

Report on

SCENARIO OF MUNICIPAL SOLID WASTE OF TULSIPUR SUB METROPOLITAN CITY, DANG



Submitted to

Tulsipur Sub Metropolitan City
Dang, Nepal

Submitted by

Enrich Nepal
Tokha Municipality-10, Kathmandu, Nepal
Kathmandu, Nepal
Tel: +977 1 6915398

May 2018

INTRODUCTION

Management of solid waste remains a major challenge in urban areas throughout the world especially in the urban areas of the developing world. Nepal, situated in the Himalayan belt has a rapidly growing population together with high urbanization rate. These factors are currently causing problems connected to municipal solid waste (MSW). E.g. leakage of hazardous substances to soil and surrounding aquatic systems, spread of odour and naturally unfamiliar materials to natural biotopes, all of which generate environmental damage and health problems.

Nepal, being a member of the UN started to include environmental issues in its plans after Stockholm conference (1972), which resulted in the formation of UNEP. Although, Nepal has signed various treaties committing to the protection of environment before 1990, the concerns found their place in the constituent of Nepal, only in the year 1990. The pertinent section, Article 26 (4) of present constitution has specifically mentioned the necessity of protecting the environment. Government of Nepal has declared 246 Municipalities, 13 Sub Metropolitan cities and 4 Metropolitan cities. As the federalism is indorsed all over the country, more power and responsibilities is transform to the local level. Solid waste management is also included as the performance indicator of Municipality. The Solid Waste Management Act of 2011 states municipalities are responsible for MSWM and mandates the local bodies to take necessary step to promote 3R's by including segregation of municipal solid waste at source.

In Nepal, solid waste management is one of the major environmental issues, especially in the urban areas. Waste segregation, though has been started in most of the hospitals, other aspects of healthcare waste management such as transportation and disposal are not taken into consideration adequately; in many cases are being disposed along with municipal solid waste. Similarly, increase in production of electrical and electronic wastes and hazardous waste are also the emerging concerns in urban areas. Solid waste being dumped in riverbanks, roadsides, or other low-lying lands, or in open pits or temporary open piles of the municipalities, without significant technical and socio-economic studies is also one of the problems in solid waste management in the municipalities of Nepal.

Until 1980s, municipal solid waste management problems were negligible other than in Kathmandu Valley. At present, solid waste management in both industrial and domestic sectors has been a great concern in urban areas. Increasing urbanization and economic development not only accelerate consumption rates but also increase waste generation. Until May 2014, when 72 new municipalities in May 2014, 61 municipalities in December 2014 and 26 municipalities in September 2015 were created, Nepal counted only 58 municipalities, unchanged since 1996. According to the 2011 census, 4.5 million people or 17 percent of the Nepalese population lived in the 58 municipalities of Nepal; however the population of the municipal areas has now reached 40 percent of the total population when municipalities increased from 58 to 217. Rapid increase of municipalities with unplanned urbanization and migration of people leads to significant quantity of municipal solid waste (MSW) in all municipalities of Nepal, including new municipalities. In addition to MSW, unmanaged disposal of medical wastes generated from the hospitals and clinics are also contributing to the pollution and health hazards in the localities. Therefore, SWM has become a major concern for the municipalities of Nepal.

Tulsipur Sub-Metropolitan City is a recently established city in 2073 BS in Dang District of Province Number Five by merging 5 new VDC's (Fulbari, Duruwa, Manpur, Bijauri, and) to Tulsipur municipality which was established on 2048. It comprises 19 Wards and a total area of 384.63 Km². The present population of this city is 141,528 with the population density of 367.95 (persons per Km²). It is surrounded by Ghorahi Sub-Metropolitan City, in the east, Shantinagar

and Dangisharan rural municipality in the west, Salyan and Rolpa district in the north, and Lamahi Municipality in the south. It is one of the major commercial hubs of Dang district. Due to the high immigration rate from near districts (Salyan, Rukum, Pyuthan, Rolpa) the population of this city has been increasing tremendously which in return has been increasing the waste generation rate of this city. TSMC has not been able to formulate effective plans to properly manage collection, transportation and disposal of MSW due to lack of proper data and information. The waste generated in few market areas (Ward number 5, 6, 7, and 9) of TSMC is being collected but the disposal system of collected wastes is not proper and scientific. They are collected and simply thrown at the bank of the river and are buried through sand of the river. Some of the wastes which can be reused or recycled are collected by waste pickers and sold to the scrap dealers. This haphazard throwing of the unsegregated waste at the bank of river has triggered water pollution, nuisance, loss in aesthetic value and environmental and health hazards. So, characterization and quantification of solid waste is necessary for formulation of proper plans and policies for sustainable solid waste management of TSMC.

OBJECTIVE

The basic objective of this study was to generate baseline data and analyze the composition and quantity of Municipal Solid Waste that is being generated in TSMC and to contribute in developing effective plans for sustainable solid waste management.

STUDY AREA

The study area is Tulsipur Sub-Metropolitan City of Dang District in Nepal.



Figure 1: Location map of Tulsipur sub-metropolitan city

DATA COLLECTION AND ANALYSIS

Desk Study

Review of books, annual reports, journals, articles, plan and policies and other publications from different governmental and non-governmental organizations, related websites and online publications etc. was carried out intensively before field visit and data collection.

Field Study

The SWM baseline survey team conducted the survey in April 2018 during dry season. Before carrying out the field activities community level meetings and interaction were carried out for ensuring the genuine data from the field. Field surveyors were employed for the fieldwork under the direct supervision of supervisor, and concerned staff of TSMC. Six wards were selected for survey on the basis of urban, semi urban and remote to represent the whole sub-metropolitan city. Random structured questionnaire survey was carried out to cater the need of the study.

Questionnaires and interview

For making survey results more accurate and realistic, different quality assurance and quality control procedures were carried out. The questionnaires were designed with a simple format and were easy to understand, allowing detailed information on various aspects of SWM to be collected. Before the fieldwork, the surveyors were fully trained. There were altogether 21 questions which include both closed and open ended type questions. For the ease of receiving quick response from the respondents, more than 85% of the questionnaire to be of close-ended structured questions for smooth solicitation of data from the respondents. The household heads were interviewed possible number of times. In case of the absence of the household heads, knowledgeable family members of the sampled households were interviewed to ensure reliability of information. The questionnaire survey was done for 180 respondents at household level. Similarly, questionnaires survey for commercial and institutional houses was also conducted. Total 36 commercial and 27 institutional houses were interviewed.

Sample Collection

Households were selected in each selected wards (4, 5, 6, 7, 8, and 9) of TSMC in terms of family size, ethnicity, and economic diversity and geographical spatial to obtain comprehensive data. Similarly, commercial and institutional houses were selected on the basis of types to make sampling representative. Around 40 households including 25 commercial houses and 15 institutional houses were selected in each ward for sampling process. The numbers of sample houses were selected on the basis of density of sample houses in a selected area of a ward. Sample was collected directly from the source where it was generated. Sample collection was done for 7 days on regular basis. Samples were weighted and segregated on site regularly to find the amount and composition of waste in ward level and required calculations were done to find out the composition of household, commercial and institutional wastes, overall composition and per capita waste generation. The supervisors provided the necessary inputs to each surveyor continuously during the field survey. During the waste quantity survey, waste samplings were repeated in households and other waste generators in cases where the waste quantity was found to be unrealistic.

Data Analysis

Data were analyzed using software Microsoft Excel (Microsoft). The primary and secondary data were interpreted in systematic way for easy interpretations. The field observation and data obtained through informal interview were presented in report in lucid manner making compatible.

RESULTS AND DISCUSSION

I. MUNICIPAL SOLID WASTE GENERATION AND COMPOSITION

The average per capita MSW generation of Tulsipur Sub-Metropolitan City is found 182.01 g/day. The quantity of waste generation is calculated to be 25.76 tons/day in which household, institutional and commercial waste contributes 20.98 tons/day, 1.02 tons/day, and 3.76 tons/day respectively.

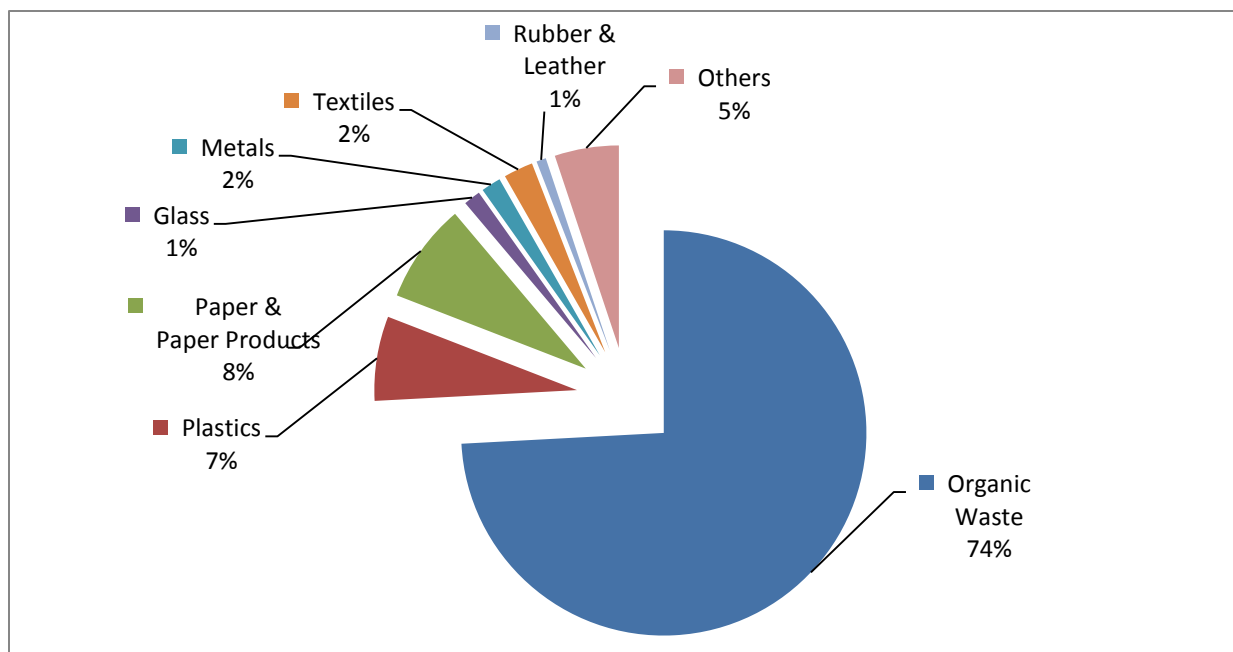


Figure: Total Households SW generation of TSMC

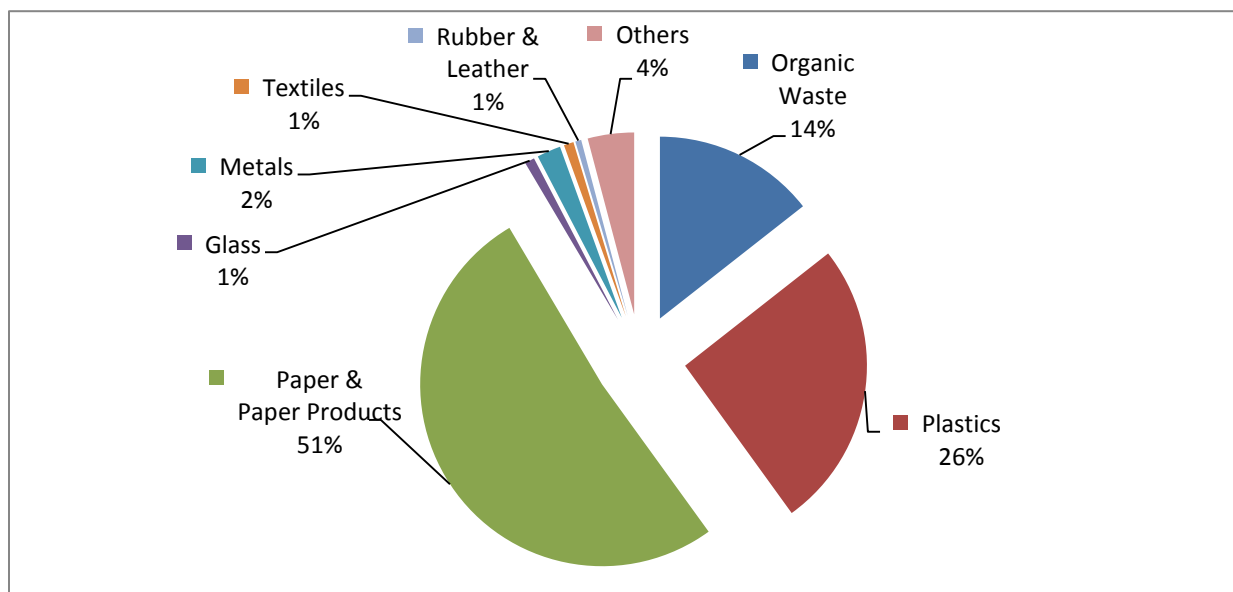


Figure: Total institutional SW generation of TSMC

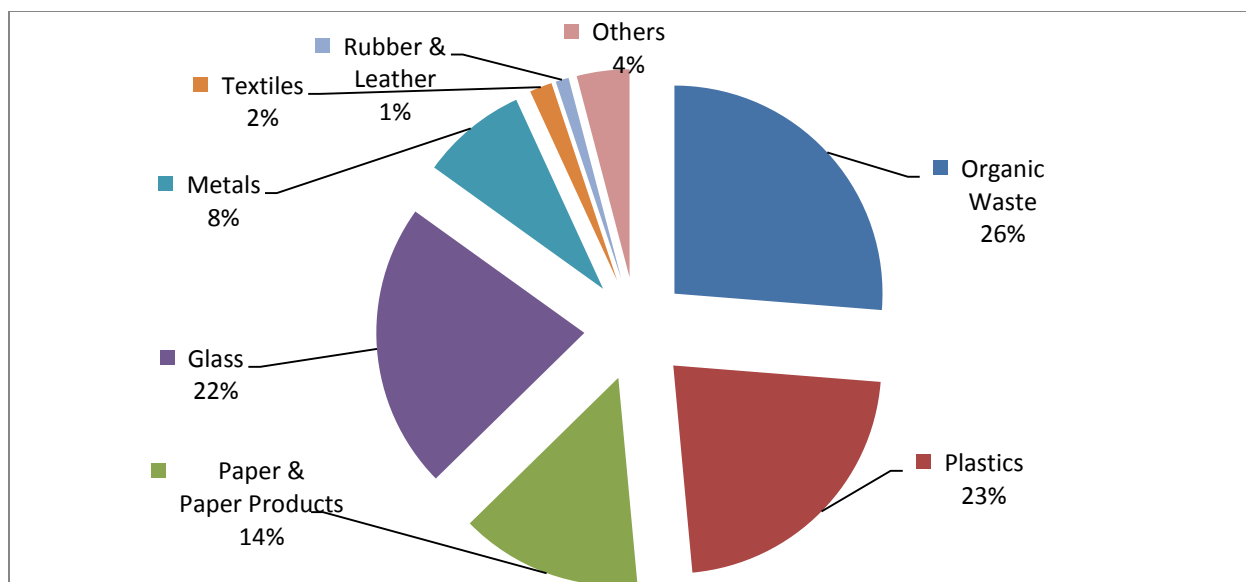


Figure: Total commercial SW generation of TSMC

The overall composition of MSW as well as composition of household, commercial and institutional waste in TSMC is shown below in pie chart.

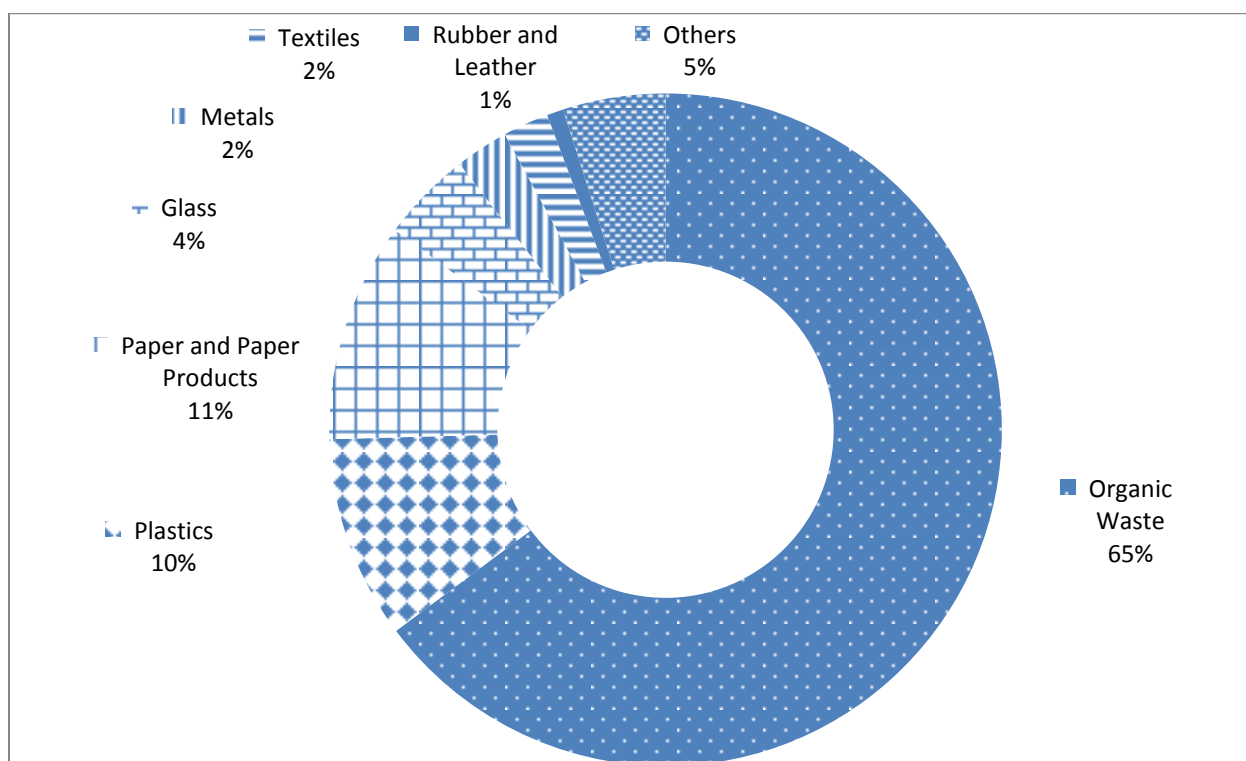


Figure: Total MSW generation of TSMC

When all three major sources of waste are combined, the average composition of MSW is as follows: organic waste 46.55%, plastics 16.68%, paper and paper products 18.55%, glass 7.03%, metals and steels 3.94%, textiles 2.04%, rubber and leather 0.77%, and others 4.44%.

II CURRENT TREND OF MSWM AND ITS FINANCIAL SET UP

Trend of MSWM of TSMC

Existing Collection System			Collection Coverage and Frequency	Final Disposal Method	Landfill site and compost plant
No segregation at source			Regular collection at ward no. 5, 6 through tripper and tractor. Weakly collection from ward nos. 4, 7, 8, and 9.	Open dumping	Lack of landfill site and compost plant
Roadside container	Roadside Pick-Up	Door to Door Collection			

Staffs for MSWM of TSMC

STAFFS	
1. Permanent	
i. Environmental Officer	1
ii. Sub Officer (Na. Su)	1
iii. Sweeper	7
2. Contract Based	
i. Driver	1
ii. Sweeper	2
3. Daily wedges	
i. Sweeper	9
ii. Driver	1
Total	22

Municipal Budget for MSWM of TSMC

Total Municipal Budget (NRs million)			Total SWM Budget (NRs million)			SWM (% of total municipal Budget)			3-Year Average
FY 071/72	FY072/73	FY073/74	FY 071/72	FY072/73	FY073/74	FY 071/72	FY072/73	FY073/74	
162.22	189.67	324.15	6.71	6.30	8.11	4.14	3.32	2.50	3.32

III. ECONOMICS OF MSW OF TSMC

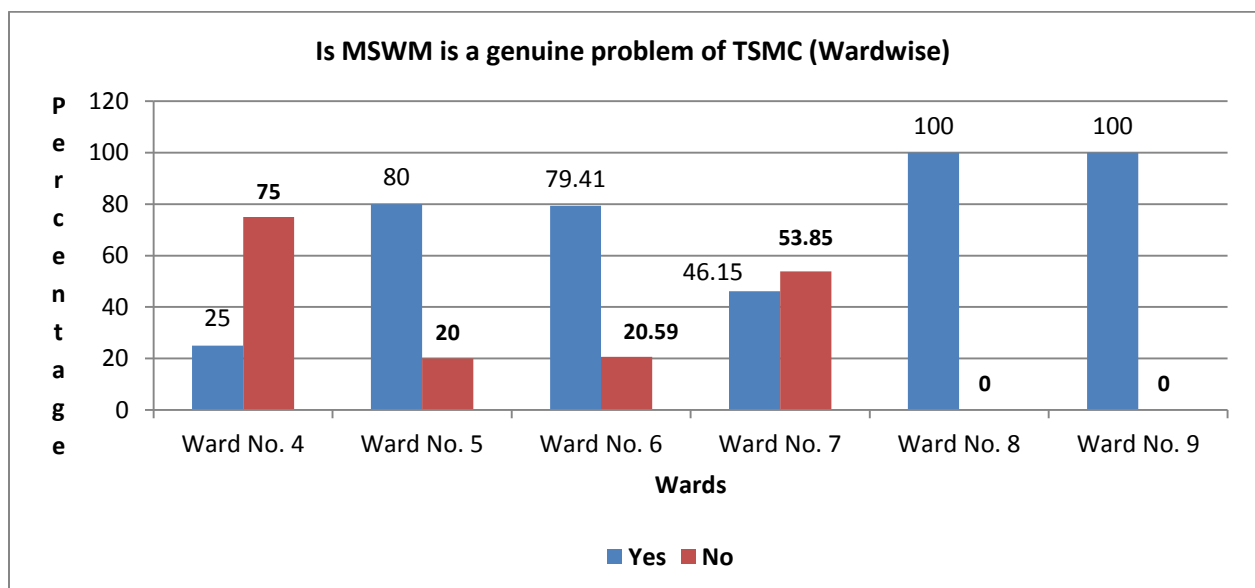
Economic value of various reusable and recyclable municipal solid waste is presented in the table below:

S.N.	Particulars	Amount (Rs.)
1.	Soft Plastics	Rs. 6-25 per Kg
2.	Hard Plastics	Rs. 30-40 per kg
3.	Heavy Metals	Rs. 30-50 per kg
4.	Soft Metals	Rs. 15-30 per Kg
5.	Paper	Rs. 12-20 per Kg
6.	Bottles	Rs. 2 -12 per bottle
7.	Cloth pieces	Rs. 3-30 per Kg. (based on quality)
8.	Shoes/Slipper	Rs. 5 -15 per Kg.
9.	Wood Pieces	Rs. 8-15 per Kg
10.	Compost	Rs. 20-50 per kg

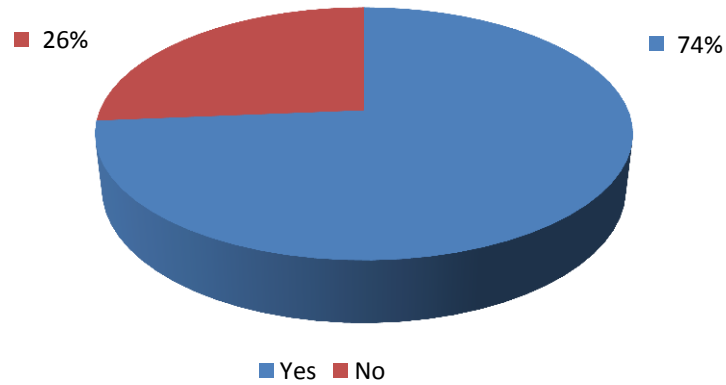
The economic value that can be generated from MSW of TSMC based on the above financial analysis with least possible rate is presented in the table below:

Total wet weight of compost from 11.99 tons organic waste	4796.5 Kg. @ NPR 15	71947.68
Valuable weight of non-degradable waste out of 13.77 tons	12393 kg. @ NPR 10.1	125169.30
Total		197116.98

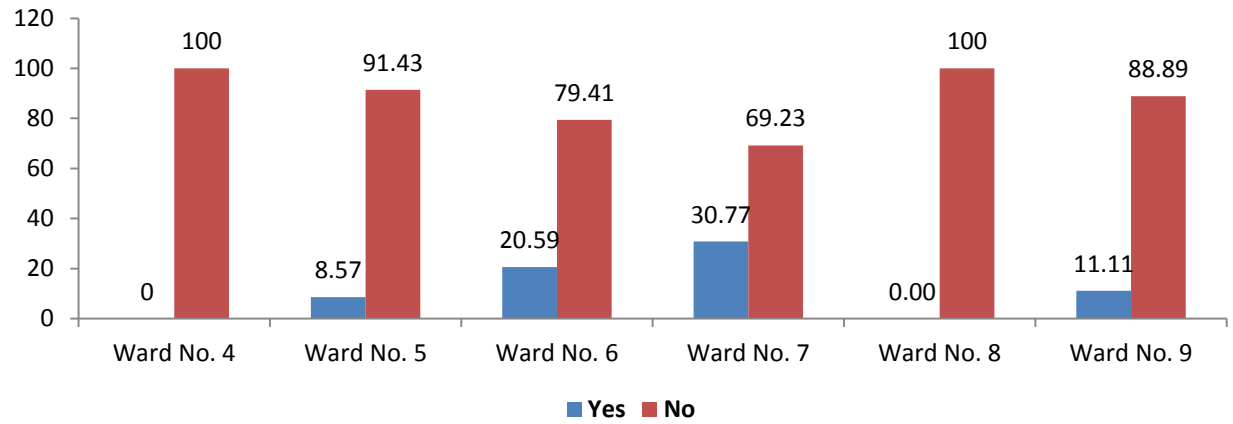
IV. MSWM Scenario through public eyes



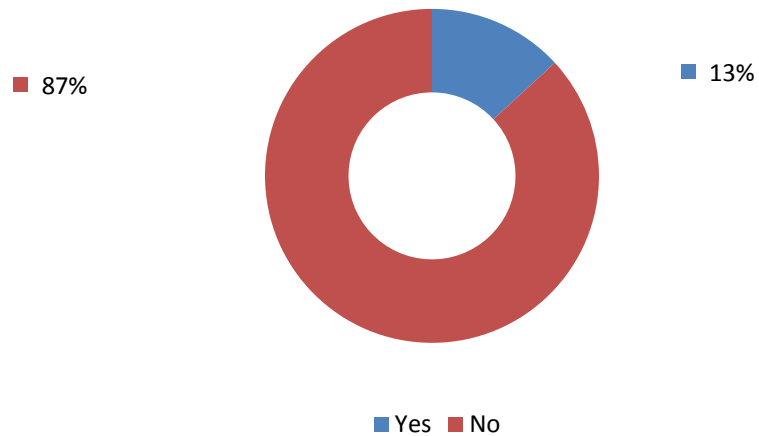
Is MSWM is a genuine problem of TSMC (Overall)

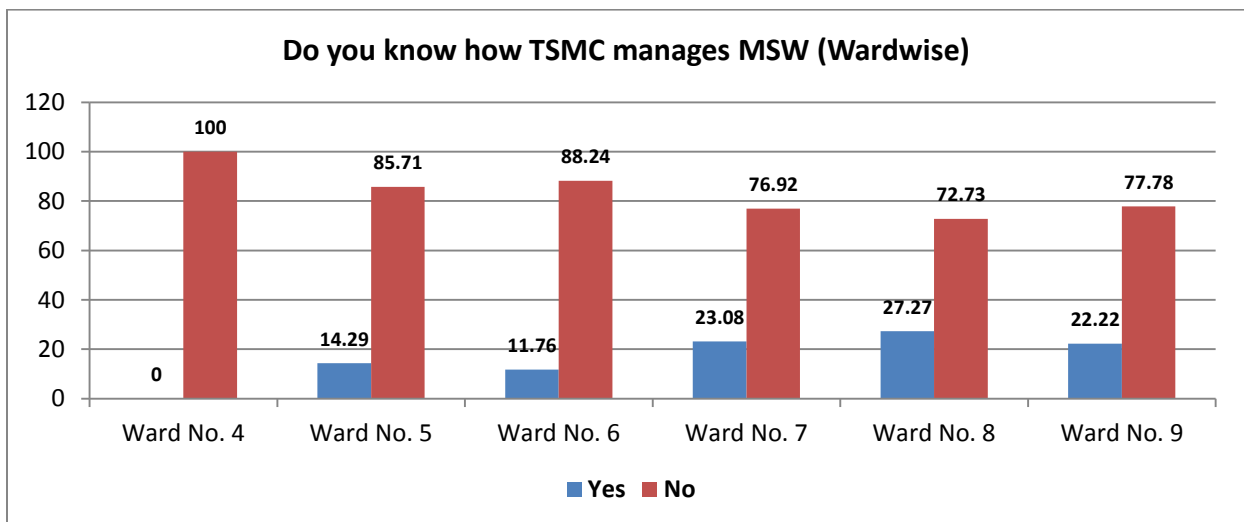
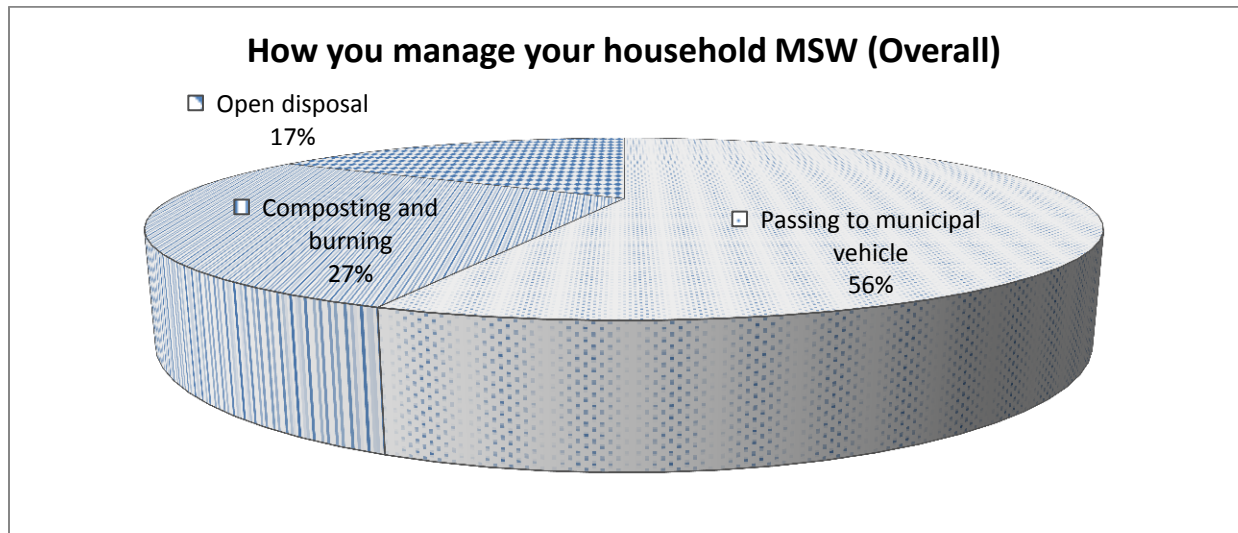
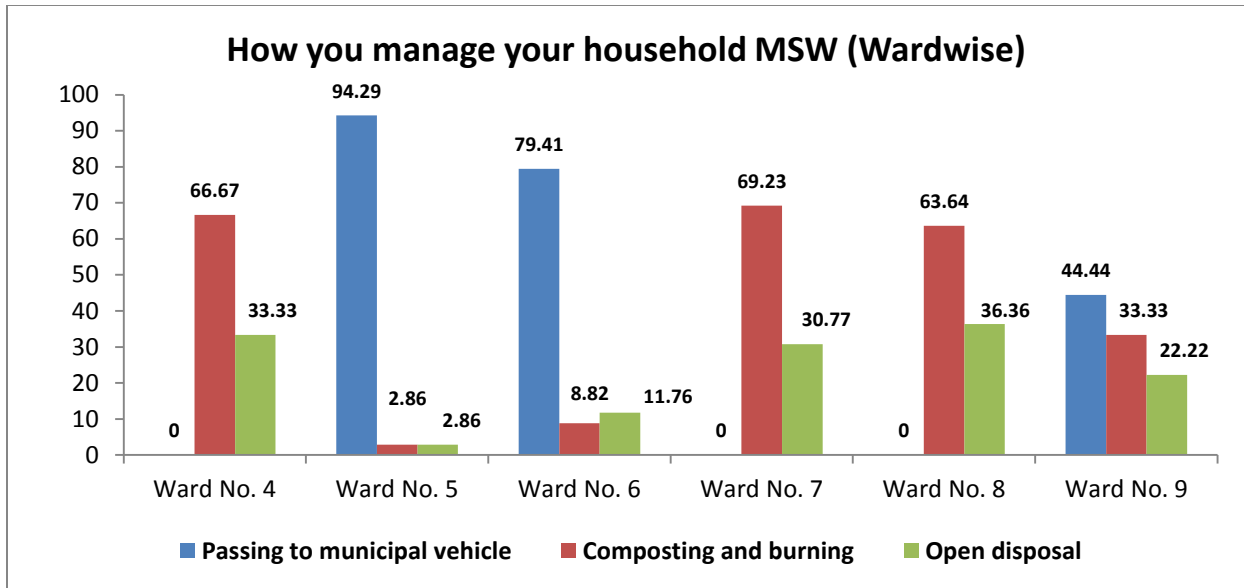


Have you ever complained to TSMC about MSWM issues (Wardwise)

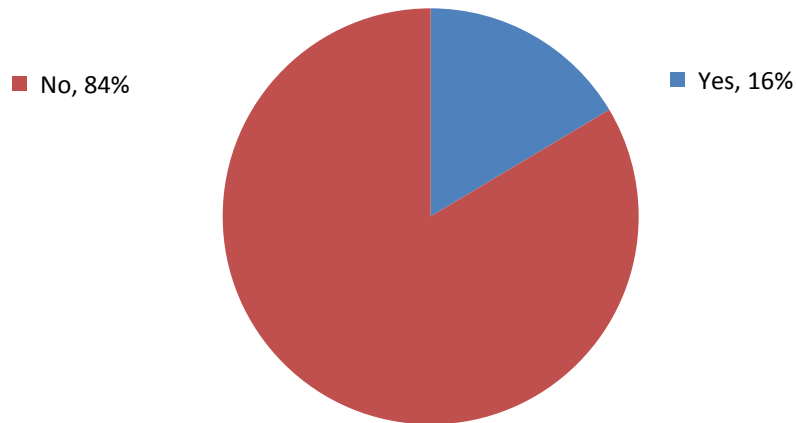


Have you ever complained to TSMC about MSWM issues (Overall)

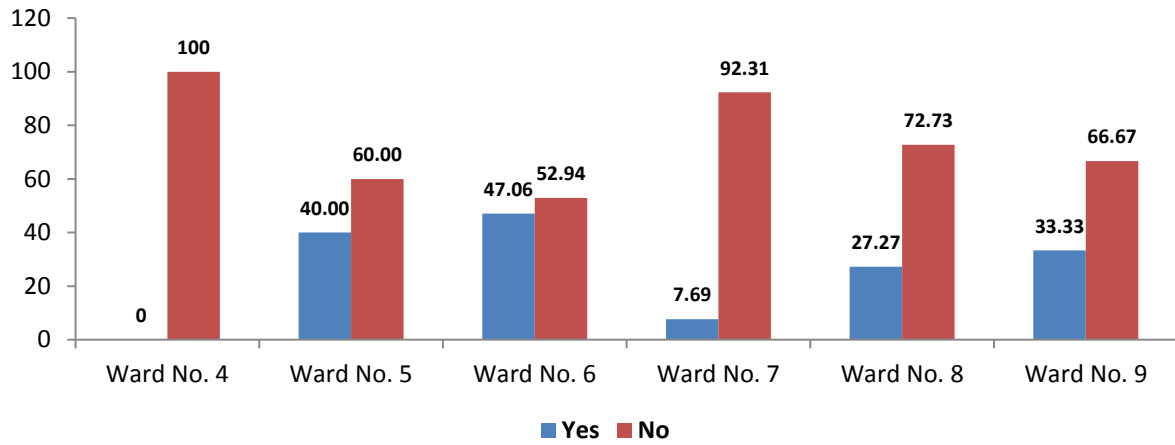




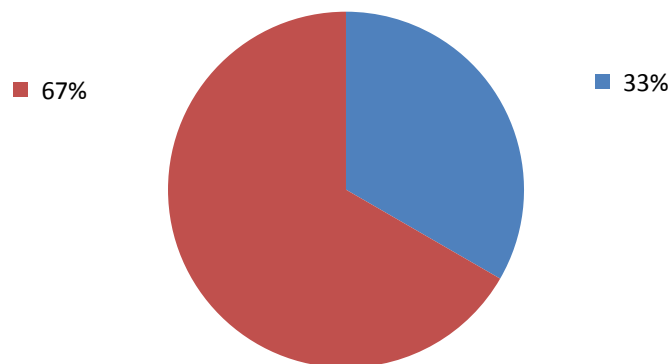
Do you know how TSMC manages MSW (Overall)

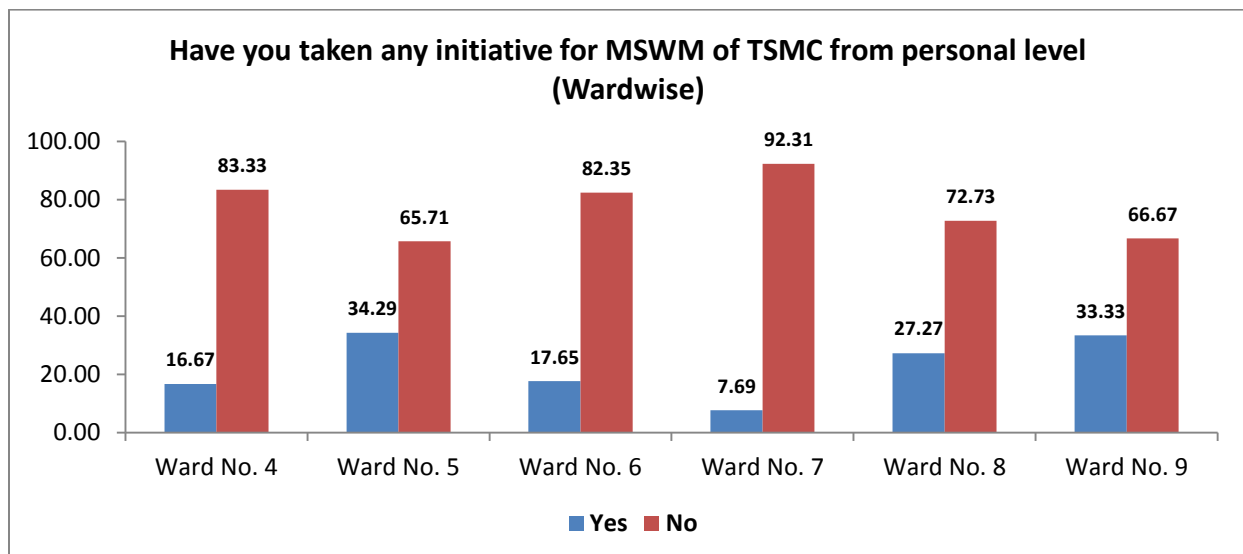
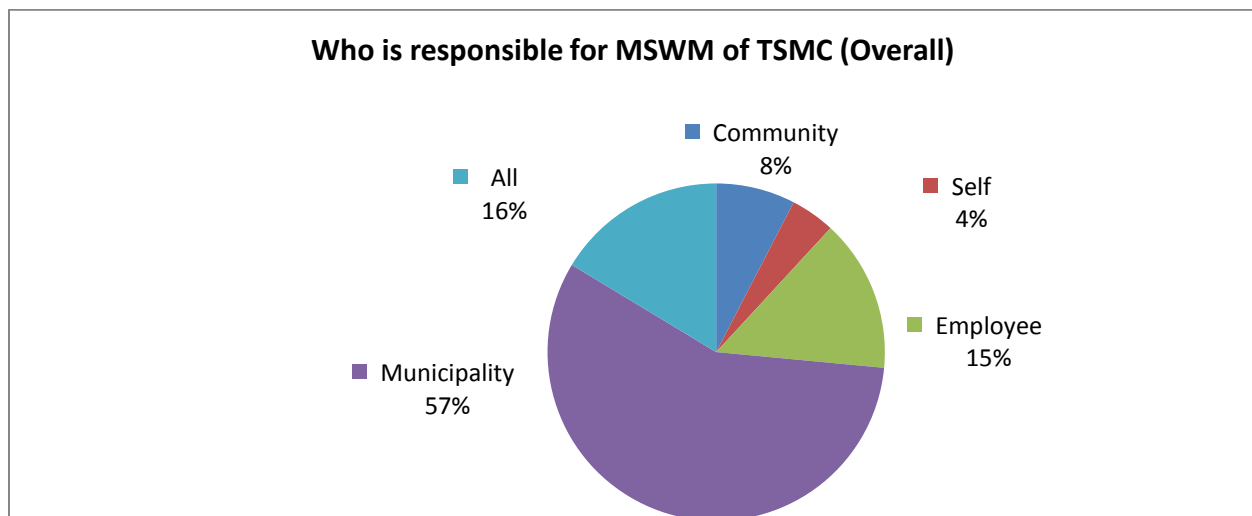
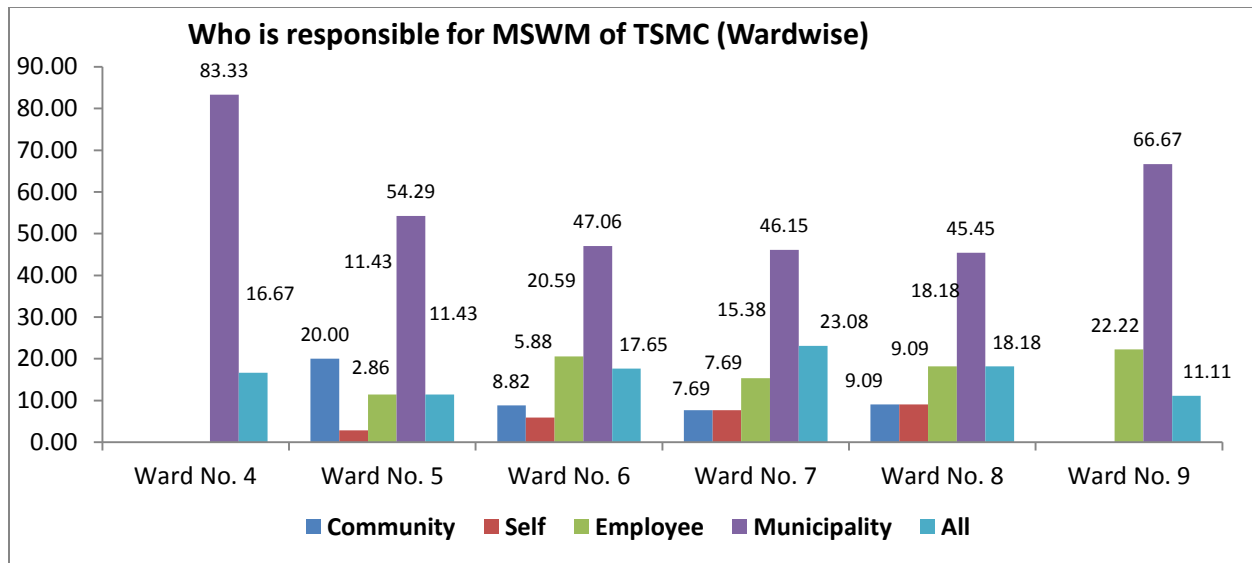


Have you participated in any program related to MSWM of TSMC (Wardwise)

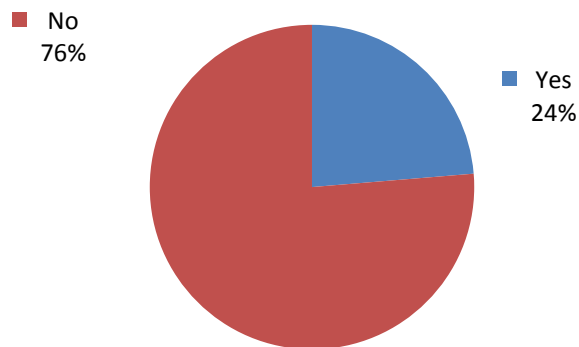


Have you participated in any program related to MSWM of TSMC (Overall)

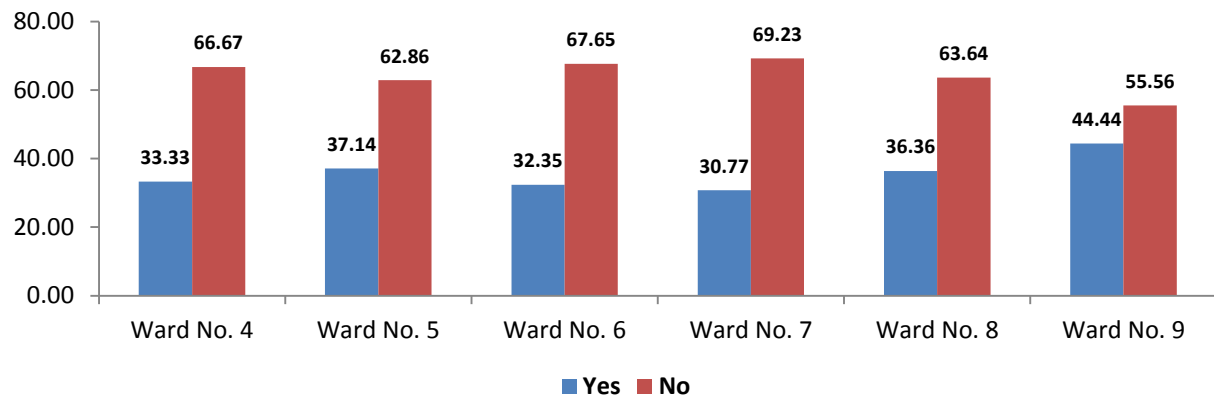




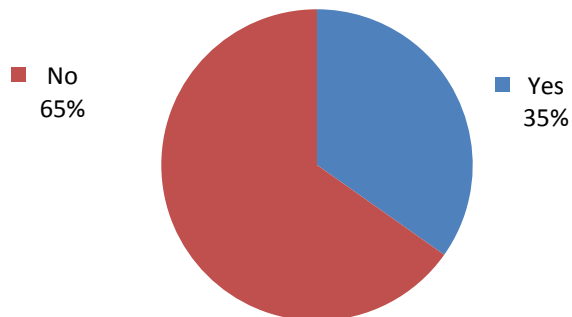
**Have you taken any initiative for MSWM of TSMC from personal level
(Overall)**

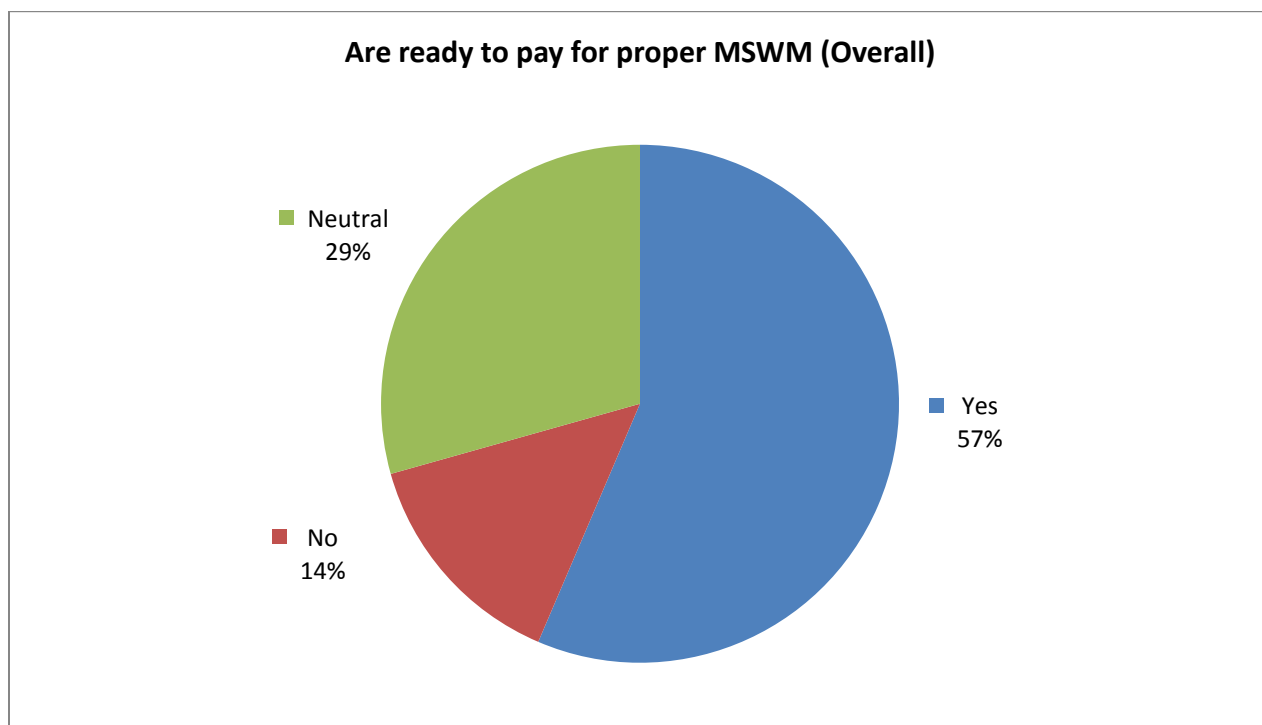
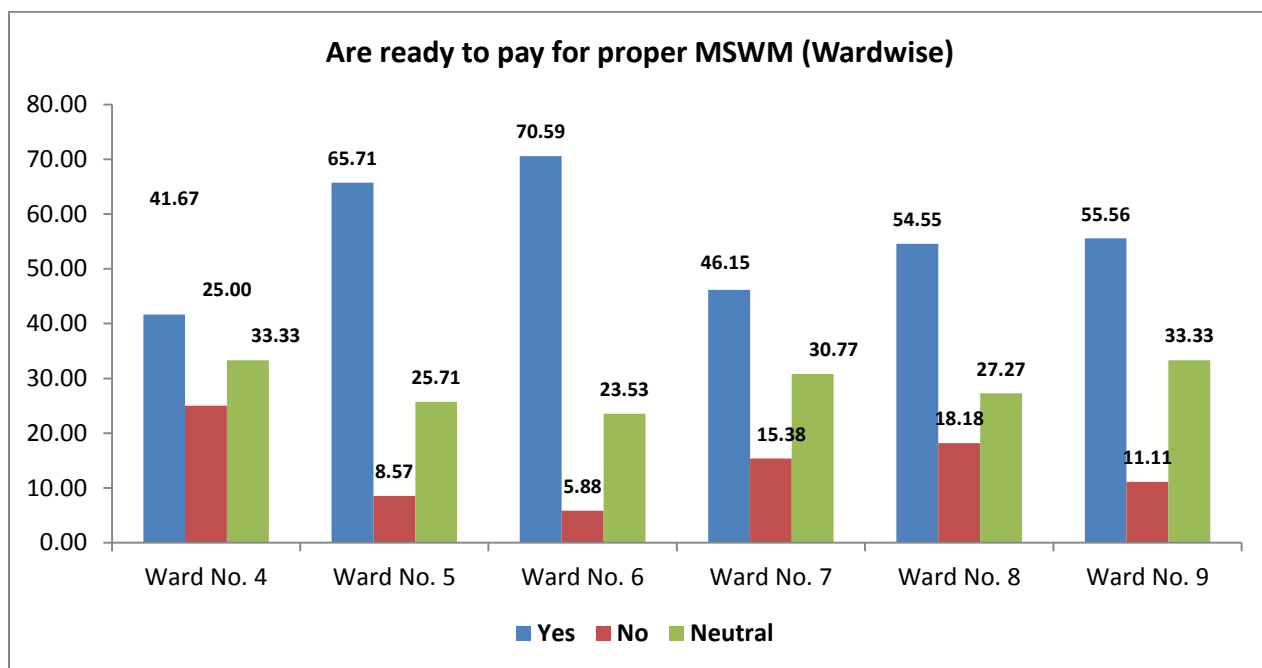


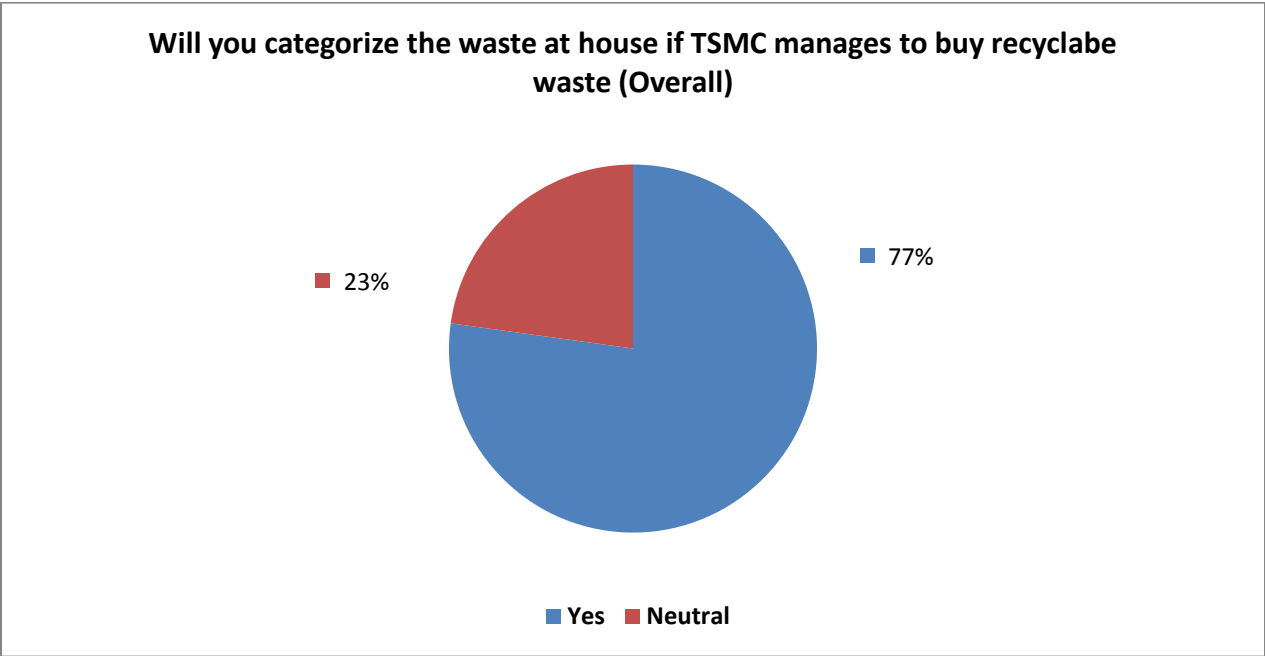
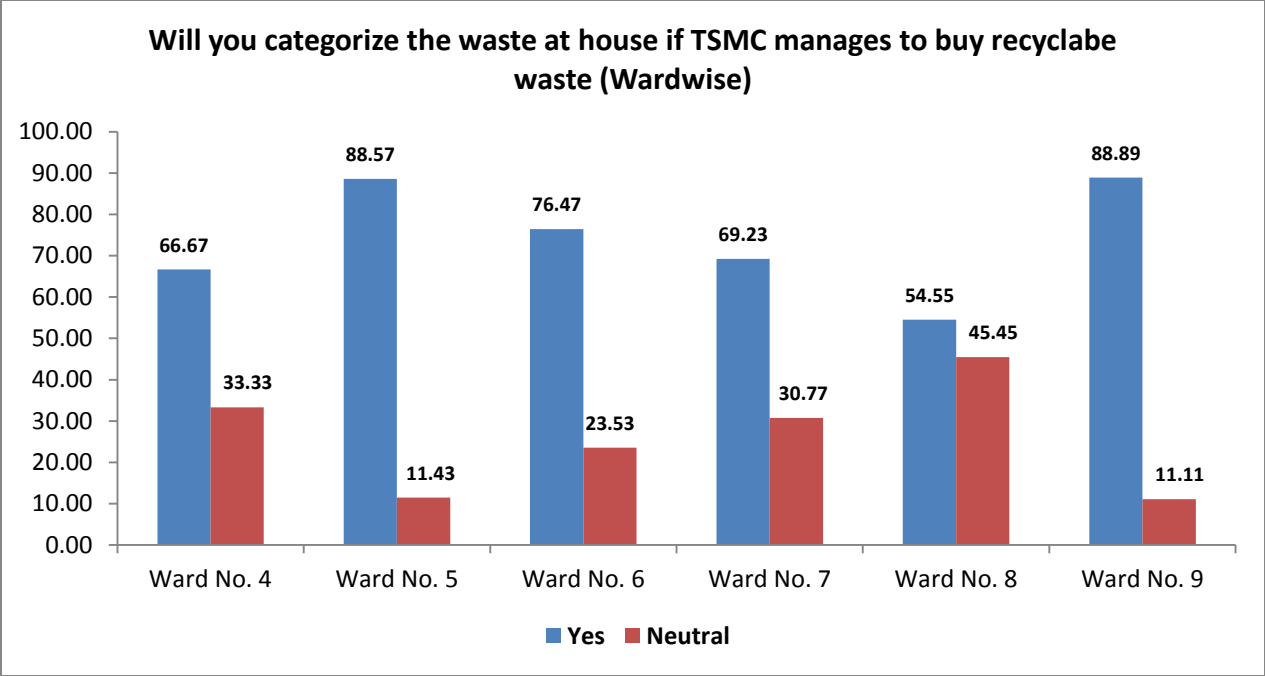
Are you selling recyclable waste ? (Wardwise)



Are you selling recyclable waste ? (Overall)







IV. SWOT Analysis

TSMC has equal challenges and opportunities for sustainable MSWM. The scenario is presented in the following table as SWOT analysis of TSMC:

STRENGTH	WEAKNESS
▪ Existence of an Environment Section. ▪ Better coordination among staffs ▪ Better physical facilities like tractor-1, tripper-1, and container-34. ▪ Regular budget allocation	▪ Lack of proper plan, laws, and policies related MSWM ▪ Tight municipal budgets and scarce resources ▪ Poorly motivated staffs ▪ Untrained human resource ▪ No efforts for introducing waste segregation model and compost plant ▪ Lack of proper dumping site ▪ Weak coordination with NGOs/CBOs and private sector in MSWM ▪ Lack of strategy for recycling /reutilizing, including technology development
OPPORTUNITY	THREAT
▪ Stable local government along with mayor with broad vision ▪ Develop business model for MSWM and raise fund for sustainable MSWM ▪ Develop dumping site as a prime tourist center to demonstrate the systematic municipal waste management system ▪ Create employment opportunities for local peoples by enhancing entrepreneurships related to municipal waste ▪ Opportunity to become role model and lead in the sector of municipal solid waste management in Nepal	▪ Changing mindset of people in peoples participation in MSWM ▪ Restriction of local communities for managing dumping site ▪ Political Obstacles ▪ Lack of awareness of public regarding environment pollution ▪ Low environmental priority at public level in comparison to other development activities

WAYS AHEAD

1. Shaping Policy, Strategy, and Guidelines

A local SWM policy and strategy that specifies key policy objectives, guiding principles, and an implementation strategy with a timeline and a clear monitoring and evaluation mechanism needs to be developed for clear strategic direction in regard to sustainable MSWM of TSMC. Technical guidelines will also need to be developed for issues such as organic composting, resource recovery technologies, and landfill management and operation.

2. Public Awareness and motivation

Awareness at local level is very important regarding sound and smooth management of MSWM. Public should be motivated for source segregation as the source segregation is the first step of sustainable MSWM. TSMC needs to organize various awareness programs like interactions, rally, cleanup campaign, school level competition etc. in a regular basis at local and school level to enhance the level of awareness and ensure the participation of local people in sustainable MSWM of TSMC.

3. Practice of Reduce, Reuse, and Recycle

TSMC's MSW has a significant organic content, constituting 46.55% of waste overall MSW. The large proportion of reusable and recyclable materials provides a great opportunity for increasing waste reuse and recycling and developing business model for sustainability of MSWM of TSMC.

Similarly, composting plants can be developed in communities depending upon their capacity, size, population, and level of interest. Introduced, composting can be gradually scaled up with keen attention to compost quality and marketing strategies.

4. Capacity building of Environment Section and stakeholders

Developing the in-house capacity of staffs of environment section is very essential. TSMC needs short- and medium-term technical support in planning, waste collection and transport, appropriate technologies for treatment, and final disposal, but it too needs capacity strengthening to strengthen the environment section for effective MSWM.

5. Community Participation and Consultation

Local bodies alone cannot meet the challenge of keeping towns clean and green. Community participation needs to be ensured through information, education, and communication campaigns to enhance citizens' awareness of 3R and better SWM. If municipality plans a new final disposal site or other facilities, communities living near the proposed site should be fully consulted and engaged as well as their views need to be addressed in the plan. Introducing appropriate methods for waste segregation and collection also requires close consultation with and collaboration from communities.

6. Development of MSWM Demonstration Site as a Tourist Center

Development of cost effective MSWM Demonstration Site is very essential in TSMC to change the mind set of local people with following features and develop site as one of the prime tourist center of TSMC:

- Space for composting, nursery,
- Collection chambers for reusable materials,
- Space for final waste for dumping
- Fencing and landscape management

- Developing site as a natural park
- Nursery management

TSMC need to explore the site and attempt immediately to develop the site in close coordination and cooperation of local communities and private partners for sustainable MSWM of TSMC.

7. Resource generation

The SWM Act directs the local bodies to levy service charges to meet the cost of SWM services and make the service self-sustaining. This study found that 76% of surveyed households would be willing to pay an SWM fee if the level of service improved. Similarly, reduction in expenditures on SWM is equally important, and municipalities should review their existing practices to identify cost-saving measures. These may include the provision of performance-based incentives to their staff, performance-based outsourcing arrangements, partnership and benefit-sharing arrangements with CBOs or private companies.

8. Improving Integrated Solid Waste Management

First and foremost current practice of collecting waste from open piles on the roadside which is not only inefficient but highly unhygienic, creating a public nuisance and health risks should be stopped. Likewise, open dumping on riverbanks, practiced by TSMC, is polluting the surrounding environment and may contaminate water sources (both surface and groundwater). An integrated approach is needed for segregation at source, collection to resource recovery and final disposal.

9. Enhance Public–Private Partnership

The involvement of the private sector has great potential to improve operational efficiency and cost effectiveness in MSW collection, transport, treatment, and final disposal. While major capital investment by the private sector in SWM may remain a challenge in the current context of Nepal, engagement of the private sector, CBOs, and NGOs in collection and transport may be promoted on a larger scale. TSMC need strengthening in the areas of conducting competitive bidding; establishing appropriate scope and performance specifications in contracts; assessing qualification requirements of private sector companies, CBOs, or NGOs; and monitoring performance in accordance with the provisions of the contract.

10. Data Management, Updating, and Dissemination

TSMC need to regularly update the baseline data to track changes and implementation progress. Key performance indicators (KPIs) for municipal SWM, which may include waste collection efficiency, rate of resource recovery through composting and recycling, efficiency of SWM charges, and rate of cost recovery, need to be identified and data collected using a uniform methodology. Periodic updates of basic data on KPIs are also essential for monitoring the progress. Dissemination of data will help the general public and other stakeholders better understand the status of SWM and enable comparisons over