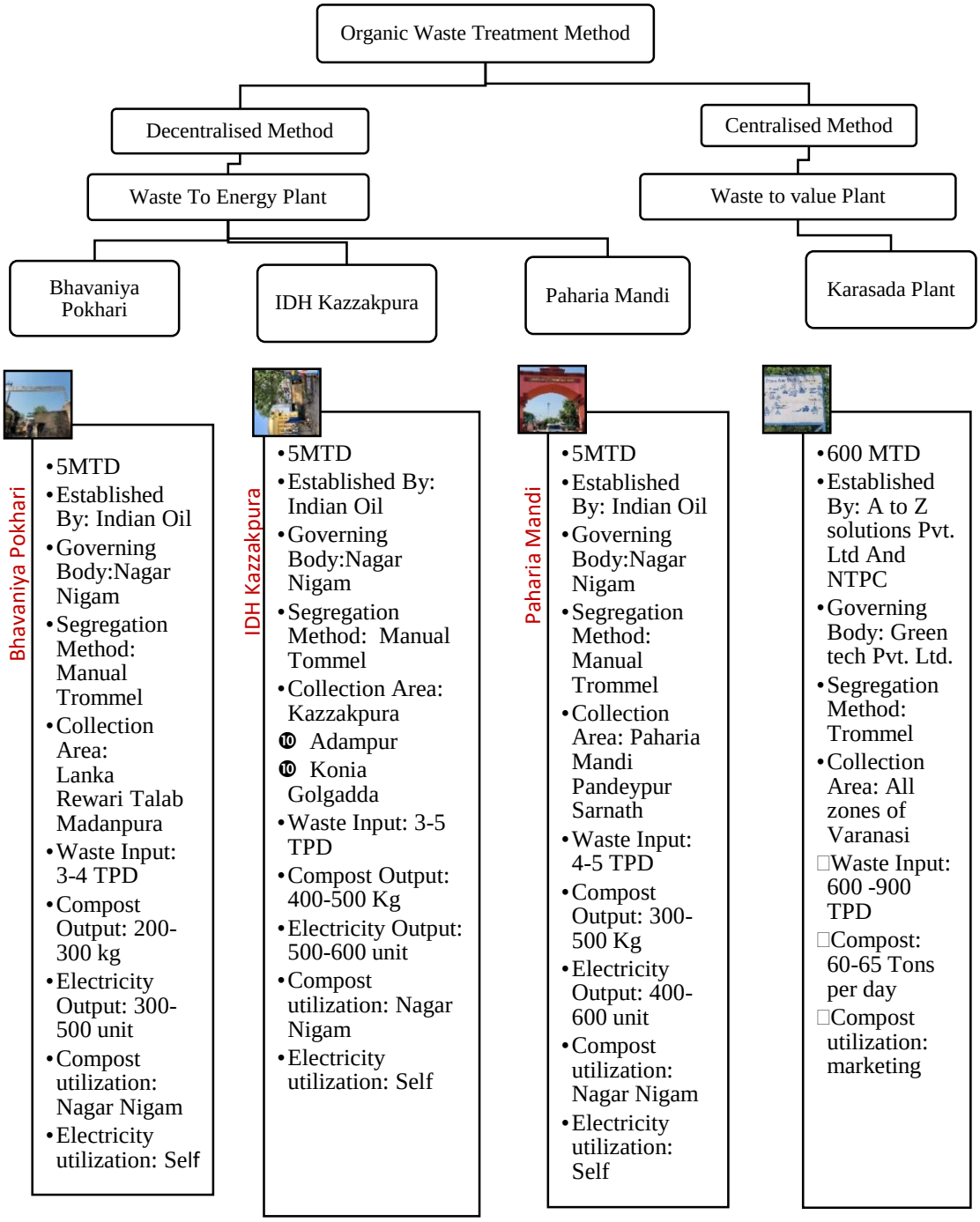

Figure 5.40: Decentralised and centralised organic treatment plant of Varanasi.

Source: Based on primary survey.

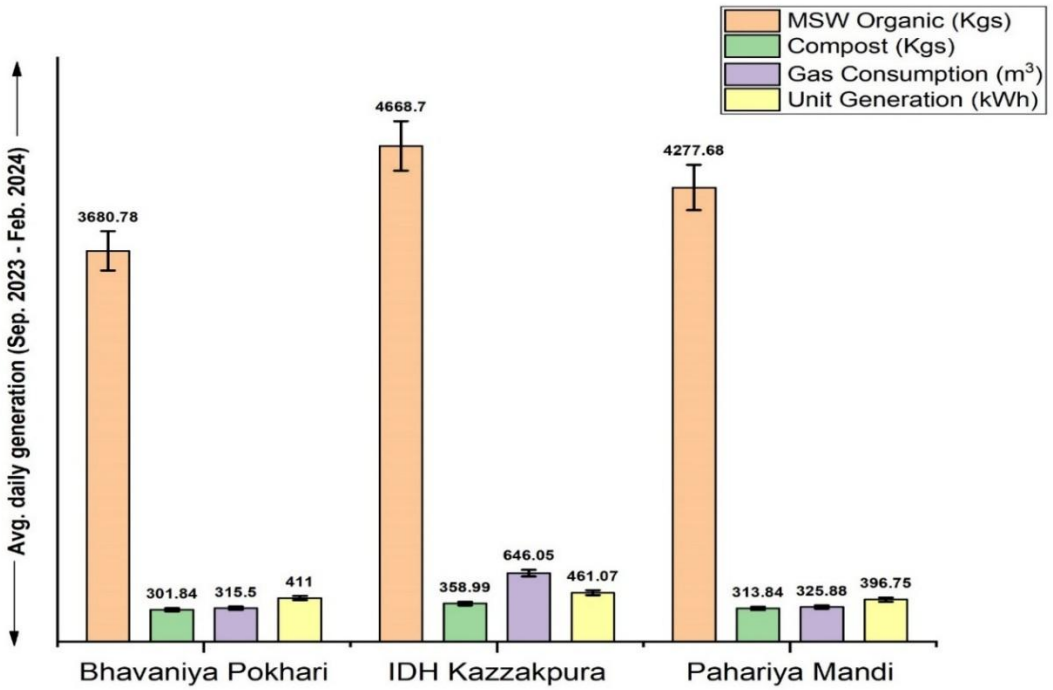

Figure 5.41: Comparative daily analysis of 3 decentralized plant in Varanasi.

Source: Compiled by author

(e) Inconsistent performance of treatment plants

We performed a comparative analysis of 3 decentalised plant and acentralised plant in Varanasi of capacity 5 TPD capacity (each) while 750 TPD respectively . The study reveals that decentralized plant are running below capacity due to shortage of raw material due lack of segregation at source. However the centralised plant is running over capacities due to high amount of mix waste that cannot be input in other decentralized plants (Fig. 5.41). The inference can be draw how a lack of target "segregating behavior" lead to failure the appropriate and adequate infrastructure or technology.

(f) Landfill: the discard of MSW after processing is place called SLF around karsada treatment plant while another dormant disposal site is Ramana.

5.2.5 Public Awareness and Participation

(a) Lack of Public Awareness: Public awareness about proper waste disposal practices is generally low. Despite efforts by various governmental and non-governmental organizations to

educate the public, a significant portion of the population continues to dispose of waste improperly. Surveys indicate that while around 70% of the population understands the importance of proper waste disposal, only 40% practice it regularly.

(b) Cultural and Religious Practices: Varanasi is a city of immense religious significance, and many cultural and religious practices involve offerings such as flowers and food, which often end up as waste on the ghats and in the Ganga River. Managing this type of waste requires not only infrastructural solutions but also cultural sensitivity and community engagement.

5.2.6 Application of COM-B of behaviour for study Area –II (Varanasi)

Table 5.10: Demographic details of Varanasi.

	Variables		Varanasi
Demographic	**Age**		AVG-34
	Gender	Male	298
		Female	153
	Education	Primary	8
		High School	37
		Intermediate	96
		Graduation	205
		Post-Graduation	105
	Occupation	Job	174
		Business	126
		Student	121
		Retired	12
		others	18
	Income (monthly)	Less Than 10000	66
		10000-25000	102
		25000-50000	223
		More Than 50000	60
	Number of wards	90	

Source: Based on personal survey, 2024

- **Demography**

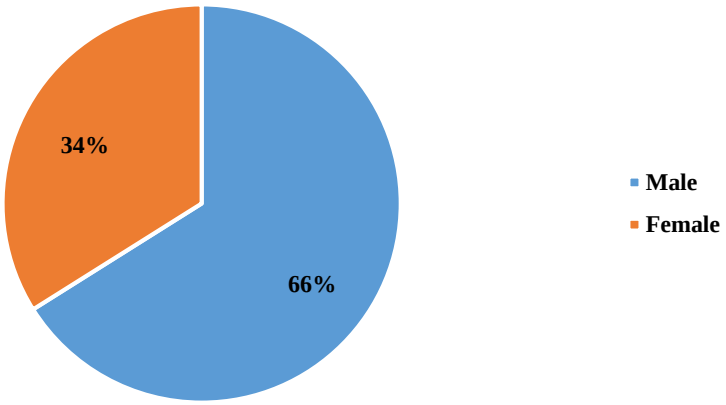

Figure 5.42: Gender of respondents.

In our survey, we found that 34% of respondents are female and 66% of respondents are male. The male and young generation feel more confident about discussing waste management issues. The mean age lies between 33 years, and most respondents, i.e., 67%, are ranging from 21 to 50 years old. They are most willing to participate and discuss the most basic problems and barriers in source segregation in MSWM (Fig. 5.42).

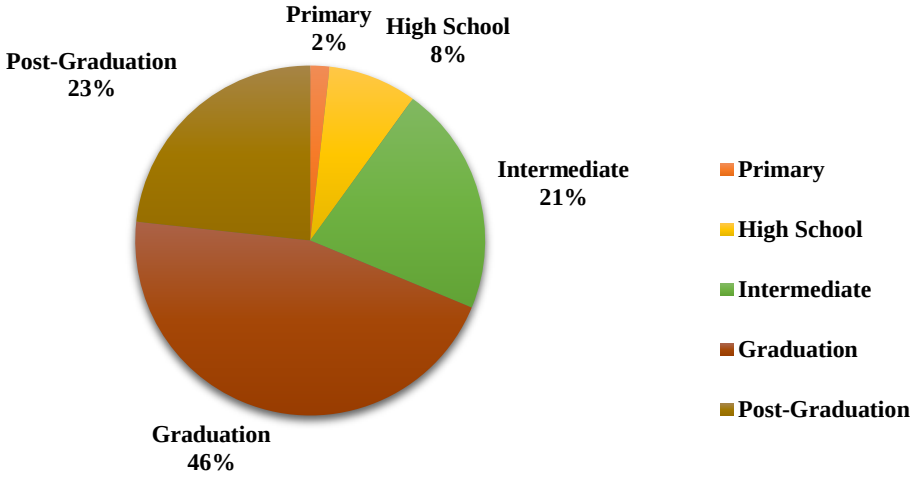

Figure 5.43: Educational Qualification of respondents.

In our survey, we found that most of the people who participated in our study have the qualifications of graduation, i.e. 46%, followed by post-graduation 23%, intermediate 21%, and high school to primary 8-2%, respectively. People with higher education are more willing to participate and share their views on waste management. In contrast, with low education, people are found to be hesitant to respond to the issue of waste management (Fig. 5.43).

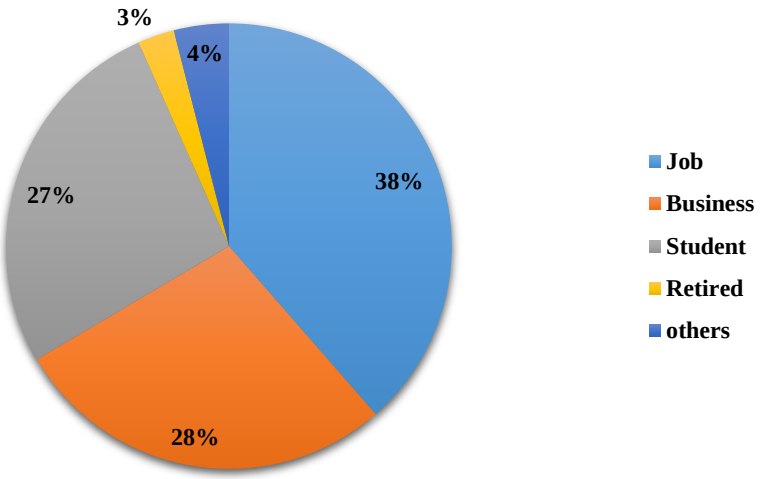

Figure 5.44: Occupation of respondents.

Let us talk about the occupations of the respondents. It is like that most people are engaged in their jobs, i.e. 38%, followed by business, 28% and students, 27%, and the rest are retired personnel or from another occupational sector (Table 5.10) (Fig. 5.44). People from different backgrounds and occupations face different types of waste management challenges, which might be revealed in the later part of the chapter.

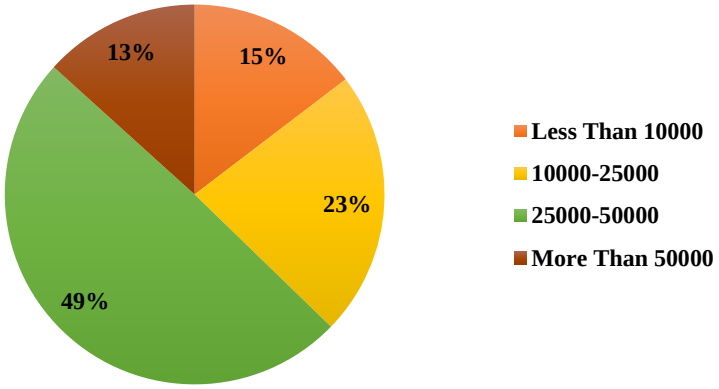

Figure 5.45: Income Level of respondents.

Most of the respondents belong to an income group ranging from 25000 to 50000, i.e. 49 %, followed by 10000 to 25000 that is 23%, followed less than 10000 15% and the rest more than 50000. In India, we find most people lie in the middle class, i.e. 85% or more of the population earning less than 50000 less (Fig. 5.45).

Now, moving to the main question of our study area is applying the COM-B model, which means capability opportunity and motivation. So, the questions start with capability. Capability is skill strength or capacity to accomplish a task. Capability is of two types: (i) physical capability (ii) psychological capability.

- **Physical Capability (VPC)**

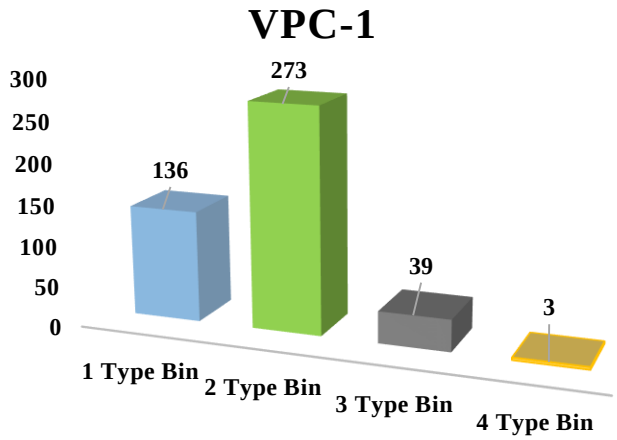

Figure 5.46: Awareness about the different type of waste bins.

In our survey, we found that approx. 70% of respondents have prior knowledge about the segregation category of more than 2 bins. At least 60 % of the respondents have said they can segregated into two bin categories, followed by 30% saying one bin, approx. 8% say they can in 3 categories. 70% awareness about having at least two or more bins for segregation has been found in the present survey. This assures the physical capability to segregate waste into at least two categories. At least two bin segregation at the source can be a meaningful outcome because the most tedious job is to separate biodegradable components from non-biodegradable ones if mixed. Sorting the rest of the categories can be manageable in the later phases. Our field observation in Varanasi found community bins, mostly single-colour or sometimes double-coloured bins. Rarely. They are often broken or overloaded, but their placement is inappropriate regarding household patterns. Many of the dustbins we have noticed get flooded with waste that spreads all around, and the collection frequency is once a day (Fig. 5.46).

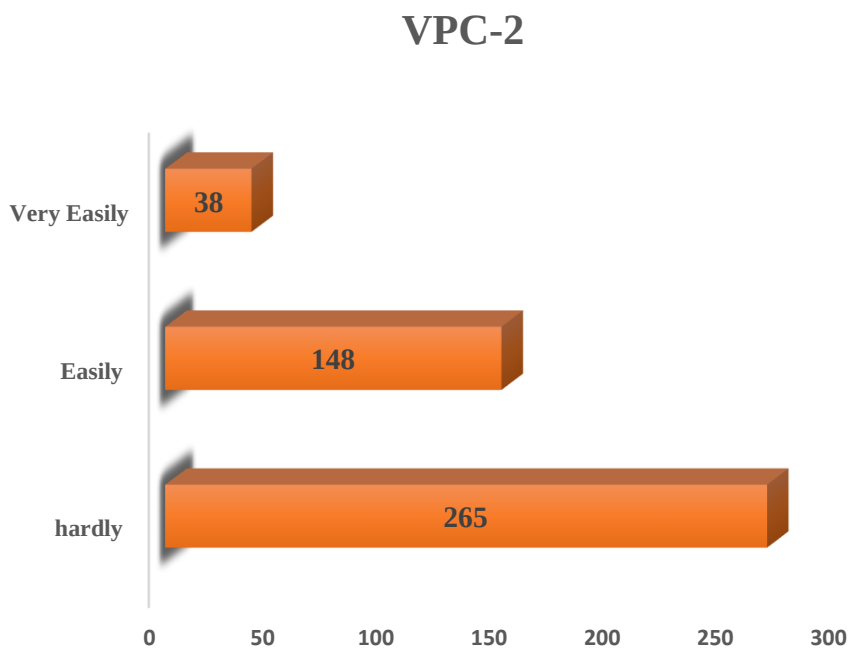

Figure 5.47: Accessibility of Waste Collection Points.

In the case of accessibility to the bins, approximately 50% of respondents said it is hardly accessible due to inappropriate distance and safety issues because most of the locations in

Varanasi, such as places like godowalia or households near Ghats, have very primitive infrastructure, so there is access issue due to narrow lanes. In contrast, safety remains a serious issue for sanitation workers because the presence of cows and stray dogs makes it hard to reach close to or around installed bins. Few locations have good accessibility, such as around 30%, like Sigra, Gurudham and Ravindrapuri. Few places have a door-to-door collection, so about 10 to 12% of people agree that it is very easy for them to dispose of their garbage appropriately and conveniently. The initiative of the door-to-door collection has already been started, and it covers most of the wards; there is continuous single jingle play for the separation of bins. The growing tendency of door-to-door collection will eliminate the issue of accessibility when it has a broad reach to every household in the municipality (Fig. 5.47).

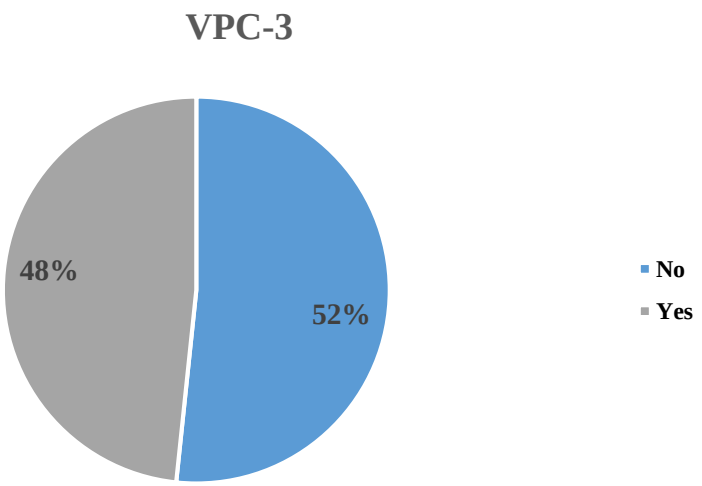

Figure 5.48: Barriers to Safe Waste Disposal.

Our study reveals that half of our respondents face this barrier, as 50% agree that this is more of a physical barrier of distance than a mindset barrier. Safety remains an issue all the time. We have already discussed in our previous paragraph that being at a pious location where a strayed animal like the cow is worshipped as a god and a dog is also the symbol of a carrier for God Kaal Bhairav. Such symbolic norms are internalised deep within the people of the religious nucleus, Varanasi, and that is why they (including the authorities) accept such behaviours of

these stray animals. Hence, as per literature, these strayed animals can create a filthy environment by breaking bins. These are the main reasons why barriers hinder people from reaching bins (Fig. 5.48).

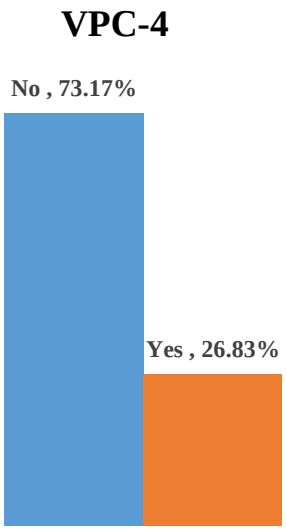

Figure 5.49: Protective Gear for Waste Workers.

When we talk about the safety and health concerns of the people, our study finds that more than 70% of the respondents have reported that workers are found without PPE kits that are without masks and gloves while collecting waste. While rest wear masks occasionally, they are vulnerable and susceptible to many communicable diseases that waste may contain. In our field observation, we tried to raise this issue by wearing masks and gloves, but the workers denied arguing that wearing them makes them uncomfortable and uneasy. Discussing the issue of being harmed by sharp objects, they agree that sometimes they get injured or wounded while segregating or sorting the waste but do not care and remain unintentional or bother less. The workers need training so they do not compromise their health during work (Fig. 5.49).

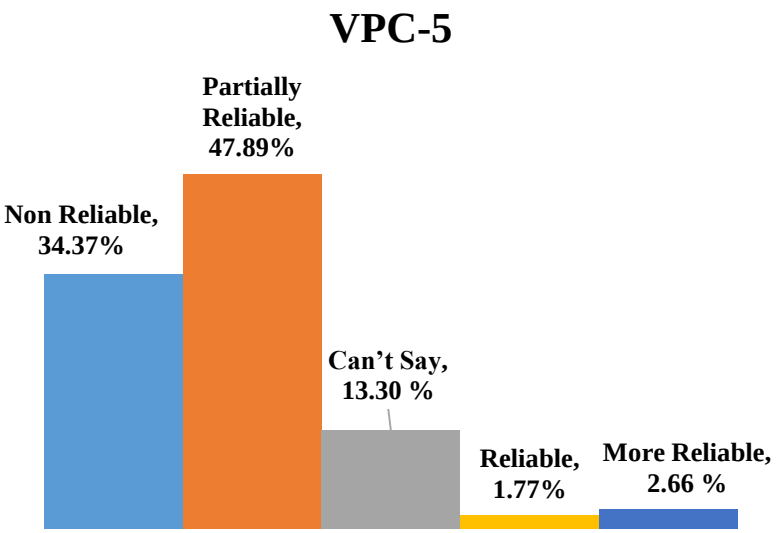

Figure 5.50: Reliability of Door-to-Door Collection.

Regarding the reliability of door-to-door collection in their wards, we find that 80% of people agree that the MSWM services are partially reliable, and 30% say they are unreliable. The rest, 50%, are not sure. It is found unreliable in most circumstances. Hence, on a star rating scale, most have rated between 2 and 3, resulting in an average of 2.24. This shows the public's mistrust of VMC's door-to-door collection system. Therefore, most people try to use community bins to dispose of their waste or dispose carelessly at a fellow land available, or land left abundant nearby. In our field observation, we have observed that the timing and the pattern of the vehicle collection for door-to-door collection are not fixed, which is why very few people are ready to pay for the services they receive varanasi municipal corporation. The frequency of the service, inculcation of trust among all stakeholders, especially residents, and the routine and frequency of collecting vehicles need to be upgraded. The workers must communicate with people to train them and segregate the waste properly (Fig. 5.50).

- **Psychological Capability (VPSC)**

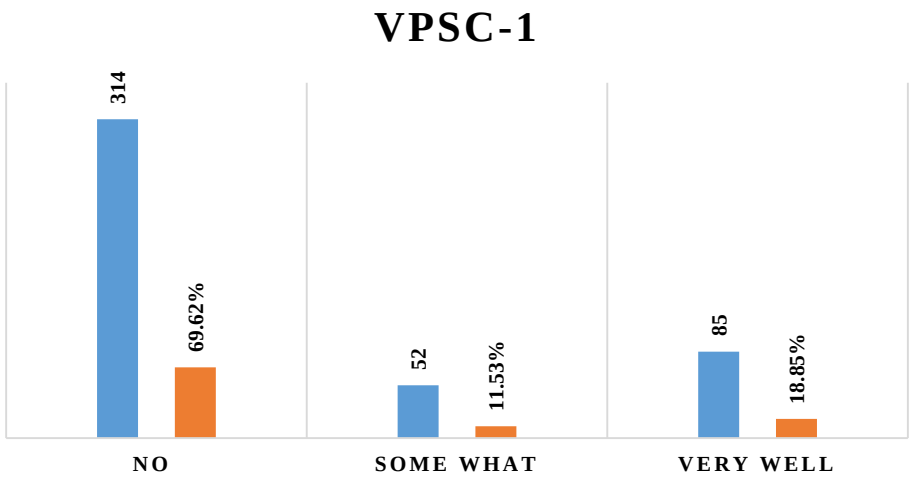

Figure 5.51: Awareness of Waste Segregation Methods.

Our results depict that 70% of the respondents said they are unaware of using three bins segregating MSW into biodegradable, non-biodegradable and hazardous components. Only 20% of the respondents agree they know very well, while 10% have confessed that they know little but are not confident. This awareness can be poor due to low advertisement of the policy and implementation issues with local government. Varanasi Municipal Corporation has tried to display hoardings and wall paintings, but these have proved inefficient. Further, the other means of nudging that could motivate the behaviour change through the person as a psychological resource, like ward members, group leaders or heads of society, can drive a campaign to increase awareness at a community level (Fig. 5.51).

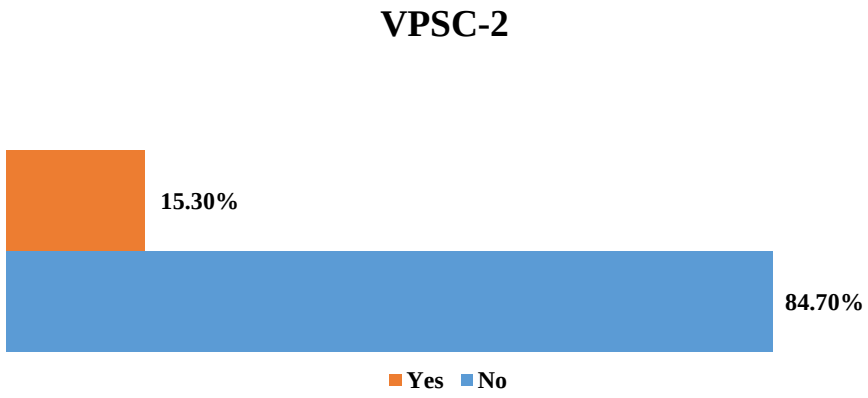

Figure 5.52: Education on waste through Public Programs.

Our study reveals that 85% of the respondents denied participating or being aware of the conduction of any workshop or education programme or kind of training program for awareness on segregating or recycling behaviour. Only 15% agree about programs that happened at the time of Swachhata Pakhwada, a week close to Gandhi Jayanti on 2nd October on the birth anniversary of Mahatma Gandhi or the anniversary of Swachh Bharat Mission (SBM, a country-wide campaign for cleanliness). So, this month is observed as a month for cleanliness (swachhta pakhwada). Different organisations in the country coordinate drives, campaigns, and awareness activities along with the Municipal Corporation to motivate the public to participate in cleanliness activities and assume such public hygienic phenomena as the responsibility of an ideal citizen. These occasional drives or workshops cannot lead to a significant change in society. However, we know that behaviour change is a continuous and dynamic process. In our field observation, we have observed that workshops are being conducted on a few occasions, such as Gandhi Jayanti or similar occasions, to complete the required awareness program according to the guidelines for the SBM. Local leaders usually represent and showcase society's cleanliness in this function. However, it happens only rarely, which shows that it lacks priority in VMC's vision and seriousness for cleanliness. Thus, the minute impacts get diluted (Fig. 5.52).

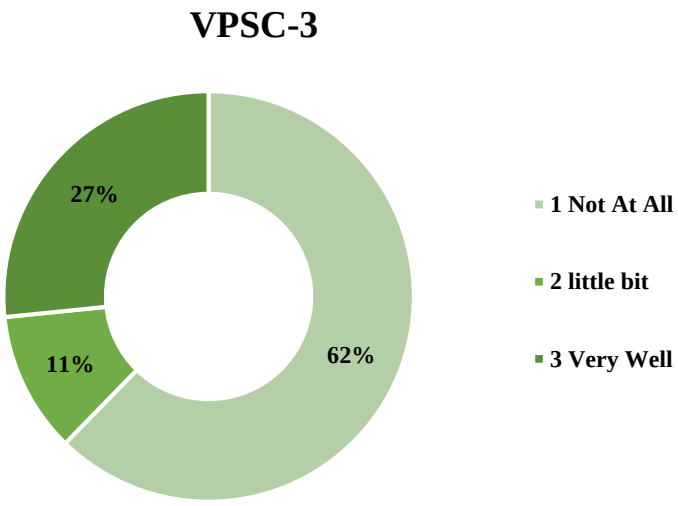

Figure 5.53: Knowledge of Waste-Related Health Risks.

In the case of the health impact of MSW, our study finds that more than 60% of people are unaware of the impact of improper waste disposal. Approx. 30% agree that waste is an issue for health rest, and 10% remain confused or have little knowledge about the concern of health. According to existing literature, this improper disposal system is a breeding ground for many pathogens prone to spreading diseases. The knowledge of proper segregation can lead to more efficient handling of the waste from the source site, and safety disposal can be attained. Our field observation showed that the workers mostly did not use safety kits. The informal sector that contributes to sorting and segregation remains unrecognised and is in a vulnerable condition due to prolonged exposure to MSW. There should be a continuous IEC (education, information and communication) and BCC (Behaviour change communication) program, especially related to health needs should be initiated in Varanasi so that people need to be adequately aware of the consequences and hegemonic-ally; there will be attitude change to segregate the waste and ensure the proper disposal. Due to a lack of knowledge and awareness of MSW on health, they face many health consequences that often result in "vague behaviour" responsible for unscientific waste disposal (Fig. 5.53).

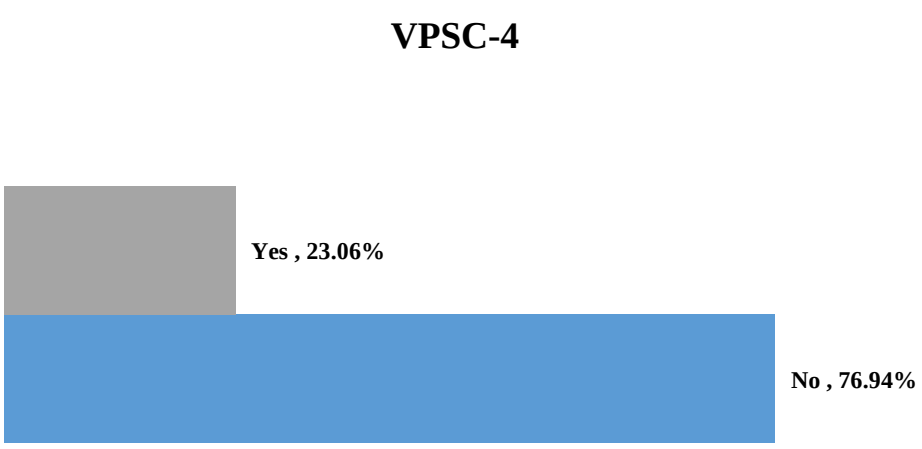

Figure 5.54: Training of Workers & individual in Waste Technology.

Our study reveals that 75 % or more of the respondents reported “No” waste workers, and individuals lack training in compost making. At the same time, 20 % or more accept that they have been trained. There are no prominent training facilities on compost making in Varanasi. However, few organisations, such as NGOs or CSR-driven entities, tend to organise this training or skill program to spread societal awareness. This shows low dissemination of knowledge regarding composting; they train few individuals or only in specific locations. In the field, we have observed that Varanasi Nagar Nigam has demarcated fewer locations as a model ward where all the training occurs prominently.

In contrast, other places remain untouched or unattended. The training for composting is necessary for waste workers and people because this helps to decentralise the handling of waste and reduces the transportation cost of moving biodegradable waste. Compost production from waste can reward their effort, which serves different purposes at home (Fig. 5.54).

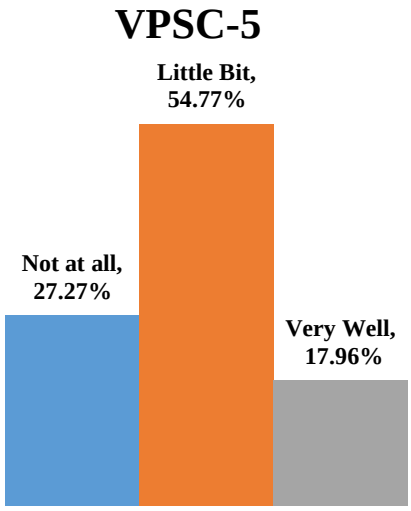

Figure 5.55: Public Familiarity with Waste Policies.

Our study reveals that most respondents, i.e. 55 %, said they know about the city's policy on MSWM a little bit, while approx. 20% say they know 'very well'. A large proportion, 80 %, deny that they know city policies with confidence and belief because waste is supposed to be the subject of municipal corporations. The commoner is never held responsible due to the

mentality of no punishment if found violated. It shows low trust and a communication gap between urban local bodies and the local public (Fig. 5.55).

- **Physical Opportunity (VPO)**

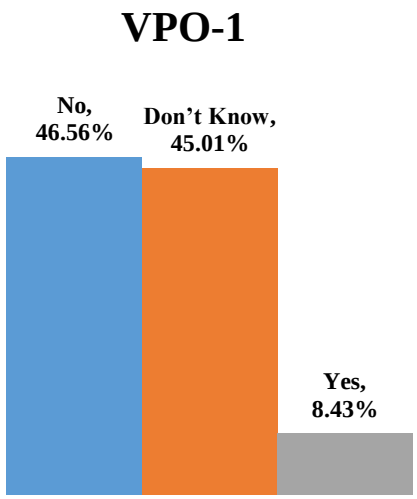

Figure 5.56: Capacity of Recycling and Landfills.

In our study, we found approx. 10% of respondents answered 'yes' while the rest had negated the response because most respondents are unaware of what is being done with the collected waste. They did not know treatment technology and the output generated by the waste collected by VMC. It may be due to low awareness or lack of attitude of knowledge. A workshop should be conducted to inform society and win trust for proper waste management services. We have observed a material recycling facility unit near Sigra that is left abundant. Apart from that, no material recycling facility is available for dry waste. For wet waste, a centralised treatment plant at Karsada and three decentralised waste-to-energy plants situated in Khazakpura, Bhavania Pokhari and Pahadiya mandi of 5 ton/ day capacity. We found that all decentralised plants are running below capacity due to the low availability of raw material that is 'segregated biodegradable waste'. While the centralised plant is running over capacity due to the higher mixing of waste, a mechanical sorting process is available for further MSW processing. The landfill or appropriate dump site is located in Ramanagar. Hence, there is a need for a strong

messaging/communication system to allow people to participate in MSWM and contribute to the welfare of society (Fig. 5.56).

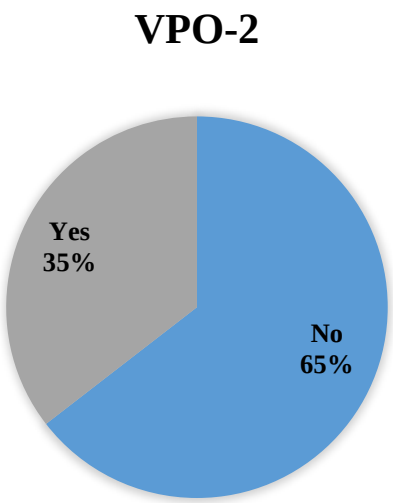

Figure 5.57: Availability of Separate Public Bins.

Our study further depicts that most of the respondents. I.e. More than 65% were confident to say 'Yes' specifically because there were only two kinds of bins: blue bins for dry waste and green bins for wet waste. The bins are disproportionately placed at uneven distances. In most of the places the bins have been damaged by the strayed animals like dogs, cows, or pigs. These animals reach the bins in the food search, which is hard to find due to mixed waste. The animal visits the place frequently, leading to damaging the bins. In field observation, we have found that there is a presence of single bins in all city locations, but their structure is being damaged in most places, and many locations have only one kind of community bin: A blue bin. Most residents complained that VMC vehicles have two distinct compartments for wet and dry waste while they collect and dispose of both segregated and non-segregated in a single compartment. This develops a sense of non-meaningful acts, which breaks respect and develops mistrust in MSW services (Fig. 5.57).

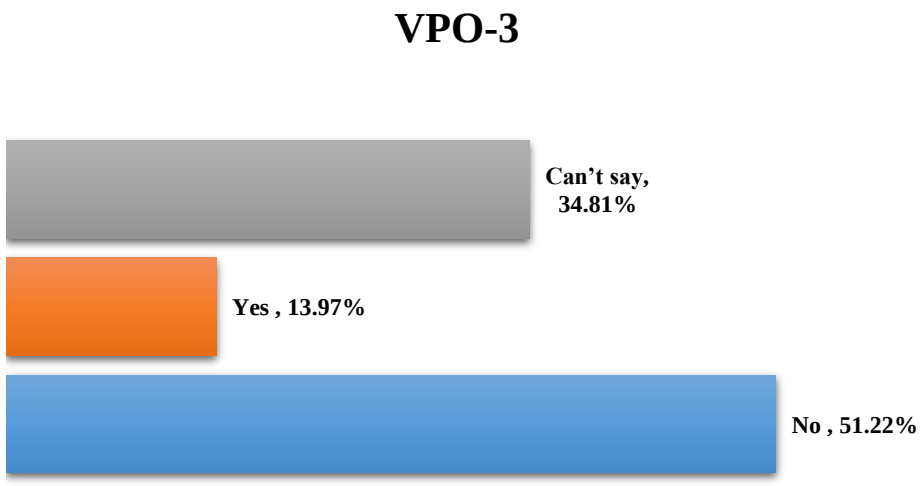

Figure 5.58: Repair System for Waste Infrastructure.

Our study has noticed that most of the bins were found in a damaged state in our field observation, and similar is the result: 85% of the bins were said to be damaged, and there is no sign of prompt repair seen, where more than 50% responding confidently deny for repair and maintenance. Over 35% are less confident in answering anything, which shows the careless attitude of MSW services and emerges as a sake of mistrust. Due to this issue, the respondents usually take the easy path, escaping from the sites by dumping the MSW to the abundant places, often open fields or ruined or damp places. These acts also promote the violation of MSW rules. In the field, we observed that most of the broken bins are abundant or filled with waste and spilt over, giving the location a filthy appearance. To cope with the problematic situation, most people try to discard their waste into nearby water bodies like river drains or ponds (Fig. 5.58).

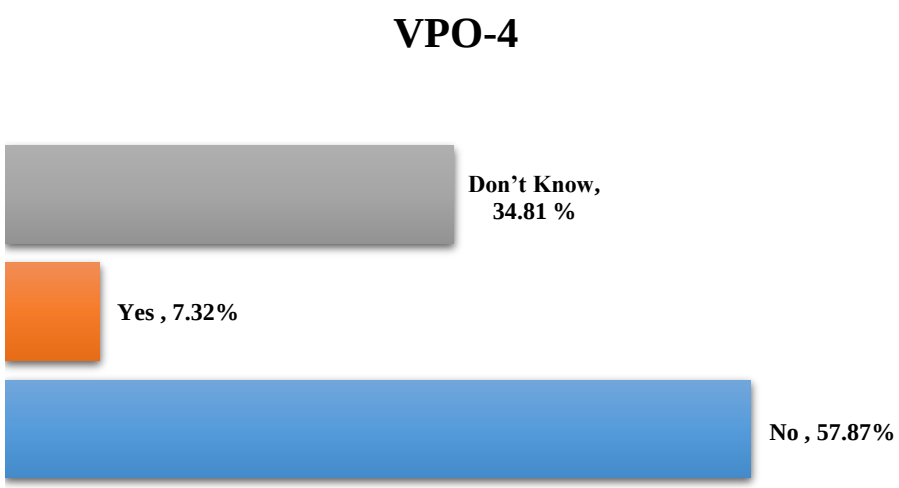

Figure 5.59: Accessibility of Household Composting Facilities.

Composting facilities are unavailable in 60% of the case, as per respondent while 34% of the location are inaccessible or their proper location cannot be determined. Composting facilities are available at the centralised plant, which is situated in Karsada. The inaccessibility to this facility leads to the belief that no treatment system works and that waste is disposed of in any other locations without treatment. In the field observation, we have found that people are less likely to be aware of the uses of waste in the form of compost, which can be made at home, and the public can treat their waste at home. It will reduce transportation costs, and resource generation will be possible. Composting can be an easy solution to improve the condition of the city. Varanasi Municipal Corporation must initiate a process that blocks organic waste / biodegradable components from being treated at the source (Fig. 5.59).

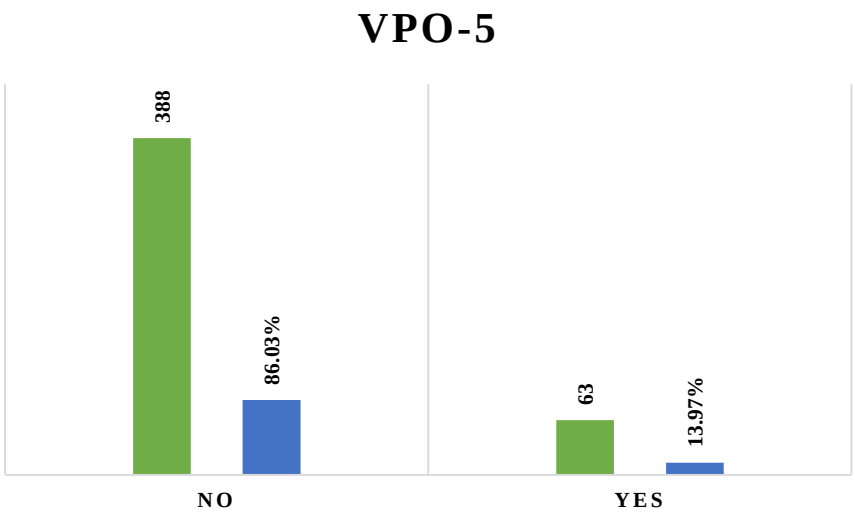

Figure 5.60: Use of Technology in Waste Management.

In the use of technology like APP and GPS-guided systems, most respondents disagree that any scientific technology is used in the collection process. More than 85 % of the respondents say there is no use of technology, while 13% are hopeful that apps are used. In the field observation, we found an app, the Kashi app, launched in December 2024, as VMC claims it has approximately all the function-performing abilities. Inappropriate communication programs, i.e. IEC programmes, are not target and motivation-oriented. So, most locations lack this IEC and BCC activity; thus, very few people participate because of a lack of reliability and trust issues. Thus, the program becomes non-participatory (Fig. 5.60).

- **Social Opportunity (VSO)**

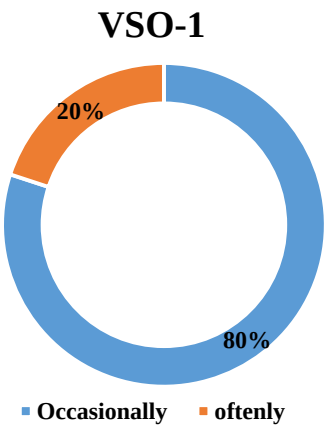

Figure 5.61: Community Leadership in Waste Segregation.

Our research found that 80% of the respondents say leaders occasionally come to promote waste segregation practices, mainly during the period of Swachata Pakhwara around the first week of October or during the period of any VIP visits or ceremonial functions. The occasional promotion has a low impact on people's attitudes because behaviour change is a long-term, continuous changing process which requires consistent stimulation and exposure to training initiatives or daily reminders. In the field observation, we found the same scenario we had discussed with the respondent. Most ward members are not interested in attending the public frequently, while other community leaders like the dharma guru and the priest are not concerned about the city's cleanliness (Fig. 5.61).

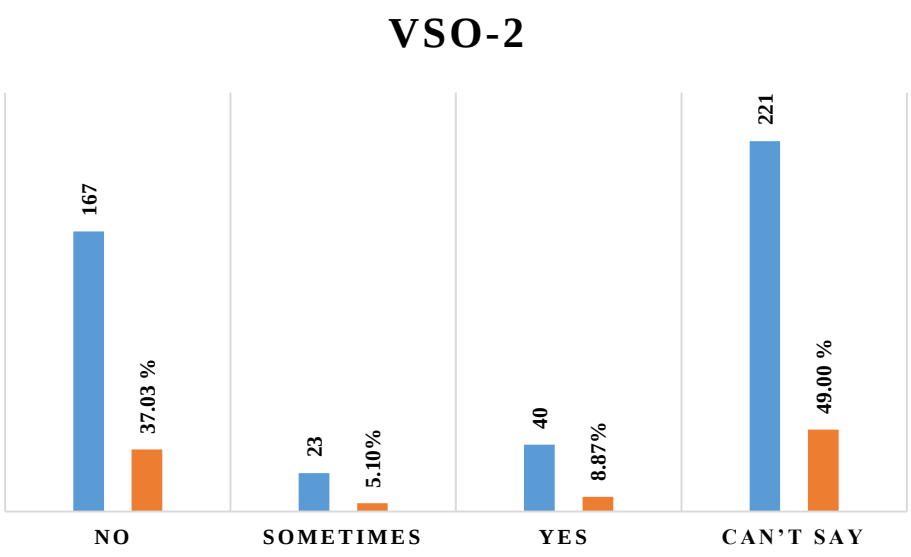

Figure 5.62: Enforcement of Littering and Dumping Penalties.

We found that no penalty was imposed for littering or illegally dumping MSW in public spaces. Approx. 40 % of respondents confidently answered "NO". Approx. 50 % say they do not know or have never heard of any penalty for the violation of the MSW. A small portion of 10% or fewer people agree that some penalties have been imposed in a few cases. However, the inconsistency of penalty gives the people leverage to circumstances violate the rules. During the field visit, we observed that people dispose of without fear or moral hesitance. The circumstances of littering here and there remain a major and common issue in the city. The city

is part of a cultural heritage and religious centre; thus, a significant chunk of tourists soars, with a footfall of 1-1.5 lakh in the form of religious deities. Large numbers of floating populations enter the city and leave daily, further diluting the impact of awareness as the visitors leave the city for a day. Hence, crowd management remains the issue that allows visitors to litter anywhere because of the non-availability or overload condition of bins and low turnover frequency by VMC fleets (Fig. 5.62).

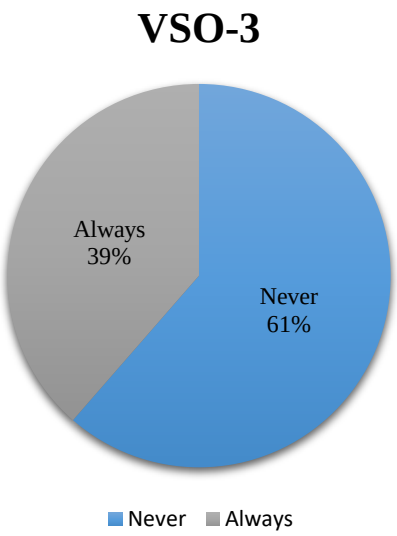

Figure 5.63: Waste management services in cultural or religious events.

Incorporation of waste management practices in religious or cultural events, most of the respondents, i.e., 60%, have answered ‘Never' and 40% say 'Always’. Varanasi is part of the cultural heritage, the destination of pilgrimage, ceremonial functions and other religious activities that go on daily or daily. These religious ceremonies are usually attended by visitors who are not part of the Varanasi population, yet violations of the rules and regulations are common due to a huge crowd gathering at religious and cultural events; it generates an enormous amount of waste that is managed by Varanasi Municipal Corporation at their own cost. In the field, we have observed that a big rally or campaign happens during this cultural and religious event that brings a huge uninvited crowd, which leads to the mismanagement of multiple resources, a shortage of bin types and appropriate sizes, and fleet deployment. The city

is ancient, so it has narrow lanes, and disproportionate planning leads to management failure due to overcrowding (Fig. 5.63).

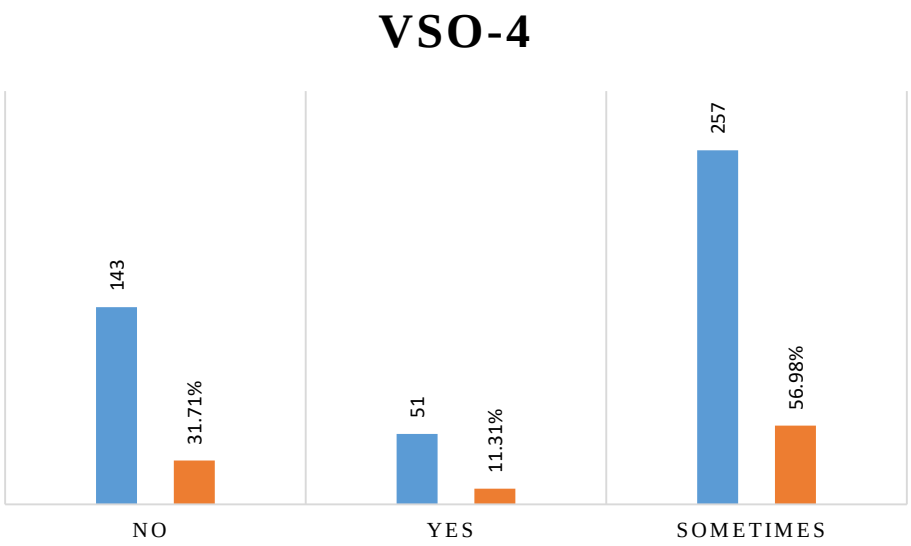

Figure 5.64: Reporting Violations by neighbours

Reporting neighbour for the violation of MSW rules - Most respondents, i.e. more than 55 %, said "sometimes" means occasionally. While 30% said they do not complain about their neighbours. A tiny chunk of 10% confidentially says that they usually complain about a violation of rules. This is a critical criterion to report because this creates social norms that do not violate rules; instead, they are under surveillance by the neighbours or the person living next door, and consequently, the sense of society and care for each other is developed. As we know, MSW is a primary health concern. Complaining to the neighbour for wrongdoing is the right act rather than promoting him to violate rules which may harm community health by making the inappropriate disposal of their waste. We have observed that most people do not complain about their neighbours. They find no opportunity because of broken bins or unreliable collection practices; both face a common problem. Hence, they tend to understand that the challenges of finding appropriate bins or services at the accessible location are inevitable (Fig. 5.64).

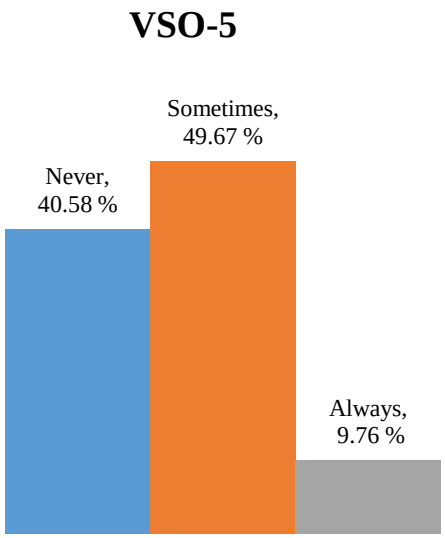

Figure 5.65: Media Promotion of Waste Initiatives.

Regarding the Media's interest in highlighting MSWM, 49% of respondents answered that 'sometimes' means occasionally, followed by 40% responding 'never' and the rest approx. 10% says 'always'. Telecast about waste management practices. Media play a visual role in spreading awareness and information among individuals. The media highlight the issue most people are aware of, as we know, through mass media, social media and other kinds of media platforms. People of different ages and regions are being connected and following it more seriously than attending physical meetings or workshops. A message that has strong dissemination and a high intensity of motivation can be achieved through mass media (Fig. 5.65).

We have observed that the media usually highlights these issues in the field. There is often news about rule violations or the initiation of new activities related to MSW management. For instance, the Swachh Kashi app has been launched for 6 months, and GPS has been integrated with the collection services. Since people have a low priority for cleanliness, we avoid acquiring knowledge about it. Thus, people have no idea about this app and technology integration. This may be due to low information frames or cheap advertisements that can cause low news dissemination.

- **Automatic Motivation (VAM)**

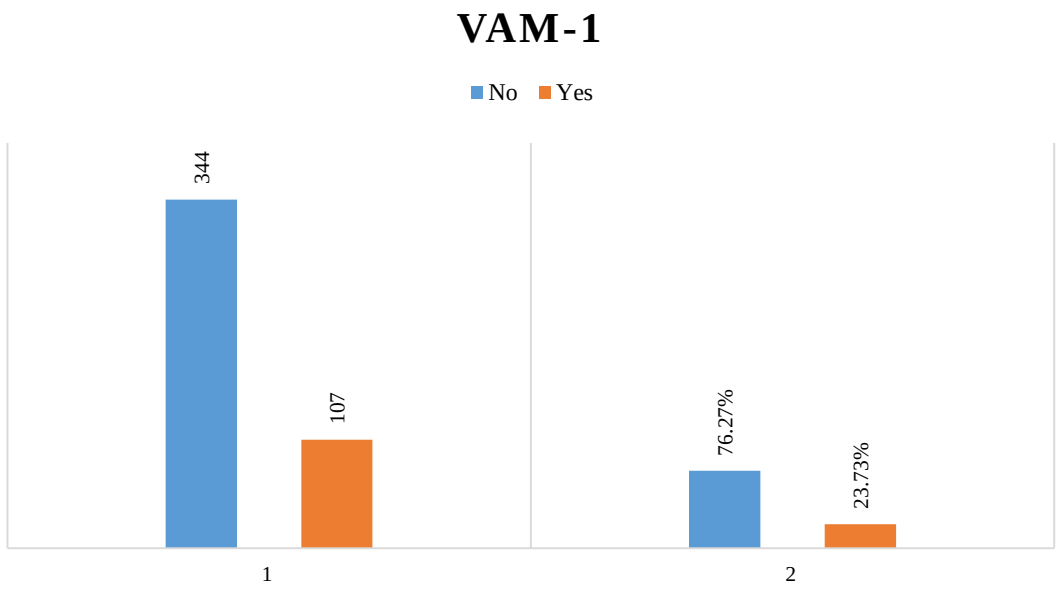

Figure 5.66: Habitual Practice of Waste Segregation.

Most of the respondent, approximately 77% or more, deny their habitual segregation practices because they lack trust in VMC, broken bins and lack of reliability of door-to-door collection. A small chunk of 20% of people still keep hope and believe in segregating the waste, and probably a few wards where the collection service is regularly done, like Sigra ward (model ward). Due to the low trust and feeble messaging system and the low involvement of people, segregation is non systematically observed. This causes a massive generation of mixed waste, which ultimately reaches the centralised plant where it is mechanically segregated. However, as we know, the importance of primary segregation is much better than secondary segregation because till the waste reaches the secondary segregation point, the organic content gets thoroughly mixed with dry waste. Hence, the recyclables are contaminated, and their value is reduced even after they are sorted (Fig. 5.66).

VAM-2

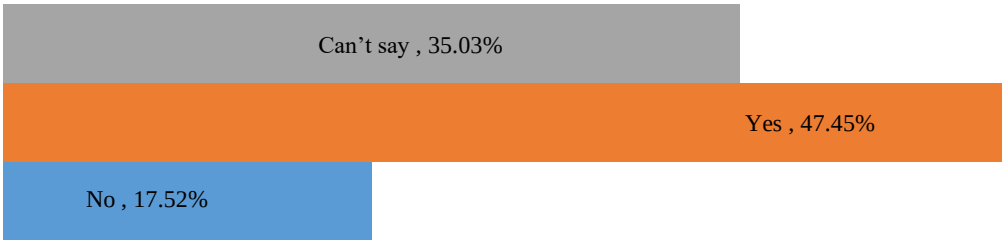

Figure 5.67: Clean Streets as a Social Norm.

In our study, we found that most of these respondents, approximately 50%, say 'yes' and Strongly believe in clean streets as the social norm of the city. Streets should be clean. This shows the hope and a bigger picture of the belief that people want cleanliness and hygiene in their town. The problem usually remains the availability and accessibility of resources at appropriate times and places. Since people strongly believe in cleanliness, it is a positive sign of pro-environmental behaviour. In the field, we can observe that the city's footfall is too high, and crowd management becomes an issue.

Along with the narrow street lane that acts as a barrier in primitive areas like godowalia and ghats. Strong perception of God Shiva's homeland and the pious belief in the sanctity of river Ganga and people are more emotionally connected by sentiment. During the preaching, unintentionally offering flowers and different elements to god and the act of rituals remaining accommodated on the river bank may be the reason for untidiness and unhygienic (Fig. 5.67).

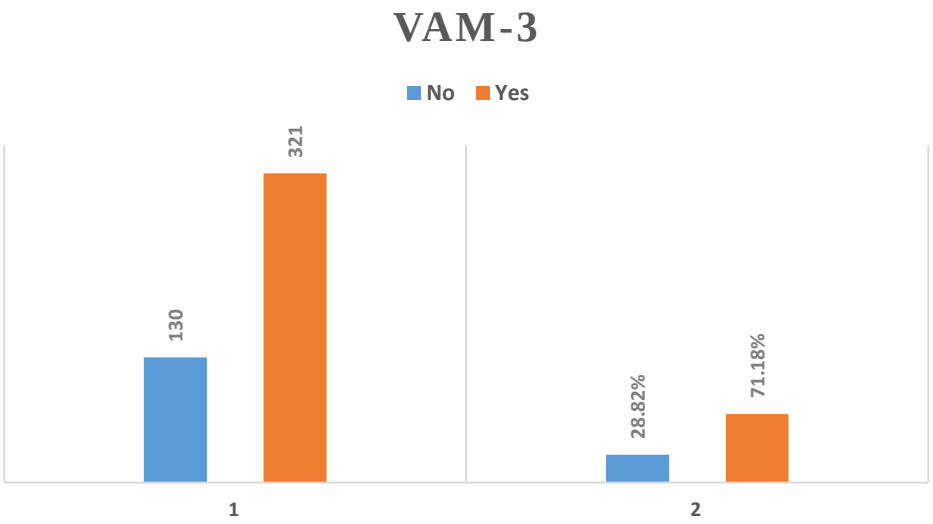

Figure 5.68: Signage and Art for Waste Nudging.

In our study, we found that more than 70% of residents responded that they had noticed the presence of signage/art to make people aware of waste-related issues. We found that prime locations like railways, roadways, bridges and boundaries of campuses are painted with slogans, art, and visual aids to spread the message of good practice and nudge for commitment to individual civic rights. While a few 30% say no because they might not see these nudges or their locality may be encrypted with these text, signage, and art (Fig. 5.68).

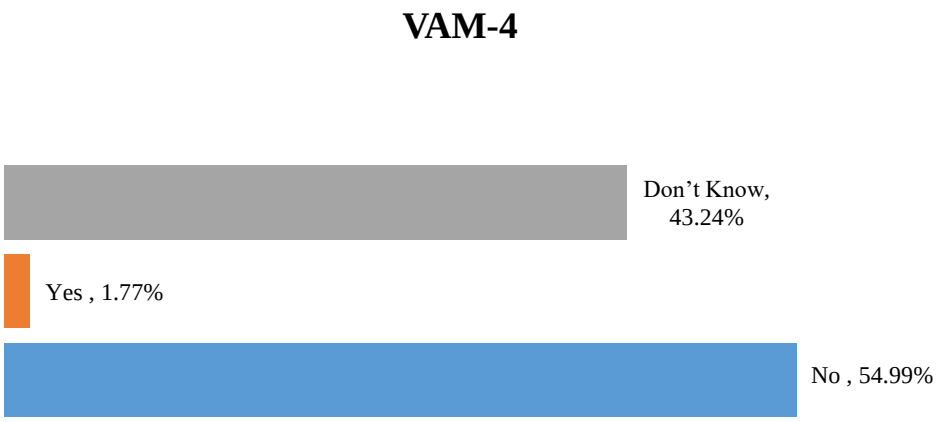

Figure 5.69: Incentives for Eco-Friendly Behaviour.

More than half of the respondents, i.e., 55%, strongly deny the availability of such rewards or recognition or organisation of any award function for green practises like composting or eco champion award for raising public of waste-related issues. At the same time, the rest remain unaware of such awards or recognition. They said they have not even heard of such a prize or recognition for practices like keeping the street clean, opting for -the pro-environmental behaviour of segregating sources. The reality on the ground is often actual because we found no such initiative either by the local government or by other bodies like NGOs to appreciate the local people who comply with civic roles in keeping a clean neighbourhood and have the potential to develop innovative waste management solutions (Fig. 5.69).

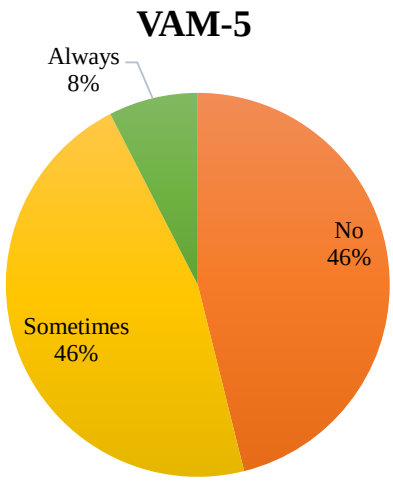

Figure 5.70: Emotional Responses to Waste Misconduct.

How do the respondents feel about non-segregation behaviour? Most of the respondents remain silent. 46% of them say 'No', which means they do not feel shy or guilty for their behaviour, and equally, 46% say they feel guilty ‘sometimes’ with low confidence. Only 8% of the people say they feel guilty for non-compliance with the segregation rule. The reason may be that they did not develop confidence in the local governing body. They found a lag in VMC capacities. As per our previous question, the non-reliability, mistrust, and low pro-environment will be due to VMC's non-serious action. People do not see their acts as meaningful because they have no such examples that may be highlighted by media or through other names where these wrong

practices are punished or good practices are encouraged. On the ground, we observe that residents are very cooperative—although they possess 'Not in My Backyard' (NIMBY) syndrome. Everybody is concerned with the cleanliness of their houses but not about the neighbourhood. They say that even if they segregate the waste, the VMC collection fleet carries a single vehicle for collecting waste with two compartments, viz., biodegradable and non-biodegradable waste. However, they can be seen mixing and filling the compartments with the same category of waste, so they do not feel guilt as they see no meaning in segregation because they end up transporting all in one in the standard vehicle (Fig. 5.70).

Reflective Motivation (VRM)

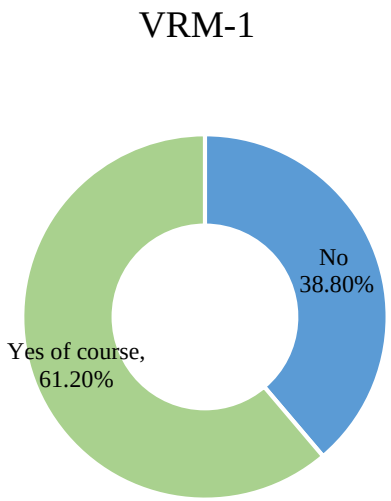

Figure 5.71: Perceived Impact of individual Efforts.

Believe in their effort, 61% of the respondents show a strong image of self where they say 'yes of course' and only 38 % negate it. The firm belief may be developed through emotional attachment to the place. As we know, Varanasi is the capital of religion. People are very pious and feel deeply connected with Ganga and lord Shiva. It is also a constituency of the country's prime minister. Regarding self-respect and self-driven action, people are more motivated to lead and perform the action enthusiastically. When it comes to group or community people start to compare with the other combine effort get shattered off instead of increasing (Fig. 5.71).

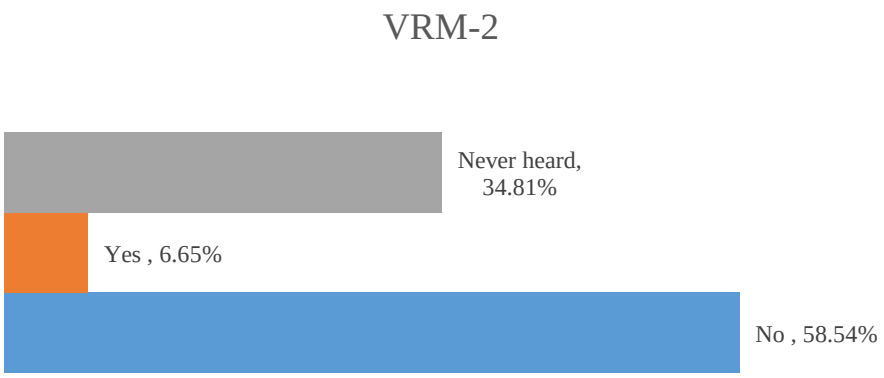

Figure 5.72: Financial Incentives /tax rebate for Recycling.

Our study reveals that most of the respondents, approximately 60% or more, replied that there is no incentive or tax rebate. Approx. 35 % say they have not heard about any incentive, which makes the statement ignorant. 90 % have neglected it, while only 5% or more say that they received an incentive or tax rebate. It is unclear what kind of incentive they got. They may have received some incentive from any NGO for any occasional function, but there is no direct tax rebate scheme available to the public as per official records. Hence, people seem less motivated to participate in recycling activities. As seen in other countries, providing incentives or giving tax rebates may be a strong motivating factor. It is very likely to be sustainable to maintain the behaviour for the long run because being human people have a desire to be appreciated in the form of recognition or monetary benefit for their good work, and the recognition not only motivates but also the other people who are likely to do but have in some barrier or endurance in executing targeted behaviour. So people get motivated by seeing the recognition of others and for their self-respect and maintain their image in society (Fig. 5.72).

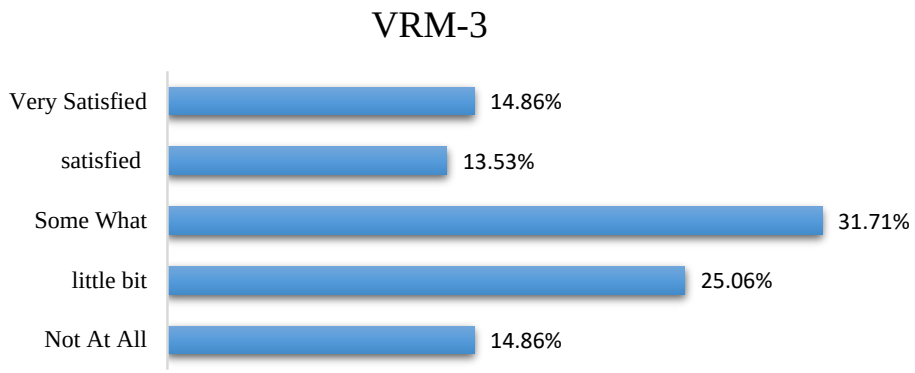

Figure 5.73: Satisfaction with Waste Services.

In the case of satisfaction with the service of the municipality, most of the respondents, approx. 60% rated between 2 and 3 out of 5 in a five-star rating. Most individuals have rated they are not satisfied or satisfied a little bit. This may be due to mistrust and lack of proper service in time or at location, as we saw in our previous paragraph interpreting results. The reliability of the collection was very meagre, the maintenance of bins was non-satisfactory, and there were no incentive rewards, punishment, or workshops, which led to the agony of the public against VMC. The most common thing seen in Varanasi is that people have the perception that the collection of solid waste management is purely the subject of the Municipal Corporation and that their role is negligible. The non-inspiration and rude behaviour of the municipal body detaches the people from being an integral part of the MSWM system (Fig. 5.73).

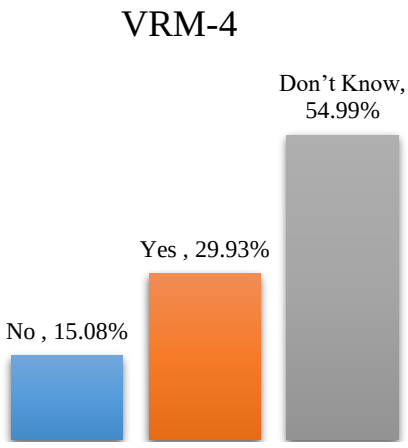

Figure 5.74: Focus on Long-Term Environmental Benefits.

In the study, we found that most of the respondents. i.e. 55% or more said they 'do not know or do not see any long-term benefit because the messaging systems are so feeble that there is no development of a framework that suggests improper MSW has health issues or is concerned if not appropriately managed. One-third of the people, due to their self-respect and partial belief in the VMC campaigns, may have environmental benefits due to their higher education or connectedness with the municipality. This led to the development of this attitude. In other cities like Indore, where there is a sense of pride for cleaning their city and making or ranking them No.1 and keeping it consistently in the ranking list, it is also lacking in the messaging system of VMC (Fig. 5.74).

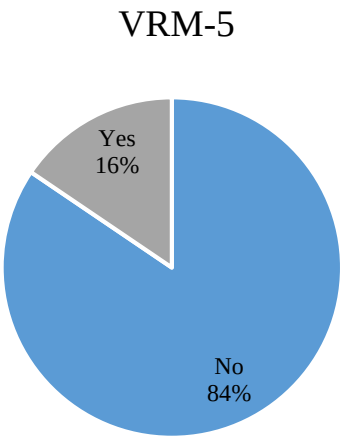

Figure 5.75: Resident Participation in Waste Policy.

Residents will be involved in planning Varanasi's policy, which will be approximately 85% said 'NO'; they are never involved. While 15% say yes, this shows partial or non-inclusive criteria of Municipal Corporations where the feedback mechanism is absent. Hence, the policy that needs to be implemented for the resident must be shared and discussed to address their challenges, and their issues and policy should be of public welfare, i.e. socially acceptable. As a stakeholder, incorporating residents in the feedback mechanism is crucial for implementing and sustaining MSW rules. In the field, we have observed that the people of municipal corporations are not very connected with the local public. Community leaders are sometimes

involved and discuss issues with the ward members, i.e., an officially nominated person from the municipal ward (Fig. 5.75).

5.2.7 Identification of enabler and barrier in effective municipal solid waste management & Mapping of COM-B, TDF for Varanasi.

After Analysis of COM-B data enabler and barrier are identified & Mapping of COM-B, TDF for Indore is done below (Table 5.11, 5.12, and 5.13).

5.2.8 Selection of appropriate intervention function by APEASE criteria.

After analysis, a list of suggested interventions are drafted and finally appropriate interventions are selected through APEASE criteria for Varanasi. **(**Table 5.14)

Table: 5.11: Identification of enabler and barrier in effective municipal solid waste management & Mapping of COM-B, TDF with intervention function for Varanasi.

COM-B Components	TDF domains	Barriers	Enablers	Intervention functions
Physical Capability	Environmental Context and Resources (ECR)	• 58.76% find collection points "hardly accessible." • 48.34% report physical barriers (e.g., distance, safety). • 73.17% of waste workers lack protective gear. • 34.37% rate door-to-door collection as "non-reliable.	60 % of respondents has knowledge of two type of segregation (ECR)	• Training • Enablement
Psychological Capability	Knowledge (K), Skills (S)	• 69.62% unaware of segregation methods. • 84.70% report no workshops. – • 62.31% unaware of health impacts. • 76.94% of workers untrained in technologies. • 27.27% "not at all" familiar with policies.		• Education • training
Physical Opportunity	Environmental Context and Resources (ECR)	• 46.56% say insufficient recycling plants. • 64.52% lack separate bins in public spaces. • 51.22% report no repair system for infrastructure. • 57.87% lack composting access. • 86.03% report no app use for collection.		• Environmental restructuring • Enablement
Social Opportunity	Social Influences	• 80.04% say leaders promote segregation "occasionally."		• Restriction • Modelling

COM-B Components	TDF domains	Barriers	Enablers	Intervention functions
		• 37.03% report no penalties for littering. • 61.42% say events "never" include waste practices. • 31.71% not encouraged to report violations. • 40.58% say media "never" highlights initiatives.		
Automatic motivation	Behavioural Regulation, (BR) Reinforcement (R), Emotion (E)	• 76.27% do not segregate without reminders. • 17.52% do not see clean streets as a norm. • 28.82% lack signage/art nudges. • 54.99% report no rewards for green practices. • 46.12% feel no guilt/shame for improper disposal.		• Environmental restructuring • Enablement • Incentivisation • Persuasion • Modelling • Enablement
Reflective motivation	Beliefs about Consequences (BC), Reinforcement (R), Social / Professional Role (SR)	• 8.54% report no tax rebates/incentives. • Only 14.86% are "very satisfied" with services. • 15.08% say benefits not emphasized. • 84.48% not involved in planning.	61 % has belief on their effort.	• Incentivisation • Persuasion • Modelling • Enablement

Source: Based on personal survey

Note:

% less than 50 is termed as '**barrier**'.
% more than 50 is termed as '**enabler**'.

Table 5.12: COM-B intervention matrix for Varanasi.

	Education	Persuasion	Incentivisation	Coercion	Training	Restriction	Environmental restructuring	Modelling	Enablement
physical capability							X		X
psychological capability	X				X				
physical opportunity							X		X
social opportunity						X		X	
automatic motivation		X	X		X		X		X
reflective motivation	X	X	X					X	X

Source: Based on personal data.

Table 5.13: Intervention policy matrix for Varanasi.

	Education	Persuasion	Incentivisation	Coercion	Training	Restriction	Environmental restructuring	Modelling	Enablement
Communications and marketing	X	X	X					X	
Creating and disseminating guidelines	X	X	X		X	X	X		X
Using fiscal measures			X		X		X		X
Enacting regulations	X	X	X		X	X	X		X
Enacting legislation	X	X	X		X	X	X		X
Using environmental and social planning							X		X
Providing a service	X	X	X		X			X	X

Source: Based on personal data

Table 5.14: Selection of appropriate intervention through APEASE Criteria for Varanasi.

BCW intervention function	Possible interventions	COM-B Component	Selection of appropriate intervention through APEASE criteria
Environmental Restructuring	Provide a variety of bins for different waste types (e.g., wet, dry, recyclable) in households and public areas.	PC	NO
	Increase the number and strategic placement of collection points to reduce travel distance and improve convenience.	PC	YES
	Improve infrastructure, such as adding pathways or better lighting, to reduce distance and enhance safety for waste disposal.	PC	YES
	Upgrade the collection system or fleet (e.g., more vehicles) to enhance service consistency.	PC	YES
	Invest in building more recycling facilities to process waste effectively in Varanasi.	PO	NO
	Install clearly labeled separate bins (e.g., for recyclables, organic waste) in public areas like markets or parks.	PO	YES
	Establish a dedicated maintenance and repair system for waste management infrastructure (e.g., bins, vehicles).	PO	YES
	Set up community composting facilities in neighbourhoods to manage organic waste locally.	PO	YES
	Integrate waste management activities (e.g., sorting demos) into community events or festivals.	SO	YES
	Use visual cues (e.g., color-coded bins) or automated reminders (e.g., app alerts) in households.	AM	YES
	Install creative signage or art installations (e.g., murals) to encourage proper waste disposal.	AM	NO (already exists)
	Improve the quality and reliability of waste services (e.g., timely pickups, better equipment).	RM	YES

BCW intervention function	Possible interventions	COM-B Component	Selection of appropriate intervention through APEASE criteria
Enablement	Distribute bins to households and ensure they are easily accessible to encourage segregation.	PC	NO
	Provide transportation or assistance for residents facing physical barriers to reach collection points.	PC	NO
	Offer alternative collection methods, like scheduled pickups, for those with mobility or safety concerns.	PC	YES
	Supply necessary protective gear (e.g., gloves, masks, boots) to all waste workers to ensure safety.	PC	NO (already exists)
	Implement a reliable scheduling system with accountability measures to ensure timely collection.	PC	YES
	Make workshops accessible and engaging by hosting them locally and using interactive formats.	PSC	YES
	Ensure workers have access to the necessary tools and equipment to apply their training effectively.	PSC	NO (already exists)
	Create easy-to-understand guides or mobile apps explaining policies in simple language.	PSC	NO (already exists)
	Facilitate partnerships with private companies to expand recycling initiatives and capacity.	PO	NO (already exists)
	Ensure regular maintenance and emptying of bins to keep them functional and appealing.	PO	Yes
	Allocate budget and resources for regular upkeep to prevent breakdowns.	PO	NO (allocation done but not used)
	Provide composting bins and basic education to households to encourage participation.	PO	YES
	Develop and promote a mobile app for scheduling waste collection and sharing waste management information.	PO	NO

BCW intervention function	Possible interventions	COM-B Component	Selection of appropriate intervention through APEASE criteria
	Provide resources like bins or volunteers to event organizers to include waste practices.	SO	YES
	Create a simple, anonymous reporting system (e.g., hotline or app) for waste violations.	SO	YES
Enablement	Provide tools like labelled bins or segregation guides to make the process intuitive.	AM	NO (labelling already exists)
	Involve local artists or schools in designing these nudges to foster community ownership.	AM	NO (already exists)
	Simplify participation in reward programs, possibly through the waste app.	RM	YES
	Simplify the process to claim incentives, ensuring accessibility for all.	RM	YES
	Collect resident feedback and involve them in service improvement plans to address concerns.	RM	YES
	Create participatory platforms (e.g., town halls, online surveys) for citizens to contribute to waste planning.	RM	NO (already exists)
Training	Educate workers on the importance and proper use of protective gear to maximize its effectiveness.	PC	NO (happens usually)
	Train waste workers on efficient collection methods and consistent schedules to improve reliability.	PC	NO (happens usually)
	Provide hands-on training sessions for residents and workers to practice waste segregation.	PSC	YES (for residents)
	Provide technical training for workers on new waste management tools or technologies (e.g., sorting machines).	PSC	YES
Persuasion	Use emotional appeals or real-life examples (e.g., local health stories) to emphasize the importance of proper disposal.	PSC	YES (need to incorporate health risk message)

BCW intervention function	Possible interventions	COM-B Component	Selection of appropriate intervention through APEASE criteria
	Leverage leaders' influence to persuade the community to adopt better waste habits through speeches or endorsements.	SO	YES
	Collaborate with local media to regularly feature stories on waste management successes or tips.	SO	Yes (to do regular update on initiatives)
	Use social media or campaigns to promote clean streets as a desirable community standard.	AM	NO (already exists)
	Use campaigns with emotional messaging (e.g., "Keep Varanasi beautiful") to evoke responsibility.	AM	NO (already exists)
	Share data and success stories (e.g., before-and-after photos) showing the impact of waste efforts.	RM	YES
	Highlight benefits (e.g., cleaner air, fewer pests) in all waste-related communications.	RM	YES
Education	Conduct awareness campaigns via pamphlets, videos, or community talks to teach proper segregation methods.	PSC	NO (happens occasionally)
	Organize regular workshops on waste management practices to build knowledge and skills.	PSC	YES (lacks regularity)
	Inform the public about health risks (e.g., disease spread) linked to improper waste management through media or talks.	PSC	YES (no health risk message exists)
	Disseminate waste management policy information through flyers, radio, or social media for broad reach.	PSC	YES
	Teach residents how to use the app effectively through tutorials or community demonstrations.	PO	YES
	Inform residents about the negative community and environmental impacts of improper disposal.	AM	NO (exists via wall paintings)

BCW intervention function	Possible interventions	COM-B Component	Selection of appropriate intervention through APEASE criteria
	Inform residents about the negative community and environmental impacts of improper disposal.	RM	YES
	Provide clear, relatable information on how waste management benefits the community and environment.	RM	NO (usually explained by mass media)
Modelling	Encourage local leaders to actively promote and demonstrate good waste practices (e.g., public clean-ups).	SO	YES
	Showcase community members or areas excelling in waste practices as examples for others to follow.	SO	YES
	Highlight neighbourhoods with clean streets as examples to inspire others.	AM	YES
	Showcase successful examples of community involvement from other areas or cities to motivate participation.	RM	YES
Restriction	Implement and enforce penalties (e.g., fines) for littering and non-compliance with waste rules.	SO	YES (lacking enforcement)
	Offer rewards or recognition for residents who report violations to boost participation.	SO	YES
	Introduce reward programs (e.g., discounts, vouchers) for households or businesses excelling in waste management.	AM	YES
	Introduce tax rebates or utility discounts for households complying with waste rules.	RM	YES
Coercion	Use fines or mandatory community service as deterrents to discourage improper disposal.	SO	NO (fines exist but not implemented)

Source: Based on personal data

Table 5.15: Final suggested interventions for Varanasi city.

BCW intervention function	Possible interventions	COM-B Component	Selection of appropriate intervention through APEASE criteria
Environmental Restructuring	Provide a variety of bins for different waste types (e.g., wet, dry, recyclable) in households and public areas.	PC	YES
	Increase the number and strategic placement of collection points to reduce travel distance and improve convenience.	PC	YES
	Improve infrastructure, such as adding pathways or better lighting, to reduce distance and enhance safety for waste disposal.	PC	YES
	Upgrade the collection system or fleet (e.g., more vehicles) to enhance service consistency.	PC	YES
	Install clearly labeled separate bins (e.g., for recyclables, organic waste) in public areas like markets or parks.	PO	YES
	Establish a dedicated maintenance and repair system for waste management infrastructure (e.g., bins, vehicles).	PO	YES
	Set up community composting facilities in neighbourhoods to manage organic waste locally.	PO	YES
	Integrate waste management activities (e.g., sorting demos) into community events or festivals.	SO	YES
	Use visual cues (e.g., color-coded bins) or automated reminders (e.g., app alerts) in households.	AM	YES
	Improve the quality and reliability of waste services (e.g., timely pickups, better equipment).	RM	YES
Enablement	Offer alternative collection methods, like scheduled pickups, for those with mobility or safety concerns.	PC	YES

BCW intervention function	Possible interventions	COM-B Component	Selection of appropriate intervention through APEASE criteria
	Implement a reliable scheduling system with accountability measures to ensure timely collection.	PC	YES
	Make workshops accessible and engaging by hosting them locally and using interactive formats.	PSC	YES
	Provide composting bins and basic education to households to encourage participation.	PO	YES
	Provide resources like bins or volunteers to event organizers to include waste practices.	SO	YES
	Create a simple, anonymous reporting system (e.g., hotline or app) for waste violations.	SO	YES
	Simplify participation in reward programs, possibly through the waste app.	RM	YES
	Simplify the process to claim incentives, ensuring accessibility for all.	RM	YES
	Collect resident feedback and involve them in service improvement plans to address concerns.	RM	YES
Training	Provide hands-on training sessions for residents and workers to practice waste segregation.	PSC	YES (for residents)
	Provide technical training for workers on new waste management tools or technologies (e.g., sorting machines).	PSC	YES
Persuasion	Use emotional appeals or real-life examples (e.g., local health stories) to emphasize the importance of proper disposal.	PSC	YES (need to incorporate health risk message)
	Leverage leaders' influence to persuade the community to adopt	SO	YES

BCW intervention function	Possible interventions	COM-B Component	Selection of appropriate intervention through APEASE criteria
	better waste habits through speeches or endorsements.		
	Collaborate with local media to regularly feature stories on waste management successes or tips.	SO	YES (to do regular update on initiatives)
	Share data and success stories (e.g., before-and-after photos) showing the impact of waste efforts.	RM	YES
	Highlight benefits (e.g., cleaner air, fewer pests) in all waste-related communications.	RM	YES
Education	Organize regular workshops on waste management practices to build knowledge and skills.	PSC	YES (lacks regularity)
	Inform the public about health risks (e.g., disease spread) linked to improper waste management through media or talks.	PSC	YES (no health risk message exists)
	Disseminate waste management policy information through flyers, radio, or social media for broad reach.	PSC	YES
	Teach residents how to use the app effectively through tutorials or community demonstrations.	PO	YES
	Inform residents about the negative community and environmental impacts of improper disposal.	RM	YES
Modelling	Encourage local leaders to actively promote and demonstrate good waste practices (e.g., public clean-ups).	SO	YES
	Showcase community members or areas excelling in waste practices as examples for others to follow.	SO	YES
	Highlight neighbourhoods with clean streets as examples to inspire others.	AM	YES
	Showcase successful examples of community involvement from other	RM	YES

BCW intervention function	Possible interventions	COM-B Component	Selection of appropriate intervention through APEASE criteria
	areas or cities to motivate participation.		
Restriction	Implement and enforce penalties (e.g., fines) for littering and non-compliance with waste rules.	SO	YES (lacking enforcement)
	Offer rewards or recognition for residents who report violations to boost participation.	SO	YES
	Introduce reward programs (e.g., discounts, vouchers) for households or businesses excelling in waste management.	AM	YES
	Introduce tax rebates or utility discounts for households complying with waste rules.	RM	YES

Source: Based on personal data

Chapter-5C

Chapter 5.3 Comparative analysis of Technical & behavioral aspect two Cities Indore & Varanasi.

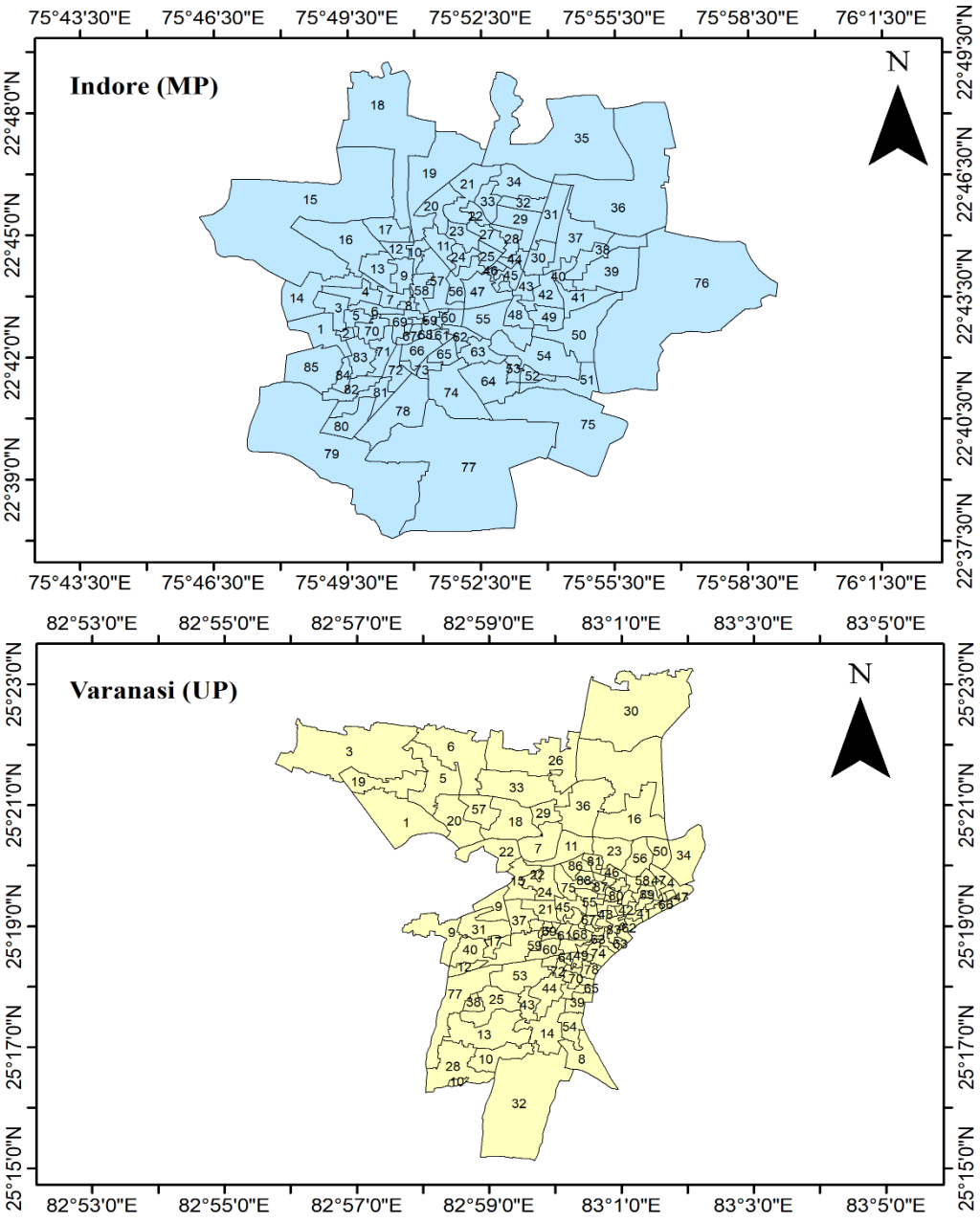

Figure 5.76: ward-wise map of Indore and Varanasi.

5.3.1 Justification for Comparison

Indore was chosen with Varanasi for comparative analysis instead of other cities in Uttar Pradesh largely due to its reputation as the cleanest city in India since 2016 (2nd Swachhatta Sarveshan).This selection aimed to examine the best practices, policies, and innovative strategies that have propelled Indore to the top in cleanliness, and how these can be adapted or applied in Varanasi (Fig. 5.76).

Few key factors driving this decision is the similarity between the two cities.

- Both Indore and Varanasi are tier-2 cities (as)
- Comparable administrative setups in terms of their municipal framework. Varanasi has 90 wards, while Indore has 85, making the scale of governance and the challenges related to sanitation and cleanliness similar.
- Additionally, neither city is a state capital. Capital cities tend to receive more attention, resources, and infrastructure support, which can skew their performance in areas like cleanliness.

5.3.2 Comparison of MSWM components of Indore and Varanasi

(a) Comparison of waste composition between Indore and Varanasi.

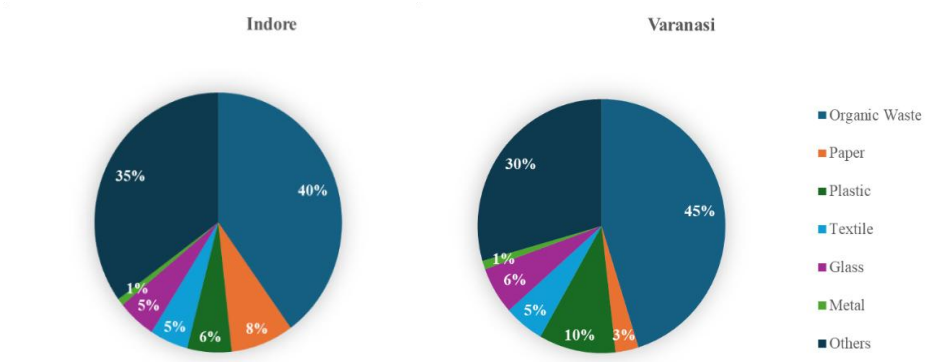

Figure 5.77: waste composition and their component in both city.

Table 5.16: Waste composition of Varanasi and Indore.

S. No	City	Organic Waste	Paper	Plastic	Textile	Glass	Metal	Others
1	**Indore**	40 %	8.2 %	5.8 %	5 %	5 %	0.89%	35 %
2	**Varanasi**	45 %	3 %	10 %	5.2 %	6 %	1.1 %	29.3 %

The composition of solid waste might vary considerably based on the source of the garbage and the prevailing municipal rules and waste management techniques. Varanasi possesses a greater quantity of organic garbage compared to Indore; nevertheless, when paper trash is included, both cities have about equivalent levels of organic waste. Thus, the inquiry is, who administers its organic waste more effectively? In this domain, Indore appears to be the unequivocal victor. Varanasi generates about twice the amount of plastic garbage than Indore, likely due to Indore's stringent plastic ban policy (Fig 5.77). The enforcement of policy in Indore surpasses that in Varanasi, rather than merely adhering to stringent regulations. Indore Municipal Corporation (IMC) CSE, 2016, Swachh Bharat Mission. The subsequent notable group is termed "other," or, in scientific terminology, "inert." Inert materials are often disposed of as waste. Indore is generating an increased volume of trash in several or combined categories. Thus, garbage disposal is crucial provided we begin to utilise all our refuse. Improper dumping significantly endangers the environment (Dasgupta et al., 2013). (Table 5.15) indicates that nearly all major cities globally have approximately 50% organic garbage. The percentage of organic waste in cities varies based on their classification as developed or developing, typically exceeding or falling below 50%. Developed cities generate less organic garbage compared to poorer nations.

Table 5.17: comparison of MSW characteristic in both cities.

	INDORE	VARANASI
Moisture content	31± 13.3	44 ±13.3
PH	7	6.37
C:N Ratio	29.3±11.4	19.4±11.4
HCV	804±711.9	1437±711.9

The chemical composition significantly influences various aspects of waste management. The pH of Varanasi's garbage is acidic, whereas Indore's is neutral. The waste's acidic properties render it unsuitable for composting. It also impacts the characteristics of the soil at the dumping site, particularly if the location is illegal or inadequately prepared in accordance with established norms and statutory rules. (Nakasaki et al., 1993; Srivastava et al., 2020).The occurrence of these minerals in waste items does not inherently indicate a concern to the health of humans or the environment. It is essential to effectively manage and dispose of waste materials to mitigate potential adverse effects on the environment and human health. Baseline emissions for Varanasi, as reported by TERI in 2019b.

(b) Moisture and C:N ratio for organic waste

Moisture content denotes the quantity of water contained within a material. It is generally articulated as a percentage of the material's overall weight. The moisture level of a material influences its physical and chemical properties and is frequently a critical aspect in processes such as drying, burning, and decomposition (Magrinho & Semiao, 2008). Moisture content influences numerous critical characteristics, such as calorific value. The calorific value is essential as it assesses the efficacy of a substance as fuel; a higher calorific value indicates greater energy production upon combustion (Komilis et al., 2014).

The carbon-to-nitrogen ratio (C:N ratio) quantifies the relative proportions of carbon and nitrogen in a substance. It is frequently employed to forecast the decomposition rate of organic materials, including plant matter, manure, and food waste (Bernal et al., 2009). A reduced C:N ratio signifies a higher nitrogen content relative to carbon, suggesting that the material will undergo decomposition at an accelerated rate (Gao et al., 2010). An elevated C:N ratio signifies a greater carbon content relative to nitrogen, suggesting that the substance will undergo decomposition at a slower rate. The ideal carbon-to-nitrogen ratio for composting typically ranges from 25:1 to 30:1 (Bishop, 1983). An analysis of the C:N ratio in Varanasi and Indore reveals that Indore's C:N ratio falls within the range of 25-35, indicating it is a suitable candidate for composting. Table : 5.16 indicates that Varanasi waste is deficient in this regard, exhibiting a C:N ratio of 19. Manipulation can render it appropriate for compositing. This may be a plausible explanation for improved organic waste management in Indore, as organic waste constitutes almost 50% of the overall garbage. Proper management of the issue will inherently resolve fifty percent of the waste problem. The objective is not to breakdown the organic matter but to produce high-quality compost. on many states, the issue persists that organic waste is transformed into compost; yet, due to its substandard quality, farmers are hesitant to utilise it on their crops.

Table 5.18: comparison of collection and transportation facilities in both cities.

Components	*Indore*	*Varanasi*
Door to Door Collection	100%	75%
Mechanical Sweeping	15%	8%
Maual Sweeping	85%	92%
Waste Collection Vehicles (Small & Medium)	470	178
Bulk Waste Trucks	78	58
Rickshaw Trolley	350	717
Segregated Waste Transport	100%	50%

(c) Collection and transportation in Varanasi and Indore

Solid waste management is a significant challenge in urban areas globally, including Varanasi and Indore in India. Environmental preservation, sustainable development, public health, and the general standard of living in a city all depend on effective solid waste management.

In Varanasi and Indore, solid waste is gathered and conveyed to specified landfill locations for disposal. The Varanasi Municipal Corporation is generally tasked with the management of solid waste collection and disposal. The Indore Municipal Corporation oversees solid waste management in Indore . In certain instances, private enterprises may also be inclined to offer solid waste management services. IL&FS Environmental Infrastructure and Services Limited, a private entity, is responsible for the sanitation and solid refuse management of 84 wards in Varanasi, including those that are adjacent to the Ganga Ghats. Kiyana Solutions is tasked for sweeping and doing door-to-door collection over 30 wards in collaboration with the Varanasi Municipal Corporation. Organic Recycling Systems Private Limited operates three waste-to-energy plants in Varanasi, including the Bhavaniapokhari and Adampur facilities. Ankur Scientific

oversees the waste-to-energy operations at the Karsada waste disposal and management facility (Table 5.17). Indore city A2Z infrastructure similarly takes rubbish from bins and delivers it to the open dumping site (VMC, 2019).

(d) Processing and Treatment facilities

Varanasi, recognised as the oldest continuously inhabited city in the world, features narrow lanes and streets, rendering cleaning and waste collection a challenging endeavour. In contrast, Indore is a relatively modern city characterised by an extensive network of broad highways and pedestrian pathways. Varanasi commenced its capacity building initiatives in 2015, whereas Indore initiated its waste management infrastructure development in 2009. The infrastructural deficit is apparent from Table 3, where Indore outperforms Varanasi in nearly all areas, except for hand carts. Due to its small streets and street culture, attributed to its status as the oldest living city in the world, hand carts are more widespread in Varanasi. The workforce in Varanasi presents a challenge, as it requires a greater number of manual labourers compared to Indore due to its intrinsic rural mentality, which contrasts with that of Indore (CBUD, 2015, Final City Development Plan). Varanasi experiences a labour shortage due to recruiting being conducted at the state level. The Varanasi Municipal Corporation is unable to sustain a greater workforce due to prevalent financial constraints across nearly all Urban Local Bodies in India. Varanasi possesses 38 sanitation supervisors, when the requirement is 108 (Nigam VN 2018), thus demonstrating a personnel deficiency in the city. Varanasi generates a greater volume of organic garbage than Indore; nevertheless, Indore exhibits superior management efficiency. One possible explanation for this is that the carbon-to-nitrogen ratio in Indore is superior to that in Varanasi. Composting is more feasible in Indore's organic waste management. Consequently, for the

aforementioned reason, Indore is capable of producing high-quality compost. High-quality compost, consequently, renders the process of organic waste composting a far more economically viable alternative. If the quality of compost is subpar, farmers will be hesitant to utilise it on their fields. A preconceived notion exists that compost derived from organic waste may be less effective than traditional compost produced from cow dung.

Cities must establish efficient solid waste management systems to guarantee adequate collection, transportation, and disposal of garbage, thereby mitigating adverse effects on human health and the environment. (TERI, 2019a, Evaluation Report)

(e) Transfer and treatment in Varanasi and Indore.

Indore and Varanasi are Indian cities recognised for their substantial solid waste management issues. In both cities, the predominant approach to solid waste collection and disposal is via landfills, while initiatives are in progress to enhance trash segregation, recycling, and composting (Rai et al., 2017).

The primary landfill facility in Indore is situated near Devguradia and is overseen by the Indore Municipal Corporation (IMC). The IMC manages multiple transfer stations, where solid waste is gathered and subsequently transported to the landfill for disposal **(Table**: 5.18). In recent years, the IMC has instituted many programs to encourage trash segregation, including the distribution of green and blue bins for the collection of biodegradable and non-biodegradable waste, respectively (Singh, 2021).

Table 5.19: comparison of treatment and disposal facilities in both cities.

	Indore	Varanasi
Sanitary Landfills / open Dumpsites	2	1
Waste To Energy plant	2 units (7%)	3 units
Composting Operations	93%	50%
Waste Transfer Points	36	27
Pyrolysis Plant	1(600 MT/month)	1 (400 MT/month)

The principal landfill site in Varanasi is situated at Karsada and is administered by the Varanasi Municipal Corporation (VMC). The VMC manages multiple transfer stations, where solid waste is gathered and conveyed to a landfill for disposal. Similar to Indore, Varanasi has enacted measures to encourage garbage segregation, such as distributing green and blue bins and creating community composting centres (Tripathi, 2018). Indore and Varanasi encounter considerable difficulties in solid waste management, particularly in enhancing trash segregation and augmenting recycling and composting efforts. Nevertheless, continuous initiatives are being undertaken to tackle these difficulties and enhance the solid waste management systems of both cities. As previously mentioned, Indore possesses an appropriate C: N ratio, as demonstrated in Table 4. Indore is achieving a composting rate of 93%, but Varanasi has accomplished only 50% of its composting activities.

Table 5.20 : Key policy comparisons.

Aspect	Indore	Varanasi
Collection Coverage	100% door-to-door collection since 2016	Door-to-door collection under implantation phase with user charges
Segregation	• 100% segregation at source, achieved through citizen awareness campaigns • Sorting into 6 types	• Not explicitly stated as 100%; part of holistic strategy, but implementation details unclear. • Targeted for 2 type segregation wet & dry
Processing Methods	Conversion of waste into compost and Refuse Derived Fuel (RDF)	Focus on composting and potential power generation from waste Karsada Solid Waste Management plant
Citizen Participation	High participation. extensive awareness campaigns and community involvement, with citizens playing a significant role in cleanliness	Low participation. Continuous IEC and BCC activity need to be implemented.
Technological Integration	GPS tracking for garbage vans command center for monitoring enhancing operational efficiency	specifics are not detailed, with less focus on technological integration
Private Sector Involvement	Private companies involved in collection and processing, enhancing service delivery	Planned involvement of private firms for comprehensive waste management, including power generation, with agreements in progress

(f) Policy Intervention and gaps of Varanasi and Indore with global prospective

In the instances of Varanasi and Indore, Varanasi commenced its waste control efforts later. Prior to the establishment of core policy formulations in Varanasi, Indore secured the top position in the Swachh Bharat Sarvekshan in 2016. Since 2016, Indore has

rapidly advanced its waste management practices (Table 5.19). Key policy-level measures visible in effective waste management in Indore include the following

- Real-time tracking and oversight of waste collection vehicles for optimal routing and management. It commenced in 2017 in Indore. Varanasi has also initiated this with a specialised command centre.
- Distinct mechanism for substantial garbage producers. Developing customised solutions and eschewing a one-size-fits-all approach.
- Implemented a biometric attendance system linked to Aadhaar for personnel in the waste management division. This facilitates improved human resource management.
- Unexpected visit by public officials such as the Mayor and Members of Legislative Assemblies (MLAs). Senior officials often engage in on-site assessments of the prevailing circumstances.

Additional factors contributing to the success of the Indore model include enhanced policy implementation. For instance, while every city has prohibited plastic bags, Indore has effectively implemented this prohibition by targeting not just consumers but also retailers and manufacturers. Indore implemented stringent measures by confiscating substantial amounts of plastic from manufacturers and vendors.

Figure 5.78 Data Collected through different stakeholders during field visit.

5.3.3 Comparative analysis of Indore & Varanasi through COM-B model of behaviour.

Table 5.21 : COM-B comparison of Indore and Varanasi.

COM-B Component	Indore	Varanasi
Capability (C)		
Physical	**Strength:** • 82% report frequent door-to-door collection (rating 4.5/5). • Diverse bin with sorting in 6 categories • 80 % Waste worker uses safety gears **Gap:** • No gaps found in physical capability	**Strength:** More than 60% capable of segregating atleast in 2 bin system. **Gap:** • 58% report bin are hardly accessible and have safety issues. • More than 70% worker lack PPE kits (lack of proper training) • Non reliable door to door collection
Psychological	**Strengths:** • Approx. 70% residents aware of waste segregation and are well aware of policies • More than 80% are attend workshop and concerned to health risk. • Waste worker are trained to handle technologies **Gaps:** no gap identified in psychological capability	**Strengths:** no strength reported **Gaps:** • 70% know about segregation and unfamiliar with city's MSWM policies • 85% unaware of workshops/school programs hence no concern of health. • While 80% workers non-technical
Opportunity (O)		
Physical	**Strengths:** • 85 % reports availability of separate bins & 311 app usage. • 65 % confirms sufficiency of recycling facilities • 55% reported promptly repairs occur to damage bins **Gaps:** • More than 55% have no access to composting facilities	**Strengths:** **Gaps:** • More than 85% deny application usage in MSWM and non-repair of broken bins • 65% reported insufficient recycling facility & availability of separate bins • 60% have no composting facility available

Social	**Strengths:** • Approx. 80 % found active role of local leader and incorporation of MSWM practises in religious or cultural event. • 70% cases were penalised for violation of MSWM rule • 60 % Media highlights success stories. **Gap:** • Only 50 % cases of neighbour violation are reported	**Strength:** **Gaps:** • 90% non-imposition of penalties/fines. • More than 80% cases no reporting against neighbour. • 60 % non-priority of MSWM services in religious or cultural event. • 50% cases of MSWM violation are reported sometime.
Motivation (M)		
Automatic	**Strengths:** • 90 % individual involve in habitual segregation while they found signage or art to encourage proper disposal. • More than 65 % perceive clean street as social norm. • 60 % feel guilty for non-compliance of rule **Gaps:** • 70 % received no award or recognition for proper segregation /disposal.	**Strengths:** • More 70 % report they find signage / art nudging for proper disposal • More than 50 % feel clean street as social norm. **Gaps:** • 95 % lack rewards for green practices**.** • 90 % feel guilt/shame sometimes for improper disposal. • Approx 80 lack habitual segregation.
Reflective	**Strengths:** • 90% believe their effort improve cleanliness. • 90% are satisfied with MSWM services & rated (4.5/5) • 70 % believe in long term benefit by policies or actions & reported to be involved in city policy development **Gaps:** • 67 % reports no tax rebates.	**Strengths:** • 60% believe their effort improve cleanliness **Gaps:** • Approx. 90% report no tax rebates. • Approx. 85 % non-involvement in policy development. • Approx. 70% dissatisfied with services & rated 2.33/5 & don't find any long term benefit by policies or actions.