

Report on

SCENARIO OF MUNICIPAL SOLID WASTE OF

SIRAHA MUNICIPALITY, SIRAHA



Submitted to

Siraha Municipality
Siraha, Province No. 2, Nepal

Submitted by

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1. INTRODUCTION

Nepal, officially the **Federal Democratic Republic of Nepal** is a landlocked country in South Asia. It is located mainly in the Himalayas but also includes parts of the Indo-Gangetic Plain with an estimated population of 26.4 million. It is 48th largest country by population and 93rd largest country by area. It borders China in the north and India in the south, east, and west. The government system is a federal democratic republic; the chief of state is the president, and the head of government is the prime minister. Nepal has a traditional economic system in which the majority of the population engages in subsistence agriculture, and the allocation of available resources is made on the basis of primitive methods. Nepal is a member of the South Asian Association for Regional Cooperation (SAARC). Nepal is a multiethnic nation with Nepali as the official language.

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 276 Municipalities, 11 Sub Metropolitan cities, 6 Metropolitan cities and 460 Rural Municipalities. 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.

Increasing urbanization and economic development not only accelerate consumption rates but also increase waste generation. 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 276. 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.

Siraha Municipality lies in Siraha district of Province No. 2. It covers an area of 94.17 sq.km with total population of 83403. It is one of the old municipalities among 58 municipalities. The municipality is composed of 22 wards. Siraha Municipality neighbors to Bishnupur and Arnaama Rural Municipality in the north; Bihar (India) in the south; Dhanusha District in the west and Aurhi and Arnama Rural Municipality in the east. The population mainly composes of people from Hindu, Muslim and Buddhist community. Nepali, Hindi, Maithali and Urdu are majorly spoken in the community.

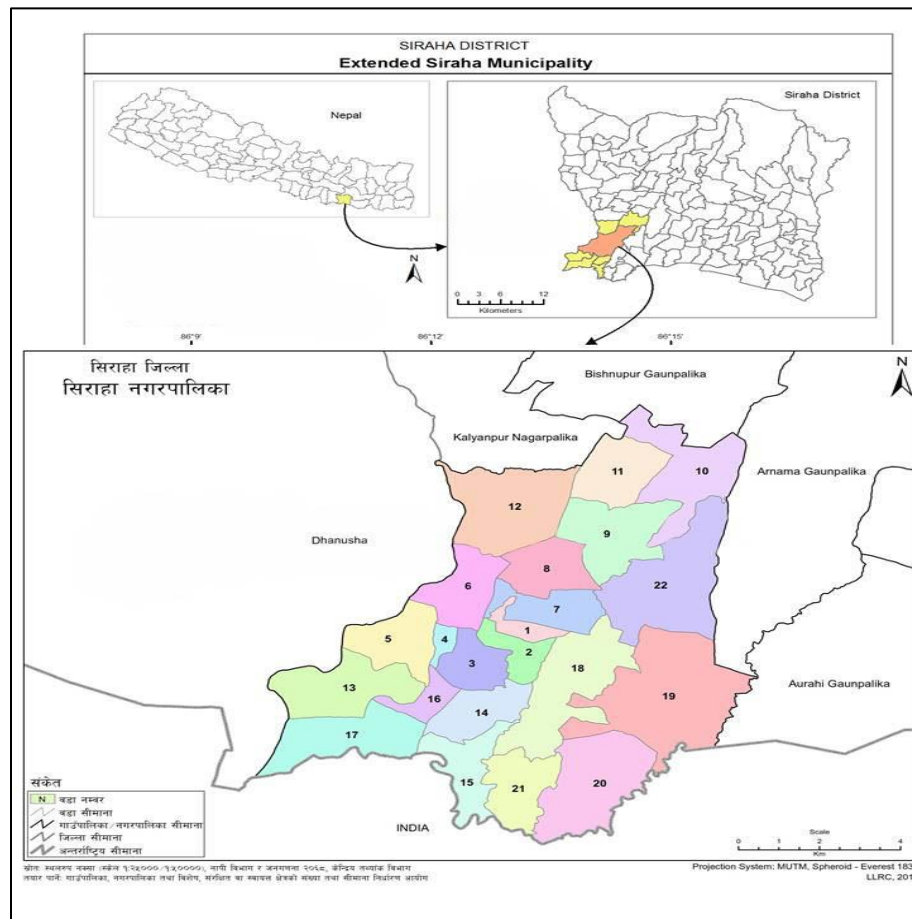
Due to the high immigration rate from near districts the population of this city has been increasing tremendously which in return has been increasing the waste generation rate of this city. Siraha Municipality has not been able to formulate effective plans to properly manage collection, transportation and disposal of MSW due to lack of proper data and information. The waste generated in few market areas of Siraha Municipality is being collected but the disposal system of collected wastes is not proper and scientific. They are collected and simply thrown at the riverside. This haphazard throwing of the unsegregated waste 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 Siraha Municipality.

2. 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 Siraha Municipality and to contribute in developing effective plans for sustainable solid waste management.

3. STUDY AREA

The study area is Siraha Municipality of Siraha District, Province Number 2 of Nepal.



4. 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 December 2018 during winter season. Before carrying out the field activities community level meetings and interaction were carried out for ensuring the genuine data from the field. Four 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: 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 22 questions which include both closed and open ended type questions. For the ease of receiving quick response from the respondents, more than 80% of the questionnaire to be of close-ended structured questions for smooth solicitation of data from the respondents. 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 250 respondents at household level. Similarly, questionnaire survey for commercial and institutional level was also conducted. Total 150 households, 63 commercial and 37 institutions were interviewed.

Sample Collection: Households were selected in each selected wards (1, 7 and 8) of the municipality in terms of family size, ethnicity, and economic diversity and geographical spatial to obtain comprehensive data. Similarly, commercial and institutions were selected on the basis of types to make sampling representative. For sampling process each ward was categorized in three categories i.e. Urban (ward no 1), Semi-urban (ward no 7) and Rural (ward no 8). Among 150 respondents; 90 household, 38 commercials and 22 institutions were selected in urban area for sampling process. Among 63 respondents; 38 households, 16 Commercials and 9 institutions were selected in Semi-urban area for sampling process while Among 37 respondents in rural area 22 households, 9 Commercials and 6 institutions were selected. 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.

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.

5. RESULTS AND DISCUSSION

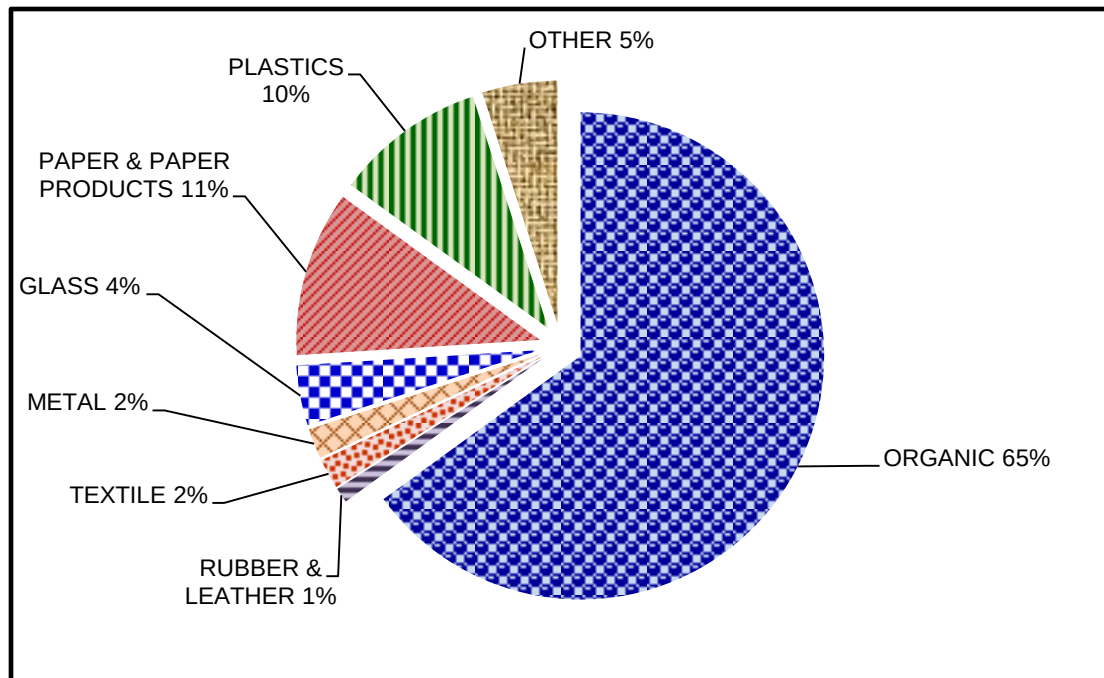
I. MUNICIPAL SOLID WASTE SCENARIO IN A NUTSHELL

❖ Total Area (KM ²)	94.17
❖ Total Population	83,403
❖ Population density (persons per KM ²)	886
❖ Total number of wards	22
❖ Average HH Size	6
❖ Average HH Waste (kg/day)	0.81
❖ Average per Capita MSW (g/capita/day)	135.43
❖ Average per Capita HH waste (g/capita/day)	92.44
❖ Total HH waste (ton/day)	7.71
❖ Total institutional waste (ton/day)	0.47
❖ Total commercial waste (ton/day)	3.12
❖ Total MSW Generation (ton/day)	11.3

II. MUNICIPAL SOLID WASTE GENERATION AND COMPOSITION

The average per capita MSW generation of Siraha Municipality is found 135.43 g/day. The quantity of waste generation is calculated to be 11.3 tons/day in which household, institutional and commercial waste contributes 7.71 tons/day, 0.47 tons/day, and 3.12 tons/day respectively. The overall composition of MSW of Siraha Municipality is shown below in the figures;

Fig:



Composition of Overall MSW generation of Siraha Municipality

The composition of household, institutional and commercial waste in Siraha Municipality is shown separately below in the respective figures.

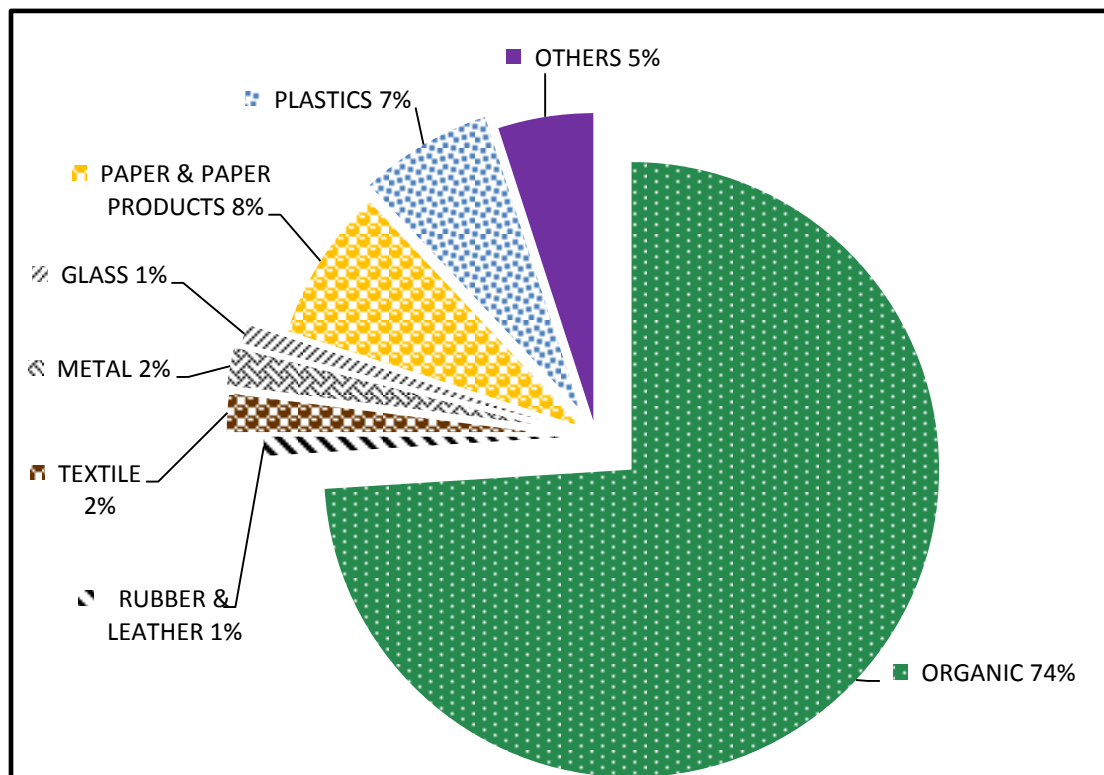


Fig: Total Household SW Composition of Siraha Municipality

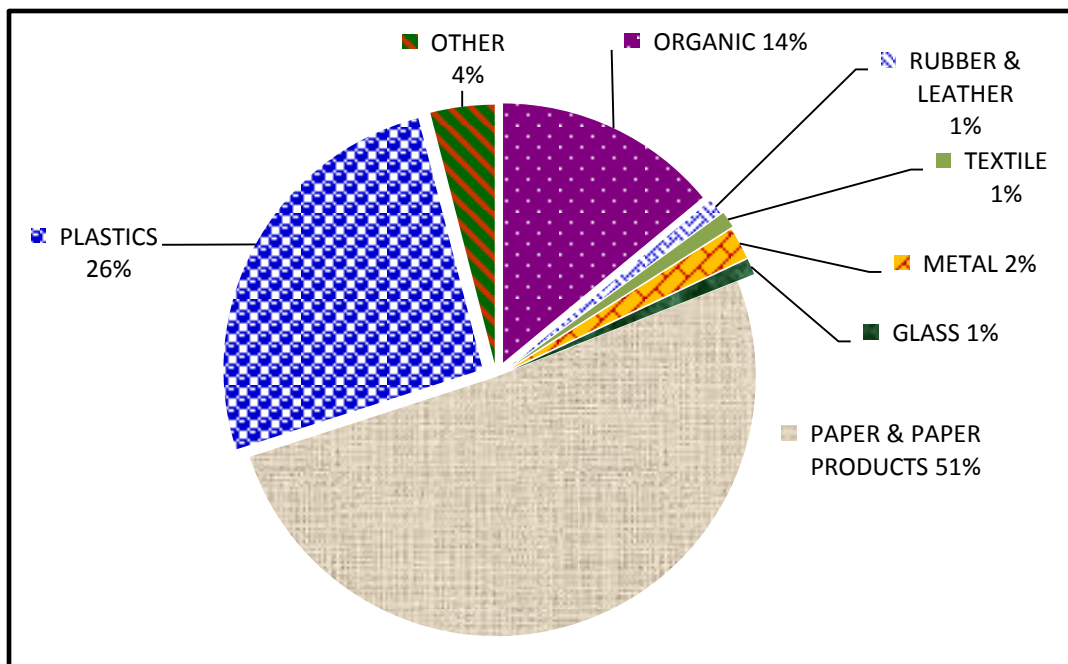


Fig: Total Commercial SW Composition of Siraha Municipality

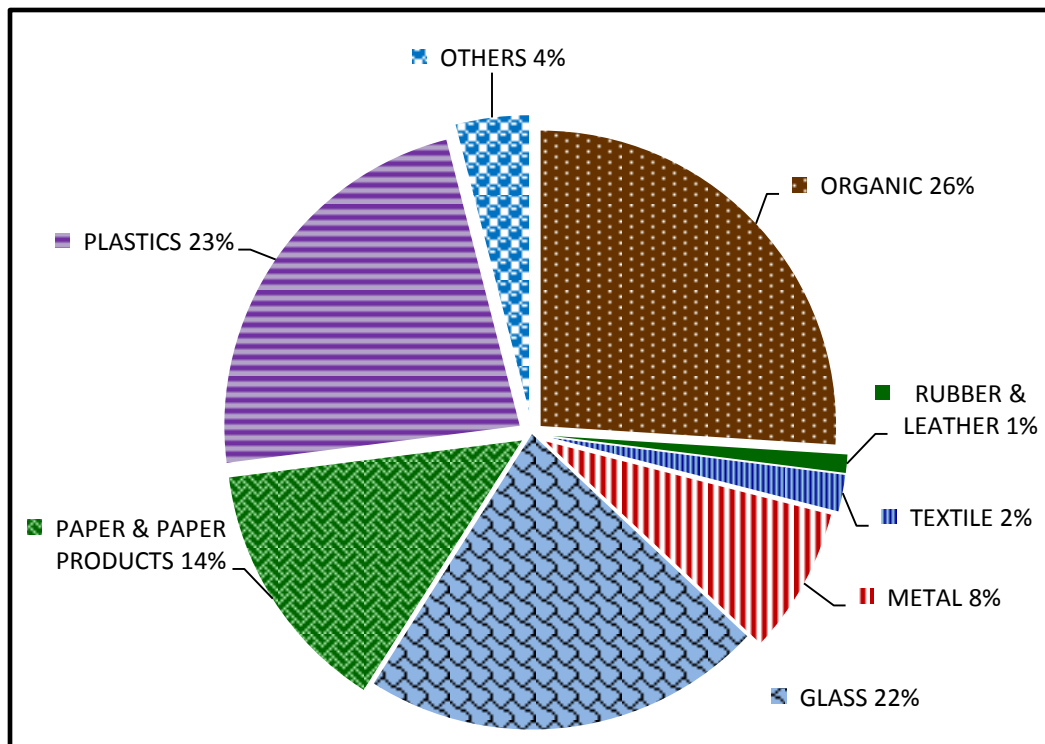


Fig: Commercial SW Composition of Siraha Municipality

III. CURRENT TREND OF MSWM AND ITS FINANCIAL SET UP

Trend of MSWM of Siraha Municipality

Existing Collection System	Collection Coverage and Frequency	Final Disposal Method	Landfill site and compost plant
No Door to Door Collection	Frequently in core area of Siraha Bazaar	Open and River-side Dumping	Lack of landfill site and compost plant
No Road Side Container			
Roadside Pick-Up from Open Piles			

Municipal Budget for MSWM of Siraha Municipality

Based on the study 'Solid Waste Management in Nepal, ADB, 2013' average percentage of municipal budget allocation for solid waste management is only 0.67. From this it is clear that the budget allocated for MSWM of Siraha Municipality is very less even though the issues of MSWM of Siraha Municipality is at the top priority. The municipality should be serious in this regard and should develop sound mechanism and system of MSWM through sufficient resource mobilization. Lack of sufficient resource mobilization for MSWM is one of the serious problems for most of the municipalities in Nepal including Siraha Municipality.

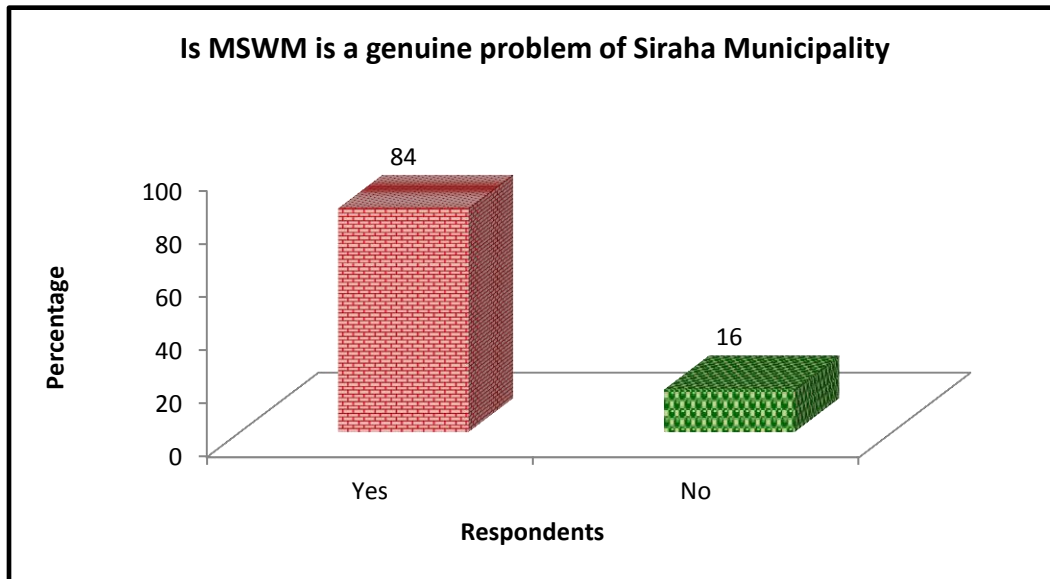
IV. ECONOMICS OF MUNICIPAL SOLID WASTE

During the study the economic value of the varied reusable and recyclable municipal wastes were analyzed. The economic values of various reusable and recyclable municipal solid wastes that are prevalent in Siraha Municipality is presented in the table below:

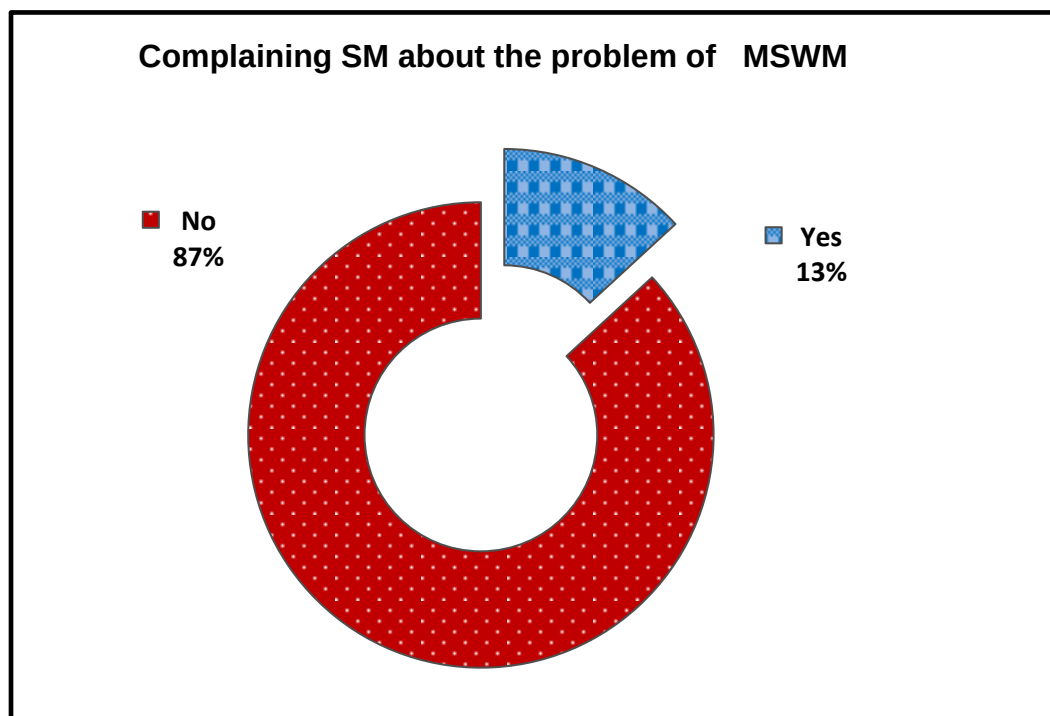
S.N.	Particulars	Amount (Rs.)
1.	Soft Plastics	Rs. 6-25 per Kg
2.	Hard Plastics	Rs. 30-40 per kg
3.	Heavy Metals	Rs. 30-50 per kg
4.	Soft Metals	Rs. 15-30 per Kg
5.	Paper	Rs. 12-20 per Kg
6.	Bottles	Rs. 2 -12 per bottle
7.	Cloth pieces	Rs. 3-30 per Kg. (based on quality)
8.	Shoes/Slipper	Rs. 5 -15 per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

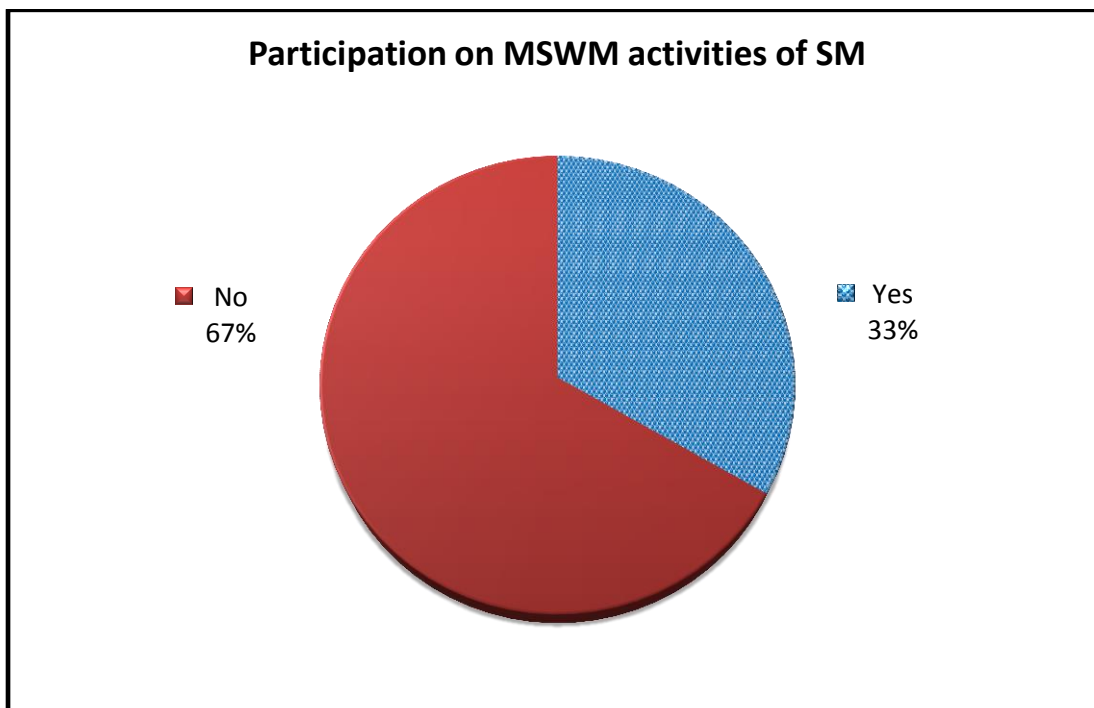
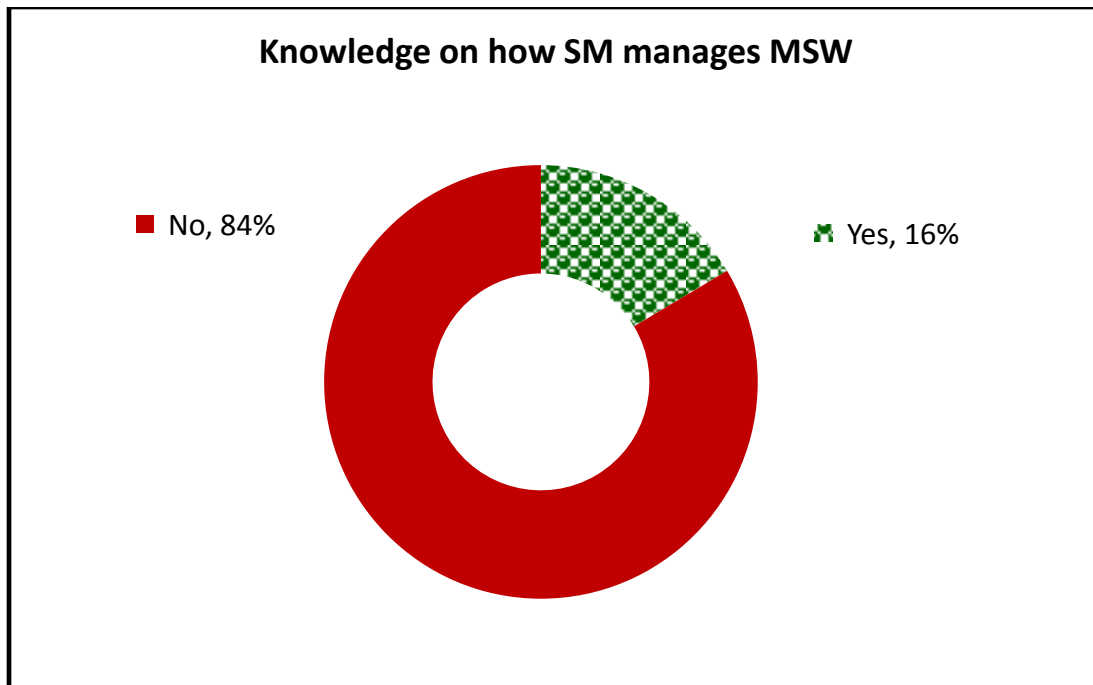
V. MSWM SCENARIO OF SIRAHA MUNICIPALITY THROUGH PUBLIC EYES

During the study public opinion in regard to MSWM of Siraha Municipality were solicited from various categories of people living in the municipality. The reflections of their opinion are presented in following graphs:

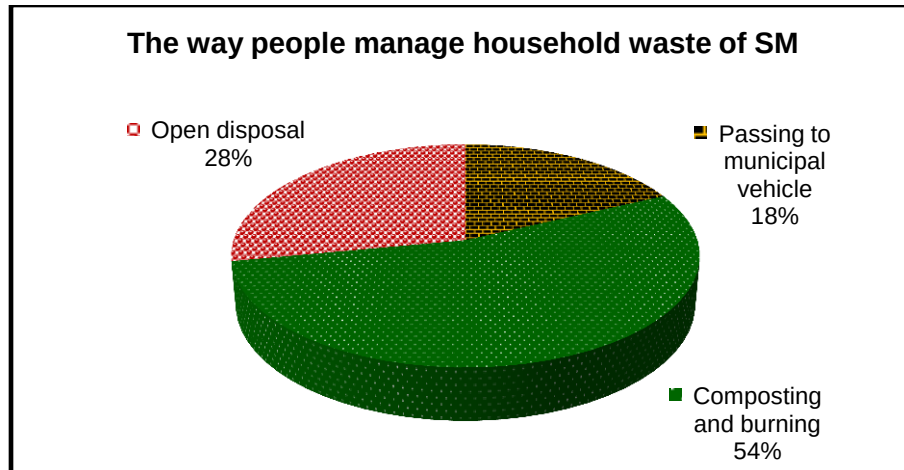


The above graph clearly indicates that the 87 % peoples of the municipality realize that the problem of MSWM is one of the major issues of the municipality. Hence the municipality should take sustainable and concrete steps in this regard.

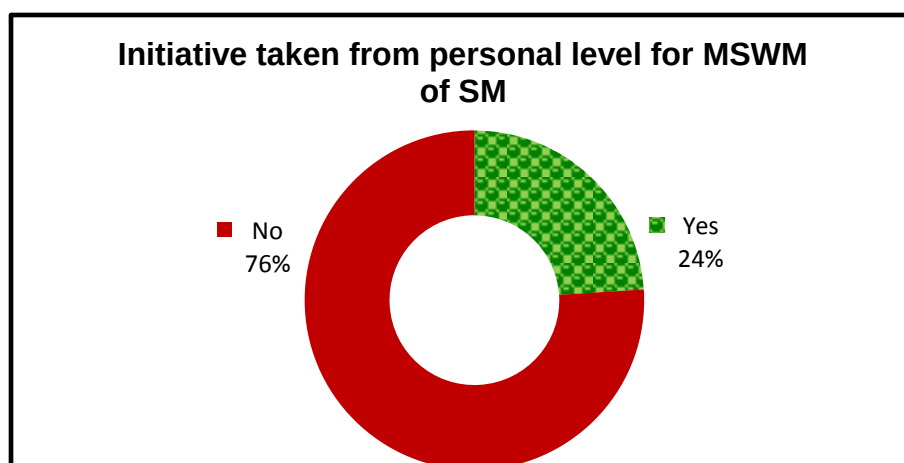
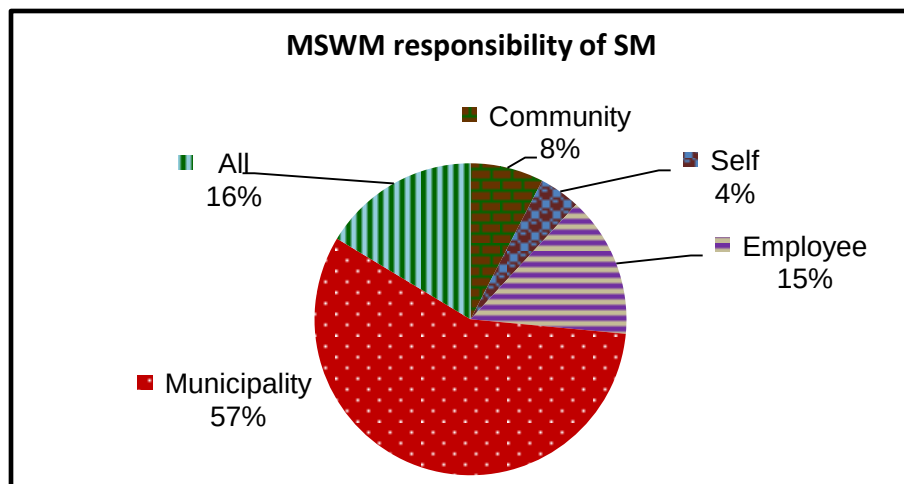




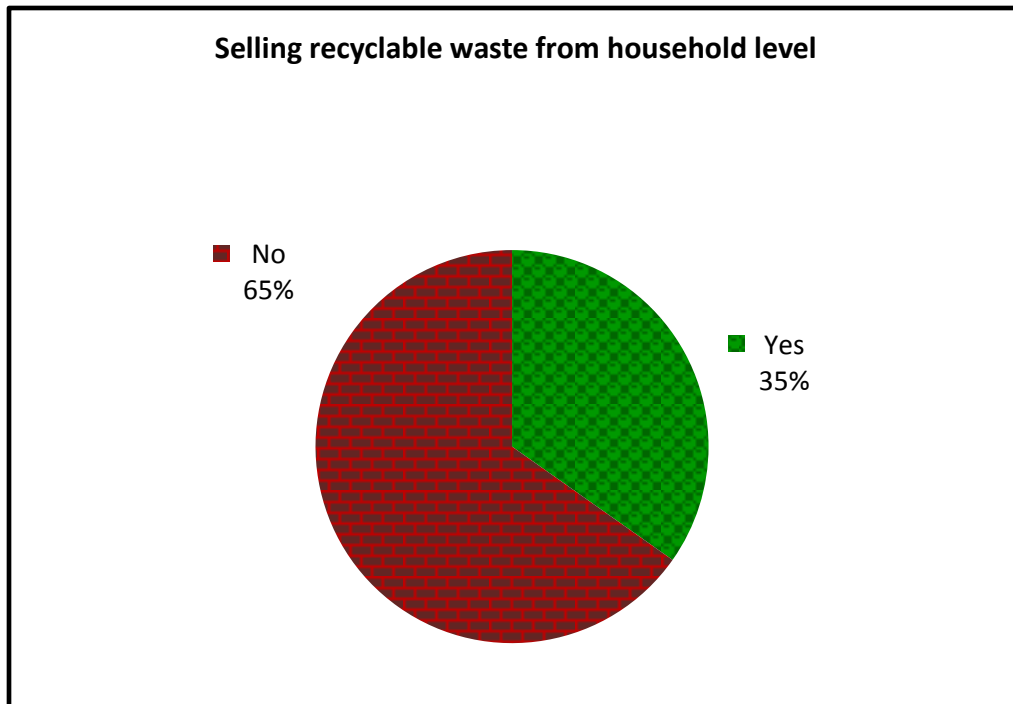
The graphs above clearly signify that peoples of SM don't complain the issues to the relevant agency for better solution. Even the peoples don't bother to know how the municipality manages the MSW. Besides, participation of local peoples in MSWM activities of SM is very low. This behavior might be one of the cases that the municipality is not taking serious steps towards proper MSWM of SM.



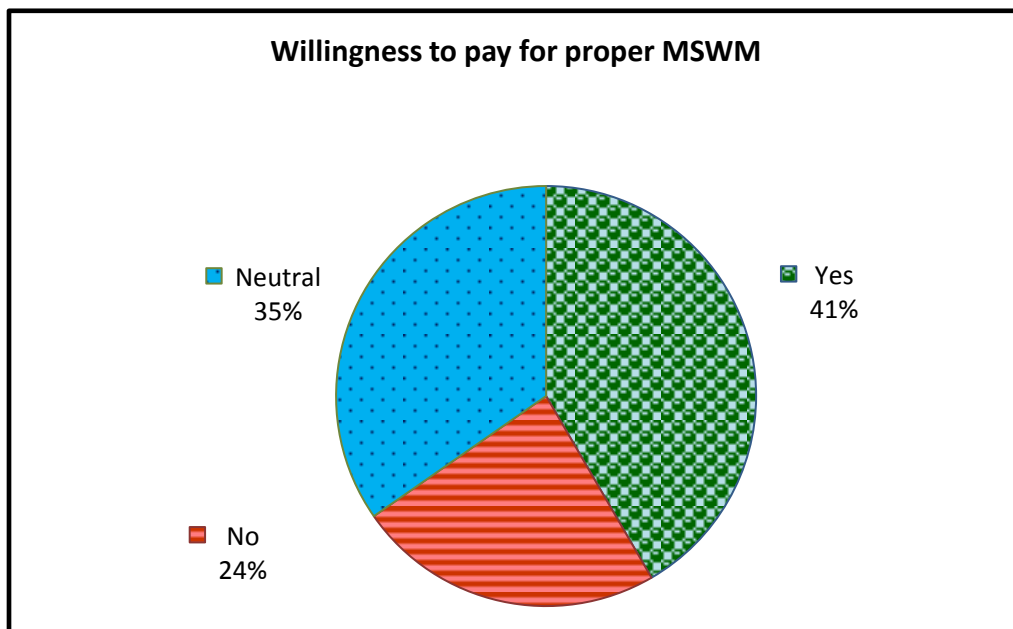
The above graph reflects that more than 82% of MSW still needs proper collection and management. The peoples are still living in the through away societies. The communities better awareness in regard to MSWM of Siraha Municipality.



The graph above depicts that most of the peoples in Siraha Municipality still thinks that only municipality is responsible for MSWM of SM. They need realization of their responsibilities and roles in MSWM. Hence SM should take better steps to enhance mass awareness in this regard.



The above graph indicates that most of the peoples in the SM are aware that non degradable wastes like paper, metals etc. have economic values. Hence they are storing those wastes in the house and selling it to the Kawardis (Waste pickers).



The above graphs clearly indicate that peoples are quiet sensitive towards clean municipality and have willingness to pay as well as segregate waste at household level for better MSWM of SM.

6. SWOT Analysis

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

STRENGTH	WEAKNESS
▪ Better institutional set up ▪ Availability of financial resource for MSWM ▪ Regular budget allocation ▪ Peoples with willingness to pay for better MSWM ▪ Better coordination among staffs ▪ Availability of vehicles for waste collection ▪ Authority of enacting laws and policies related MSWM ▪ Availability proper land for demonstrating model municipal waste management site	▪ Lack of proper plan, laws, and policies related MSWM ▪ Poorly motivated staffs ▪ Lack of skilled human resource for MSWM ▪ No efforts for introducing waste segregation model and compost plant ▪ Open dumping of MSW ▪ Weak coordination with local stakeholders ▪ Poorly motivated private sectors for investing in municipal solid waste management ▪ Lack of system for recycling /reutilizing, including technology development
OPPORTUNITY	THREAT
▪ Stable local government ▪ 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 entrepreneurship 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 ▪ Lack of sufficient awareness of public regarding environment pollution ▪ Low environmental priority at public level in comparison to other development activities

7. WAYS AHEAD

- ❖ **Shaping Policy, Strategy and Guidelines:** A local MSWM 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 Siraha Municipality. Technical guidelines will also need to be developed for issues such as organic composting, resource recovery technologies, and landfill management and operation.
- ❖ **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. Siraha Municipality 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 Siraha Municipality.
- ❖ **Practice of Reduce, Reuse, and Recycle:** Siraha Municipality's MSW has a significant organic content, constituting 65% of 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 Siraha Municipality. 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.
- ❖ **Capacity building of Environment Section and Stakeholders:** Developing the in-house capacity of staffs of environment section is very essential. Siraha Municipality 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.
- ❖ **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.
- ❖ **Development of MSWM Demonstration Site as a Tourist Center:** Development of cost effective MSWM Demonstration Site is very essential in Siraha Municipality to change the mind set of local people with following features and develop site as one of the prime tourist center of Siraha Municipality:

- 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

Siraha Municipality needs 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 Siraha Municipality.

- ❖ **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.
- ❖ **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 Siraha Municipality, 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.
- ❖ **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. SM 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.
- ❖ **Data Management, Updating, and Dissemination:** SM needs 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.

ANNEXE I: FORMAT OF QUESTIONNAIRE SURVEY

सिरहा नगरपालिकाको फोहोर मैला व्यवस्थापन सँग सम्बन्धित अद्ध्यन

प्रश्नावली

वार्ड न.

मिति:

व्यक्तिगत विवरण

(क) नाम:

(ख) पेशा:

(ग) लिंग:

(घ) उमेर:

(ङ) ठेगाना (वार्ड न. र टोल):

१. स्थाइ:

२. अस्थाइ:

(च) सम्पर्क: १. मो. न.

२. इमेल:

(छ) शिक्षा:

(ज) परिवार संख्या:

(झ) परिवार को प्रकार:

१) सि.न.पा.को फोहोर मैला व्यवस्थापनको समस्या छ कि छैन

छ ☐

छैन ☐

छ भने कस्तो समस्या छ ?

२) फोहोर मैला व्यवस्थापनको समस्यावारे नगरपालिकालाई तपाइले व्यक्तिगत रुपमा गएर सल्लाह सुझाव या कुनै लिखित या मौखिक जाहेरी गर्नु भएको छ?

छ ☐

छैन ☐

छ भने कस्ताई, कहिले र त्यसको प्रतिक्रिया कस्तो आयो?

३) तपाइको घरवाट या पसलवाट निस्कने फोहोरलाई कसरि व्यवस्थापन गरिरहनु भएको छ?

४) नगर पालिकाले फोहोर उठाउन आउँछ?

आउँछ ☐

आउँदैन ☐

आउँछ भने कहिले कहिले आउँछ अनि कसरि उठाउँछ र त्यसको प्रभावकारिता कस्तो छ?

५) सि.न.पा.ले फोहोर मैलाको व्यवस्थापन कहाँ र कसरी गर्छ? थाहा छ?

छ ☐

छैन ☐

छ भने कसरि र कहाँ गर्छ?

६) फोहोर मैलाको व्यवस्थापनका लागि उचित स्थान कहाँ हुन सक्छ? तपाइलाई त्यसको बारेमा केहि जानकारी छ?

छ ☐

छैन ☐

छ भने कहाँ र किन? (क्रमागत)

७) फोहोर मैला व्यवस्थापनसँग सम्बन्धित कार्यक्रम मा सहभागी हुनुभाको छ कि छैन?

छ ☐

छैन ☐

छ भने त्यस कार्यक्रम को आयोजक को थियो ?

८) के फोहोर मैला व्यवस्थापन सि.न.पा.को प्रमुख समस्या हो त?

हो ☐

हैन ☐

हो भने अहिले सम्म किन उचित व्यवस्थापन हुन नसकेको होला ?

९) फोहोर मैला व्यवस्थापन समस्याको जिम्मेवार को हो?

नगरपालिका ☐

समुदाय ☐

कर्मचारी ☐

नगरवासी ☐

स्वयं ☐

अन्य ☐

१०) फोहोर मैला व्यवस्थापनको लागि तपाईंले व्यक्तिगत रुपमा कुनै पहल गर्नु भएको छ?

छ ☐

छैन ☐

छ भने कस्ता प्रयासहरु गर्नु भएको छ ?

११) फोहोर मैला व्यवस्थापनको समस्या वाट सबै भन्दा प्रभावित समुदाय अथवा क्षेत्र कुन कुन हुन्/अथवा तत्कालै action मा जानुपर्ने समुदाय/क्षेत्र कुन कुन हुन्? प्राथमिकता साथ लेख्ने

१२) तपाईंको घरवाट दैनिक सरदार कति फोहोर उत्पादन हुन्छ?

कुहिने: ☐

नकुहिने: ☐

१३) तपाईंको घरवाट उत्पादन हुने कुहिने फोहोरको नाम (क्रमागत)

१४) तपाईंको घरवाट उत्पादन हुने नकुहिने फोहोरको नाम (क्रमागत)

१५) काम नलाग्ने कुनै त्यस्तो फोहोर छ जस्लाई तपाइले बेच्ने गर्नु भएको छ?

छ ☐

छैन ☐

छ भने कुन कुन हुन् अनि कस्लाई र कसरी बेच्ने गर्नु भएको छ?

१६) नगर सरसफाई अभियान संचालन भएको थाहा छ ?

छ ☐

छैन ☐

छ भने तपाईं त्यस सरसफाई अभियान मा सहभागी हुनुभएको छ कि छैन?

छ ☐

छैन ☐

किन?

१७) तपाइको टोल या समुदायमा सरसफाई अभियान सुरु भएमा तपाइ सहभागी बन्नुहुन्छ ?

बन्छु ☐

बन्दैन ☐

किन?

१८) सि.न.पा.ले फोहोर व्यवस्थापन गरेवापत तपाईं सँग शुल्क लिने गरेको छ कि छैन?

छ ☐

छैन ☐

१९) तपाइको घरवाट कसैले नियमित रुपमा फोहोर उठाउने र फोहोरको समुचित व्यवस्थापन गरेमा तपाइले मासिक शुल्क दिन तयार हुनुहुन्छ ?

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छैन ☐

हुनुहुन्छ भने कति ?

२०) नकुहिने फोहोर किन्दीन आएमा त्यस्ता फोहोर वर्गीकरण गरेर घरमा जम्मा गरेर राख्नु हुन्छ?

राख्छु ☐

राख्दैन ☐

राख्नु हुन्छ भने कसरि र कहाँ?

२१) व्यक्तिगत या समुदाय स्तरमा फोहोर व्यवस्थापन का लागि सि.न.पा. या अन्य ठाउमा गरिएका त्यस्ता केहि अनुकरणीय प्रयाशहरुको बारेमा तपाइलाई केहि जानकारी छ?

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छैन

छ भने खुलाईदिनुस?

२२) सि.न.पा.को फोहोर मैला व्यवस्थापनसंग सम्बन्धित व्यक्तिगतरुपमा तपाईंका सल्लाह/सुझावहरु के के छन्?

ANNEXE II: ENGINEERING DESIGN: PROPOSED MSWM DEMONSTRATION SITE

Name of the project: Construction of MSWM Demonstration Site of Siraha Municipality

Location: Koilapokhari-14, Siraha Municipality, Siraha

Summary of Cost

S.N.	Description of Work	Amount	Remarks
1	Civil works	5425996.426	
2	Contingency	271299.821	
	Total	5697296.248	

ANNEXE II: FEW GLIMPSES OF THE STUDY

