Fly-tipping – An intentional offense or a compelled action: A case study of HMDA, Telangana

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Abstract Fly-tipping is a common social crime that has been traditionally practiced by certain people within a social group from the beginning of the modern civilization. In course of time this practice has become a habit and for some people it is the last option as they have their own excuses for committing the offense. But, in the present time, it is also seen practiced by the civic bodies who in fact are responsible for providing the service amenities of safe waste-disposal. In case of the present study, the scope of the research focuses on investigating the root cause of the fly-tipping practice performed by the locales and/or the civic bodies at some localities within the jurisdiction of Hyderabad Metropolitan Region which is the fifth largest metropolitan mega agglomeration in the country and the capital city of the Indian states of Telangana consisting of 40 municipalities/NPs. The initial observation revealed that apart from the other 28 municipalities/NPs within the jurisdiction, fly-tipping is seen at most of the places in the GHMC region which is the central municipal corporation in HMDA consisting of 12 municipalities. On investigating the offenders, it was discovered that at some places including the civilians the civic authorities are also engaged in committing the crime in disguise. A detailed one-to-one survey was conducted to find out the root of the offense through structured questionnaire and the analytical result of the interview is described in the paper.

Keywords —Fly-tipping, MSWM, Littering, Dump-yard, Urban Waste, Urban Amenities, SBM

I. INTRODUCTION

Waste, as everyone knows, is defined as any material that is undesirable or no longer useful. This implies that it contains no further economic value that could be gained through any kind of exploitation. Waste can exist in any kind of physical state, including gaseous, liquid, and solid. The majority of the time, gaseous waste is released into the atmosphere automatically, but solid waste, liquid waste, and sewage waste require controlled releases into the environment because there isn't as much space as there is in our atmosphere for their disposal. Liquid waste is often disposed of by sewer drains, which frequently join to form broad main drains. These drains are then released into flowing surficial waterbodies or straight into bays and oceans, regardless of whether the garbage is residential, commercial, or something else. In order to extract the dangerous and some helpful solvents from the water, the contaminated sewer is frequently treated utilizing cutting-edge scientific techniques. However, solid waste must first be stored individually, then it must be gathered from the source and centralized in one location. After that, the collected waste needs to be disposed of or separated and recycled. Every human living in a civilization has an obligation to dispose of waste in order to maintain a clean and healthy lifestyle. Aside from the occasional littering, dumping in designated dump yards and random landfilling is also practiced date back to the dawn of human civilization. Majority of the time, the solid waste is disposed of in low-lying areas, pits, sumps or swamps either for composting or to level the soil more easily and cheaply. Each of these landfills can only contain a certain quantity of waste load before it begins to rise above the surrounding terrain. Overflowing, the dump begins to disperse around the neighborhood due to surface runoff, wind, or animal activity, which causes pollution.

The amount of garbage produced is closely correlated with population and product consumption. The kind of region, the socioeconomic classes of the population groups, individual literacy, the availability of amenities and sanitation services, the availability of waste-disposal spaces, and other factors all affect the quantity and quality of trash produced. When comparing the Tribal, Rural, Fringe, and Urban regions, it is evident that the Urban regions have the largest population

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concentration and density. Furthermore, there is a significant difference in all of the aforementioned criteria, particularly in metropolitan areas. Urban areas are typically unplanned in the beginning but eventually organized to ensure smooth operation. Of all the behaviors associated with an urban environment, disposing of garbage is one of the most important tasks. It depends on the understanding of the residents and the local government, which is in charge of providing sanitization services. Other significant elements influencing [i]waste management in metropolitan areas are transport facilitation, management policies, availability, feasibility, and proximity of disposal sites.

Some notable issues of every urban area are the unplanned, rapid expansion of the cities, improper landuse, hasty population growth, development of satellite towns, sprawls, and fringes, absence of public common areas, high volume of residual [ii]nondegradable consumer goods, disposal of synthetic wastes, and construction debris. But in all of these addressed difficulties, ULBs, communities, and every urbanite contribute to the grounding of the main issues, which are unchecked pollution of the air, water, and soil, which eventually leads to a host of other related issues. Wastes are disposed of in order to keep the house clean, yet doing so seriously damages our home's environment, making it unhealthy and even poisonous for all living beings.

II. OBJECTIVES OF THE STUDY

This study aims at and attempts to investigate the status of illegal waste disposal sites and practices by the urbanites and the civic authorities within the jurisdiction of HMDA. Hence the Main objectives of the studies are as followed:

1. To identify the notified and illegal dumping sites within the jurisdiction of HMDA.
2. To investigate the waste disposal practices adopted by the locals.
3. To highlight the root cause of fly-tipping practice exercised by the offenders.

III. DATABASE & METHODOLOGY

To address the issue in the present situation, at first the places with similar visual appearance with the notified dump sites were searched on the high resolution google earth imagery. Then to ensure the identified spots are truly illegal dump sites, a pilot tour of the study area was conducted during which several photographic evidences were captured. Added to which, most of the old settlement areas, vegetable markets, outskirt of the industrial hubs, urban waterbodies and low-lying areas, slums and dense-populated areas were visited too. Based on the evidence gathered through the pilot tour and field observation, the assumptions were made to structure the questionnaire to interview the inhabitants of the identified places and the concerned authorities achieve each objective of the study. Followed by this, the first secondary data pertaining to the waste management system, its performance and efficiency of the civic ULBs in terms of provided amenities and services were collected from CDMA, Hyderabad. This along with the previously published newspaper [iii],[iv],[v],[vi],[vii],[viii],[ix],[x],[xi],[xii],[xiii],[xiv],[xv],[xvi],[xvii],[xviii],[xix],[xx,[xxi] articles indeed helped in distinguishing the notified and illegal dump sites within the study area. In the next step, the collected GPS coordinates of the identified illegally fly-tipped locations were overlayed on the HMDA administrative map to identify the exact ULBs boundaries where the crimes are taking place. The physiographic characteristics of the study area are mapped and generated from several secondary Remote Sensing sources. Relief and slope of terrain and drainage network are generated from the Global Digital Surface Model (GDSM) (JAXA-AW3D30) raster data at 30m horizontal spatial resolution which is acquired by Japanese [xxii]Advanced Land Observing Satellite (ALOS) and is distributed through Earth Observation Research Center (EROC) and Japanese Aerospace Exploration Agency (JAXA)'s online data distribution gateway. Such data is a reliable source as the vertical accuracy is ±5m with ±20m horizontal accuracy compared to the SOI toposheet. Even though the vertical interval of the contour lines on SOI toposheet is 20m but it's restricted to digitize due to SOI restriction policy. Moreover, all contour lines are not printed on 1:50000 toposheets of OSM series too. Hence, DEM/DSM/DTM are the only reliable sources for civilian use without violating the national security mandates for digital mapping.

A set of temperature and precipitation data are collected from [xxiii]**C**limatologies at **H**igh resolution for the **E**arth's **L**and **S**urface **A**reas (**CHELSA**) official website which is hosted by the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), CHELSA is based on a quasi-mechanistically statistical downscaling of reanalysis and global circulation model output and is freely available in the download section. The trustworthiness of the data is described in these [xxiv][xxv][xxvi]**Peer Reviewed Articles**.

In the next step, the field survey was conducted for collecting the ground truth on the practiced offence.

Different methods used in the research are:

1. Geotechnical

At first the geomorphic data such as relief, slope and aspect were generated using the acquired DSM raster in ArcMap 3D Analyst tool. The same DSM was used for extraction of drainage network by using Hydrology tool of Spatial Analyst in ArcMap. A graphical illustration of the Model which was run to generate the Drainage Network and River Basin vector from the

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DSM in ArcMap is demonstrated below.

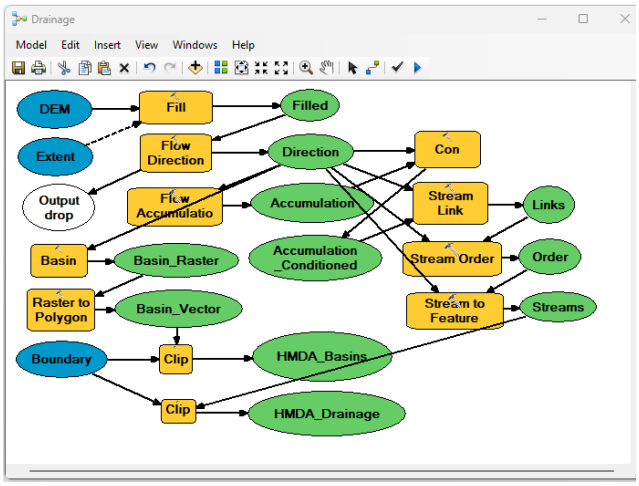

Figure 3.1: GIS Model for extraction of Drainage and River Basin from DSM

2. Physical

The physical method involves the ground truth collection from the sample sites through structured questionnaire. The ground truth includes real-time field photography of the affected areas where fly-tipping was occurring more compared to the ordinary littering. Such places, where market areas and residential areas in different municipalities within HMDA jurisdiction.

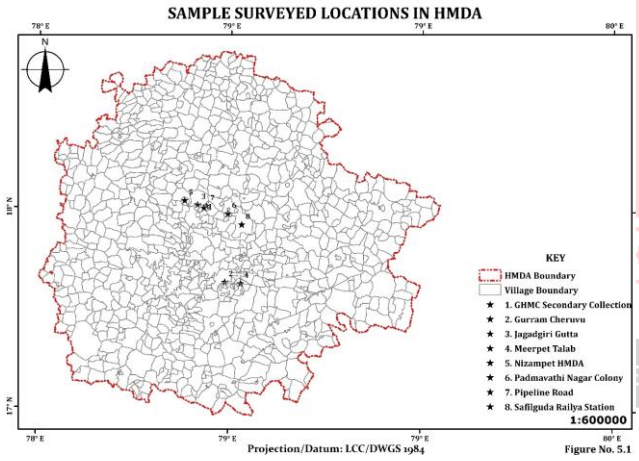

Figure 3.2: Sample Surveyed Locations in HMDA

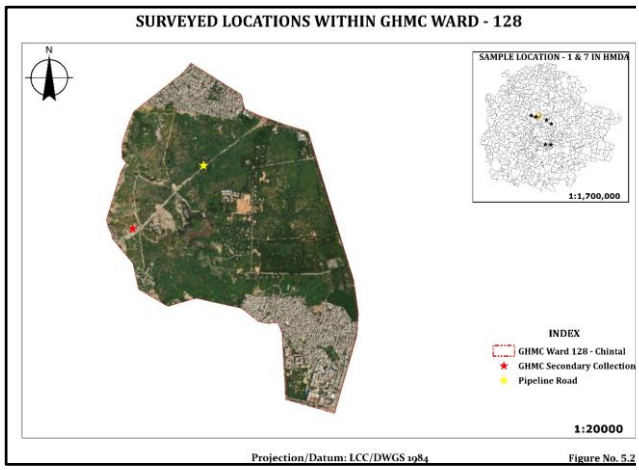

Figure 3.3: Boundary of surveyed location within GHMC Ward - 128

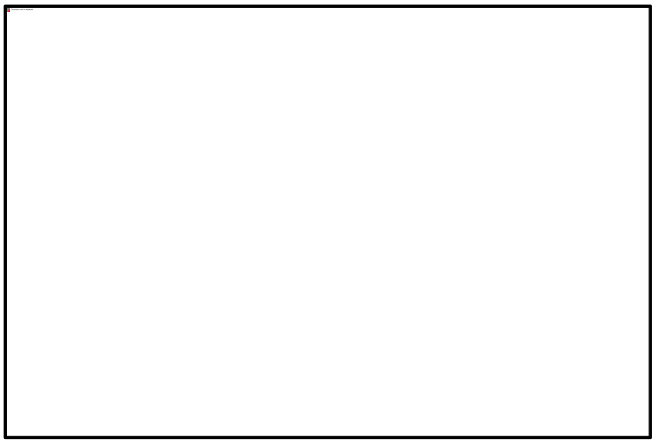

Figure 3.4: Physical Inspection of the area found based on the method used on satellite imagery analysis.

3. Statistical

Statistical technique involves the processing of the responses obtained from the respondents. Through descriptive statistics the frequencies of the responses were computed which insighted the percentage of people responding to similar and unique views on the ongoing issue. To establish the correlation between the various parameters such as government policies, government responsibilities, government's efficiency, performance of the civic bodies, literacy, education, and awareness of the people, individual to community level responsibility of the people, willingness of the people to follow the rules and regulations with the severity of the situation, Pearson's correlation was used.

IV. RESULTS

Based on the structured questionnaire which are interviewed to the locales of the place where maximum fly-tipping was observed, following are the responses presented in graphical form and the questionnaire is attached in the Annexure – 1 at the end of the report.

The data reflects a population where 54% are female, 47% are male, with 16% illiterate, 12% literate, 20% postgraduates, 27% schooled, and 26% undergraduates. This composition provides a snapshot of the diversity within the community.

Waste disposal practices show that 92% use dustbins at home, 9% opt for self-disposal, and most individuals are aware of dry or wet waste distribution. However, only 23% practice waste segregation at home, revealing a gap between awareness and implementation.

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Frequency and methods of disposal indicate variations, with 69% not engaging in waste segregation at home. Disposal frequencies range from 13% daily, 9% alternative days, to 1% twice a week. Notably, 11% dispose of waste in nearby open spaces, indicating a lack of adherence to designated waste disposal practices.

Awareness and education efforts have reached 40% through academic education, 40% through awareness programs, 55% through print media, 63% through digital media, and 15% through elders at home. While 59% are aware of the environmental impacts of fly-tipping, 41% remain unaware.

Observations on fly-tipping show that 62% have observed it, primarily on roadsides, open spaces, filled litterbins, abandoned civil sites, market yards, structural gaps, backyards, open sewers, low-lying lands, and water bodies.

Responses to fly-tipping complaints reveal that 57% have complained to authorities, with varied responses: 48% neutral, 38% positive, 12% negative, and 5% ignored.

Attitudes and intentions demonstrate that 79% would still dump waste at overfilled sites if authorities remain neutral. Waste collection is predominantly done by Urban Local Bodies (91%), with only 9% by private firms. All respondents unanimously reject "paid waste collection."

Graphical representation of the data can be found in the appendix.

V. TIMELINE OF THE STUDY AREA

In Hyderabad, the introduction of municipal administration occurred in 1869. With time, the city expanded from a modest 55 km² area to a mega agglomeration that is now the fifth largest metropolis in India, covering 7257 km². The first Municipality was formed in 1869, and it was the year the city began to flourish. Over time, the Chaderghat neighborhood's surrounding suburbs were incorporated as a new municipality in 1886. The Hyderabad Municipality first grew to 84 km² in 1921. It eventually combined with the Chaderghat Municipality in 1933 to become the Hyderabad Municipal Corporation. Subsequently, in the years 1937 and 1945, respectively, Jubilee Hills (which included Banjara Hills) and Secunderabad were established as two more significant municipalities. The municipalities grew into two sizable municipal corporations in 1950, covering an area of 172 km²: Hyderabad Municipal Corporation and Secunderabad Municipal Corporation. Both corporations combined to become the Municipal Corporation of Hyderabad (MCH) in 1955, just before the state of Andhra Pradesh was established. Later that year, in 1956, the tween city was designated as the state capital. Since so many small towns had already developed at that time, the development authority for the various parts of the city began to take shape gradually. In 1975, the Buddha Purnima Project Authority (BPPA) and the Bhagyanagar Urban Development Authority (BUDA) were established concurrently. In 1981, BUDA changed its name to Hyderabad Urban Development Authority (HUDA). In addition, the Cyberabad Development Authority (CDA) was established in 2001 and the Hyderabad Airport Development Authority (HADA) in 1996. In the meantime, the MCH region expanded to 650 km² through mergers with many other neighboring areas, and in 2007 it was renamed as Greater Hyderabad Municipal Corporation (GHMC). Ultimately, in 2008, the four largest municipal corporations—HUDA, HADA, BPPA, and CDA—merged to become the Hyderabad Metropolitan Development Authority (HMDA), a mega agglomeration covering 7257 km² and home to more than 10 million people. The city is situated on the table land of the Deccan Trap, along both banks of the Musi River, and stretches from 78.00°E to 79.05°E longitude and 16.96°N to 17.89°N latitude. As of right now, the Greater Hyderabad Municipal Corporation (GHMC) has jurisdiction over 7 Districts (including the entire districts of Hyderabad and Medchal, as well as parts of the districts of Rangareddy, Bhuvanagiri, Sangareddy, Medak, and Siddipet); 70 Mandals; 1032 Villages; and 40 Municipalities & Nagar Panchayats (which include 175 Villages in GHMC, 138 Villages in NPs, and the remaining 719 Villages under the umbrella of HMDA).

VI. DISCUSSION

Waste can be accumulated, collected, deposited, and disposed of in different ways depending on its nature, source, quality, and quantity; storage methods like mixed or segregated containers; collection methods like paid or free services; user attitudes like willingness and awareness; dump sites; and localities, among other factors. There are many different ways to dispose of solid trash: giving the waste to the waste pickers; littering near the source; littering while driving; tossing close to the source without sealing; illegally dumping on low-lying areas or landfilling; fly-tipping; dumping at designated dump yards, etc. The majority of the aforementioned practices are offensive, and fly-tipping is a common occurrence among people.

Regardless of the waste's amount and physical condition, fly-tipping is an illegal conduct that is committed as a crime. Typically, the amount of this kind of waste might vary greatly, from a few packets or tiny bin bags to an entire van or truck. When seen, the discarded rubbish in and around a community creates a blight, giving the area a messy, dilapidated appearance. Not to mention that fly-tipping occurs at diverse locations for residential wastes, retail market wastes, and building or demolition debris most of the time. Since the government and institutions have stringent regulations governing industrial, mining, and clinical wastes, they lack appropriate oversight or control over domestic, market, and construction wastes. Additionally, fly-tipping locations are arbitrary, making it impossible to precisely

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forecast whether or not there would be unlawful garbage disposal there one day. These areas typically include crevices between buildings, partially destroyed civil structures, lowlands, isolated, desolate areas, dead or perpetual waterbodies, deserted homes, underutilized backyards, open spaces, shrublands, and roadside sites where one cannot be observed while committing a crime. Large amounts of rubbish are frequently fly-tipped along the sides of city roads, in fallow or unproductive agricultural lands along the rural-urban border, and on disputed territories that are yet unclaimed and unknown. Fly-tipping is a prevalent practice in rural areas, particularly on farmlands and shallow areas that dry up after monsoon. Fly tipping typically affects farms, ditches, lakes, and rivers.

Fly-tipping is not the same as littering, which is when waste is removed from its source with the specific intention of illegally disposing of it somewhere it won't be discovered or caught on camera. There are no particular causes for this accident. Although it is a purposeful act of offense, it is not always the case that those who fly-tip are doing it with the intention of damaging the environment. People foolishly search for locations where they can fly tip without being discovered, believing that as long as they are not discovered, no one or the environment will be harmed. In actuality, a large number of these individuals are unaware of the harm they are causing. Most often, people fly tip because they don't know how to handle the waste, don't have time to dispose of it in the public dump, can't deposit it with the waste picker at the appropriate time, or do so for financial gain or savings because they can't afford paid services. Other reasons include laziness or the belief that someone else will clean up after them. The frequency of uncontrolled illegal waste disposal has increased to the point where it is now dangerous[xxvii]. It contains non-biodegradable wastes like plastics, glasses, and ceramics, unsegregated wastes from various sources, and toxic substances like expired medications, cosmetics, and other synthetic polymers or chemicals.

Fly-tipping leaves obvious consequences behind, which people either intentionally or unintentionally choose to ignore. This has a significant negative influence on wildlife and frequently contaminates the soil with dangerous chemicals that endanger crops and cattle. Trash left outside can draw rodents and transmit disease in cities. Items discarded in lakes and rivers, for instance, can have a detrimental effect on the food that aquatic life, birds, and other creatures eat. Additionally, hazardous substances from discarded waste can seep into the ecosystem, poisoning wildlife and plant habitats. They may enter streams and degrade the quality of the soil. Fly-tipping is a severe criminal offense for which a person may face prosecution, charges, and prison time in addition to a permanent confiscation of the vehicle used in the offense. Fly-tipping is actually a problem since the people who conduct the crime stand to gain financially from not having to pay the waste management fee. In addition, they are steadily poisoning the environment and causing the development of various diseases.

VII. RECOMMENDATIONS

Based on the observations made on the fly-tipping practice at the sample locations within the study area following recommendations are suggested for the improvement of the situation.

1.Targeted Awareness Campaigns:

a) Develop and implement targeted awareness campaigns focusing on specific waste types, with an emphasis on degradable and non-degradable categories.

b) Leverage digital media and educational programs to ensure widespread dissemination of information.

2.Promote Waste Segregation:

a) Launch community-centric initiatives to promote waste segregation at the source, emphasizing the importance of this practice for effective waste management.

3. Enhance Public Participation:

a) Encourage community engagement and public participation in waste management through workshops, community clean-up drives, and collaboration with local NGOs.

4.Strengthen Complaint Mechanisms:

a) Streamline and improve mechanisms for reporting fly-tipping, ensuring timely and effective responses to complaints.

b) Establish feedback mechanisms to keep complainants informed about actions taken.

5.Community Monitoring Initiatives:

a) Promote community-led monitoring initiatives to discourage fly-tipping and raise awareness about its environmental impact.

b) Encourage residents to actively participate in reporting and addressing instances of improper waste disposal.

6.Targeted Intervention in Fly-Tipping Hotspots:

a) Identify and target specific areas with a high incidence of fly-tipping for focused interventions, such as increased surveillance and awareness campaigns.

7. Transparent Communication by Authorities:

a) Ensure transparent communication by authorities regarding actions taken in response to complaints, fostering trust and cooperation from the public.

8. Policy Advocacy for Stricter Enforcement:

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a) Advocate for stricter enforcement of waste disposal norms and penalties for fly-tipping, emphasizing the legal consequences of such activities.

9. Continuous Evaluation and Adaptation:

a) Regularly evaluate the effectiveness of implemented measures and adapt strategies based on changing circumstances and community feedback.

10. Collaboration with Private Firms:

a) Explore collaborative efforts with private firms to enhance waste collection services and improve overall waste management infrastructure.

VIII. CONCLUSION

The case study on fly-tipping within HMDA, Telangana, paints a nuanced picture of waste disposal practices, awareness levels, and the intricate interplay of intentional actions and compelled behaviors. Despite a commendable awareness among the population, evidenced by high dustbin usage and active complaints to authorities, critical gaps persist in waste segregation and understanding diverse waste types.

The intentional act of fly-tipping, observed by over 60% of respondents, predominantly occurs in common areas like roadsides, indicative of a potential need for stricter enforcement and community engagement. While public participation is notable, especially in reporting offenses, the neutral responses from authorities (46.60%) underscore inefficiencies in the complaint resolution process.

Compelled actions, evident in the reliance on waste collectors (74.76%), highlight the need for improved waste disposal infrastructure and accessibility. Despite a majority observing fly-tipping, only a fraction actively engages in warning or monitoring offenders, pointing to a potential gap in community-driven solutions.

The rejection of paid waste collection by the entire population suggests a preference for existing waste management structures but also raises questions about the accessibility and equity of such services.

In essence, the paper concludes that fly-tipping in HMDA is both an intentional offense, driven by a subset of the population, and a compelled action, influenced by inadequate waste disposal infrastructure and gaps in community-driven initiatives. Addressing these dual aspects requires a multifaceted approach, encompassing targeted community education, enhanced waste disposal infrastructure, and a more responsive complaint resolution system. The findings offer valuable insights for policymakers, urban planners, and community advocates striving to mitigate the challenges posed by fly-tipping in the region.

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APPENDIX

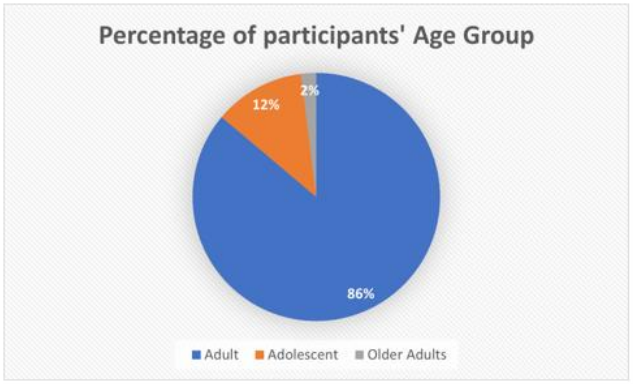

Figure No. 1: Percentage of participants' Age Group

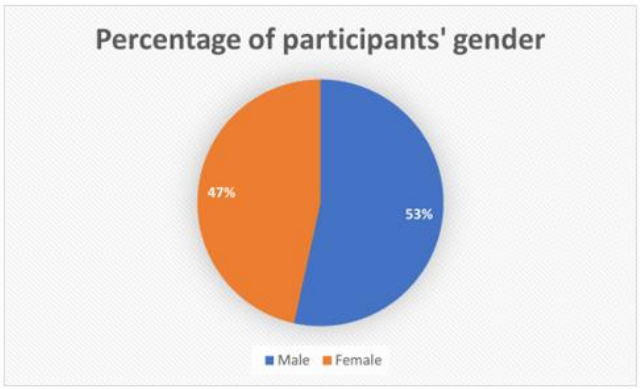

Figure No. 2: Percentage of Participants' gender

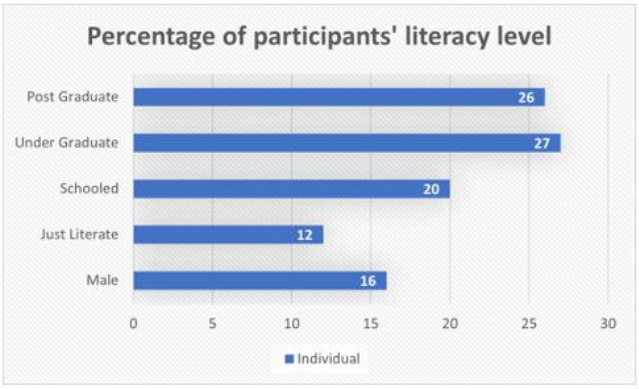

Figure No. 3: Percentage of participants' literacy level

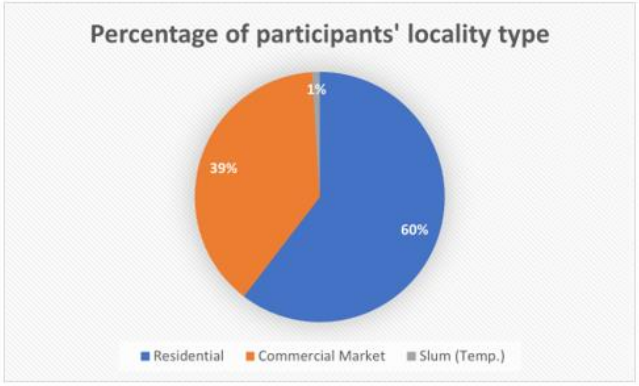

Figure No. 4: Percentage of participants' locality type

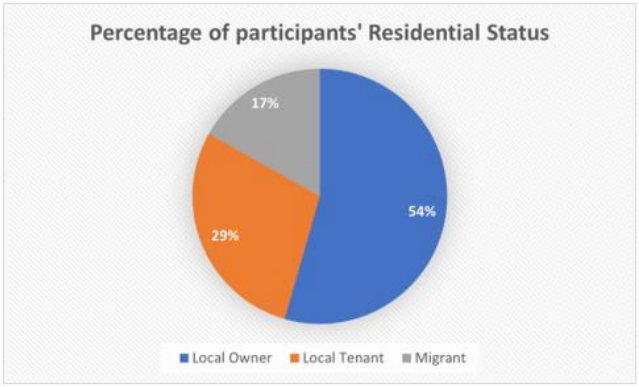

Figure No. 5: Percentage of participants' residential status

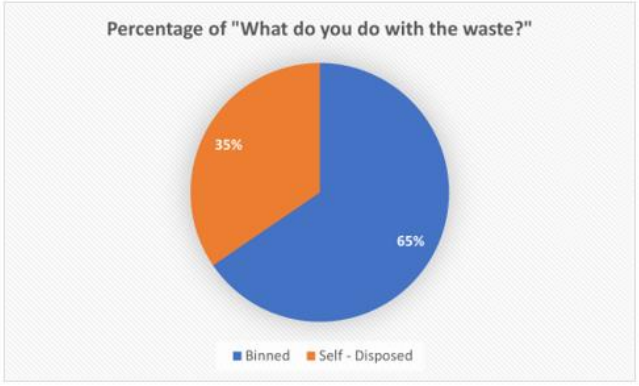

Figure No. 6: Percentage of "What do you do with the waste?"

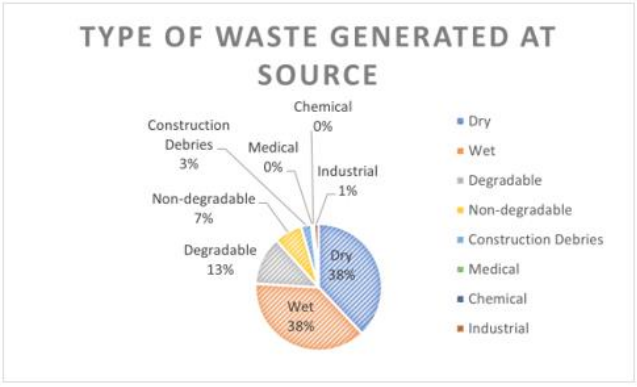

Figure No. 7: Type of waste generated at source.

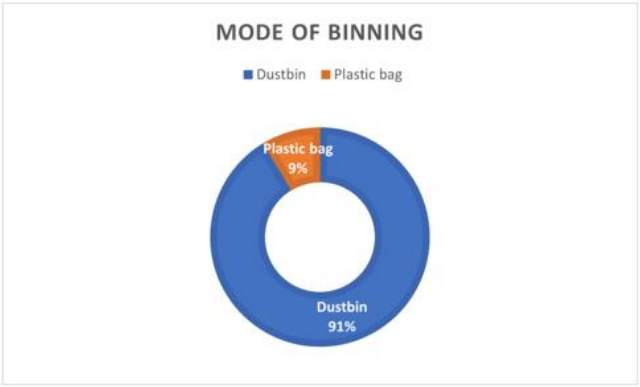

Figure No. 8: Mode of binning

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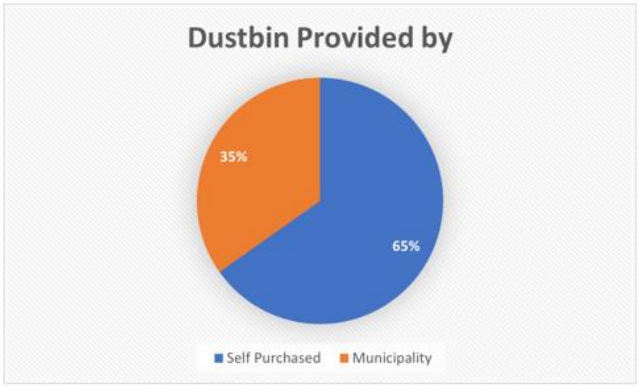

Figure No. 9: Dustbin provided by

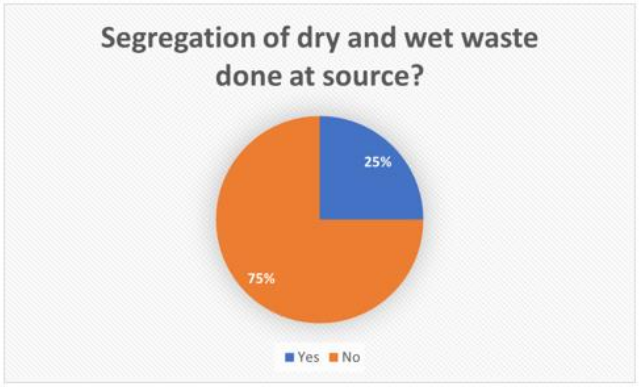

Figure No. 10: Segregation of waste

Figure No. 11: Disposal Mode

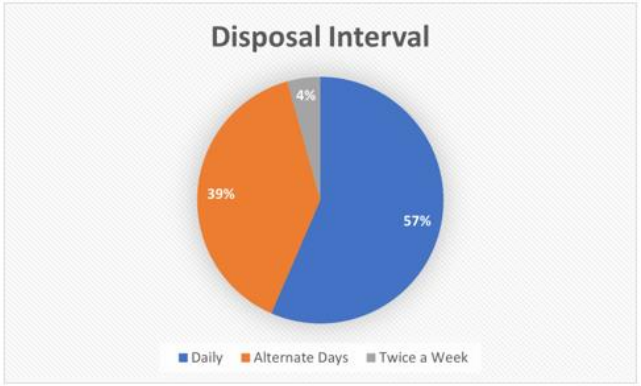

Figure No. 12: Disposal Interval

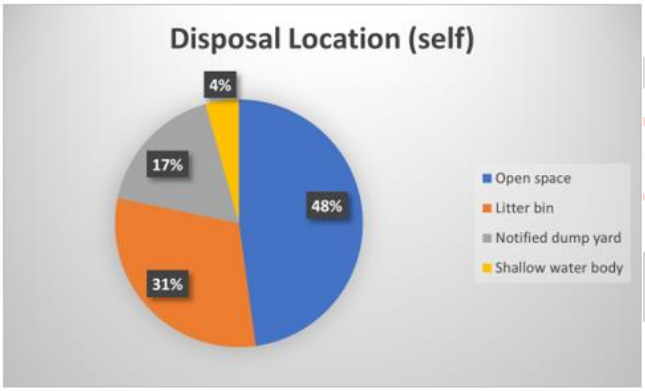

Figure No. 13: Disposal Location

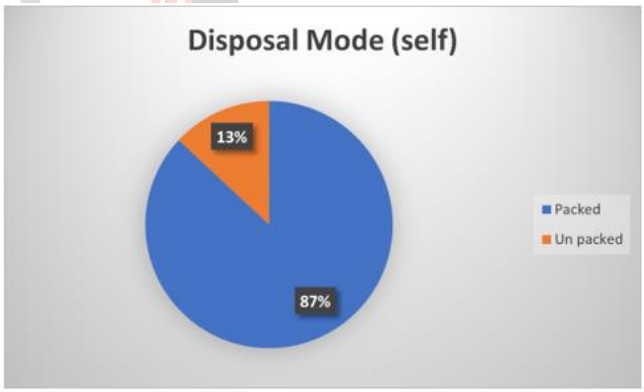

Figure No. 14: Disposal Mode

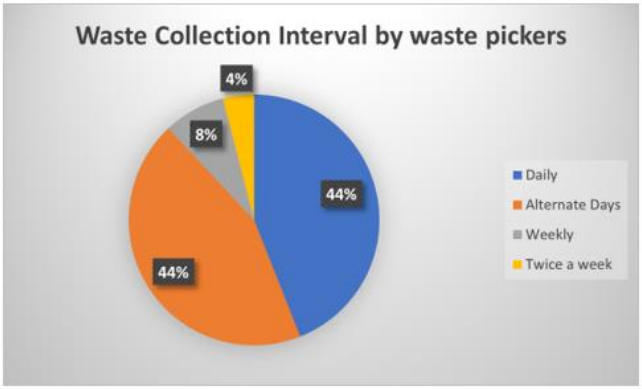

Figure No. 15: Waste Collection Interval

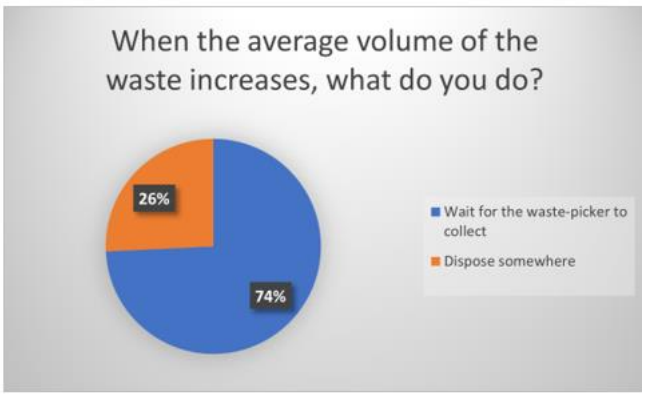

Figure No. 16: Average volume increase

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Figure No. 17: Disposal Location

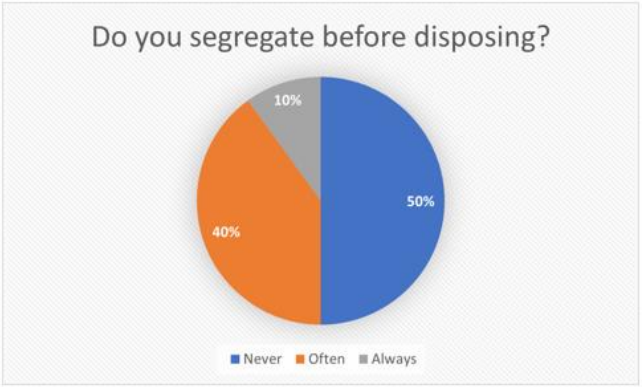

Figure No. 18: Segregate before disposing.

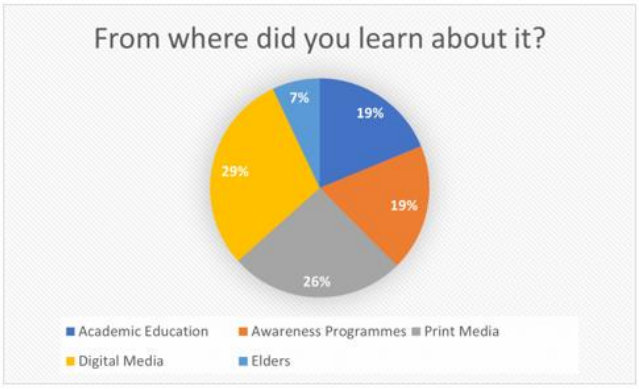

Figure No. 20: Source of learning

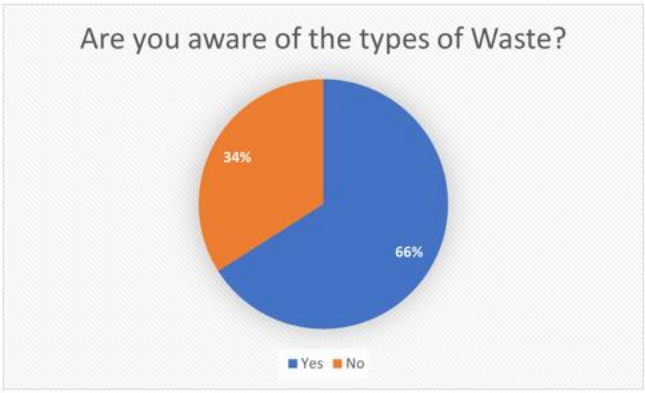

Figure No. 19: Awareness on types of waste

Figure No. 21: Learned at what age.

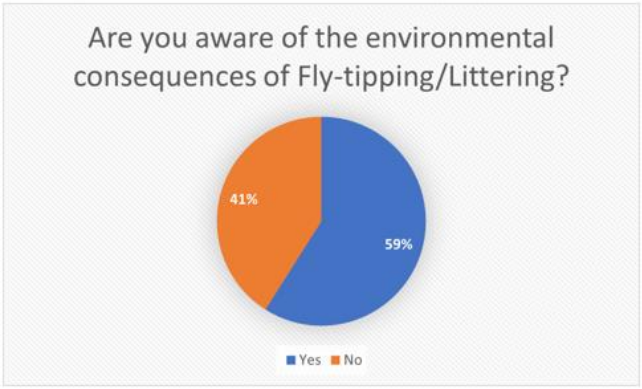

Figure No. 22: Environmental consequences.

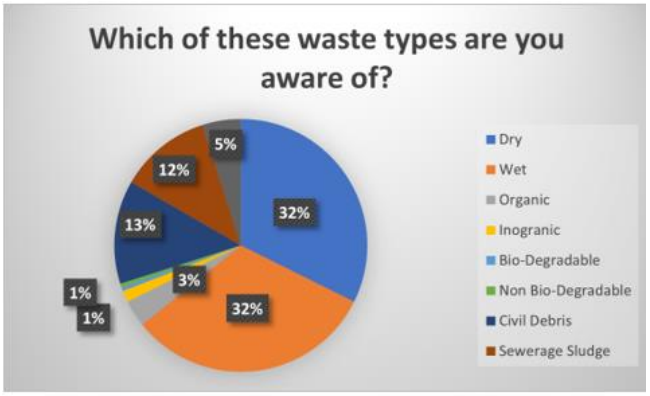

Figure No. 23: Awareness on Waste Types

Figure No. 24: Criminal Offence of Fly-tipping and littering.

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Figure No. 25: Complaints made or not.

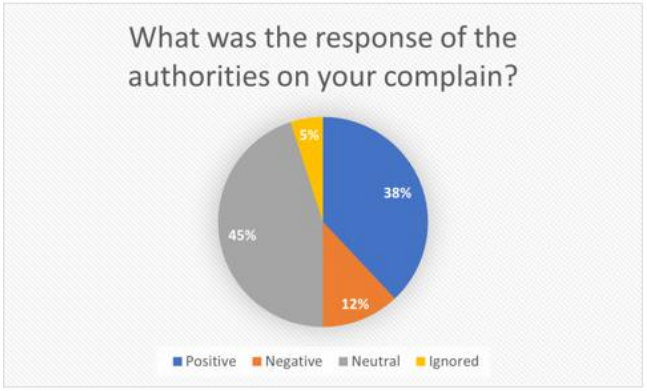

Figure No. 26: Response on the complaints.

Figure No. 27: Action on the complaint.

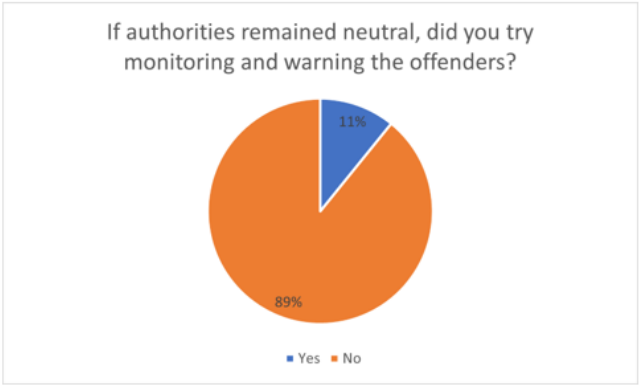

Figure No. 28: Further actions if remained neutral.

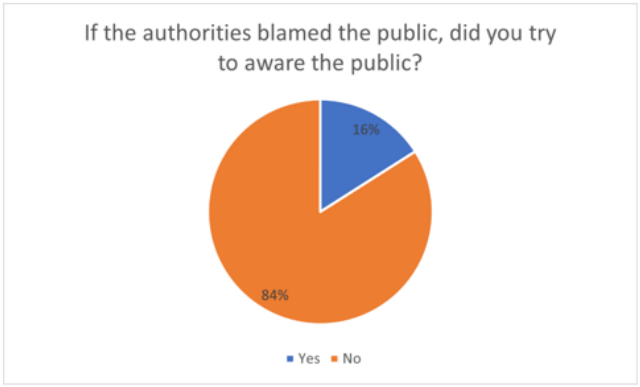

Figure No. 29: Authorities blamed public.

Figure No. 30: Justification of paid waste collection system

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