Data Collection Survey on Waste Management in Nepal

Final Report

June, 2024

Japan International Cooperation Agency (JICA)

Yachiyo Engineering Co., Ltd.
Nippon Koei Co., Ltd.

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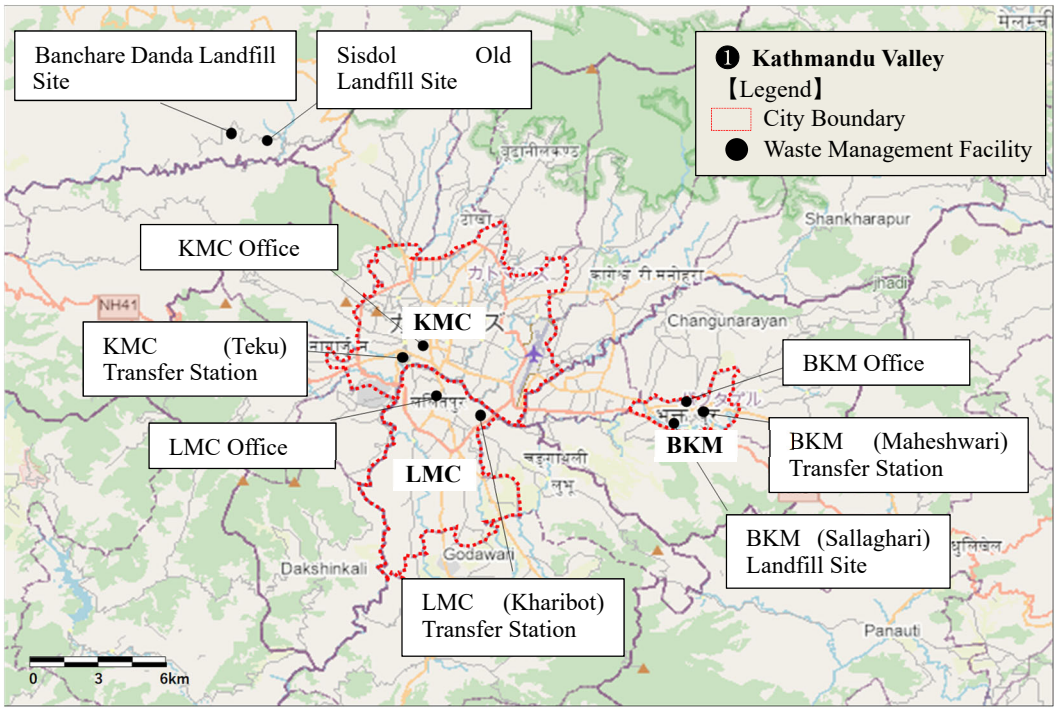
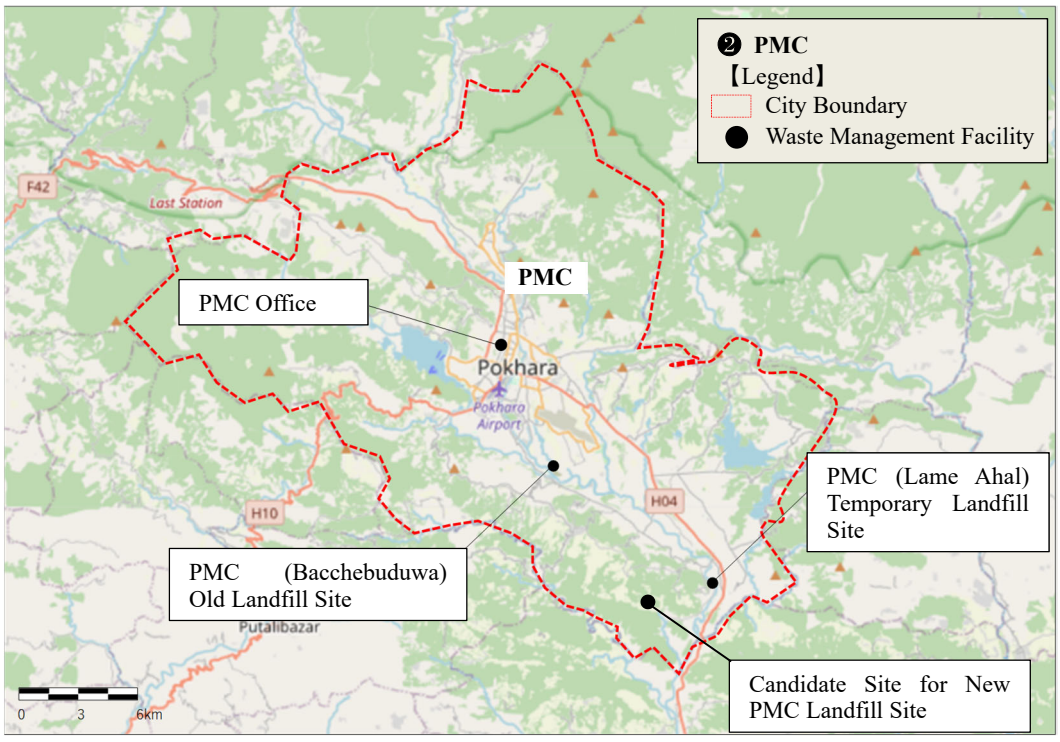
JR
24-013

Item＼Region	Nepal	KMC	LMC	BKM	PMC
Population in 2011 (thousands)	26,495	975	285	82	403
Population in 2021 (thousands)	29,165	862	294	79	514
Area (km^2)	147,296	49.45	36.12	6.89	464.28
Population Density (person/km2)	198	17,440	8,142	11,486	1,106
Annual Population Growth Rate (%)	0.96	-1.22	0.32	-0.32	2.45

Note: Population of Nepal 2011 (Nepal Population and Housing Census 2011, CBS). Population of 753 Local Unit (CBS), Nepal and 4 other cities 2011 (Nepal Population and Housing Census 2021, CBS). Population density (population/area in 2021). Population growth rate (10-year average annual growth rate from 2011 to 2021).





Survey Target Area

Photos

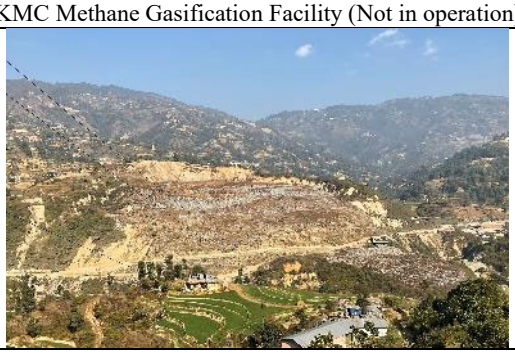
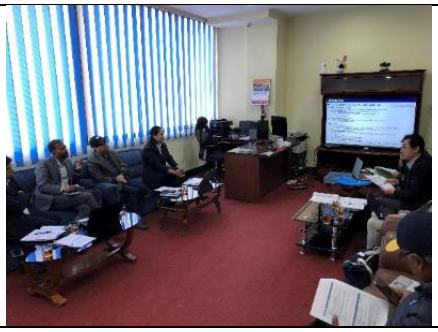
【Federal Government】

	
11/30：Kick-Off Meeting (MoUD)	12/6：Meeting (MoFE)
	
12/10：Meeting (MoFAGA)	12/11：Meeting (MoHP)
	
12/17：Meeting (MoICS)	12/18：Meeting (MoUD)
	
3/5：Meeting (DUDBC)	3/10：Meeting (MoUD)

	
3/18：Meeting (MoUD)	

【KMC】

	
11/27：Meeting (KMC)	12/4：Kick-Off Meeting (KMC)
	
12/4：Meeting (KMC Mayoral Waste Management Advisor)	12/18：Meeting (KMC Secretary)
	
KMC Direct Management Collection	KMC (Teku) Transfer Station

	
KMC Workshop	KMC Methane Gasification Facility (Not in operation)
	
Banchare Danda Landfill Site	Sisdol Old Landfill Site
	
3/7：Meeting (KMC City Planing Committee)	3/10：Site Visit of Source Separation Pilot Project in KMC

【LMC】

	
11/29：Kick-Off Meeting (LMC)	12/20：Courtesy (LMC Mayor)

	
LMC Direct Management Collection	LMC (Kharibot) Transfer Station

【BKM】

	
12/10：Meeting (BKM)	12/19：Courtesy (BKM Mayor)
	
BKM Direct Management Collection	BKM (Maheshwari) Transfer Station (Composting Facility)
	
BKM (Sallaghari) Landfill Site	12/10：Meeting (BKM)

【PMC】

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>12/1：Kick-Off Meeting (PMC)</td><td>12/10：Meeting (PMC)</td></tr>
<tr><td> 
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<tr><td>12/15：Courtesy (PMC Mayor)</td><td>PMC Collection (Outsourcing to Private Business Operators)
Due to opposition from residents in the area surrounding the temporary landfill site, waste collection cannot be in operation temporarily, and the municipality was flooded with waste.</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>PMC (Bacchebuduwa) Old Landfill Site</td><td>PMC (Lame Ahal) Temporary Landfill Site</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Candidate Site for New PMC Landfill Site</td><td>3/4：Meeting (PMC)</td></tr>
</table>

【Other Donors】

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<tr><td> 
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<tr><td>3/4：Meeting UNDP)</td><td>3/5：Meeting (ADB)</td></tr>
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<tr><td>3/7：Meeting (WB)</td></tr>
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【Private and Social Sector】

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>12/5：Meeting (Industrial District Management Ltd.)</td><td>Medical Waste Management in KMC's Public Hospitals</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Transfer Station for a major private business operator in the Kathmandu Valley</td><td>Composting facility of a major private business operator in the Kathmandu Valley</td></tr>
</table>

	
3/4：Meeting (Himalayan Life Plastic Pvt. Ltd.)	3/6：Meeting (SWMAN)

【Workshop】

	
Workshop Day1 (Morning): Session on Discussion of Current Situation and Issues Identification	
	
Workshop Day1 (Afternoon): Site Visit to Banchare Danda Landfill Site	
	
Workshop Day2 (Morning): Session on Discussion of Countermeasures	

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List of Abbreviations

Abbreviations	Description
3R	Reduce, Reuse, Recycle
ADB	Asia Development Bank
BES	Brief Environmental Study
BKM	Bhaktapur Municipality
CBS	Central Bureau of Statistics
CKV	Clean Kathmandu Valley
DUDBC	Department of Urban Development and Building Construction
EIA	Environmental Impact Assessment
GDP	Gross Domestic Product
IBN	Investment Board Nepal
IEE	Initial Environment Evaluation
JCCI	JICA Clean City Initiative
JICA	Japan International Cooperation Agency
KMC	Kathmandu Metropolitan City
KOICA	Korea International Cooperation Agency
LMC	Lalitpur Metropolitan City
M/P	Master Plan
MoF	Ministry of Finance
MoFAGA	Ministry of Federal Affairs and General Administration
MoFE	Ministry of Forest and Environment
MoHP	Ministry of Health and Population
MoICS	Ministry of Industry, Commerce and Supplies
MoUD	Ministry of Urban Development
NGO	Non-Governmental Organization
NWMCC	National Waste Management Coordination Committee
PMC	Pokhara Metropolitan City
PPP	Public Private Partnership
Rs.	Nepalese Rupees
SOP2077	National Health Care Waste Management Standards and Operating Procedure 2077
SWM Council	Solid Waste Management Council
SWMAN	Solid Waste Management Association Nepal
SWMTSC	Solid Waste Management Technical Support Center
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USD	US Dollars
WB	World Bank
WHO	World Health Organization
WtE	Waste to Energy

Summary

1. Outline of the Survey

(1) Background of the Survey

The waste generation amount in the South Asia region is expected to nearly double from 334 million tons /year in 2016 to 661 million tons /year in 2050. This waste generation amount mirrors the trend observed in the East Asia region, marked by remarkable economic development. The population[1] of Nepal is projected to increase from 30.55 million in 2022 to 37.4 million in 2050, and other South Asian countries, including India, Bangladesh, Bhutan, Sri Lanka, are also experiencing similar growth trends. These demographic changes are the primary drivers behind the aforementioned increase in waste generation.

On the other hand, the Gross Domestic Product per capita in South Asian countries, has been increasing rapidly since 2000, indicating active socioeconomic activities. Despite this growth, the value remains in the range of USD 1,000-3,000/person, placing these countries in the lower middle-income group according to the World Bank's indicators. However, Nepal is still classified as a Least Developed Country by the United Nations Committee for Development Policy.

In accordance with the support framework outlined in Cluster Project Strategy "Improvement of Waste Management and Realization of a Sound Material-Cycle Society" under the "JICA Clean City Initiative" (JCCI), Nepal falls into the "1st stage" category where improvement of public health is required due to the above-mentioned economic situation and other factors (Prior to the survey, it was assumed to be the 1st stage, but as a result of understanding and analyzing the current situation through this survey, it was revealed that the issues in the 2nd stage are in focus).

(2) Purpose of the Survey

The Survey will assess current situations, identify and analyze issues, and consider countermeasures to address these issues. The countermeasures will be categorized into the following three groups: objectives achievable through Nepal's own efforts, those requiring donor support, and those with potential for private investment. The need for JICA's financial and technical assistance will also be evaluated.

(3) Target Sites

The target sites for the Survey include KMC, LMC, BKM, and PMC.

2. Management System for SWM and Situation of Industrial Waste and Medical Waste in Nepal

(1) Legal Regulations and Policies

[1] Our World in Data

The EPA2077 and EPR2077, which regulate the conservation and protection of the environment, were amended in 2020. The Government of Nepal, through these regulations, mandates EIA and pollution control. The list attached to EPR2077, indicating the type and size of projects requiring three levels of environmental studies (i.e. BES, IEE and EIA), including those related to the solid waste sector, was updated in 2021.

The SWMA2068 was enacted in June 2011, with a primary focus on solid waste management. It outlines the responsibilities of municipalities, strengthens penalties for illegal waste dumping, and mandates the establishment of the SWM Council and the SWMTSC. Based on this law, the SWMR2070 were enacted in 2013, establishing a fundamental framework for solid waste management. This includes delineating municipal responsibilities and implementing a licensing system for private companies engaged in solid waste management activities.

Following the enactment of the new constitution in 2015, the SWM Council and the SWMTSC, established under the SWMA2068, were disbanded, and amendments to SWMA2068 were made to remove descriptions related to the center. Since then, other federal-level organizations, such as the IBN of Nepal and the PPP Center established under the National Planning Commission, have been assisting municipalities in implementing PPP projects including ones of the SWM sector.

Furthermore, the NSWMP2079 was formulated in 2022. This policy mandates the establishment of a NWMCC with MoFAGA as the coordinator and other relevant ministries as members. Recognizing that more than 10 years have passed since the enactment of law and regulations, excluding NSWMP2079, MoFAGA has proposed a new solid waste management bill, pending approval by the National Assembly. However, in November 2023, a decision was made to transfer the coordination role of NWMCC from MoFAGA to MoUD. As a result, upcoming laws and policies will be implemented under the MoUD. Other federal government agencies, such as MoF and MoFE, play roles in the technical, financial, and environmental aspects of solid waste management.

(2) Relevant Organizations

1) Ministry of Urban Development (MoUD)

The MoUD is the federal government agency responsible for urban infrastructure development, including urban and housing development, among other areas. As outlined in the Nepal Gazette on the 23rd of November 2023, the responsibility for waste management at the national level, previously under the jurisdiction of the MoFAGA, was transferred to the MoUD. The MoUD is set to review the NSWMP2079 and the SWMA2068, and will initiate work on a national-level waste management policy, guidelines, and the SWMTSC, which has been suspended since the 2015 constitutional amendment.

The department overseeing waste management is the Urban Infrastructure Division. The DUDBC, an agency under MoUD, played a role in the construction of the Banchare Danda landfill in the Kathmandu Valley, as described below.

2) Ministry of Federal Affairs and General Administration (MoFAGA)

The MoFAGA is responsible for overseeing local administration carried out by municipalities. As mentioned in 2.3.1, the MoFAGA previously held responsibility for waste management at the national level from the standpoint of supervising municipalities. However, this responsibility was transferred to the MoUD as per the Nepal Gazette on the 23rd of November, 2023.

3) Ministry of Forest and Environment (MoFE)

The MoFE is responsible for setting EIAs and effluent standards for various facilities, including waste management facilities. However, it does not hold specific executive responsibilities for waste management.

4) Ministry of Industry, Commerce and Supplies (MoICS)

The MoICS is responsible for promoting industry, commerce, and related sectors. The Industrial Infrastructure and Environment Division of MoICS oversees industrial waste at the national level as part of manufacturing management. However, the MoICS does not directly handle the collection, treatment, and disposal of industrial waste; instead, the responsibility for industrial waste management lies with the factories generating the waste.

5) Ministry of Health and Population (MoHP)

The MoHP is responsible for health and medical administration and is tasked with overseeing medical waste at the national level. Medical waste is managed from the perspective of infection prevention in hospitals and falls under the purview of the Population Management and Health Coordination Department. The MoHP considers medical waste management to be the responsibility of the medical institution that generates the waste. While the MoHP itself does not directly collect, treat, or dispose of medical waste, it plays a supervisory role in ensuring proper management practices.

3. Waste Management in Kathmandu Metropolitan City

(1) Outline of Kathmandu Metropolitan City

- In this report, the population of KMC in 2024 (Resident Population + Floating Population) is estimated to be approximately 1,231,000. Floating Population was estimated by urban planning department of KMC (about 400,000 people).
- The Solid Waste Management Division in the Environmental Management Department is responsible for waste management.

(2) Municipal Waste Generation Amount

- This Survey estimates the municipal waste generation amount in KMC based on the unit generation rate of 0.490kg/person/day in the most recent survey results (WB2021).

- The estimated municipal waste generation amount, multiplying the projected population (1,231,000 people) in KMC in 2024 by the unit generation rate of 0.490kg/person/day is about 603 tons/day.

(3) Collection and Transportation of Municipal Waste

1) Overview of Collection and Transportation in KMC

- The waste collection by collection and transportation companies is not performed under a contract or license granted by KMC; collection and transportation companies provide their services under individual contracts with residents and businesses. The waste collection and transportation services in KMC are jointly provided by KMC and private companies. The estimated waste collection amount in KMC is about 510 tons/day, representing an 85% collection rate of the generation amount.

2) Collection and Transportation by KMC

- The KMC operates the Teku transfer station, receiving waste collected by its own vehicles. Waste collection is estimated to be approximately 105 tons/day. Despite having a drop-off platform, it remains inactive due to complaints from nearby residents about waste scattering.

3) Collection and Transportation by Private Business Operator

- The SWMA2068 and SWMR2070 outline a licensing system for private business operators, supervised by the municipality, to enter the waste management sector. However, in areas without waste collection services, several private operators are active. However, KMC has not issue licenses to private operators. KMC acknowledges this issue but faces a bottleneck due to a frozen privatization plan for waste management in the Kathmandu Valley, drafted by the federal government before the shift to federalism.
- In interviews conducted by JST, the SWMAN specific requests to both the municipality and the federal government: (1) provision of land, (2) formal approval through a licensing system, and (3) assistance with investment costs and technology implementation.
- Interviews were conducted with 30 of the collection and transportation companies that provide waste collection services in KMC. The total waste collection amount obtained from the interviews with each collection and transportation company was roughly 405 tons/day.

(4) Intermediate Treatment and Recycling

1) Intermediate Treatment and Recycling by KMC

- Although a composting facility existed when the Teku transfer station was built, it was taken out of service and demolished due to complaints about unpleasant odors from neighboring residents. However, as of March 2024, composting activities have resumed at a part of Teku transfer station from the viewpoint of reducing the final disposal amount.

2) Intermediate Treatment and Recycling by Private Business Operator

- Recycling in KMC is mainly conducted by private recycling companies. Upon delivering collected waste to

their transfer stations, workers employed by these companies undertake the sorting of recyclables.

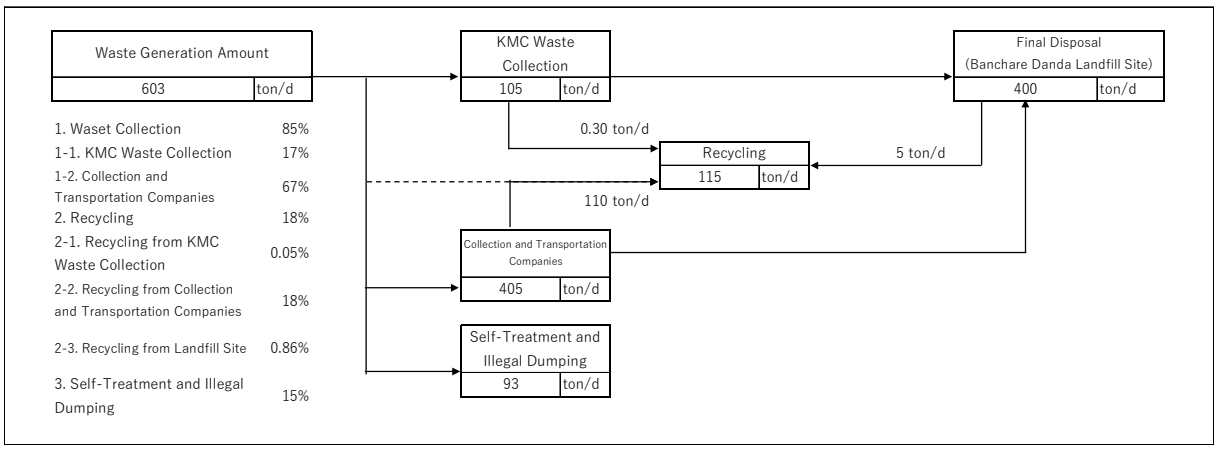
- The distribution of recyclable materials collected by waste pickers and waste collection workers working at waste management facilities and on the streets in the four target municipalities was confirmed through interviews. The collected recyclable materials are sold to recycling companies and exporters through buyers.

(5) Final Disposal

- In 2005, the Sisdol old landfill Phase 1 commenced operations as a pilot project within the CKV Study. Utilizing the semi-aerobic landfill method, it was followed by the subsequent operation of the Aletar old landfill adjacent to Sisdol old landfill and the Sisdol old landfill Phase 2. Due to delays in the initiation of the Banchare Danda landfill site, the Sisdol old landfill exceeded its intended capacity in accommodating waste. The Banchare Danda landfill site, constructed with funds from the federal government, became operational in March 2022. Currently, 24 municipalities, including 19 in the Kathmandu Valley, mainly KMC, and 5 municipalities around the Kathmandu Valley, are engaged in final disposal activities.
- As of December 2023, the top of the landfill has been covered with a final soil cover. Despite it being the dry season, leachate was observed on certain slopes where the final soil cover had not been applied. KMC expressed concerns about potential hazards during the rainy season, anticipating waste collapse, and the environmental pollution caused by leachate runoff. Under these circumstances, the safe closure of the Sisdol old landfill site is urgent.
- The Banchare Danda landfill site, designed and constructed by the MoUD, is mainly managed by KMC after commencing operations. The landfill is generally operated properly for sanitary landfill purposes, with daily soil cover and leachate management. However, there is room for improvement in systematic operations, such as waste compaction, landfilling plans, and soil cover spreading.

(6) Municipal Waste Material Flow

- The waste material flow of KMC is shown below.



(7) Municipal Waste Management System

- KMC has enacted the KMC Environment and Natural Resources Protection Act 2077 (A.D. 2020) as a local act pertaining to solid waste management. The Act outlines waste management responsibilities, waste prevention measures, waste segregation requirements, licensing procedures for waste management operations, and the involvement of private business operators and communities.
- KMC lacks a formal policy and plan for waste management. KMC acknowledges that the suspended privatization plan for waste management in the Kathmandu Valley, coupled with the lack of coordination with collection and transportation companies, poses challenges to the formulation of a new policy and plan.
- Despite detailed information being available in KMC's Budget Book, the data is not organized by department, making it challenging to extract information specifically related to waste management. The Environmental Management Department also encountered difficulties accessing its own budget and had to ask the Finance Department to extract the budget information related to waste management. This suggests that budget and cost management related to waste management might not be properly implemented.

4. Waste Management in Lalitpur Metropolitan City

(1) Outline of Lalitpur Metropolitan City

- In this report, the population of LMC in 2024 (Resident Population + Floating Population) is estimated to be approximately 346,000. Floating Population was estimated by LMC (about 60,000 people).
- The Solid Waste Management Center, responsible for waste management.

(2) Municipal Waste Generation Amount

- LMC estimates waste generation amount by itself for planning and other purposes related to waste management. The waste generation amount is 139 tons/day by multiplying the unit generation rate as 0.40 kg/person/day, by the population estimated by LMC.

(3) Collection and Transportation of Municipal Waste

1) Overview of Collection and Transportation in LMC

- The waste collection by collection and transportation companies is not performed under a contract or license granted by KMC; collection and transportation companies provide their services under individual contracts with residents and businesses. The waste collection and transportation services in LMC are jointly provided by LMC and private companies. The estimated waste collection amount in KMC is about 116 tons/day, representing an 84% collection rate of the generation amount.

2) Collection and Transportation by LMC

- LMC has allocated a portion of land for the LMC Environmental Division office and a parking lot for collection and transportation vehicles, serving as a transfer station (Kalibot transfer station). A rough

estimation of the waste collection amount is about 52 tons/day.

3) Collection and Transportation by Private Business Operator

- Interviews were conducted with 6 of the collection and transportation companies that provide waste collection services in LMC. The total waste collection amount obtained from the interviews with each collection and transportation company was roughly 64 tons/day.

(4) Intermediate Treatment and Recycling

1) Intermediate Treatment and Recycling by LMC

- Several waste pickers from the informal sector sort resources at the Kalibot transfer station.

2) Intermediate Treatment and Recycling by Private Business Operator

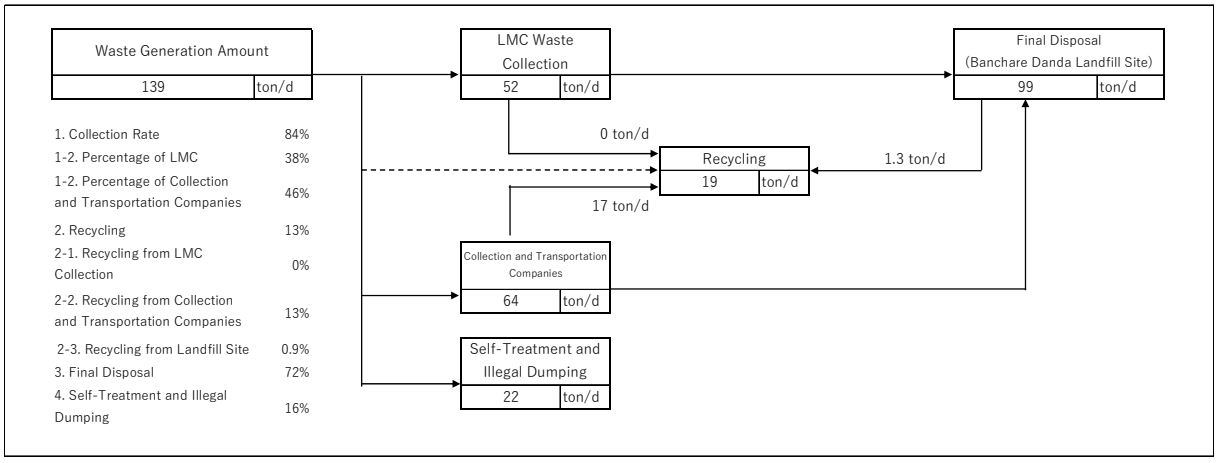
- Recycling in LMC is mainly conducted by private recycling companies. Upon delivering collected waste to their transfer stations, workers employed by these companies undertake the sorting of recyclables.
- The distribution of recyclable materials collected by waste pickers and waste collection workers working at waste management facilities and on the streets in the four target municipalities was confirmed through interviews. The collected recyclable materials are sold to recycling companies and exporters through buyers.

(5) Final Disposal

- The final disposal for LMC is carried out at the Banchare Danda landfill site. Regarding the operation of the Banchare Danda landfill site, LMC provided one wheel loader and has no additional cost burdens.

(6) Municipal Waste Material Flow

- The waste material flow of LMC is shown below.



(7) Municipal Waste Management System

- LMC has enacted the LMC Solid Waste Management Act 2075 (A.D. 2019) as a local act governing solid waste management. The Act addresses various aspects of waste management, encompassing waste

management responsibility, waste generation reduction, waste segregation, licensing for waste management operations, and private sector/community involvement.

- In LMC, a waste management M/P (5-year plan) was prepared in 2018 with the support of the WB. However, it has not been formally approved by the LMC and has not been implemented.
- The LMC's Budget Book incorporates a budget for waste management within its investment budget. The investment budget related to waste management allocates 18,600,000 Rs. for "Development and Revegetation of Landfill Site," "Program for Improvement of Waste Management and Environmental Sanitation," and "Maintenance of Waste Management Office". However, the operating budget lacks a breakdown by sector, encompassing personnel and fuel costs.

5. Waste Management in Bhaktapur Municipality

(1) Outline of Bhaktapur Municipality

- In this report, the population of KMC in 2024 (Resident Population + Floating Population) is estimated to be approximately 1,231,000.
- The Sanitation Section of BKM is responsible for waste management.

(2) Municipal Waste Generation Amount

- This Survey estimates the municipal waste generation amount in BKM based on the unit generation rate of 0.385kg/person/day in the most recent survey results (WB2021). The estimated municipal waste generation amount, calculated by multiplying the population (78,000 people) in BKM in 2024 by the above mentioned unit generation rate (0.385kg/person/day), is about 30 tons/day.

(3) Collection and Transportation and Secondary Transfer of Municipal Waste

1) Overview of Collection and Transportation in BKM

- Unlike KMC and LMC, BKM directly manage waste collection for the entire municipality; no collection and transportation companies provide waste collection services in BKM. The estimated waste collection amount in BKM is about 24 tons/day, with a collection rate of approximately 80% of the generation amount.

2) Collection and Transportation by BKM

- BKM distributes waste containers (green: organic waste, red: non-organic waste) for source separation to all households and businesses, and about 40% of these households cooperate with the source separation.
- BKM has been conducting final disposal at the Banchare Danda landfill site since around February 2024, and has closed the landfill site along the Hanumante River, which had previously been used for final disposal. The round-trip distance between BKM and the Banchare Danda landfill site is about 80 km, which significantly increases the time and cost of transporting waste to the landfill site, so BKM has begun secondary transfer.

(4) Intermediate Treatment and Recycling

1) Intermediate Treatment and Recycling by BKM

- In BKM, organic waste separated during the direct collection and transportation process is utilized for composting. A composting facility in the eastern part of BKM receives about 2 tons/day of organic waste.

2) Intermediate Treatment and Recycling by Private Business Operator

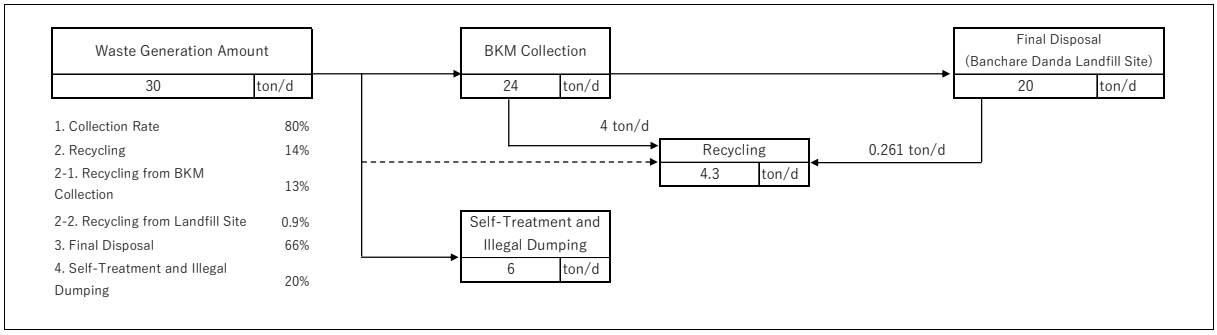
- The distribution of recyclable materials collected by waste pickers and waste collection workers working at waste management facilities and on the streets in the four target municipalities was confirmed through interviews. The collected recyclable materials are sold to recycling companies and exporters through buyers.

(5) Final Disposal

- Until February of 2024, BKM did not have a permanent landfill site and utilizes an area along the Hanumante River for landfill purpose. Minimal environmental measures, such as daily soil covering and chemical application, were implemented. However, previously dumped waste is exposed about 200 m upstream of the landfill site on the riverbank, raising concerns about the negative impact on the river environment. Since residents living near the landfill site have filed complaints with BKM about the operations, waste transfer to Banchare Danda landfill site began in February of 2024 and the old landfill site at Hanumante River was closed. However, the long distance to the Banchare Danda landfill site remains an operational challenge.

(6) Municipal Waste Material Flow

- The waste material flow of BKM is shown below.



(7) Municipal Waste Management System

- BKM has enacted the BKM Sanitation Act 2076 (A.D. 2020) as a local act addressing waste management. The Act allows municipalities to implement various waste management measures, including promoting the separation of organic and inorganic wastes, prohibiting the dumping of medical wastes outside designated areas, requiring proper treatment of hazardous wastes by generators, and designating plastic-free zones.
- BKM currently lacks specific policies or dedicated plans for waste management.

- BKM's Budget Book is not organized by department, making it challenging to extract budgets related exclusively to waste management.

6. Waste Management in Pokhara Metropolitan City

(1) Outline of Pokhara Metropolitan City

- In this report, the population of PMC in 2024 (Resident Population + Floating Population) is estimated to be approximately 607,000. Floating Population was estimated by PMC (about 50,500 people).
- The Sanitation Section of the Urban Development, Tourism and Environment Division is responsible for waste management.

(2) Municipal Waste Generation Amount

- The study determined the unit generation rate of municipal waste in PMC to be 0.354 kg/person/day. The estimated municipal waste generation amount, multiplying the projected population (607,000people) in PMC in 2024 by the unit generation rate of 0.354 kg/person/day, is about 215 tons/day.

(3) Collection and Transportation and Secondary Transfer of Municipal Waste

1) Overview of Collection and Transportation in PMC

- In PMC, only road sweeping is directly managed by PMC, while the collection of household and commercial waste is contracted out to the private sector. The waste collection amount in PMC is estimated to be about 116 tons/day, with a collection rate of approximately 54% of the generation amount.

2) Collection and Transportation by PMC

- PMC's road sweepers are responsible for transporting the collected waste to fixed points. Transportation from the fixed point to the landfill site is considered the responsibility of the private business operators.

3) Collection and Transportation by Private Business Operator

- Currently, there are six operators managing municipal waste and one overseeing medical waste. These operators function under consignment agreements with PMC. According to the contract between PMC and the private business operators, collection services are stipulated to be provided to all 32 wards in PMC. However, the frequency of collection varies across wards, with daily collection in the central municipality area (considered the Core Area), once to three times a week to every other week in the suburban areas (considered the Outer Area), and bi-weekly or almost no collection service in the rural areas. According to interviews with PMC, the estimated incoming collection and transportation amount is about 116 tons/day.
- PMC does not offer secondary transfer services due to the absence of transfer stations owned by private business operators. The current landfill site, located at the southeastern edge of the municipality, which is approximately 20 km in the total travel distance from the municipality center, necessitates travel time between the northwest part of municipality and municipality center and the landfill site. PMC has formulated a (draft)

plan for the future development of a transfer station to address this issue, but specific details such as timing and site location have not been determined yet.

(4) Intermediate Treatment and Recycling

1) Intermediate Treatment and Recycling by PMC

- Currently, PMC lacks a municipality intermediate treatment facility.
- KOICA and UNDP are planning to implement the Green Job Creation to Recycling and Up-recycling project.

2) Intermediate Treatment and Recycling by Private Business Operator

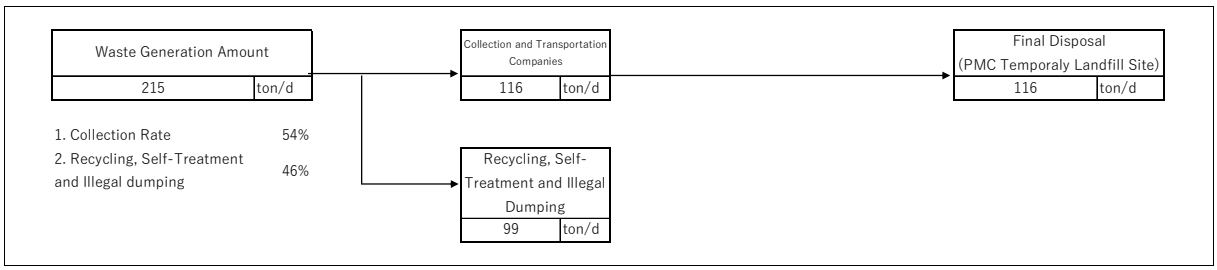
- To prevent waste scattering and sewage leakage onto roads during collection operations, PMC prohibits workers of private waste collectors from collecting recyclables. PMC also prohibits the temporary storage of waste and collection of recyclables on the premises of private waste collectors. Furthermore, in consideration of residents living near the temporary landfill, activities by waste pickers, previously allowed in the closed landfill, are now prohibited in the temporary site.

(5) Final Disposal

- From 2011 until December 2022, PMC utilized the old landfill site adjacent to the Pokhara International Airport. However, due to challenges such as bird strikes, making continued landfilling impractical, the landfill activity was halted. Starting January 2023, landfilling activities transitioned to a temporary landfill approximately 20 km away from PMC urban area. Urgency surrounds the need to cease operations promptly, given the high risk of waste layer collapse and the insufficient landfill area. Local residents also oppose the ongoing use of the landfill.
- The candidate site for the new landfill is located approximately 5 km away from the temporary landfill, with no residential structures in proximity. However, the price of the sale proposed by the landowner is much higher than the price at which a government agency can purchase the land, as required by law. Therefore, it was confirmed that the land could not be purchased by PMC, the government agency. As of March 2024, PMC has decided to proceed with the project under a PPP (BOT), where the private contractor will implement the repository project, including the land acquisition.

(6) Municipal Waste Material Flow

- The waste material flow of KMC is shown below.



(7) Municipal Waste Management System

- PMC has instituted the PMC Solid Waste Management Rules 2074 (A.D. 2017) as an ordinance governing waste management. These rules were revised and are currently in effect as of 2021. Regarding waste management, the regulations outline responsibilities, waste generation reduction, waste segregation, licensing for waste management operations, and the involvement of private companies and communities.
- PMC has been designated as the "Capital Municipality of Tourism Pokhara" and is committed to promoting "Clean Pokhara Green Pokhara". Considering the JCCI proposed by JICA, it is anticipated that PMC will be the target of the project, integrating the environmental sector.
- Despite the presence of detailed information in PMC's Budget Book, the lack of organization by department hinder the extraction of specific budgets related to waste management. Additionally, the Sanitation Section lacks access to its own budget, further complicating the extraction of the budget related to waste management. This suggests that budget and cost management related to waste management may not be properly implemented.

7. Support by Other Donors for Solid Waste Management in Nepal

(1) WB

Actual input and direction of support as well as potential for collaboration identified in discussions with WB are described below.

Actual Input and Direction of Support	・ Three surveys in the waste management sector were conducted in 2020-2021. Another baseline survey is underway to check the status after COVID-19.
Potential for Collaboration	・ Those three survey targets plastic waste and covers four cities; KMC and LMC, which is also target of JICA Survey. MoUD is the target agency for support for federal ministries. ・ For MoUD including support for SWMTSC, it is envisioned to provide (1) support for policy development, (2) support for preparation of Technical Standard, and (3) capacity development for municipalities. ・ However, since both studies (WB and JICA) are still in the baseline survey stage, therefore discussion on coordination and overlap will be made after the projects are scoped specifically.

(2) UNDP

Actual input and direction of support as well as potential for collaboration identified in discussions with UNDP are described below.

Actual Input and Direction of Support	・ UNDP focuses on support for local municipalities, with the main areas of support being collection, recycling, and RDF conversion of plastics, and treatment of hospital waste (autoclaving). ・ Support to MoFAGA in developing a strategy to control plastic waste is being conducted, and a draft report has been submitted to MoFAGA in September 2023. ・ In recent years, in collaboration with KOICA, a Recycle & Up-cycle project was launched for PMC.

Potential for Collaboration	・ Since UNDP targets local municipalities, the potential for duplication is low. ・ For PMC, since UNDP focuses on support for the private sector related to recycling, JICA is expected to provide support to PMC in administrative support and the development of a landfill site.

(3) ADB

Actual input and direction of support as well as potential for collaboration identified in discussions with ADB are described below.

Actual Input and Direction of Support	・ The LMC Mayor requested gasification and melting as an emergency project to achieve zero waste. The KMC also received a request for WtE in May 2023.ADB considers these requests as one of many requests. ・ Since PMC plans to proceed with the waste management project through PPP, ADB plans to support the tourism project in PMC. ・ A project for gasification and melting in the DBO scheme is under consideration to be implemented in Biratnagar. The implementer is expected to be an Indian company. ・ ADB is providing technical support to SWMTSC in 2012 for organizational development and strengthening in response to the SWM Act 2011. ・ In addition, a number of other projects in the waste management sector are being planned and implemented.
Potential for Collaboration	・ ADB plans to support SWMTSC once the budgetary measures by MOF and the establishment of the organization are in place. ADB considers DUDBC as one of the main C/P agencies. ・ ADB is of the view that it can cooperate with JICA on the Countermeasures presented by JICA (i.e., (1) formulation of national waste reduction policy, (2) development of guidelines for municipalities to formulate action plans, and (3) support for SWMTSC). ・ Since ADB is implementing and planning many waste management-related projects, consultation will be necessary in each case. ・ ADB pointed out that in waste management in Nepal, MoFAGA specializes in administrative aspects and MoUD in technical aspects, and that the division of roles between the two ministries is an issue. ・ ADB is working with AEPC (Alternative Energy Promotion Center/ Ministry of Energy) in Dharan municipality, and ADB advised that AEPC is an important institution when considering WtE.

(4) KOICA

In PMC, KOICA and UNDP are working on a "Green Job Creation to Recycling and Up-recycling Project" and are currently in the final stages of selecting a contractor and determining the project site. The municipality comprises approximately 200 communities, with 5 in the Core area, 4 in the Outer area, and 3 in the rural area. This project is a community-based recycling and waste reduction initiative that includes education, awareness, and job creation. Besides awareness and education, the project aims to generate employment. Specific details will be confirmed during the implementation phase of the project, but synergistic effects can be expected through collaboration with JICA's 3R efforts.

8. Holding Workshop

The workshop was held on March 13 and 14, 2024. On day 1 was mainly targeted at the working level of waste management, with a session on “Discussion of Current Situation and Issues Identification" in the morning and a "Visit to Banchare Danda Landfill Site” in the afternoon. On day 2, decision makers from the federal government and municipalities were invited to participate in the “Discussion of Countermeasures” session, where good practices were shared and countermeasures were discussed.

Throughout the workshop, discussions covered (1) the role and involvement of the Federal government in waste management in Nepal, (2) the importance of waste reduction, and (3) the improvement of the Banchare Danda landfill site. In (1), each municipality and the private sector expressed their request for the Federal government's active involvement in waste management practiced by the municipality and their expectations for the restart of the SWMTSC. In (2), the participants recognized the reduction of final disposal amounts as an urgent common issue for each municipality, and reaffirmed the need to promote waste reduction treatment, including reduction at the source and recycling through separation collection. In (3), issues related to the operation and maintenance of the Banchare Danda landfill site were pointed out, and the need to clarify the regional management and burden sharing among the 24 municipalities that jointly use the landfill site was confirmed.

9. Common Issues on Waste Management and Analysis of Needs

(1) Analysis of Issues in Each Field of Waste Management

Common issues (6 items) in waste management at the national level and in the four municipalities studied (KMC, LMC, BKM, and PMC) were identified and analyzed.

- [Issue-1] Responding to Changes in Federal Government Policies and Systems, and Strengthening Federal Government Leadership
- [Issue-2] Development of Waste Management Plans based on Objective Data
- [Issue-3] Improvement of Waste Collection Service in Cooperation with Private Business Operators and Introduction of Separation Collection
- [Issue-4] Reducing the Environmental and Social Impact of Landfill Sites and Extend their Life Spans
- [Issue-5] Appropriate Regional Waste Management
- [Issue-6] Strengthening Leadership of Responsible Organizations for Industrial and Medical Waste

(2) Identification of Needs from related Organizations

The major needs for waste management expressed by relevant organizations in the survey are listed below. This section also shows the relationship between the needs of relevant organizations and the six common issues listed above.

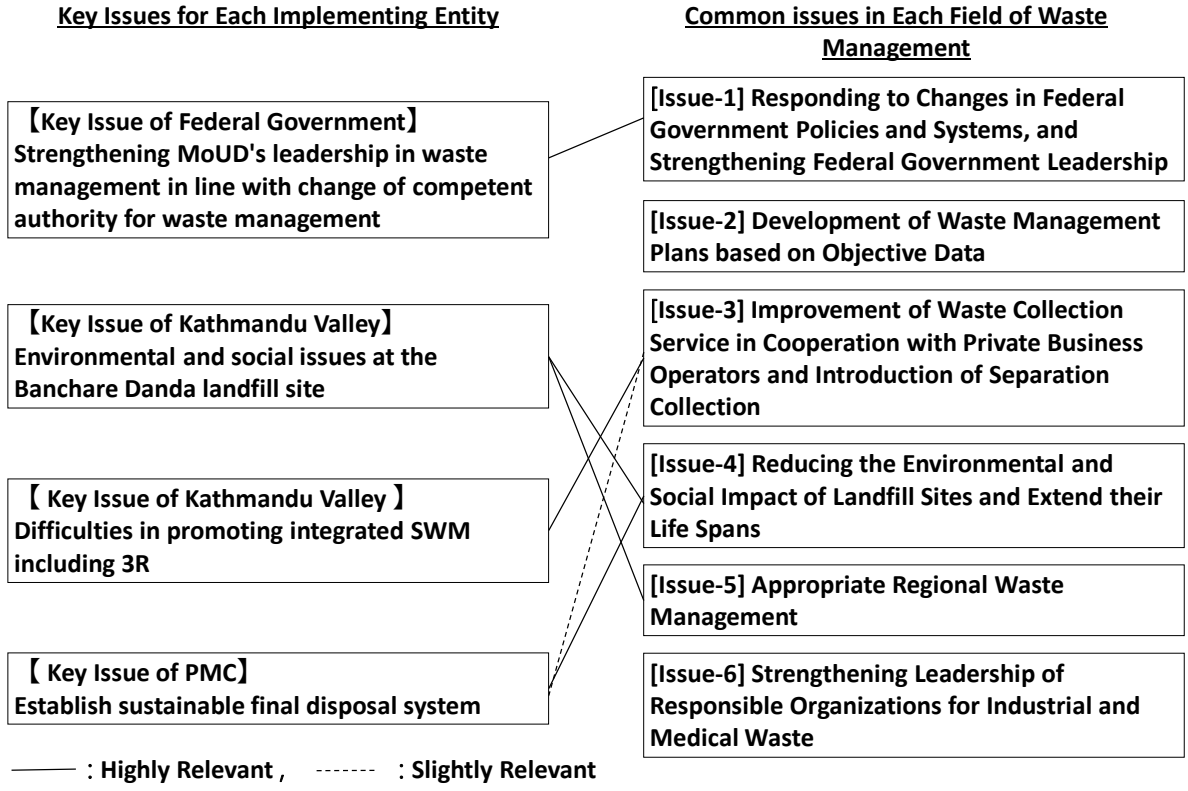
Organization	Needs	Common Issues					
		1	2	3	4	5	6
MoUD/ DUDBC	● Development of guideline for operation and management for municipalities nationwide (including leachate treatment).	●			●		
	● Development of technical standard for intermediate treatment and recycling for municipalities nationwide.	●		●			
	● Introduction of source separation			●			
	● Growth of the venous industry that accepts organic waste and valuable materials.			●			
	● Comprehensive guidance on the entire process from waste generation to treatment and disposal, including recycling, based on the premise of source separation and the 3Rs, which are implemented based on an understanding of waste generation amounts and waste composition.	●					
KMC	● KMC expects SWMTSC about the following items.						
	➢ Development of access roads to the Banchare Danda landfill site (route from Tinpiple to Sisdol)				●		
	➢ Raising the embankment of the Banchare Danda landfill site, leachate treatment, etc.				●		
	➢ Coordination among ministries and relevant organizations to solve waste management issues (e.g., sharing responsibility among municipalities for improvement of the Banchare Danda landfill site operations, etc.).					●	
	➢ Resolving social issues with residents living near the Banchare Danda landfill site				●		
	● Development of composting facilities for the treatment of organic waste collected through source separation. However, since it is difficult to secure sites in the city, it is necessary to secure sites in the surrounding area.			●			
	● Market acceptance exist for non-organic waste collected through source separation, such as PET, but currently non-recyclable items (some hard plastics, colored glass bottles, etc.) need treatment.			●			
	● Appropriate management of the Banchare Danda landfill site, leachate treatment, and data management using truck scale are needed.		●		●		
	● Closure measures for the Sisdol old landfill site are required, such as slope shaping and stabilization, vegetation, leachate treatment, and site use planning.				●		
	● Development and implementation of a business plan based on waste amount data is needed.		●				
LMC	● Improvement of waste management requires ensuring circular economy and financial sustainability.			●			
	● The SWMTSC is expected to take the lead in (1) raising awareness and education, (2) recognizing the importance of landfill sites, and (3) strengthening recycling, especially composting.			●	●		
	● The SWMTSC should be an independent organization that is not affected by changes or modifications in line ministries.	●					
	● There is an urgent need to approve and issue a Waste Management Act. This act will address the social issues of the Banchare Danda landfill site by delineating responsibilities among the relevant organizations (Federal government, state government, and municipality), as stipulated in the Waste				●		

Organization	Needs	Common Issues					
		1	2	3	4	5	6
	Management Act. ● There is a need to reduce the final disposal amount by introducing source separation and promoting recycling as required in the EIA for the initial Banchare Danda landfill site. ● Although the promotion of privatization has not progressed for a long time, it is expected that the application of the new SWM Act (e.g., clarification of the responsibilities of government agencies) will resolve this issue.			●	●		
BKM	● There are problems related to landfill sites (long distances to landfill sites, high costs, lack of vehicles, etc.), and there is an urgent need to reduce waste amount. ● Land needs to be secured for recycling operation. ● Reuse and recycling of plastic waste are needed. ● Procurement of compactors that can compact and transport waste is needed. ● Waste treatment facilities need to be addressed because residents are opposed to them due to odor issues.			● ● ● ●	● ●		
PMC	● Pilot project for appropriate site selection and operation of new temporary landfill site, measures related to medical and industrial waste. ● Waste reduction through source separation and 3Rs is necessary. ● Resumption of SWMTSC ➢ There is a gap between existing laws and regulations and the current situation. The SWMTSC needs to take the lead in updating laws and regulations on e-waste, industrial waste, medical waste, etc. ➢ Training for municipalities is required. ● The PPP project for the new landfill site assumes to be a facility that includes WtE (Bio-gas and power generation). ● Support for improving the operation of temporary landfill sites and the development of new ones is needed.	●		●	● ● ● ●		● ●
SWMAN	● PMC expects SWMTSC about the following items. ➢ The SWMTC should be an independent organization, not under the umbrella of a ministry. Previously, it was placed under the umbrella of the MoLD and was difficult to access. ➢ The Waste Management Act/Policy should include a provision on site acquisition for treatment facilities. ➢ The Waste Management Act/Policy should emphasize a focus on private sector utilization. ● The introduction of 3Rs and development of recycling industry (venous industry) are important. ● Contract or license with municipality for waste collection services.	● ● ●		 ● ● ●			

Note: ●Highly relevant

10. Proposal on Support Policy for Realization of Countermeasures for Each Issue

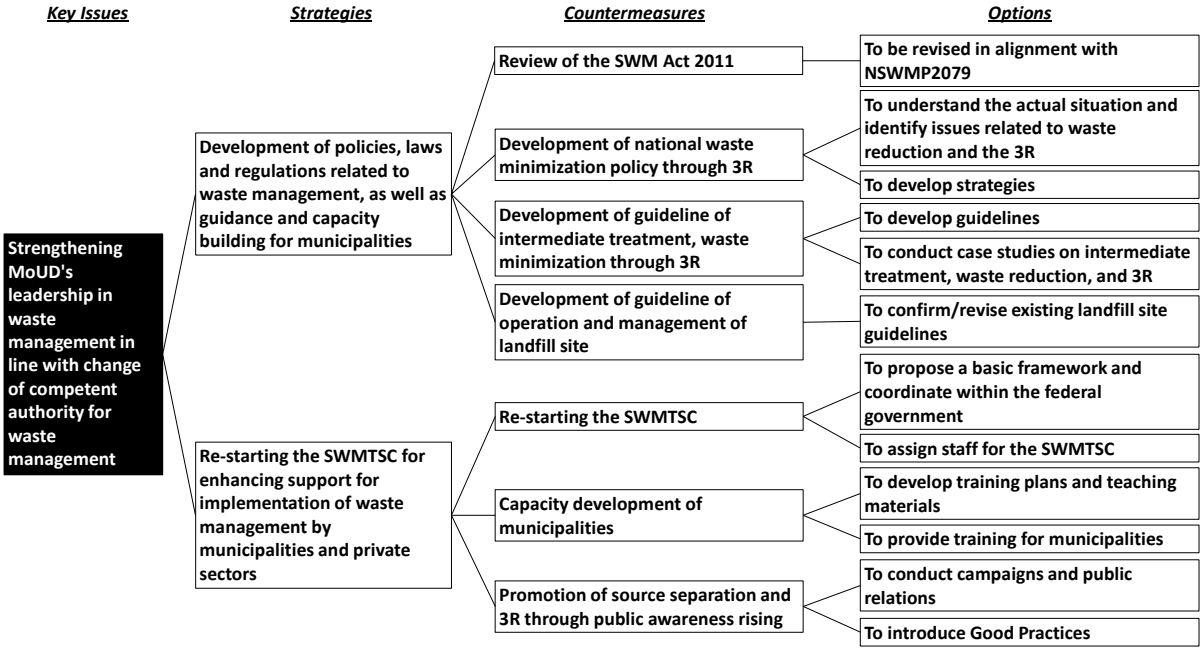
Based on the issues and needs analysis described in Section 9, the key issues for each Federal government, Kathmandu Valley (mainly KMC and LMC), and PMC are summarized in the figure below. The key issues and measures to address them for each entity are discussed in more detail below.



Relation between Key Issues for Each Implementing Entity and Common Issues in Each Field of Waste Management

(1) Key Issues and Countermeasures related to Federal Government

In Nepal, the competent authority for waste management was transferred from MoFAGA to MoUD in November 2023. As a result, MoUD will now be responsible for the development of policies, laws and regulations related to waste management, as well as guidance and capacity building for municipality. The key issue for the federal government is to strengthen MoUD's leadership in waste management for municipalities and other entities in line with this change in ministry jurisdiction. Strategies, countermeasures and specific options for the key issues are shown in Figure 10-2. For the key issues, MoUD will be required to develop laws and regulations and guidelines for municipalities and actively provide guidance to municipalities through the SWMTSC.

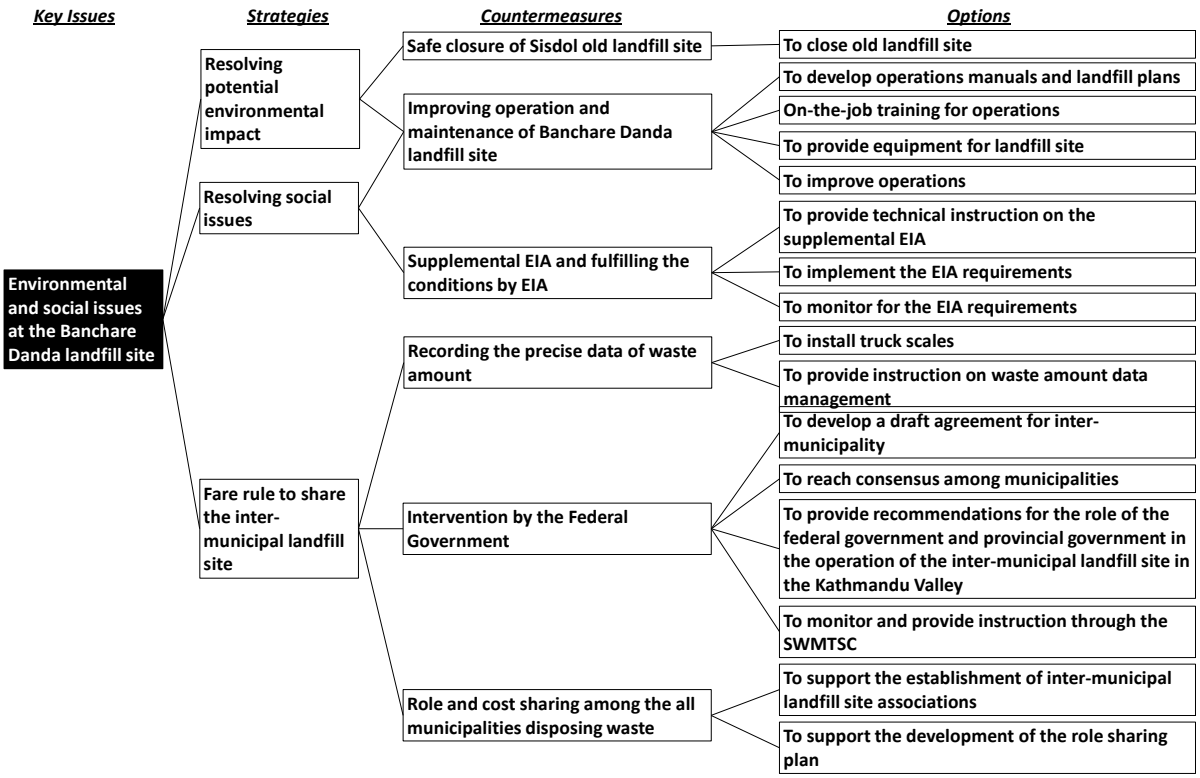


Strategies and Countermeasures for Key Issues of Federal Government

(2) Key Issues and Countermeasures related to Kathmandu Valley

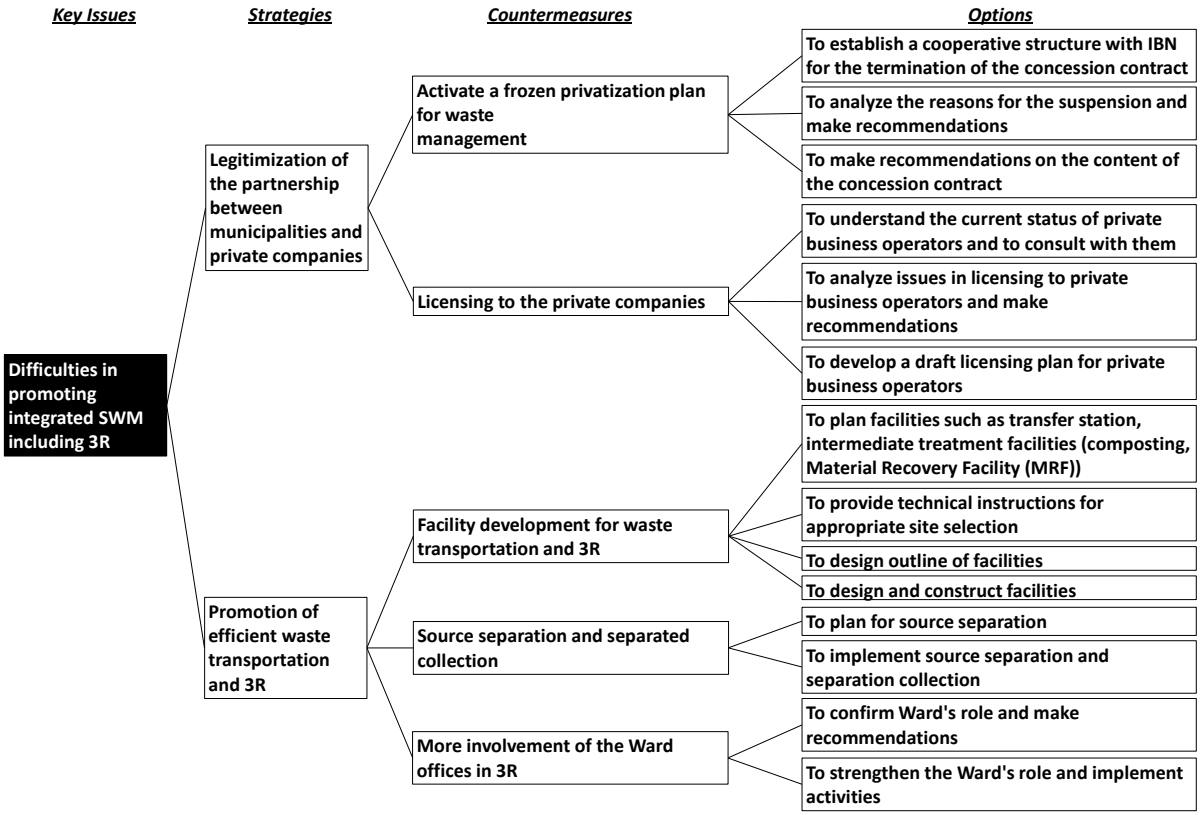
The Banchare Danda landfill site is the only official landfill site in the Kathmandu Valley. In order to ensure the sustainability of waste management in the Kathmandu Valley, it is essential to (1) solve the problems at the Banchare Danda landfill site and ensure its continuous use. In addition, in order to extend the life span of the landfill site as much as possible, it is also essential to (2) implement comprehensive waste management practices, including the reduction of final disposal amounts through the introduction of the 3R.

The strategies, countermeasures and specific options for these two key issues are shown in Figure 10-3 and Figure 10-4. Regarding the Banchare Danda landfill site, the potential negative environmental impacts of the Sisdol old landfill site and other sites must be reduced, and social problems, such as conflicts with local residents, must be resolved. The Banchare Danda landfill site is operated by KMC with its own funds, without collecting disposal fees from other municipalities. However, to ensure sustainable operation in the future, consideration should be given to the equitable sharing of responsibilities among the municipalities that contribute waste.



Strategies and Countermeasures for Key Issues of Kathmandu Valley (1)

Waste reduction, including the 3R, is essential to extend the life span of the Banchare Danda landfill site. However, collection and transportation companies operating in the Kathmandu Valley are considered the informal sector and do not have formal contracts with the KMC or LMC, and have not been able to establish a cooperative system. Therefore, it is necessary to establish a formal contract and cooperative system with private business operators, and cooperate with private operators to promote 3R and establish an efficient secondary transfer system.

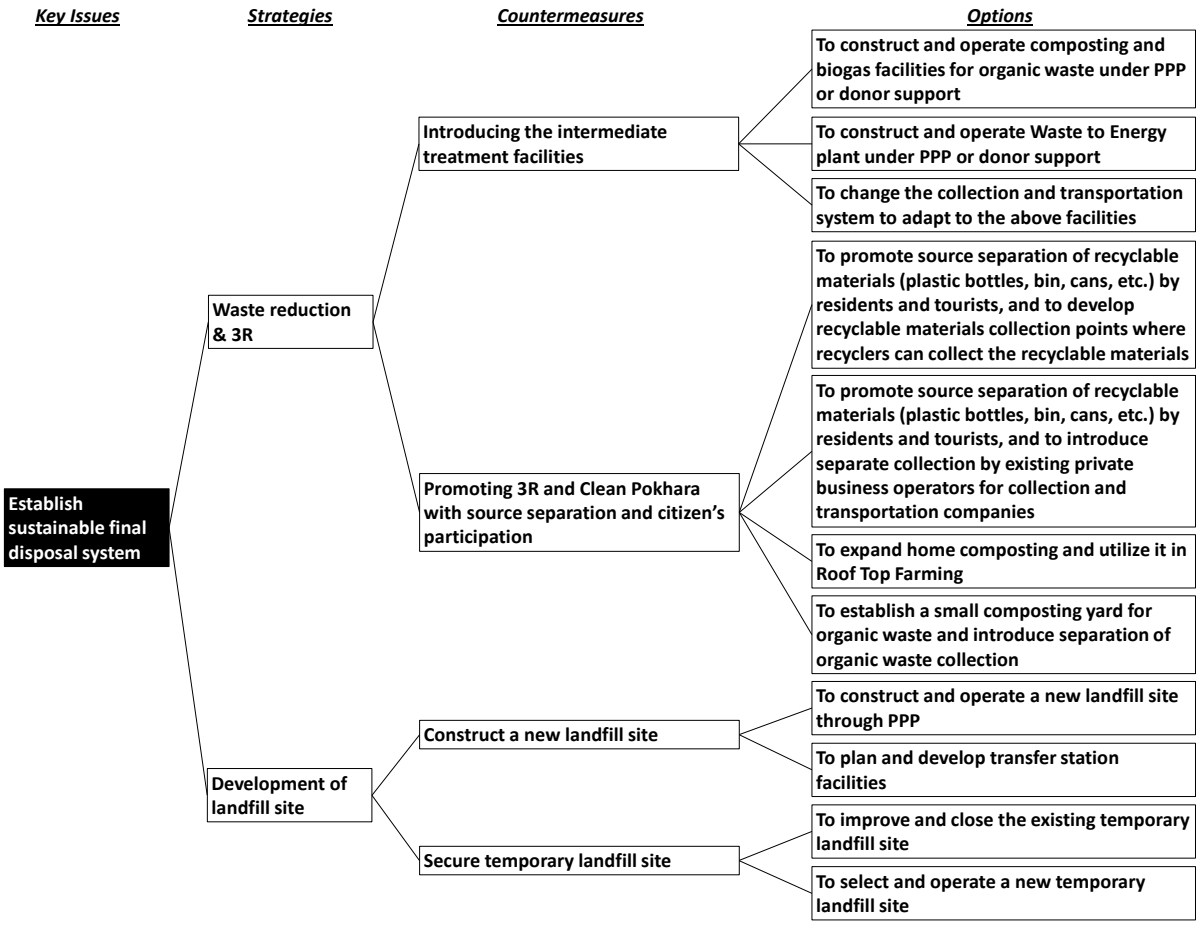


Strategies and Countermeasures for Key Issues of Kathmandu Valley (2)

In addition to the aforementioned issues, key issues include the development of a master plan for waste management and the systematic implementation of waste management projects based on established targets. Regarding BKM, the efficient transportation of waste to the Banchare Danda landfill site is a key issue.

(3) Key Issues and Countermeasures related to PMC

The biggest problem is that the PMC does not have an official landfill site and disposes of waste at a temporary landfill site. Therefore, the key issue for waste management in the PMC is to establish a sustainable final disposal system. Strategies, countermeasures and specific options to address the key issues are shown in Figure 10-5. In order to solve the issue, it is necessary to (1) reduce the final disposal amount of waste through waste reduction and the 3R, and (2) develop a landfill site as soon as possible. Other key issues to be addressed are: (1) to develop a master plan for waste management and systematically implement waste management projects based on the set targets, and (2) to strengthen the collection and transportation system by private business operators in order to improve the waste collection rate. However, it is crucial to note that strengthening collection and transportation should be implemented after the new landfill site is constructed, since increasing the waste collection rate will also increase the final disposal amount.

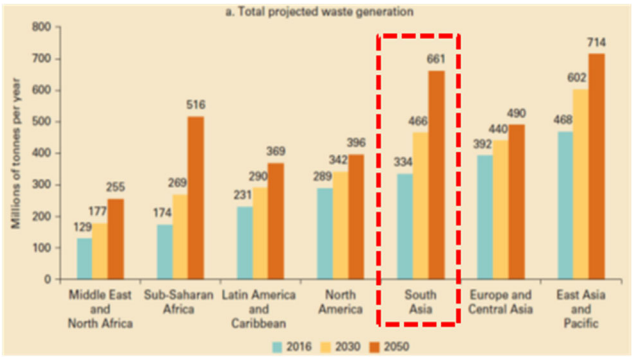


Strategies and Countermeasures for Key Issues of PMC

Chapter 1 Outline of the Survey

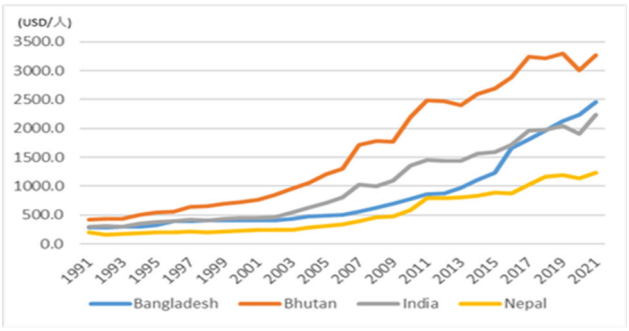
1.1 Purpose and Background of the Survey

The waste generation amount in the South Asia region is expected to nearly double from 334 million tons /year in 2016 to 661 million tons /year in 2050, as shown in Figure 1-1. This waste generation amount mirrors the trend observed in the East Asia region, marked by remarkable economic development. The population[2] of Nepal is projected to increase from 30.55 million in 2022 to 37.4 million in 2050, and other South Asian countries, including India, Bangladesh, Bhutan, Sri Lanka, are also experiencing similar growth trends. These demographic changes are the primary drivers behind the aforementioned increase in waste generation.



Source: What A Waste 2.0, the World Bank

Figure 1-1 Estimation of Future Global Waste Generation



Source: World Bank Data

Figure 1-2 GDP Per Capita in South Asian countries

On the other hand, the Gross Domestic Product (hereinafter referred to as "GDP") per capita in South Asian countries, shown in Figure 1-2, has been increasing rapidly since 2000, indicating active socioeconomic activities. Despite this growth, the value remains in the range of USD 1,000-3,000/person, placing these countries in the lower middle-income group according to the World Bank (hereinafter referred to as "WB")'s indicators. However, Nepal is still classified as a Least Developed Country by the United Nations Committee for Development Policy.

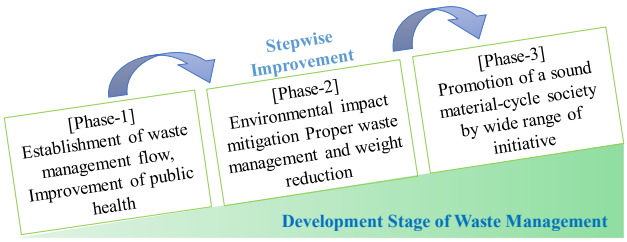


Figure 1-3 Development Stage of Waste Management

In accordance with the support framework outlined in Cluster Project Strategy "Improvement of Waste Management and Realization of a Sound Material-Cycle Society" under the "JICA (hereinafter referred to as "JICA") Clean City Initiative" (hereinafter referred to as "JCCI"), Nepal falls into the "1st stage" category where improvement of public health is required due to the above-mentioned economic situation and other factors (Prior to the survey, it was assumed to be the 1st stage, but as a result of understanding and analyzing the current situation through this survey, it was revealed that the issues in the 2nd stage are in focus). In recent years, JICA has initiated a cluster project strategy focused on "improving waste management and realizing a sound material-cycle society",

[2] Our World in Data

under the "Environmental Management JCCI". This JICA Study Team (hereinafter referred to as “JST”) has supported waste management in Dhaka, the capital municipality of Bangladesh, for about 20 years through the "Clean Dhaka Project" and has achieved results in increasing the waste collection rate, improving landfill sites, and promoting waste reduction awareness among local residents, step by step. In addition, the JST has implemented the strengthening of waste collection, transportation, and final disposal through the "Urban Strengthening Project" with a yen loan project. This survey (hereinafter referred to as “the Survey”) will identify the above-mentioned project as a hub for cluster strategies in the South Asia region and will consider initiatives that can be applied in Nepal. Furthermore, based on the identification of the current situation and issues in the target municipalities of the Survey, initiatives in other developing countries, as well as knowledge and technology from Japan, will also be considered for application in Nepal. As a result, the JST expects that the level of waste management in the South Asian region will be improved.

1.2 Implementation Policy of the Survey

The objectives and flow of the Survey are shown in Figure 1-4. The Survey will assess current situations, identify and analyze issues, and consider countermeasures to address these issues. The countermeasures will be categorized into the following three groups: objectives achievable through Nepal’s own efforts, those requiring donor support, and those with potential for private investment. The need for JICA's financial and technical assistance will also be evaluated.

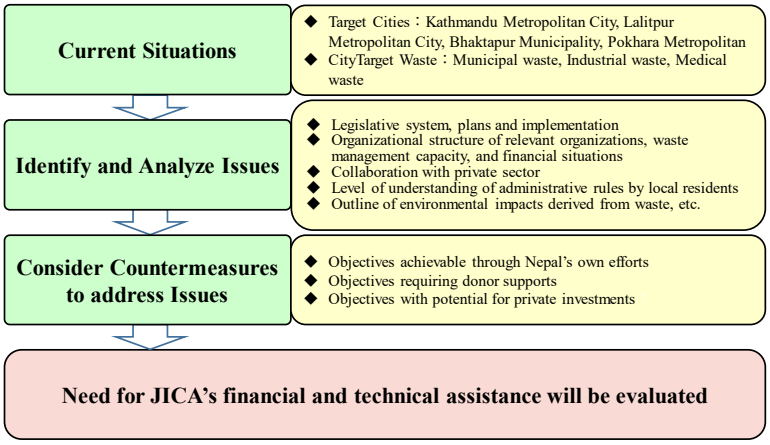


Figure 1-4 Objectives and Flow of the Survey

1.3 Target Sites

The target sites for the Survey include Kathmandu Metropolitan City (hereinafter referred to as “KMC”), Lalitpur Metropolitan City (hereinafter referred to as “LMC”), Bhaktapur Municipality (hereinafter referred to as “BKM”), and Pokhara Metropolitan City (hereinafter referred to as “PMC”).

KMC, LMC and BKM constitute the three major municipalities in the Katmandu Valley, the political and economic center of Nepal. These municipalities are included in the Survey, as the population growth and economic development in the region are likely to result in an increase in waste generation. Capacity development in waste management is therefore, an urgent issue.

PMC, Nepal’s second-largest city, stands as the foremost tourist destination in the country, attracting 1 million visitors every year. The tourism-driven economic development and associated population growth raise concerns

about water pollution in PMC. In response to this challenge, ongoing efforts to enhance the sewage management are underway through the implementation of the Project for the Development of a Master Plan (hereinafter referred to as "M/P") for Wastewater Management in Pokhara Metropolitan City, Nepal (hereinafter referred to as "Pokhara Wastewater Management M/P Project"). Supported by JICA, the Survey aims to explore opportunities for the integrated improvement of sewage management and waste management.

1.4 Relevant Organizations

The relevant organizations on the Nepal side involved in the Survey are listed in Table 1-1.

Table 1-1 Relevant Organizations on the Nepal Side

Federal government	・ Ministry of Urban Development (hereinafter referred to as "MoUD") ・ Ministry of Federal Affairs and General Administration (hereinafter referred to as "MoFAGA") ・ Ministry of Forest and Environment (hereinafter referred to as "MoFE") ・ Ministry of Industry, Commerce and Supplies (hereinafter referred to as "MoICS") ・ Ministry of Health and Population (hereinafter referred to as "MoHP") ・ Ministry of Finance (hereinafter referred to as "MoF")
Municipality	・ KMC ・ LMC ・ BKM ・ PMC

1.5 Implementation Structure

The implementation structure of the Survey is shown in Figure 1-5.

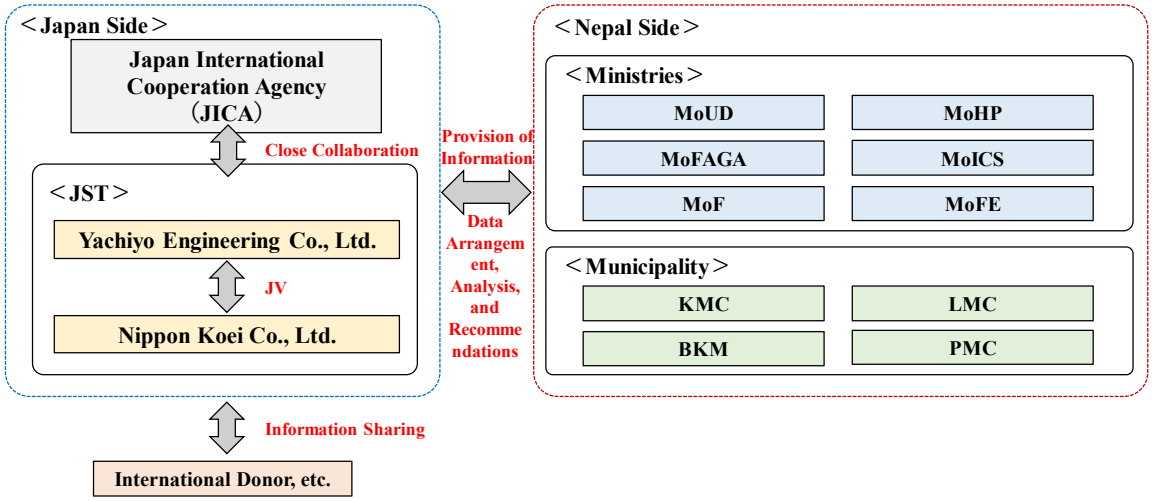


Figure 1-5 Implementation Structure

The members of the JST for the Survey are shown in Table 1-2.

Table 1-2 Member of the JST

Position	Name of Expert
Team Leader / Waste Management Policy, Plan and Situation Analysis	YAMAUCHI, Hisashi
Deputy Team Leader / Waste Management (Institutional System, Financial Analysis)	ARAI, Takatoshi
Waste Management System	KAMISHITA, Takahiro
Waste Management (Waste Collection / Transportation)	SANO, Yosuke
Waste Management (Separation / Resource Utilization / Intermediate Treatment / Final Disposal)	SAWANOBORI, Tomoari

1.6 Assignment Plan

The assignment plan and actual input of each expert are shown in Table 1-3.

Table 1-3 Assignment Plan

Name of Expert	Plan	Actual
YAMAUCHI, Hisashi	2.73 MM	2.73 MM
ARAI, Takatoshi	2.73 MM	2.73 MM
KAMISHITA, Takahiro	2.73 MM	2.73 MM
SANO, Yosuke	2.98 MM	2.98 MM
SAWANOBORI, Tomoari	2.98 MM	2.98 MM
Total	14.15 MM	14.15 MM

1.7 Work Schedule

The work schedule is shown in Table 1-4.

Table 1-4 Work Schedule

Items \ Period		2023		2024					
		11	12	1	2	3	4	5	6
【100】Domestic Preparation Survey / First Domestic Works									
【101】	Situation analysis based on existing and relevant data, understanding of background, estimation of issues								
【102】	Consideration of survey approach, survey contents, and specific survey methods								
【103】	Preparation of inception report								
【200】First Field Survey									
【201】	Explanation of the survey's purpose to the Nepal side								
【202】	Confirmation of waste management systems and related policies and plans								
【203】	Confirmation of existing systems, rules, and a series of processes for disposal								
【204】	Confirmation of medical waste and industrial waste								
【205】	Data collection for waste generation and composition								
【206】	Collaboration and engagement with local residents and the industrial sector								
【207】	Survey for the improvement and safe closure of existing landfill sites								
【208】	Confirmation of current status of license distribution for private business operators								
【209】	Verification of the informal sector								
【210】	Trends in recycling industry								
【211】	Data collection on other donor support								
【212】	Confirmation of public awareness efforts								
【213】	Possibility of cooperation with the Master Plan for wastewater management in PMC								
【300】Second Domestic Works									
【301】	Preparation of interim report								
【302】	Consideration of applicability of good practices in third country to Nepal								
【303】	Planning for second field study								
【400】Second Field Survey									
【401】	Holding workshop								
【402】	Confirmation and discussion of items to be implemented in the future								
【403】	Proposal of support schemes considering Japan's knowledge and DX								
【404】	Others								
【500】Third Domestic Works / Domestic Arrangement Period									
【501】	Preparation of draft final report								
【502】	Preparation of final report								

Legend: ■ Field survey period, □ Domestic work period、 △—△ Explanation of reports, etc.

Chapter 2 Management System for SWM and Situation of Industrial Waste and Medical Waste in Nepal

2.1 Legal Regulations

2.1.1 Legal Regulations for Municipal Waste Management

2.1.1.1 Major Laws and Regulations on General Waste Management

The laws and regulations related to municipal waste management in Nepal are outlined in Table 2-1.

The Environmental Protection Act 2077 (A.D. 2020) (hereinafter referred to as "EPA2077") and Environmental Protection Rules 2077 (A.D. 2020) (hereinafter referred to as "EPR2077"), which regulate the conservation and protection of the environment, were amended in 2020. The Government of Nepal, through these regulations, mandates environmental impact assessments (hereinafter referred to as "EIA") and pollution control. The list attached to EPR2077, indicating the type and size of projects requiring three levels of environmental studies (i.e. Brief Environmental Study (hereinafter referred to as "BES"), Initial Environmental Examination (hereinafter referred to as "IEE") and EIA), including those related to the solid waste sector, was updated in 2021.

The Solid Waste Management Act 2068 (A.D. 2011) (hereinafter referred to as "SWMA2068") was enacted in June 2011, with a primary focus on solid waste management. It outlines the responsibilities of municipalities, strengthens penalties for illegal waste dumping, and mandates the establishment of the Solid Waste Management Council (hereinafter referred to as "SWM Council") and the Solid Waste Management Technical Support Center (hereinafter referred to as "SWMTSC"). Based on this law, the Solid Waste Management Rules 2070 (A.D. 2013) (hereinafter referred to as "SWMR2070") were enacted in 2013, establishing a fundamental framework for solid waste management. This includes delineating municipal responsibilities and implementing a licensing system for private companies engaged in solid waste management activities.

Furthermore, the National Solid Waste Management Policy 2079 (A.D. 2022) (hereinafter referred to as "NSWMP2079") was formulated in 2022. This policy mandates the establishment of a National Solid Waste Management Coordination Committee (hereinafter referred to as "NWMCC") with MoFAGA as the coordinator and other relevant ministries as members. Recognizing that more than 10 years have passed since the enactment of law and regulations, excluding NSWMP2079, MoFAGA has proposed a new solid waste management bill, pending approval by the National Assembly. However, in November 2023, a decision was made to transfer the coordination role of NWMCC from MoFAGA to MoUD. As a result, upcoming laws and policies will be implemented under the MoUD. Other federal government agencies, such as MoF and MoFE, play roles in the technical, financial, and environmental aspects of solid waste management.

On the other hand, due to delays in implementing waste management measures, there are no recycling-specific laws focusing on resource circulation and the principle of Reuse, Reduce, Recycle (hereinafter referred to as "3R"), or laws and regulations regarding circular economy and the extended producer responsibility have been enacted.

Following the enactment of the new constitution in 2015, the SWM Council and the SWMTSC, established under the SWMA2068, were disbanded, and amendments to SWMA2068 were made to remove descriptions related to

the center. Since then, other federal-level organizations, such as the Investment Board (hereinafter referred to as "IBN") of Nepal and the Public-Private Partnership (hereinafter referred to as "PPP") Center established under the National Planning Commission, have been assisting municipalities in implementing PPP projects including ones of the SWM sector.

Table 2-1 Solid Waste Management Laws and Regulations of Nepal

Month/Year	Laws and Regulation
June 2011	Solid Waste Management Act 2068*[1]
July 2013	Solid Waste Management Rules 2070
June 2020	Environmental Protection Act 2077
June 2020	Environmental Protection Rules 2077 *[2]
May 2022	National Solid Waste Management Policy 2079

Source: JST
Note (*1): The SWMA2068 was edited in 2017, involving the deletion of SWMTSC
Note (*2): The attached documents (list of project types and size that require environmental study) of the EPR2077 were amended in 2021.

2.1.1.2 Environmental Protection Act 2077 (A.D. 2020), Environmental Protection Rules 2077 (A.D. 2020)

The EPA2077 outlines provisions for EIA and pollution control in connection with project developments.

Hazardous materials are defined according to the Basel Convention, with solid waste identified as one of the pollutants. The EPR2077, serving as the implementing regulation of the EPA2077, specifies the project sizes in the solid waste, industrial, and medical sectors that require a BES, IEE, and EIA, as shown in Table 2-2 and Table 2-3. Both the Environmental Protection Act and Rules require that applicable studies be conducted based on factors such as the annual waste disposal amount, target population, and the size of the waste management facility.

Table 2-2 Waste Management Projects and Industries Requiring a BES

Sector	BES
Forest Sector:	(omitted) (7) Constructing and operating landfill site for dumping solid waste within the forest area. (omitted) (12) Implementing any proposals within national parks, hunting reserve, wildlife reserve area.
Waste Management Sector:	(1) Operation up to 5 MLD capacity of sewerage management project. (2) Operation of sewerage management and solid waste management with the objective to provide service up to 50,000 base year population. (3) Management of bio-hazardous material from the 25 bedded health centers, hospital or nursing home.
Industries Sector	(1) Establishment and operation of workshop (including maintenance facility) with investment from 10 million to 50 million Rs. on machines and equipment. (2) Establishment of industrial village/industrial area, industrial park, special economic zone, inland special economic zone, dry port and commercial area with area up to 10 hectares in areas other than the forests. (3) Processing up to 25 tons of sand per day.

Source: EPR 2077 (Revised 2021)

Table 2-3 Solid Waste Management Projects and Industries Requiring IEE and EIA

Sector	IEE	EIA
Waste Management Sector:	(1) Following works to be done for waste generated from homes and settlements: a) Operation of sewer management project of more than 5 MLD capacity. b) Operation of sewer, sanitation, and solid waste management to cater to more than 50,000 base year population. c) Disposing 1,000 up to 5,000 tons solid waste annually in the landfills. d) Transfer station covering 5 up to 10-hectares and works related to resource recovery. e) Selection, segregating and re-using waste using chemical, mechanical or biological processes in the area covering 5 up to 10-hectares. f) To perform the works related to compost plant in the area covering 5 up to 10 hectares. (2) Management of bio-hazardous material from the health centers, hospital or nursing home having more than 25 and up to 100 beds.	(1) Following works to be done for waste generated from homes and settlements: a) Disposing more than 5,000 tons solid waste per year in the landfills. b) Transfer station covering more than 10-hectares and works related to resource recovery. c) Selection, segregating and re-using waste using chemical, mechanical or biological processes in the area covering more than 10-hectares. d) To perform the works related to compost plant in the area covering more than 10 hectares. e) Burying of solid waste generated from urban area with population of minimum 10 thousand people. (2) To do the following construction related work related to hazardous waste of the following nature and of any level a) Constructing solid waste management mechanism. b) Constructing solid waste recovery plant. c) Constructing of solid waste filling, piling, or burying place. d) Constructing solid waste storing place. e) Construction solid waste treatment facility. (3) To do the following works related to hazardous waste: a) Disposing and managing any radioactive materials having half-life of more than 25 years. b) Disposing and managing any radioactive material with more than 50 lethal doses. c) Final disposal and management of bio-hazardous waste generated from health centers, hospitals or nursing homes having more than 100 beds. d) Utilizing more than 1 hectare of land for destroying or reusing any hazardous materials and any energy generation works.
Industrial Sector	(1) Establishing and operating the storage yard for construction related industry with investment exceeding 50 million Rs. on machines and equipment. Etc. 80 industrial types in total	(1) Establishment of industrial village/industrial area, industrial park, special economic zone, inland special economic zone, dry port, and commercial area with more than 200 hectares in areas other than the forest Etc. 31 industrial types in total

Source: EPR 2077 (Revised 2021)

2.1.1.3 Solid Waste Management Act 2068 (A.D.2011)

The SWMA2068 explicitly designates municipalities with the responsibility for waste management, including the establishment and management of landfills. The Act also permits municipalities to engage in PPP. The SWM Resource Mobilization Center, originally established under the Solid Waste Resource Mobilization Act 1987 with the support of GTZ before the SWMA2068, has been renamed as SWMTSC.

Industrial waste, acknowledged as hazardous and polluting materials resulting from business activities, falls under

the generator`s responsibility for proper disposal, including hazardous waste such as medical waste.

In 2017, following the enactment of the new Constitution, the Waste Management Law was revised, leading to a change in the Ministry overseeing waste management administration (from MoLD to MoFAGA). This change reflects shifts in ministries since 2011, and descriptions related to the SWMTSC were subsequently removed.

A summary of the SWMA2068 is presented in Table 2-4.

Table 2-4 Overview of the SWMA2068

Chapter	Main Information	Notices
1. Preface	− Law enforcement − Definition	Industrial waste refers to hazardous or contaminated waste discharged from industry.
2. Waste Discharge, Collection, Reduction, and Final Disposal	− Municipality responsibilities regarding waste management − Waste management responsibilities − Responsibility for reducing waste by reducing waste generation − Waste separation − Proper waste disposal − Designation of waste collection point − Proper transportation − Promotion of 3R	Municipal waste is the responsibility of municipalities, while medical waste, industrial waste, and chemical waste are the responsibility of waste generators.
3. Transfer Station, Landfill	− Selection of transfer station − Sanitary landfill	The Ministry of Local Development (MOLD) was in charge of securing a landfill (acquiring land) when it is difficult for a municipality to do so, and coordinating when a landfill is shared by two or more municipalities. It says that support can be requested for (at that time). It also says that appropriate closure is necessary.
4. Private Sector and Community Participation	− Issuance of license − Waste management by the private sector − Introduction of competition principle − Permission for the private sector to establish and operate sanitary landfill − Waste management through PPP	If a company does not obtain a license, it states that it is not allowed to carry out waste management operations.
5. Waste Management Service Fee	− Collection of waste management service fees − Suspension/cancellation of service	If the waste management service fee is not paid, the waste management service can be suspended or canceled.
6. Control and Monitoring of Pollution from Waste Management Activities	− Pollution control − Waste management monitoring − Social and economic development of areas affected by sanitary landfills	Development of affected areas is the responsibility of municipalities. Additionally, the affected areas will be announced in the official gazette.
7. Establishment of Waste Management Council	− Establishment of SWM Council − Committee functions, duties and rights − committee meetings, decisions	The chairperson is the Minister of Regional Development.
8. Establishment of SWMTSC***1**	− Establishment of SWMTSC − SWMTSC functions, duties and rights − Establishment of a Board of Directors − Board of Directors meetings, decisions − Employment of SWMTSC staff − SWMTSC budget − Annual report	Depending on the work, the necessary staff will be hired to carry out the work.

Chapter	Main Information	Notices
9. Misconduct and Punishment	− Cheating − Punishment	Illegal activities include carrying out waste management activities without a license, dumping waste in public places other than designated areas, and obstructing waste management activities.
10. Others	− Medical waste management − Chemical pesticide management − Community sector records − Award system	

Source: Prepared by JST based on the Waste Management Act 2068

Note: *[1]The description regarding SWMTSC was deleted due to the 2017 revision.

2.1.1.4 Waste Management Rule 2070 (A.D. 2013)

The SWMA2068 has been reinforced in practice through the introduction of SWMR2070, which details the implementation of each provision. The responsibilities of municipalities are detailed in accordance with the law, and operational aspects, including requirements for waste transportation, are laid out in the rules.

A summary of the SWMR2070 is presented in Table 2-5.

Table 2-5 Summary of SWMR2070

Item	Main Information
1. Abbreviation and Start	−
2. Definition	−
3. Waste Separation and Management	• Responsibility for organic and inorganic separation by municipalities • Responsibility of municipalities to separate hazardous and chemical waste • Responsibility for implementing awareness-raising activities by municipalities
4. Waste Management	• Responsibility for specifying time, place, and method for municipal waste discharge • Responsible for determining waste sorting time and transportation method for municipalities
5. Discharge and Management of Hazardous and Chemical Waste	• Prohibition of mixed discharge of hazardous, chemical, organic and inorganic wastes • Responsibility for obtaining licenses from municipalities for the treatment of hazardous, chemical, organic, and inorganic wastes
6. Discharge and Management of Medical Waste	• Responsibility of medical facilities for the treatment and management of medical waste • Responsibility for obtaining licenses from municipalities regarding purification, treatment, and management of medical waste • Possibility of requesting municipalities to handle medical waste if medical facilities do not have the capacity to manage it
7. Transporting Waste	• Requirements for waste transportation vehicles by municipalities
8. Operation of Sanitary Disposal Site	• Responsibility for measures to prevent the generation of leachate, gas, and odor • Measures to reduce impact on surrounding residents • Responsibility of municipalities for establishing sanitary landfill site management rules
9. Management of Closed Landfill Sites	• Responsibility for measures to prevent the generation of leachate, gas, and odor • Reuse of old landfill site • Compliance with other regulations regarding the operation of sanitary landfill sites after closure by municipalities
10. License Application	• Items to be included in license application to municipalities
11. Issuance of License	• Responsibility for examining license applications by municipalities • Responsibility to explain screening results and reasons in case of disqualification • License period (5 years)
12. Revocation of License	• If the conditions indicated in the license are not met, etc.

Item	Main Information
13. License Renewal	• Renewal applications must be submitted at least 6 months before the license expiration date. • The examination results will be notified by the municipalities at least 3 months before the license expiration date.
14. NGOs Mobilization	• Utilizing communities and Non-Governmental Organization (hereinafter referred to as "NGO")s to promote the 3R
15. Compliance	• Following the rules established by the municipalities when operating the sanitary landfill sites. • License cancellations in case of non-compliance with regulations
16. Determining Service Fees	• Factors to consider in setting service fees
17. Service Fee Reduction	• Consideration of the economic situation of the dischargers
18. Establishment of a Committee in Areas Affected by Sanitary Landfill Sites	• Committee members that are established by municipalities
19. Council Responsibilities and Powers	• Policies decision • Formation of interagency collaboration mechanisms for waste management
20. Center's Responsibilities	• (Additional responsibilities to the description of the SWMA2068)
21. Board Features and Privileges	• (Additional functions/authorities to the description of the SWMA2068)
22. Executive Director Compensation, Facilities, and Term of Office	• Shown as an attachment
23. Internal Audit	• Conducting internal audits and storing income and expenditure statements by the center
24. Instructions	• Power of the federal government to issue instructions to municipalities • Authority of municipalities to issue instructions to individuals, groups, and organizations
25. Monitoring Clause	• Formation of a monitoring committee at the federal government level • Follow-up responsibilities by municipalities
26. Corrections/Changes	• Amendments and changes will be made in the official gazette.
27. Abolition	• Abolition of Waste Resource Mobilization Law

Source: Prepared by JST based on SWMR2070

2.1.1.5 National Solid Waste Management Policy 2079 (A.D. 2022)

The Government of Nepal formulated the National Policy on Solid Waste Management 2050 (A.D. 1996), predating the NSWMP2079. The main pillars of the policy aimed at 1) promoting mobilization and involvement of municipalities and the private sector, 2) ensuring effective resource utilization through recycling, 3) implementing fees for waste management services, 4) imposing fines for non-compliance with regulations, and 5) conducting public education on solid waste. To ensure the effectiveness of these measures, the SWM Council, a national-level organization chaired by the Ministry of Rural Development (at that time, MoLD), was established. However, the activities of the SWM Council were sluggish, reflecting the underdeveloped state of the private sector, including the recycling industry, during that period.

The NSWMP2079 outlines the establishment of a NWMCC with MoFAGA as the coordinator and other relevant ministries as members. Municipalities play a pivotal role in managing municipal waste, including infrastructure development. The federal government is tasked with formulating policies, laws, standards, research technology development, and coordinating assistance from foreign countries. Meanwhile, provincial governments have the responsibility for inter-municipality coordination on infrastructure construction. In November 2023, the roles of

solid waste management administration in the federal government including a role as NWMCC coordinator, was transferred from MoFAGA to MoUD.

“Article 9: Strategies" lists eight strategies, and Article 10 provides the direction of each strategy. However, the specific measures are to be decided by the municipalities, underscoring the expectation for leadership and facilitation from the federal and provincial governments.

Table 2-6 Strategies Presented in NSWMP2079

Strategy (Article 9)	Directional Excerpts for Each Strategy (Article 10)
9.1 Preparing a legal basis for the management of waste by classifying it according to its nature	• The local level will be made responsible for household waste management and the related producers or organizations for the management of hazardous, chemical, industrial and health institutional waste. • While formulating the law on waste management, waste classification, reduction, reuse and processing will be encouraged.
9.2 Formulating and implementing separate criteria for classifying waste according to its nature	• Adherence and coordination of standards will be made effective by arranging appropriate institutional structures related to waste management at the federal, provincial and local levels. • Necessary support and facilitation will be provided to the provincial and local levels for the implementation of standards related to waste management.
9.3 Minimizing waste at source and making use of landfill sites sustainable	• Recycling, processing and composting of household waste will be encouraged. • Hazardous, chemical, industrial and health institutional waste will be processed and the remaining waste will be disposed of safely in coordination with the local level. • Service charges will be arranged according to the nature and quantity of waste and the "Waste generators pays" principle will be adopted.
9.4 Enhancing citizen responsibility in waste management	• Participation and cooperation of households, communities, village development organizations and other stakeholders in waste management will be encouraged. • Public awareness raising will be broadened and institutionalized by including topics related to waste management in the curriculum of school education and non-formal education
9.5 Clarifying the responsibilities and roles of union, state and local levels in waste management	• The role of the Nepal government in waste management will be focused on policy, law and standard formulation, study research and technology development, foreign aid mobilization. • The role of the provincial government will be established for co-ordination and coordination between local levels in the construction of infrastructure related to waste management. • The local level will be made responsible for the construction and operation of the infrastructure and structures required for the collection, disposal and processing of waste.
9.6 Enhancing partnership, partnership, collaboration and participation in waste management	• In the construction of large infrastructures and structures related to waste, cooperation between federations, provinces and local levels and partnership and cooperation with national and international NGOs will be encouraged. • The private sector will be mobilized according to the concept of PPP in waste management.
9.7 Studying, researching and preparing a strong statistical base related to waste management	• Studying and researching on the development of the latest technology related to waste management will be encouraged. • The development of the information system related to waste management and a strong statistical base will be prepared.
9.8 Enhancing the capacity of agencies and stakeholders involved in waste management	• Sharing of domestic and foreign experience and learning related to waste management will be regularized.

Strategy (Article 9)	Directional Excerpts for Each Strategy (Article 10)
	• Training, study and observation visits related to waste management will be conducted regularly.

Source: Prepared by JST based on NSWMP2079

2.1.2 Legal Regulations for Industrial Waste Management

As highlighted in 2.1.1.3, the SWMA2068 classifies industrial waste as a type of solid waste, representing hazardous and polluting materials generated from industrial activities. The responsibility for disposal lies with the waste generator. It should be noted that industrial and healthcare waste generators are permitted to bring their waste to municipal waste treatment and disposal facilities after proper treatment, with the requirement to pay an agreed-upon fee to the municipality. This provision is stated in the ordinances of the four municipalities targeted in the Survey.

The SWMA2068 defines industrial wastes as hazardous and polluting materials generated from industrial activities. In contrast, the EPA2077 does not mention industrial wastes as hazardous and polluting materials. It refers to the list of the Basel convention. The LMC ordinance (see 4.9.1), lists medical waste and industrial waste as hazardous wastes, and further specifies materials under each category using common nouns rather than material names.

At the same time, the Industrial Enterprise Act was enacted to promote industrial development in Nepal, with the latest revision made in 2020. The Act, while lacking provisions applicable to waste management and disposal, includes Article 24, which allows for the deduction of expenses for systems and equipment for pollution prevention, control to minimize environmental impact through recycling, and waste reuse. This deduction is permitted up to 50% of the adjusted taxable income of the same year. There is also a preferential provision for deductibility of capital expenditures for the recycling and reuse of waste materials, particularly for expenses exceeding the maximum adjusted taxable income of the relevant industry in the following income year.

2.1.3 Laws and Regulations of Medical Waste

2.1.3.1 Laws and Regulations on Medical Waste Management

The SWMA2068 specifies that the generator is responsible for the management of medical and industrial wastes. Meanwhile, the MoHP has established relevant laws and regulations for medical wastes, as outlined in Table 2-7.

Table 2-7 Laws and Regulations on Medical Waste

Laws and Regulations	Year of Issue
Health Care Waste Management Guideline 2071	2014
Public Health Service Act 2075	2018
National Health Care Waste Management Standards and Operating Procedure 2077	2020

Source: Prepared by JST based on the laws/regulations by MoHP

A summary of the major laws and regulations is provided below.

2.1.3.2 Health Care Waste Management Guideline 2071 (A.D. 2014)

The guidelines offer comprehensive information on waste separation, storage, collection, treatment and disposal requirements. They classify waste according to national laws, international conventions, other regulations on medical waste management, and United Nations Environment Programme (UNEP)/ Secretariat of the Basel Convention (SBC)/ World Health Organization (hereinafter referred to as "WHO") technical guidelines (2004[3]). The guidelines only covered solid wastes; wastewater and waste gases are not included.

In addition, for each of the eight types of healthcare facilities (seven types for hospitals, health care centers, health posts, etc., and pharmacies), the guidelines include management methods for the following categories of medical wastes: Non-Risk Healthcare waste, Healthcare waste requiring special attention (Infectious and highly infectious waste), Radioactive waste (Infectious and highly infectious waste), Radio waste (Infectious and highly infectious waste), Radioactive waste, and Other hazardous waste.

2.1.3.3 Public Health Service Act 2075 (A.D. 2018)

According to the Act, the federal government is mandated to establish standards aimed at preventing environmental pollution and health hazards from waste, aligning with existing laws. It also specifies the establishment of standards for the collection, reuse, treatment, and disposal of medical waste. The Act underscores the responsibility of medical facilities for the management of medical waste.

2.1.3.4 National Health Care Waste Management Standards and Operating Procedure 2077 (A.D. 2020)

The National Health Care Waste Management Standards and Operating Procedure 2077 (A.D. 2020) (hereinafter referred to as "SOP2077") was developed to enhance the practice of proper waste management in healthcare facilities. Implementing proper waste management practices is crucial for reducing exposure of healthcare workers, patients, and visitors to hazardous healthcare waste, as well as protecting the environment through waste reduction and proper disposal.

In addition to outlining national standard procedures, SOP2077 includes a comprehensive compilation of definitions of medical waste and related laws and regulations, including international treaties.

The document is accompanied by a medical waste generation record sheet (daily, weekly, and monthly), a checklist of waste management practices, and "National Standard Procedures (the document's title itself)," which is useful for application in medical facilities.

[3] The Technical Guidelines on Environmentally Sound Management of Biomedical and Health care waste provided by the Conference of the Parties to the Basel Convention on the Control of Trans-boundary Movements of Hazardous Waste and their Disposal. (UNEP/SBC/WHO, 2004)

2.2 Policies and Plans

2.2.1 The 15th Five-Year Plan

In Nepal, where political stabilization has been achieved with the promulgation of the new constitution, the 15th Five-Year Plan (2019/20-2023/24), shown in Table 2-8, is currently being planned and implemented. Of particular note in relation to waste management is the construction of the Banchare Danda landfill site, which was realized with a project budget of 650 million Rs. in 2018/21.

Table 2-8 15th Five-Year Plan (2019/20-2023/24)

Item	Outline of Plan
Road Map	Short-term Goal: Graduation of Least Developing Countries by 2022 Mid-term Goal: Graduation of Developing Country by 2030 Long-term Goal: Graduation of Middle Developed Countries by 2045
Scenarios for Achieving Long-Term Goals	・Economic growth rate averaged 10.5% per year. ・Economic growth rate by industry: primary industry: 5.5%, secondary industry: 13%, tertiary industry: 10.9%. ・The share of primary, secondary, and tertiary industries in GDP in 2045 will be 9%, 30%, and 61%, respectively.
National Development Strategy	・Achieve rapid and sustainable job-oriented economic growth ・Ensuring affordable, quality health care and education ・Improvement of interconnectivity between domestic and international transportation infrastructure and development of sustainable municipalities and settlements ・Improvement of production and productivity ・Provide comprehensive, sustainable, and productive social security and social protection ・Building a just society characterized by poverty reduction and socioeconomic equality ・Conserving and utilizing natural resources and improving their resilience ・Strengthening public services, promoting balanced local development and national cohesion
Sectoral Development Goals	Macroeconomic Sector / Economic Sector / Social Sector / Infrastructure Development Sector / Democracy and Good Governance Sector / Transversal Sectors
Related Waste Management Issues	Although there is no systematic description, in the sectoral development plans, we can see descriptions of waste treatment from the tourism industry (economic sector), appropriate treatment of medical waste (social sector), alternative fuel production using organic waste, development of waste treatment facilities in municipalities (infrastructure development sector), development of standards to prevent pollution by industrial waste, etc., and development of intermediate treatment facilities through PPP (cross-sectoral sector). The development of intermediate treatment facilities through PPP (Transversal Sector), etc. can be confirmed.

Source: The Fifteenth Plan (Fiscal Year 2019/20 – 2023/24)

2.2.2 The 16th Five-Year Plan

The concept paper for the 16th Five-Year Plan, currently in the formulation stage, assesses the implementation of the 15th Five-Year Plan and identifies severable issues, including the declining contribution of the secondary industry to GDP, the widening trade deficit, and the necessity to improve domestic creation and productivity. Additionally, the economic slowdown caused by the spread of new coronavirus infection is acknowledged.

2.3 Relevant Organizations

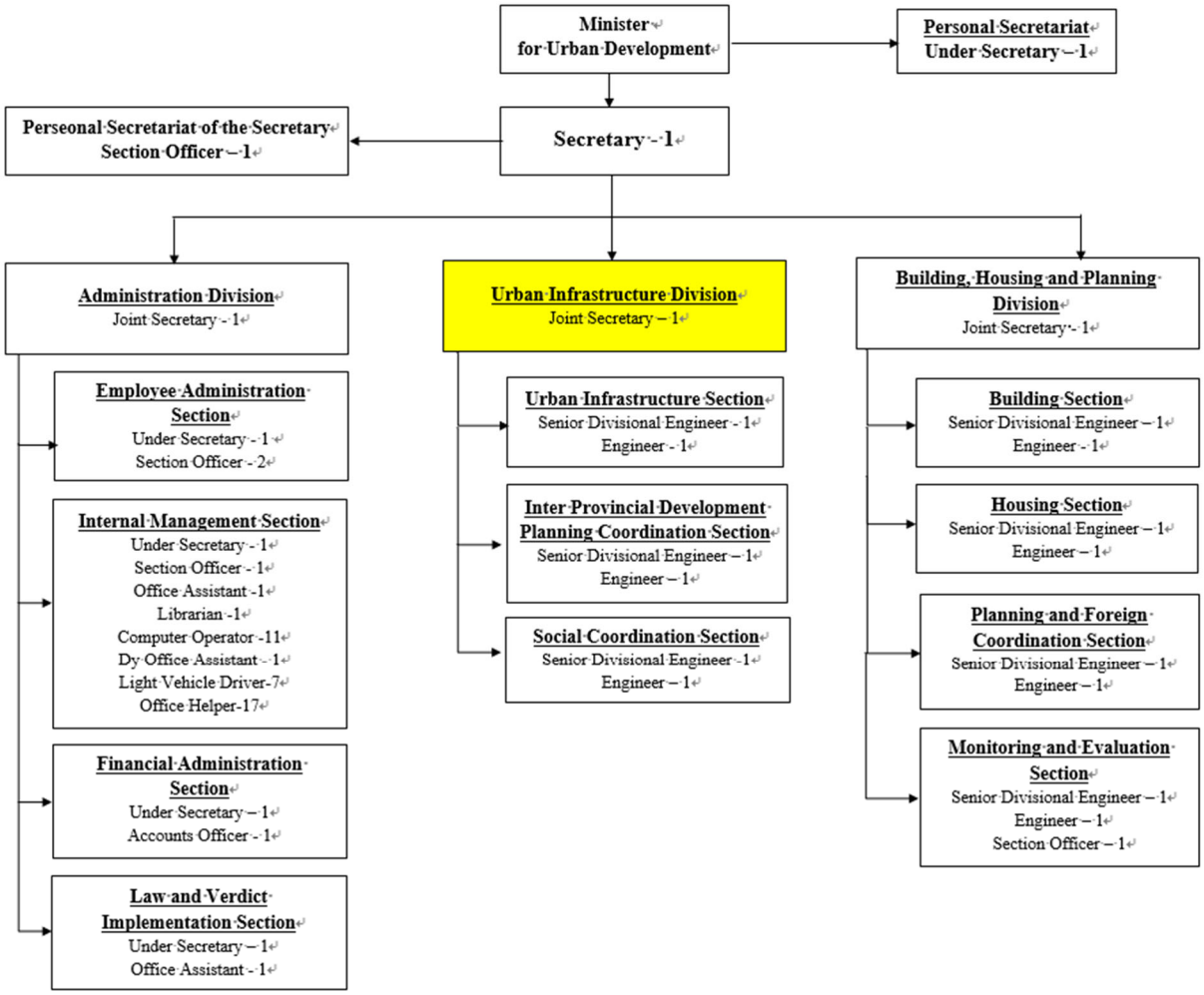
2.3.1 Ministry of Urban Development

The MoUD is the federal government agency responsible for urban infrastructure development, including urban

and housing development, among other areas. As outlined in the Nepal Gazette on the 23rd of November 2023, the responsibility for waste management at the national level, previously under the jurisdiction of the MoFAGA, was transferred to the MoUD. Specifically, the task of "coordination and promotion of solid waste management policies and legislation" was shifted from the MoFAGA to the MoUD. The definition of solid waste management is stipulated in Solid Waste Management Act 2068 (A.D.2011).

The organizational structure of the MoUD is depicted in Figure 2-1. The department overseeing waste management is the Urban Infrastructure Division. The Department of Urban Development and Building Construction (hereinafter referred to as "DUDBC"), an agency under MoUD, played a role in the construction of the Banchare Danda landfill in the Kathmandu Valley, as described below.

The MoUD is set to review the NSWMP2079 and the SWMA2068, and will initiate work on a national-level waste management policy, guidelines, and the SWMTSC, which has been suspended since the 2015 constitutional amendment. As of February 2024, The SWMTSC is currently under discussion at the level of the Secretary of the Ministry, and while its functions will be retained, its name may be subject to change. In addition, MoUD will consider the possibility of establishing a new unit to secure personnel for the SWMTSC if necessary. MoUD hold the responsibility to provide technical guidance and capacity development to municipalities. The municipalities targeted for capacity development are categorized into three types: (1) individual municipalities, (2) a group of municipalities considering cluster formation, and (3) a group of municipalities in the entire Kathmandu Valley.



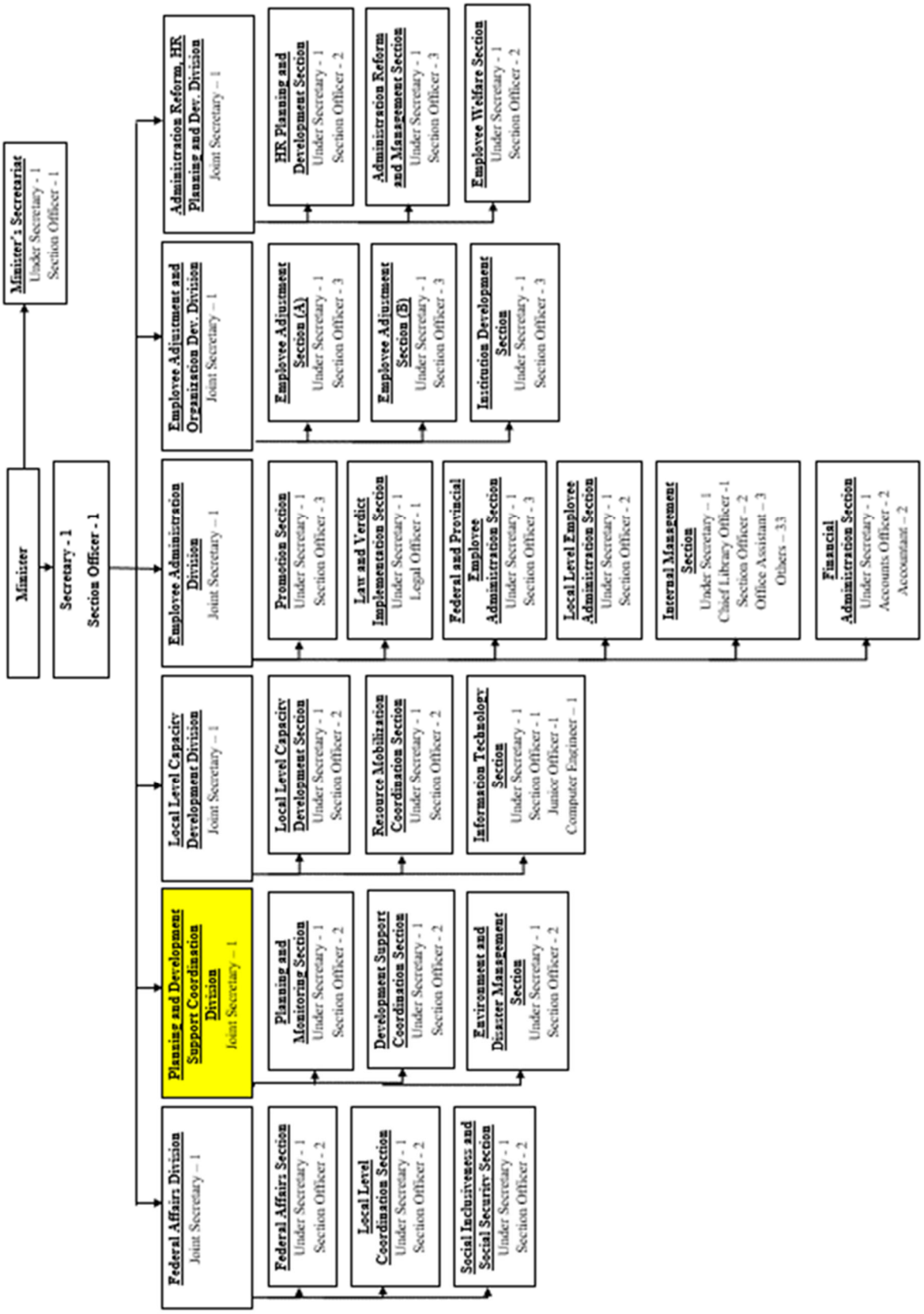
Note: Numbers in the figure indicate the number of people.
Source: Prepared by JST based on the MoUD website.

Figure 2-1 MoUD Organization Structure

2.3.2 Ministry of Federal Affairs and General Administration

The MoFAGA is responsible for overseeing local administration carried out by municipalities. As mentioned in 2.3.1, the MoFAGA previously held responsibility for waste management at the national level from the standpoint of supervising municipalities. However, this responsibility was transferred to the MoUD as per the Nepal Gazette on the 23rd of November, 2023. The organizational structure of the MoFAGA is illustrated in Figure 2-2.

The MoFAGA is considered to bear some responsibility for waste management in terms of municipal management. Still, it has taken the stance that waste management is primarily the responsibility of municipalities. There is no indication that the MoFAGA is actively engaged in municipal waste management. In the NSWMP2079, the MoFAGA was designated as the coordinator of NWMCC, but this committee has not been established yet. It is highly likely that the establishment of the NWMCC and its role as secretariat will be transferred to the MoUD in the future.

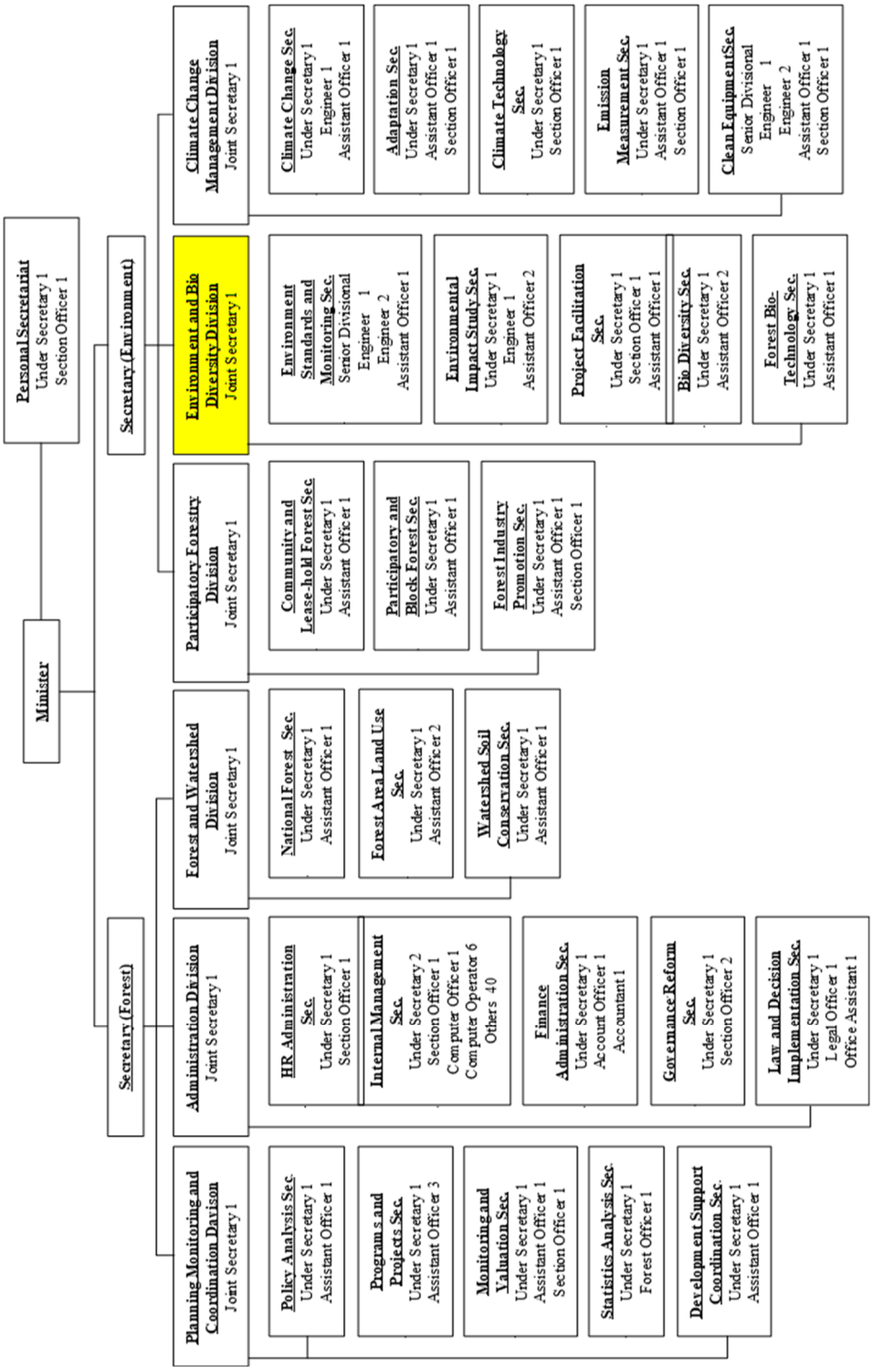


Source: Prepared by JST based on the MoFAGA website.

Figure 2-2 MoFAGA Organization Structure

2.3.3 Ministry of Forest and Environment

The organizational structure of the MoFE is shown in Figure 2-3. The MoFE is responsible for setting EIAs and effluent standards for various facilities, including waste management facilities. However, it does not hold specific executive responsibilities for waste management.

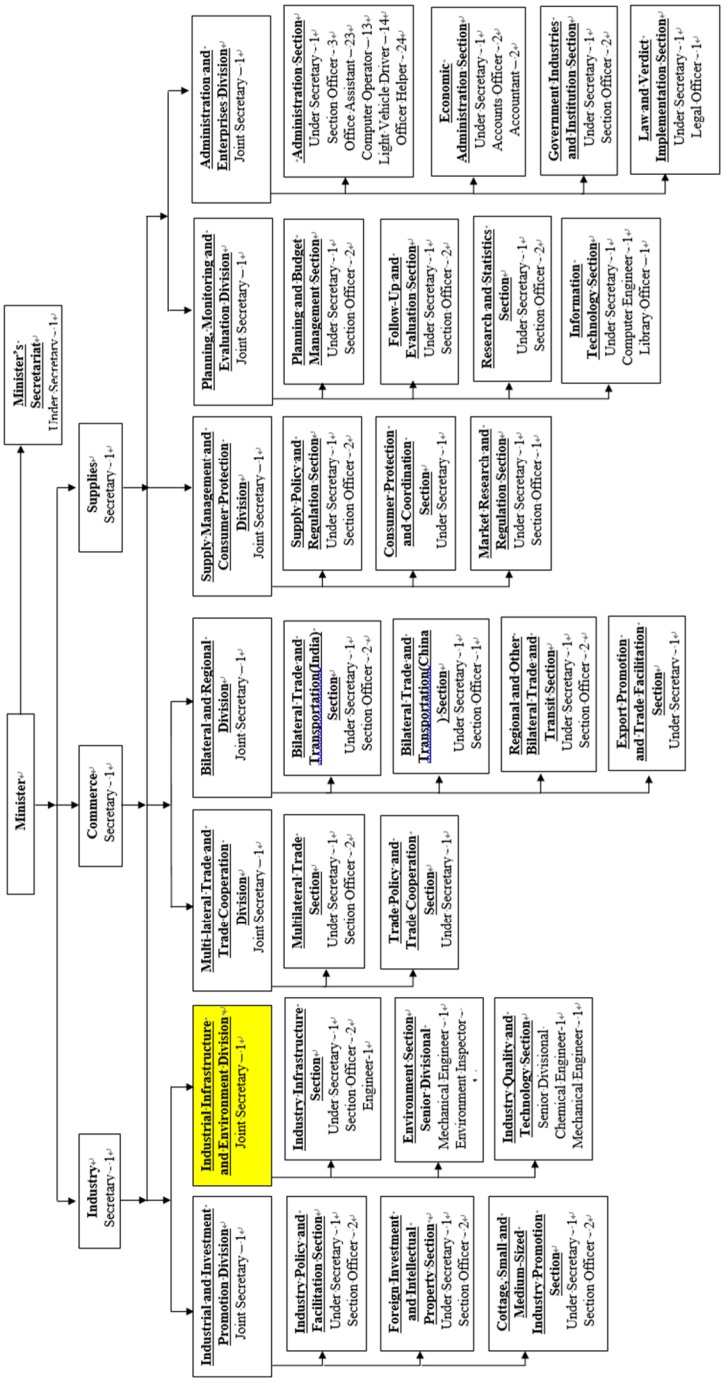


Source: Prepared by JST based on the MoFE website.

Figure 2-3 MoFE Organization Structure

2.3.4 Ministry of Industry, Commerce and Supplies

The MoICS is responsible for promoting industry, commerce, and related sectors. The organizational structure of MoICS is shown in Figure 2-4. The Industrial Infrastructure and Environment Division of MoICS oversees industrial waste at the national level as part of manufacturing management. However, the MoICS does not directly handle the collection, treatment, disposal of industrial waste as well as monitoring; instead, the responsibility for industrial waste management lies with the factories generating the waste.

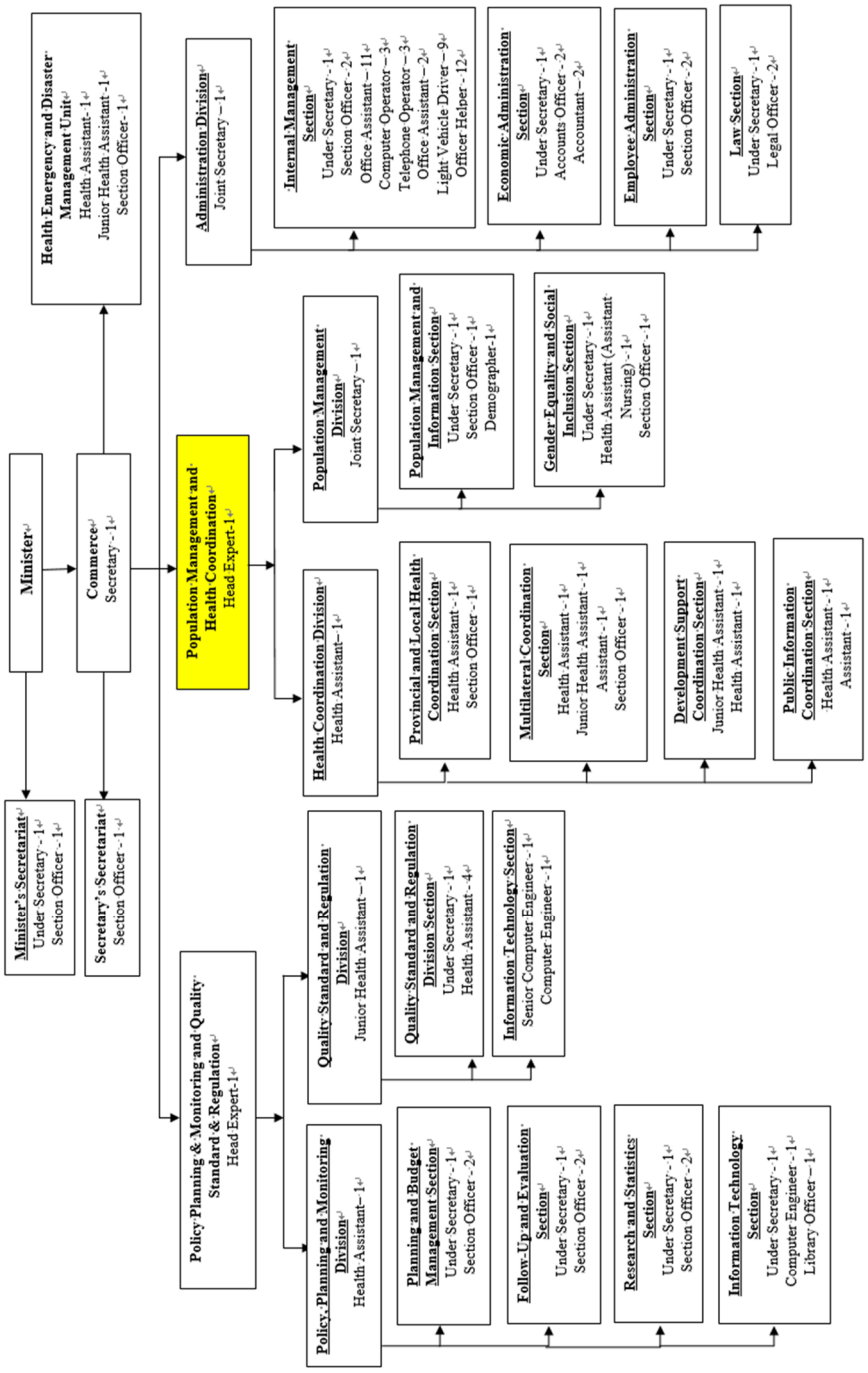


Source: Prepared by JST based on the MoICS website.

Figure 2-4 MoICS Organization Structure

2.3.5 Ministry of Health and Population

The MoHP is responsible for health and medical administration and is tasked with overseeing medical waste at the national level. Medical waste is managed from the perspective of infection prevention in hospitals and falls under the purview of the Population Management and Health Coordination Department. The MoHP considers medical waste management to be the responsibility of the medical institution that generates the waste. While the MoHP itself does not directly collect, treat, or dispose of medical waste, it plays a supervisory role in ensuring proper management practices.



Source: Prepared by JST based on the MoHP website.

Figure 2-5 MoHP Organization Structure

2.4 Current Status of Industrial Waste Management

2.4.1 Overview of Industrial Waste Management

The SWMA2068 clearly outlines the responsibility of waste generators for managing hazardous waste, including industrial and medical waste. Consequently, municipalities are not primarily responsible for hazardous waste management and lack a comprehensive understanding of the actual situation regarding industrial waste treatment. It has also been acknowledged that the generation of hazardous waste is minimal due to the characteristics of industries in the target municipalities. Since there are no guidelines for industrial solid waste management at the national or municipal levels in Nepal, individual companies make decisions about waste management.

In the Balaju Industrial Park within KMC, waste generated by industries and businesses is collected by contracted collection and transportation companies and transported to the Banchare Danda landfill site for disposal. Private waste collection companies charge fees to businesses based on a pay-as-you-go system. The waste nature in the Balaju Industrial Park is materials that do not contain hazardous substances, falling under the category of general business waste. Therefore, it is not classified as industrial waste according to the definition in the SWMA2068.

While there is a possibility that materials such as paint, mercury, lead, and pesticides, listed in the waste classification of the LMC ordinance (Table 4-13), are generated in business activities, there is no consistent data on the discharge amount. It is assumed that no separate treatment is being conducted, and the waste is disposed of in a manner similar to municipal waste.

2.4.2 Industrial Solid Waste Management in Kathmandu Valley

2.4.2.1 Generation and Segregation of Industrial Waste

JST conducted the interview survey to the industrial parks and factories to understand the current situation. The basic information, number of factories, and percentage of factory industries for the industrial parks targeted for the interview survey are shown in Table 2-9, Table 2-10, and Figure 2-6, respectively.

All three industrial parks located in the three target municipalities in the Kathmandu Valley were interviewed in the survey. All industrial parks were developed by the public corporation (Industrial District Management Ltd.), belonging to the federal government and attracting private companies. The contract between the industrial estates and their tenants stipulates that the tenants are responsible for managing their own waste. Similar to the Balaju Industrial Park in KMC, the Patan industrial parks in LMC and the Bhaktapur Industrial Park in BKM are not involved in waste management; instead tenant companies handle their own waste.

All factories answered that they recorded the amount of waste, except for those that answered that they did not generate waste. However, while the guidelines and technical standards that companies mentioned was only Solid Waste Management Act 2068, it was confirmed that waste management is being carried out vary across companies. Furthermore, each factory does not have a department specialized for waste management, and it is carried out by the general affairs department, etc.

Approximately 60-80% of the surveyed companies are in light industries such as food and textiles, followed by

construction materials and plastic product industries, and there is little use of substances that are concerned about toxicity, such as paints and heavy metals.

Waste separation is also carried out at the discretion of each company and their chosen collection and transportation company. NEPCEMAC Sewa Pvt. Ltd., one of the largest private waste collection companies, separates and collects valuables items, processes them at its own transfer station, and collects recyclables. This can be seen as an effort to effectively utilize waste and reduce waste.

Factories that outsource their waste collection to private waste collection companies incur collection fees on a pay-as-you-go basis. As a result, each factory responded that they are working to reduce waste.

Table 2-9 Industrial Parks for the Interview Survey

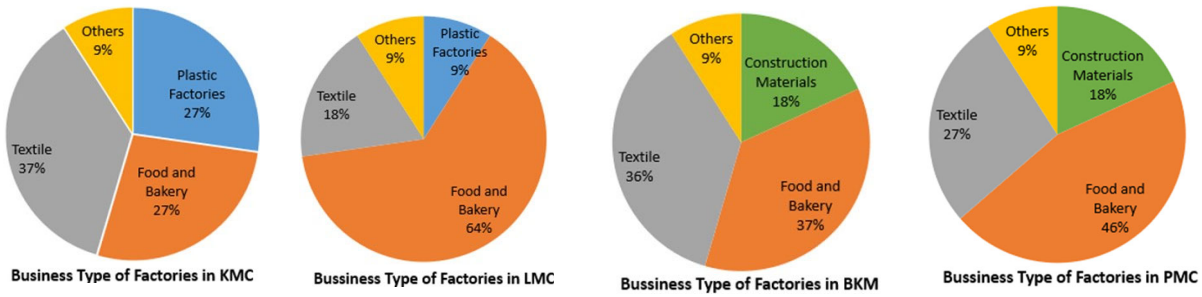
Location	Industrial Park	Established (A.D.)	Area (ha)	Number of factories	Company and Municipality for waste collection service
KTM	Balaju Industrial District	1960	34	148	Nepasemyak Sewa Pvt. Ltd. (Only for general wastes produced from Park)
LMC	Patan Industrial state	1962	15	114	Nepco Nepal (Only for General waste produced in office)
BKM	Bhaktapur Industrial area	1974	3.6	37	BMC
PMC	Pokhara Industrial Park	1974	25	77	Waste Management Recycling Pvt Ltd

Source: JST

Table 2-10 Number of Factories and Employees in the Factories Surveyed

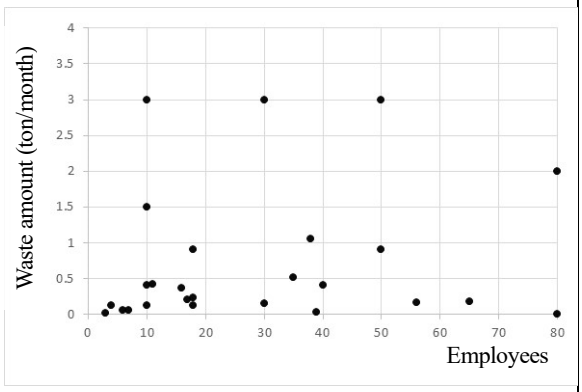
Items	KMC	LMC	BKM	PMC
Number of Factories	11	11	11	11
Employees (min and max)	10~788	5～125	3～35	6～300

Source: JST

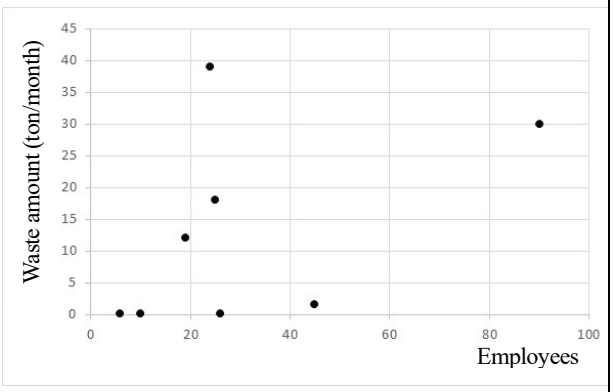


Source: JST

Figure 2-6 Bussinesss Type of the Companies Surveyed



Kathmandu valley (KMC, LMC, BKM)
Three factories (each waste generation: 5ton/day, 6ton/day, 90ton/day) which have more than 100 employees are excluded from the graph for an easier to understand data.



PMC
Two factories (each waste generation: 3ton/day, 6ton/day) which have more than 100 employees are excluded from the graph for an easier to understand data.

Source: JST

Figure 2-7 Waste Generation from the Factories

2.4.2.2 Collection and Treatment of Industrial Waste

The industrial parks located in the three surveyed municipalities in the Kathmandu Valley, KMC and LMC, outsource their waste collection, and transportation to final disposal sites to private companies, while BKM, local government, provides these services to the industrial park.

The number of waste collection companies targeted in the interview survey and the year of establishment are shown in Table 2-11. As shown in Figure 2-7, it was confirmed that four factories generate more than 10ton/month of industrial waste, the generation amount per month from the factories in PMC was more than waste amount from the factories in the Kathmandu Valley. The percentage of companies that started waste collection business after 2019 exceeded 60%, indicating that new entrants have increased during the same period. The private waste collection companies vary in size, with some having as few as 10 customers and others having contracts with 30-40 customers. Depending on the number of customers, the amount of waste collected varies widely from 2 tons/month to 40 tons/month. In this survey, no intermediate treatment companies or final disposal companies were identified that handle hazardous waste other than infectious medical waste.

Table 2-11 Private Waste Collection Companies and Established Year in the Interview Survey

Year of Establishment (A.D.)	KMC	LMC	BKM	PMC
2000-2009	2	1	0	0
2019-2023	4	2	0	1
Total	6	3	0	1

Source: JST

As mentioned above, since the nature of most industrial wastes is similar to municipal wastes and they are not hazardous, they are transported and disposed of at the Banchare Danda landfill site. These wastes are nonhazardous according to the definition in the SWMA2068. During the field survey, no treatment companies for hazardous

wastes other than infectious medical wastes were confirmed. Figure 2-8 shows pictures of waste collection from tenant companies by a collection and transportation company in Balaju Industrial Park in KMC.

Workers of Collection and Transporation

Waste Collection Works

Figure 2-8 Waste Collection Works from the Factories in Balaju Industrial Park

2.4.3 Current Status of Industrial Waste Management in PMC

2.4.3.1 Generation and Segregation of Industrial Waste

In the industrial park in Pokhara City, same as the industrial parks in Kathmandu valley, each tenant company, as the waste generator, assumes responsibility for waste management and implementation while the industrial parks are not responsible for such management.

The basic information of the industrial park, number and type of industry of the factories, covered by the interview survey are shown in Table 2-9, Table 2-10, and Figure 2-6, respectively. More than 70% of the factories surveyed were light industries such as food and textiles, and approximately 20% were construction industries. Each factory does not have a department specialized for waste management, and the management is carried out by the general affairs department and production department. Waste segregation practices vary, with factories and companies making decisions independently or relying on private waste collection services. Figure 2-9 illustrates examples of various waste streams at various factories.

Food Factory

Dairy Factory

Figure 2-9 Waste Storage Condition at the Factories in PMC

2.4.3.2 Collection and Treatment of Industrial Waste

Solid waste produced by PMC factories is collected by contracted collection and transportation companies and disposed at the temporary landfill in PMC. In an interview with one company that collects industrial waste answered that the unit collection fee is NRP30/kg. In this survey, no companies specializing in the treatment and final disposal of hazardous wastes, excluding infectious medical wastes, were identified.

Some companies opt to separate general (municipal) waste from industrial waste within their facilities. General waste is directed to municipal waste collection services, while contracted collection and transportation companies handle the industrial waste.

2.5 Current Status on Healthcare Waste Management

2.5.1 Guidelines and Definitions for Medical Waste Management

The MoHP has formulated the SOP2077 based on the WHO standards, the Health Care Waste Management Guideline 2071 (2014) of Nepal, the Public Health Service Act 2075 (2018), the Public Health Service Regulation 2077 (2020), and the National Health Policy 2076 (2019).

The SWMA2068 defines medical waste as "*waste generated by hospitals, clinics, pharmacies, blood centers, pathology laboratories, veterinary clinics, and medical research institutions that is hazardous to humans and the environment*." The SOP2077 further categorizes medical waste into general and hazardous medical waste based on their physical and chemical characteristics, and toxicity. The eight categories of hazardous medical waste are detailed in Table 2-12.

Table 2-12 Classification of Hazardous Medical Waste

Classification	Contents
Infectious Waste	Wastes that may contain pathogens and pose a risk of spreading epidemics
Sharp Waste	Sharp objects that lacerate the skin
Pathological Waste	Waste of pathology consisting of body parts, organs, skin, etc.
Pharmaceutical Waste	Drug-related wastes, ranging from general over-the-counter drugs to highly specialized drugs, including expired and unused drugs and those contaminated with drugs.
Cytotoxic Waste	Drugs containing materials that are harmful to Deoxyribonucleic acid (DNA) or cells, such as those used in anti-cancer treatment, etc.
Chemical Waste	Wastes containing solid, liquid, and gaseous chemicals generated in inspection, laboratory, and sterilization operations
Radioactive Waste	Waste containing radioactive materials generated by medical testing and treatment in medical facilities
E-Waste	Waste related to electronic equipment, including everything from small testing equipment to large medical equipment

Source: Prepared by JST based on SOP2077.

The SOP2077 is a comprehensive standard operating procedure covering a wide range of areas related to medical waste management, including planning, implementation of medical waste management (from separation to disposal), circular economy practices, and health and occupational safety measures for workers and other personnel beside training. Hospitals are recommended to use different colored waste bins for segregating medical waste, as

shown in Table 2-13.

Table 2-13 Separation of Medical Waste within a Medical Institution

Division	Classification	Contents
General Medical Waste	Organic Waste	Green
	Non-Organic Waste	Blue
Hazardous Medical Waste	Pathological Waste, Sharp Waste, Infectious Waste, Pharmaceutical Waste, Cytotoxic Waste	Red
	Chemical Waste	Yellow
	Radioactive Waste	Black

Source: Prepared by JST based on SOP2077.

The responsibility for medical waste management lies with the producing medical institution, which should either handle disposal internally or contract private operators. However, the current situation lacks a licensing/permission system for private operators, raising uncertainty about their adherence to the SOP2077.

2.5.2 Current Status of Medical Waste Management in the Kathmandu Valley

2.5.2.1 Current Status of Medical Waste Generation and Separation

(1) Current Status of Medical Waste Generation

Medical institutions carry out waste separation in accordance with the above-mentioned guideline. The generation amounts and unit generation rate of general waste ('general medical waste' under the Nepal legislation) and medical waste ('hazardous medical waste' under the Nepal legislation) from the 44 medical institutions in the Kathmandu Valley and PMC that responded to the interviews in the Survey are shown in Table 2-14. The distribution of the unit generation rate for general and medical waste is shown in Figure 2-10 and Figure 2-11. For both general and medical waste, it is presumed that the variation in unit generation rate is higher in smaller hospitals with fewer beds, due to differences in the medical services provided and other reasons. The unit generation rate of medical waste ranges from approximately 0 to about 2.5 kg/bed/day, with an average of 0.27 kg/bed/day. This result shows a similar trend to the WHO data provided for reference.

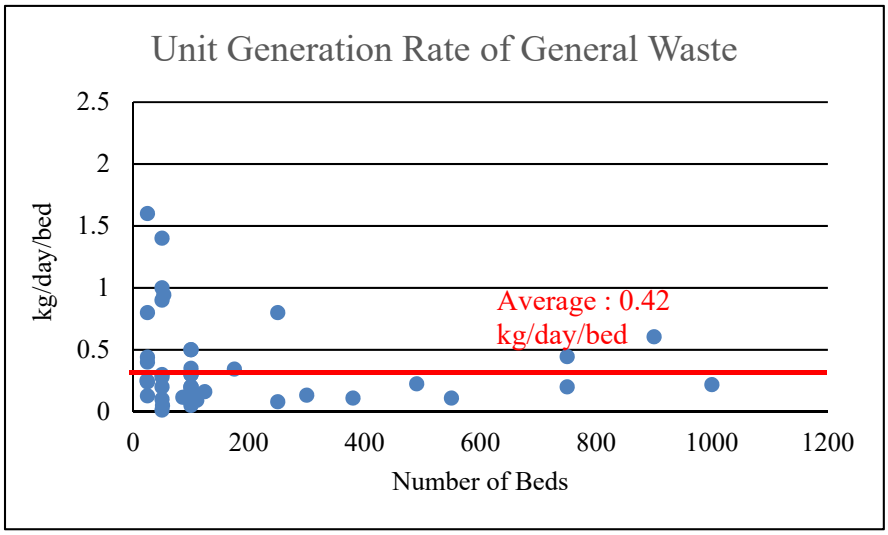
Table 2-14 Generation Amount and Unit Generation Rate of General and Medical Waste in Medical Institutions (Kathmandu Valley and PMC)

Name of Hospital	Number of Bed	Waste Amount (Kg/Day)		Unit Generation Amount (Kg/Day/Bed)	
		GW	MW	GW	MW
Bir Hospital	900	544.05	323.32	0.604	0.36
Paropakar Maternity & Women's Hospital	490	110	318	0.224	0.65
Tribhuvan University Teaching Hospital	1000	217.9	117.33	0.218	0.12
Sukraraj Tropical & Infectious Disease Hospital	100	50	60	0.5	0.60
Chhatrapati Free Clinic Hospital	25	20	15	0.8	0.60
Om Hospital and Research Center Pvt Ltd	175	60	30	0.343	0.17
Medicare Hospital Limited	100	17	18	0.17	0.18
Helping Hands Community Hospital	100	30	50	0.3	0.50
Bharosa Hospital Pvt.Ltd	50	14	8	0.28	0.16

Name of Hospital	Number of Bed	Waste Amount (Kg/Day)		Unit Generation Amount (Kg/Day/Bed)	
		GW	MW	GW	MW
Manmohan Memorial Medical College and Teaching Hospital	300	40	50	0.133	0.17
Vayodha Hospitals	50	45	12	0.9	0.24
Frontline Hospital	100	35	25	0.35	0.25
Dirghayu Guru Hospital Pvt. Ltd.	50	50	15	1	0.30
Chirayu National Hospital and Medical Institute Pvt.Ltd.	100	50	30	0.5	0.30
Civil Service Hospital	400	1100	260	2.75	0.65
Hope International college and Hospital	100	7	5	0.07	0.05
Kantipur Dental and General Hospital,Teaching Hospital and Research Centre	250	20	12	0.08	0.05
Venus Hospital	50	15	10	0.3	0.20
Patan Hospital	750	150	40	0.2	0.05
Mental Hospital	53	50	1	0.943	0.02
Ganeshman Singh Memorial Hospital & Research Center	100	20	10	0.2	0.10
Sumeru City Hospital	100	20	15	0.2	0.15
National Hospital and Cancer Center	25	10	5	0.4	0.20
Midat Hospital Pvt. Ltd.	24	6	2	0.25	0.08
Nepal Mediciti Hospital	250	200	175	0.8	0.70
Alka Hospital Pvt. Ltd.	100	5	5	0.05	0.05
Star Hospital	100	30	10	0.3	0.10
Aarus Lifestyle Hospital	25	6	10	0.24	0.40
Nidan Hospital Ltd	50	70	50	1.4	1.00
Megha Hospital Pvt. Ltd.	50	10	15	0.2	0.30
Blood and Multispeciality Hospital Pvt. Ltd.	25	40	60	1.6	2.40
Bhaktapur Cancer Hospital	124	20	60	0.161	0.48
Shahid Dharmabhakta National Transplants Centre	110	10	11.67	0.091	0.11
Bhaktapur Hospital	86	10	10	0.116	0.12
Siddhi Memorial Hospital	50	0.67	1.67	0.013	0.03
Western Regional Hospital Pokhara Academy of Health and Science	380	41.23	233.77	0.109	0.62
Gandaki Province (Infectious and Communicable Disease Hospital)	51	2.55	2.55	0.05	0.05
Matri Sisu Miteri Hospital	25	11	5	0.44	0.20
Manipal Teaching Hospital	750	333.33	100	0.444	0.13
Gandaki Medical Collage	550	60	30	0.109	0.06
Charak Memorial Hospital Pvt. Ltd.	100	20	25	0.2	0.25
Fishtail Hospital	100	10	50	0.1	0.50
Paschimanchal Community Hospital	50	5	8.33	0.1	0.17
Pokhara Hospital and Research Centre	25	3.17	5.67	0.127	0.23

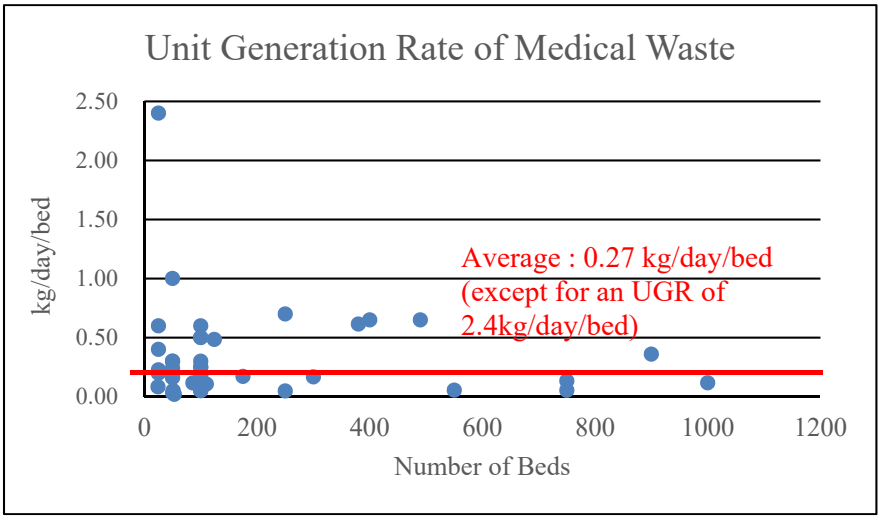
Source: Prepared by JST

Note: GW: General waste, MW: Medical waste



Source: Prepared by JST

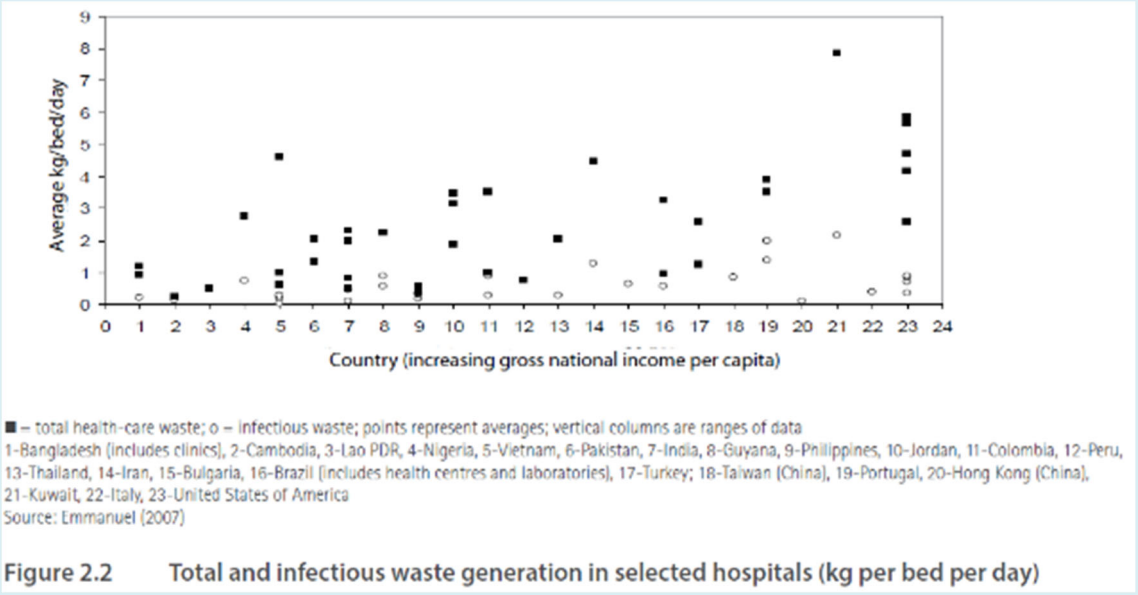
Figure 2-10 Unit Generation Rate of General Waste in Medical Institutions (Kathmandu Valley and PMC)



Source: Prepared by JST

Figure 2-11 Unit Generation Rate of Medical Waste in Medical Institutions (Kathmandu Valley and PMC)

【Reference】



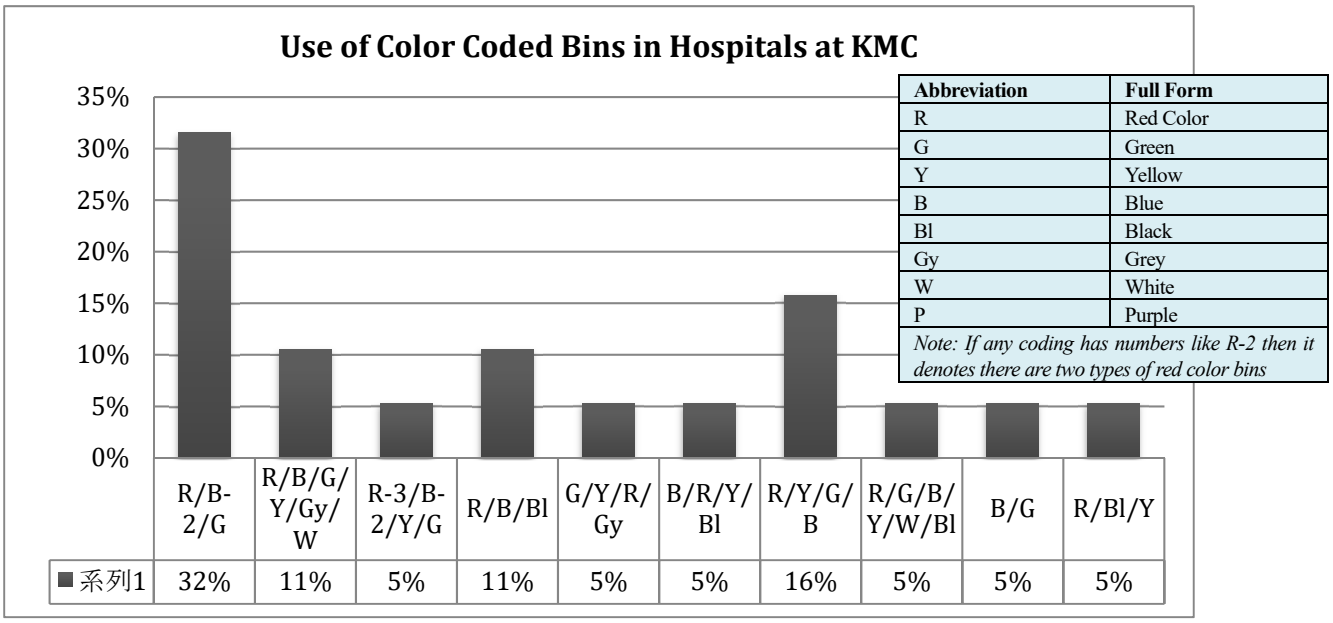
■ – total health-care waste; o – infectious waste; points represent averages; vertical columns are ranges of data
1-Bangladesh (includes clinics), 2-Cambodia, 3-Lao PDR, 4-Nigeria, 5-Vietnam, 6-Pakistan, 7-India, 8-Guyana, 9-Philippines, 10-Jordan, 11-Colombia, 12-Peru, 13-Thailand, 14-Iran, 15-Bulgaria, 16-Brazil (includes health centres and laboratories), 17-Turkey; 18-Taiwan (China), 19-Portugal, 20-Hong Kong (China), 21-Kuwait, 22-Italy, 23-United States of America
Source: Emmanuel (2007)

Figure 2.2 Total and infectious waste generation in selected hospitals (kg per bed per day)

Source：Safety management of wastes from health-care activities, 2014, WHO

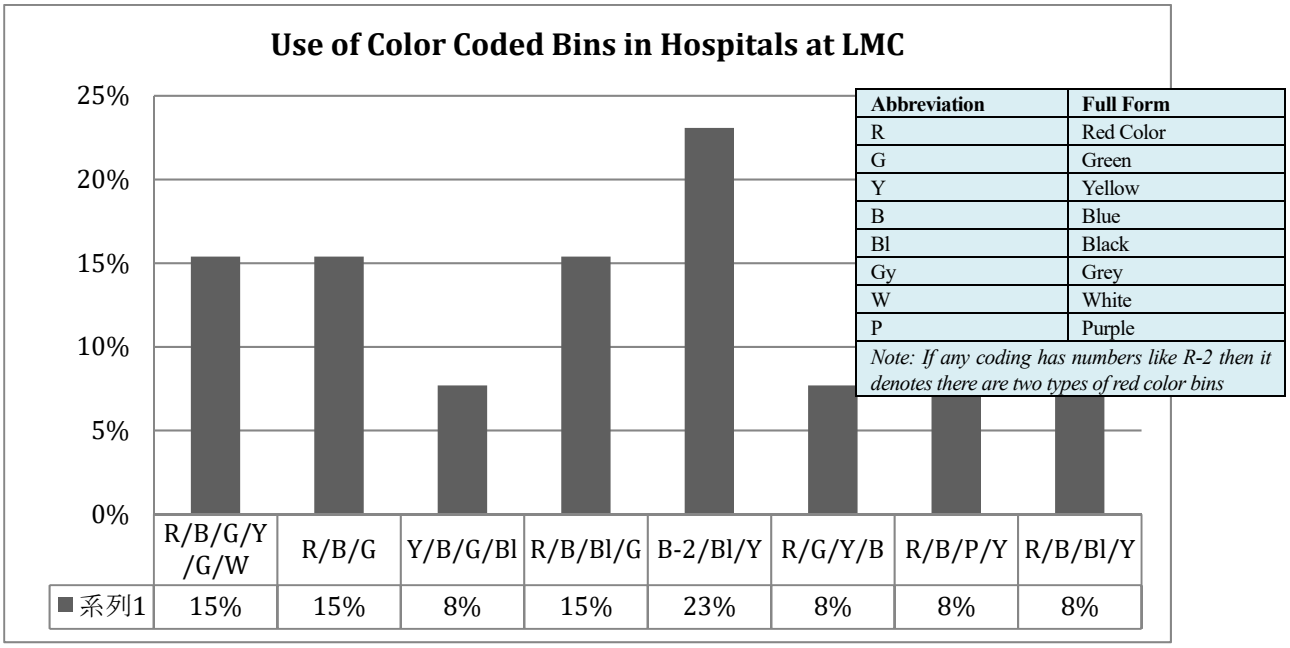
(2) Current Status of Medical Waste Separation

According to SOP 2077, general waste generated by medical institutions should be separated into green and blue bins, while medical waste should be separated into red, yellow and black bins. The status of waste separation in medical institutions in KMC, LMC and BKM is shown in Figure 2-12, Figure 2-13 and Figure 2-14. The medical institutions in the Survey had some form of waste separation. In particular, red bins for infectious waste and sharp objects were used in almost all medical institutions. In addition, some medical institutions also used yellow or grey bins, which are not specified in SOP 2077.



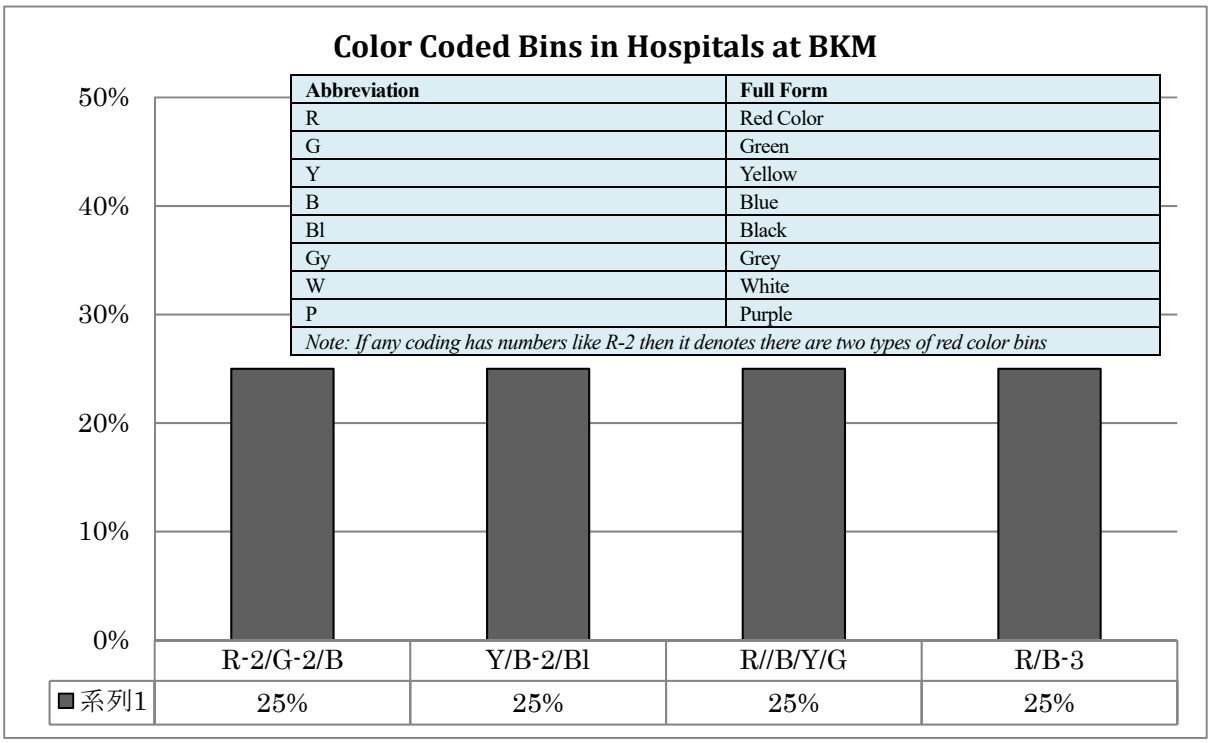
Source: Prepared by JST

Figure 2-12 The Status of Waste Separation in Medical Institutions in KMC



Source: Prepared by JST

Figure 2-13 The Status of Waste Separation in Medical Institutions in LMC



Source: Prepared by JST

Figure 2-14 The Status of Waste Separation in Medical Institutions in BKM

(3) Bir Hospital Case Study

Bir Hospital, a public hospital, follows an Infection Prevention Control manual, with two assigned nurses responsible for infection prevention and waste management.

Within the hospital premises, three waste bins are designated for different types of waste: red for infectious waste, dark blue for paper, and light blue for plastic and bottles. Additionally, a special container is allocated for sharp waste. The medical waste generated is initially separated within each hospital ward and temporary stored. It is later transported to the medical waste treatment and storage room located in the basement of the new hospital building for further processing (sterilization and storage).

The route from each hospital ward to the medical waste treatment and storage room is distinct from the general route. In the treatment room, multiple autoclaves are used to sterilize infectious materials. Bir Hospital has established a partnership with Scrap House Pvt. Ltd., selling 4.5 tons of valuable materials every half month, as shown in Table 2-15. The valuable materials are sorted into 19 categories. The remaining non-valuable materials are managed by Hatemalo Pvt. Ltd., which transports them to the Banchare Danda landfill site, incurring a charge of 400 Rs per trip for disposal regardless of the waste volume.

Table 2-15 Selling Amount of Valuable Materials in Bir Hospital (Actual from Sept. 14 to Sept. 29, 2023)

S.N	Items	Rate/kg (Rs.)	Weight (kg)	Amount (Rs.)
1	Thick Paper	6	487	2922
2	Thin Paper	8	188	1504
3	Carton	10	647	6470
4	Plastic	22	145	3190

S.N	Items	Rate/kg (Rs.)	Weight (kg)	Amount (Rs.)
5	Doll	62	7	434
6	Saline	62	60	3720
7	Water Bottle	17	490	8330
8	Gloves	9	330	2970
9	Syringe	32	205	6560
10	Waste	10	316	3160
11	Vial	0.5	726	363
12	Aluminum Silver	125	4	500
13	Steel	10	2	20
14	Old clothes	3	37	111
15	X-ray	100	2	200
16	Aluminum Foil	25	*	*
17	Broken Glasses	0.25	172	43
18	Gallon	28	*	*
19	Dialyze	10	776	7730
	Total		**4594**	**48227**

Source: Prepared by JST based on SOP2077.

Autoclave

Valuable materials after sterilization and sorting

Figure 2-15 Medical Waste Management in Bir Hospital

2.5.2.2 Current Status of Collection and Disposal of Medical Waste

The Survey identified nine medical waste collection and transportation companies in the Kathmandu Valley, as shown in Table 2-16. About half of the collection and transportation companies are engaged in collecting not only medical waste but also general waste from households and others. The medical waste collection and transportation companies also vary in size, ranging from some companies with a few employees to large companies with more than 100 employees. Fees for the medical waste collection are negotiated individually between the collection and transportation companies and medical institutions. The fees were fixed on a monthly basis for the nine companies surveyed.

Table 2-16 Medical Waste Collection and Transportation Companies in the Kathmandu Valley

Company Name	Medical Waste Collection Amount (ton/month)	Target Waste Type	Number of Employees	Number of Customers (Medical Institutions)	Monthly Fee for Medical Waste Collection
Pariwartan sewa Pvt Ltd-KMC 7	300	Medical Waste	155	30 - 35	10,000 - 50,000
Baneshwor Women environment sewa Pvt Ltd-Baneshwor-10	50	Medical Waste	20	30	10,000 - 50,000
Green city sanitation Pvt Ltd-Maccha Pokhari 16	20	Medical Waste	17	15	10,000 - 50,000
Rajak Scrip traders and Suppliers	2	Medical Waste	6	10	30,000
Best and Perfect Cleaning Services Pvt. Ltd.	6	Medical Waste, General Waste	40	3	16,000
Babu Plastic Collection Pvt. Ltd.	2	Medical Waste	5	1	31,000
Nepal Batabaran Shrijana Pvt. Ltd.	5	Medical Waste, General Waste	42	10-15	Hospital 2,000 Clinic 500 Household 250
Kantipur Sisdole Batabaran Sewa Pvt. Ltd.	4	Medical Waste, General Waste	58	15-20	Hospital 2,500 Clinic 700 Household 250
Hatteymalo Clean City Pvt Ltd	240	Medical Waste, Industrial Waste, General Waste	70	3	8,000-10,000

Source: Prepared by JST

Among the 45 medical institutions in the Kathmandu Valley that responded to the interviews in the Survey, 90% of the institutions owned autoclaves and treated their own medical waste. However, smaller institutions that did not own autoclaves, transported their medical waste to a nearby large hospital for treatment. Therefore, none of the medical waste collection and transportation companies in the Kathmandu Valley owned autoclaves or other treatment equipment. The collection and transportation companies collect treated medical waste from the hospital's autoclaves and, in some cases, sort out recyclable materials before transporting the waste to the Banchare Danda landfill site.

2.5.3 Current Medical Waste Management in PMC

2.5.3.1 Current Status of Medical Waste Generation and Separation

(1) Current Status of Medical Waste Separation

All 15 medical institutions surveyed, outsource the collection and treatment of their medical waste to Waste Service Pvt. Ltd., which is discussed later. Waste Service Pvt. Ltd. has a treatment facility, where sterilization is carried out in an autoclave at the facility. On the other hand, four out of the 15 medical institutions owned their own autoclaves. According to SOP 2077, general waste from medical institutions is to be separated into green and blue bins, and medical waste into red, yellow and black bins. The 15 Medical institutions are asked by their contractor Waste Service Pvt. Ltd. to separate waste into red, yellow, green, black and blue bins and they basically follow these

instructions.

(2) West Regional Hospital

At West Regional Hospital, a public hospital, no specific personnel are designated for Infection Prevention Control (IPC), but a waste management officer has been appointed. In practice, however, the primary responsibilities of the waste management officer revolve around maintaining the inpatient living environment, encompassing tasks such as bed linen and laundry management. The actual management of waste within the hospital is outsourced to a private operator (Waste Service Pvt. Ltd.: details provided in 2.5.3.2). Waste Service Pvt. Ltd., dispatches workers to collect and process waste within the hospital premises, utilizing an autoclave owned by the hospital. The autoclave operates twice daily, processing 50 kg/session, resulting in a daily processing capacity of about 100 kg. However, if the volume of waste exceeds the autoclave's capacity, Waste Service Pvt. Ltd. collects and processes a portion of the waste.

Within the hospital, red, blue, and green containers (for hazardous medical waste, non-hazardous non-organic waste, and non-hazardous organic waste, respectively) are provided for waste separation in accordance with SOP 2077. However, it is noted that the separation is not necessarily conducted properly. Records are kept of the quantity of waste disposed of.

Medical waste in storage

Collection of infectious waste

Figure 2-16 Medical Waste Management in West Regional Hospital

2.5.3.2 Current Status of Collection and Disposal of Medical Waste

In PMC, Waste Service Pvt. Ltd. holds a contract with PMC to manage the collection and transportation of medical waste. Serving as the exclusive medical waste management operator in PMC, Waste Service Pvt. Ltd. is tasked with gathering and processing medical waste, both general and hazardous, from 45 hospitals and approximately 200 laboratories and clinics within the PMC. While the fees for medical waste disposal are typically determined by the PMC's tariff as described below in 6.9.3, some medical institutions negotiate higher service fees based on their specific circumstances.

Currently, Waste Service Pvt. Ltd. collects and processes 5 tons/day of medical waste, evenly split between 2.5

tons of general medical waste and 2.5 tons of hazardous medical waste. The company has two collection vehicles and operates a hazardous medical waste treatment facility (Central treatment facility), built in 2018. With a total of 25 employees, including drivers for collection and transportation and workers at the treatment facility, Waster Service Pvt. Ltd. operates two autoclaves within the central treatment facility. Hazardous medical waste collected from medical institutions undergoes sterilization in the autoclaves before being sorted, along with general medical waste, into valuable materials and waste. These valuable materials are regularly sold to buyers.

Although Waste Service Pvt. Ltd. operates under a contract with PMC and is subject to some monitoring by PMC, there is currently no license or permit system in place. The company delivers medical waste collection and treatment services in alignment with its contractual agreement with PMC and follows the guidelines outlined in SOP2077.

Front of treatment facility

Valuable materials after sterilization and sorting

Figure 2-17 Medical Waste Treatment by Waste Service Pvt. Ltd.

Chapter 3 Waste Management in Kathmandu Metropolitan City

3.1 Outline of Kathmandu Metropolitan City

3.1.1 Population

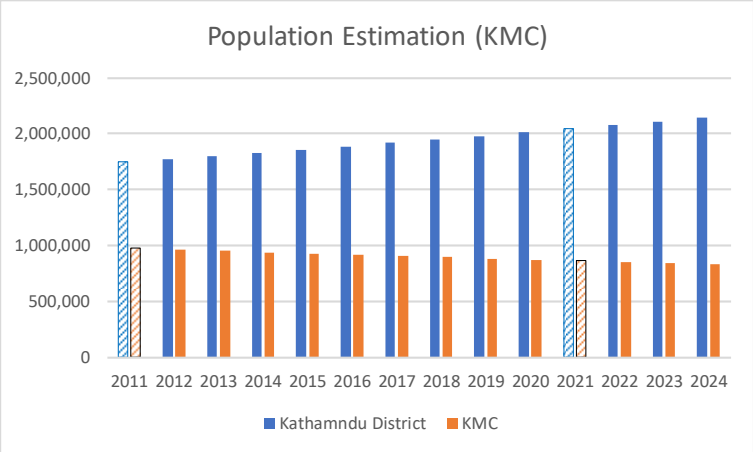
The initiation of federalism in Nepal led to a consolidation of municipalities between 2014 and 2017, resulting in changes to their geographic boundaries. Therefore, direct comparisons between the pre-federalization census population (2011) and the post-federalization census population (2021) are not straightforward. The Central Bureau of Statistics (hereinafter referred to as "CBS") of Nepal has published data estimating the population as of 2011 within the current municipalities' boundary (Table 3-1*[2]). According to this published data, the population of KMC in 2021 is lower than in 2011. A possible explanation for this decline is the presumed relocation of the population from the municipality center to satellite areas in the suburbs. On the other hand, the population of Kathmandu District has increased from 2011 to 2021. KMC is one of the target areas for this Survey. In interviews conducted by JST, KMC City Planning Committee estimates that the Floating Population, which flows into KMC from outside the region for various reasons including tourism, is approximately 400,000.

Table 3-1 Basic Information of KMC

Administrative Classification	Census 2011*1	Estimation by CBS 2011*2	Census 2021*3	Average Annual Population Change Rate*4	Area
Kathmandu District	1,744,240	-	2,041,587	1.59%	Approx. 395 km2
KMC	1,003,285	975,453	862,400	-1.22%	Approx. 49 km2

Sources: *1: National Population and Housing Census 2011 (CBS), *2: Population of 753 Local Units (CBS), *3: National Population and Housing Census Provincial Report 2021 (CBS), *4: Average annual population change rate over a 10-year period when comparing Estimation by CBS 2011 and Census 2021.

For the purpose of this report, the residential population in KMC is estimated using the average annual population change rate (-1.22%) for KMC as indicated in Table 3-1. The projected residential population of KMC in 2024 is estimated to be about 831,000. The projected residential population of Kathmandu district and KMC are shown in Figure 3-1. If the Floating Population is taken into account, the population of KMC in 2024 is estimated to reach about 1,231,000. Since the Floating Population is an important factor contributing to the municipal waste generation amount, the estimation of municipal waste generation amount in KMC in the Survey report is calculated by multiplying the population (1,231,000 people), taking into account the Floating Population, by the unit generation rate, as further described later.



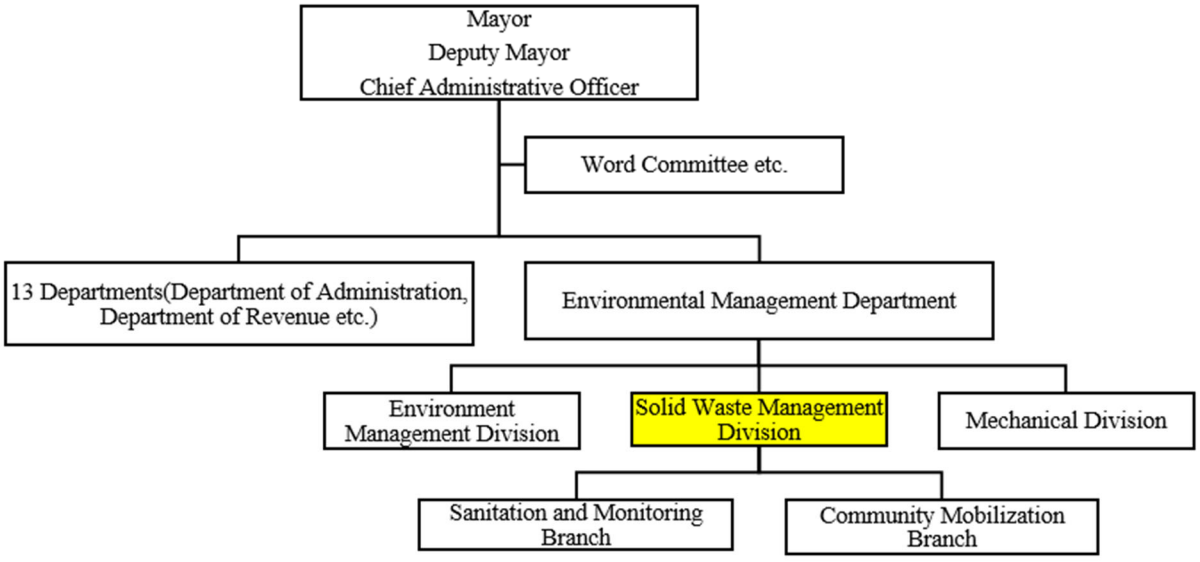
Source: JST

Note: 2011 and 2021 (hatched) are CBS estimates and census populations. 2012-2020 and 2022 onwards are JST estimates.

Figure 3-1 Estimation of Population in KMC

3.1.2 Organizational Structure

The organizational structure of KMC is illustrated in Figure 3-2, where the Environmental Management Department is responsible for waste management. The Environmental Management Department comprises a total of 784 employees, as shown in Table 3-2.



Source: KMC

Figure 3-2 Organizational Structure of KMC and Departments in Charge of Waste Management

Table 3-2 Number of Staff in the Environmental Management Department

Employment Position or Rank	Number of People
Department Head	1
Division Head and Engineer	14
Mechanic	24
Large Vehicle Driver	33
Light Vehicle Driver and Operator	101
Heavy Vehicle Operator	8

Employment Position or Rank	Number of People
Operation Supervisor	6
Guard	19
Community Affairs (Temporary Position)	1
Road Sweeper / Planting Operator	556
Banchare Danda Landfill Site Worker	21
Total Amount	784

Source: KMC

3.2 Municipal Waste Generation Amount and Waste Composition

3.2.1 Waste Generation Amount

Table 3-3 presents the results of waste amount surveys conducted in KMC. In 2013, the Asian Development Bank (hereinafter referred to as "ADB") conducted a survey estimating the unit generation rate of municipal waste by examining the unit generation rate of household, business office, and commercial waste. A baseline study conducted by KMC's City Planning Commission (CPC) in 2020 (hereinafter referred to as "KMC CPC2020") estimated the unit generation rate of municipal waste at 0.360 kg/person/day. Furthermore, an analysis of solid waste management in the Kathmandu Valley by the World Bank in 2021, titled “Catalyzing Sustainable and Inclusive Urban Development in Kathmandu Valley: Diagnostic and Policy Implications, Analysis of Solid Waste management of the Kathmandu Valley, 2021” (hereinafter referred to as "WB2021"), utilized secondary data[4] (REI-CLDP/BRBIP-AF, 2021) to analyze KMC's unit generation rate of municipal waste, estimating it at 0.490 kg/person/day. This Survey estimates the municipal waste generation amount in KMC based on the unit generation rate of 0.490kg/person/day in the most recent survey results (WB2021).

Table 3-3 Unit Generation Rate of Municipal Waste in KMC

Item	ADB2013*1	KMC CPC2020*2	WB2021*3 (REI-CLDP/BRBIP-AF 2021)
Unit generation rate of municipal waste	0.465 kg/person/day	0.360 kg/person/day	0.490 kg/person/day

Sources: *1Status of solid waste management in Nepal and policy recommendations (ADB, 2013), *2Baseline study of solid waste management in Kathmandu metropolitan area (KMC CPC, 2020), *3REI-CLDP/BRBIP-AF, 2021 REI-CLDP/BRBIP-AF, 2021

The estimated municipal waste generation amount, multiplying the projected population (1,231,000 people) in KMC in 2024 as described in 3.1.1 by the unit generation rate of 0.490kg/person/day is about 603 tons/day.

3.2.2 Waste Composition

KMC CPC2020 conducted a waste composition survey focusing on household waste. In addition, in 2023, with the support of USAID, a waste composition survey of Teku transfer stations (hereinafter referred to as "KMC

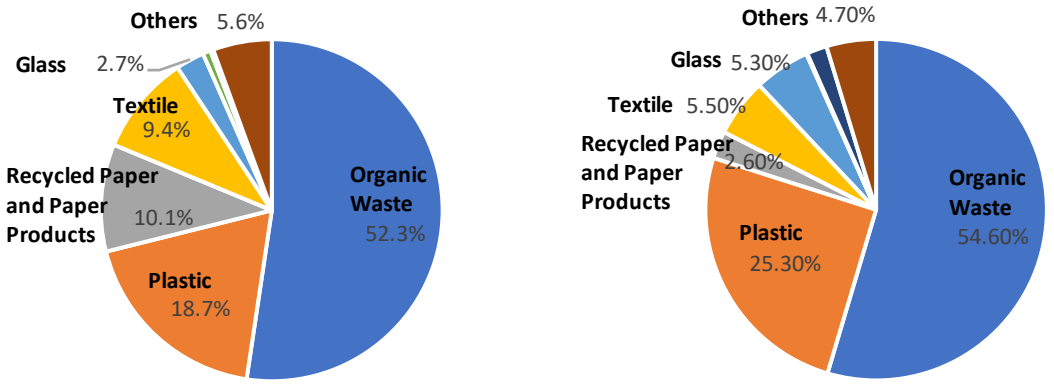
[4] 1River Environment Improvement through Community Leadership Development Project (REI-CLDP), Bagmati River Basin Improvement Project – Additional Financing (BRBIP-AF), High Powered Committee for Integrated Development of the Bagmati Civilization (HPCIDBC), Gaurighat, Guheshwori, Kathmandu.

&USAID2023") was conducted. The results of these surveys are shown in Table 3-4. Both surveys highlight organic waste as the most common item by weight, accounting for about 50% of the total. While KMC &USAID2023 focuses on the waste composition of the transfer station, the percentage of plastic appears higher than in household waste due to the inclusion of business waste.

Table 3-4 Waste Composition in KMC

Waste Type	Survey Results (by Weight)	
	KMC CPC2020*1 (Household Waste)	KMC &USAID2023*2 (Municipal Waste)
Organic Waste	52.32%	54.6%
Plastic	18.74%	25.3%
Recycled Paper and Paper Products	10.13%	2.6%
Textile	9.44%	5.5%
Glass	2.71%	5.3%
Metal	0.73%	0.1%
Rubber	0.29%	1.9%
Other	5.56%	4.7%

Source: *1: Baseline Study of Solid Waste Management in Kathmandu Metropolitan City (KMC CPC, 2020)、*2：Municipal Waste Characterization of the Core Area of Kathmandu Metropolitan City (KMC &USAID, 2023)



KMC CPC2020*1 (Household Waste)　　KMC &USAID2023*2 (Municipal Waste)

Source: Prepared by JST based on *1：Baseline Study of Solid Waste Management in Kathmandu Metropolitan City (KMC CPC, 2020)、*2：Municipal Waste Characterization of the Core Area of Kathmandu Metropolitan City (KMC &USAID, 2023)

Figure 3-3 Waste Composition in KMC

3.3 Collection and Transportation and Secondary Transfer of Municipal Waste

3.3.1 Overview of Collection and Transportation in KMC

Table 3-5 provides an overview of waste collection and transportation in KMC. The waste collection by collection and transportation companies is not performed under a contract or license granted by KMC; collection and transportation companies provide their services under individual contracts with residents and businesses. The waste collection and transportation services in KMC are jointly provided by KMC and private companies. The estimated waste collection amount in KMC is about 510 tons/day, representing an 85% collection rate of the generation amount. In WB2021, the collection rate for the entire Kathmandu Valley was estimated to be 85%. It is reasonable

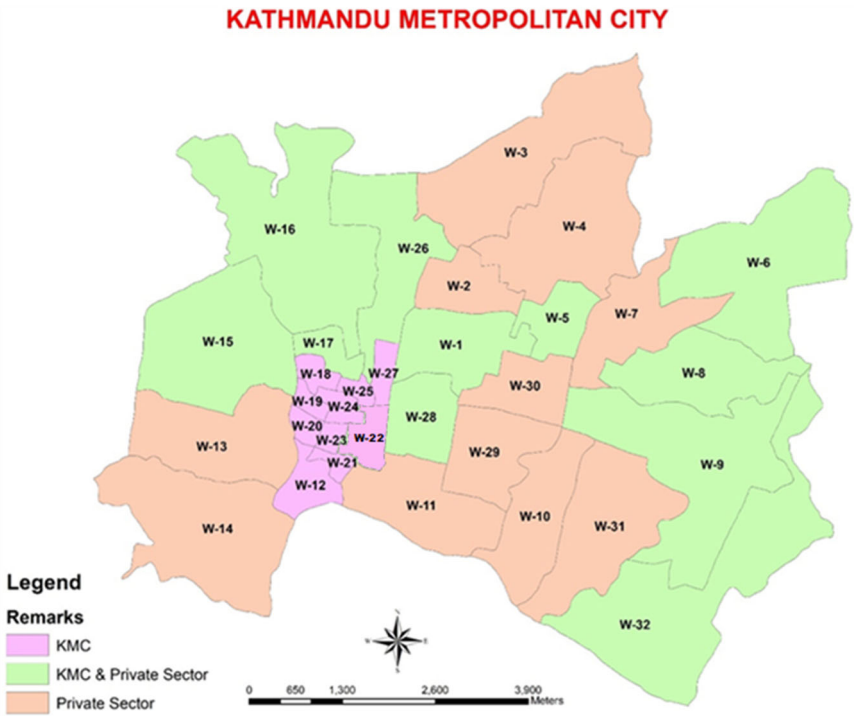
to estimate that the collection rate for KMC, which represents the Valley, is approximately 85%. As for the coverage area of collection services, directly managed collection provided regular collection services to the entire service target area (the urbanized area in the center of the municipality), which will be discussed later. On the other hand, collection and transportation company services do not provide sufficiently frequent collection services to slums and rural areas with small population densities where fees cannot be collected.

Table 3-5 Overview of Collection and Transportation in KMC

Item	Direct Management	Private	Total Amount
Generation Amount	N/A	N/A	Approx. 603tons/day
Ward to be Serviced	10	22 (some directly managed mixed)	32
Waste Collection Amount	Approx. 105tons/day	Approx. 405tons/day	Approx. 510tons/day
Collection Rate	N/A	N/A	Approx. 85%

Source: JST

KMC serves the entire area in ten wards out of 32 (No.12, No.18- 25, and No.27), located in the municipality center. Additionally, it cover some target areas in eleven wards (No.1, No.5- 6, No.8- 9, No-15- 17, No.26, No.28, and No.32). The remaining eleven wards are served by independent collection and transportation companies. Figure 3-4 illustrates the Waste Collection Service Area in KMC.



Source: Municipal Waste Characterization of the Core Area of Kathmandu Metropolitan City (KMC &USAID, 2023)

Figure 3-4 Waste Collection Service Area in KMC

Table 3-6 indicates the number of wards served by KMC and collection and transportation companies in 2012 and

2023. The number of ward locations served by KMC throughout the ward has decreased from 27 in 2012 to 10 in 2023, reflecting a reduction in KMC's collection service area. However, it should be noted that the geographical boundaries of the wards have partially changed with the initiation of federalism.

Table 3-6 Changes of Waste Collection Service Area in KMC

Ward Number	2012*1	2023*2	Ward Number	2012*1	2023*2
Ward 1	Private	KMC & Private	Ward 17	KMC	KMC & Private
Ward 2	KMC & Private	Private	Ward 18	KMC	KMC
Ward 3	KMC	Private	Ward 19	KMC	KMC
Ward 4	KMC	Private	Ward 20	KMC	KMC
Ward 5	KMC	KMC & Private	Ward 21	KMC	KMC
Ward 6	KMC	KMC & Private	Ward 22	KMC	KMC
Ward 7	KMC	Private	Ward 23	KMC	KMC
Ward 8	KMC	KMC & Private	Ward 24	Private	KMC
Ward 9	KMC	KMC & Private	Ward 25	KMC	KMC
Ward 10	KMC	Private	Ward 26	KMC	KMC & Private
Ward 11	KMC	Private	Ward 27	KMC	KMC
Ward 12	KMC	KMC	Ward 28	KMC	KMC & Private
Ward 13	Private	Private	Ward 29	KMC & Private	Private
Ward 14	KMC	Private	Ward 30	KMC	Private
Ward 15	KMC	KMC & Private	Ward 31	KMC	Private
Ward 16	KMC	KMC & Private	Ward 32	KMC	KMC & Private

Source: *1: Report on Information Collection and Verification Study on Waste Management in Kathmandu Valley, Federal Democratic Republic of Nepal (JICA 2014), *2: Municipal Waste Characterization of the Core Area of Kathmandu Metropolitan City (KMC &USAID, 2023)

3.3.2 Collection and Transportation by KMC (Direct Management)

3.3.2.1 Implementation Structure

The waste collection and transportation staff at KMC consists of 2 supervisors, 101 drivers and collection workers, and 556 road sweepers.

The collection and transportation vehicles owned by KMC are shown in Table 3-7. KMC uses 48 dump trucks, 2 container carriers, and 4 compactors. Among these vehicles, China provided the dump truck with covers (Changun), dump truck (Bin Carrying Foton), and compactor in August 2010.

Table 3-7 Collection and Transportation Equipment in KMC

Equipment Name	Capacity	Number of Vehicles
Dump Truck with covers (Changun)	3.5m3	30
Dump Truck (Tipper Eicher)	4m3	6
Dump Truck (Swarazmasda)	4.5m3	6
Dump Truck (Bin Carrying Foton)	5 m3	4
Dump Truck (Tata 6cu.m bucket)	6m3	2
Container Carrier (DCM Buket)	4m3	2
Compactor	5m3	4
Water Sprinkler Truck (Small)	-	3
Water Sprinkler Truck (Large)	-	2
Road Sweeper (Small)	-	2
Road Sweeper (Large)	-	1

Source: KMC

Dump Truck with covers (Changun)

Dump Truck (Bin Carrying Foton)

Figure 3-5 Collection and Transportation Equipment in KMC

3.3.2.2 Collection Method

KMC focuses its collection efforts on household waste, business waste generated by shops, restaurants, hotels, and offices, and road sweeping waste. Commencing as early as 5:00 a.m. to avoid traffic congestion, collection and transportation activities are concluded before the peak commuter rush (9:00-10:00 a.m.).

For household waste collection, dump trucks are utilized, employing a bell collection approach where residents directly load waste onto the stopped trucks. Separation collection is not carried out, and various containers, including plastic bags, waste bins (returnable), and cardboard boxes are used without specific discharge containers. The container collection and fixed-point collection are not practiced for household waste collection, as it is a source of complaints from residents due to littering around containers and fixed-point collection points.

Figure 3-6 Collection and Transportation of Household Waste in KMC

Business and road sweeper waste are collected concurrently with household waste through bell collection and fixed-point collection in commercial areas of the municipality center. Waste transportation to fixed collection points is facilitated by the waste generator, KMC road sweepers, or primary collectors (workers hired by the commercial cooperative to collect and transport waste from door fronts to fixed collection points). KMC ensures daily waste collection from fixed points.

Fixed collection points in commercial areas

Road sweeping waste loading point

Figure 3-7 Collection and Transportation of Commercial and Road Sweeping in KMC

3.3.2.3 Separation Collection Pilot Project

KMC has been implementing a pilot project for separation collection in Ward 27 and Ward 10 since February 2024. Ward 27 is one of the central city wards where KMC has direct collection, and was selected as the pilot project area because of its relatively small population size and the cooperative efforts of the Ward office. Ward 10 is an area where collection and transportation company manages waste collection, but KMC, the Ward office, and the collection and transportation company are working together and holding stakeholder meetings with residents to reach a consensus, and then separation collection is being introduced. KMC plans to expand the pilot project to other wards (Ward 5 and Ward 25) depending on progress.

In Ward 27, KMC and the Ward office worked together to conduct community meetings and microphone promotions, and then separation collection was started. When the JST visited the site, about a month had passed, and it was confirmed that collection workers were guiding residents and the residents were cooperating in source separation. KMC has installed a partition in the bed of a dump truck with covers. It is carrying organic waste in the front section of the partition, and non-organic waste in the rear section for separate collection. Three dump trucks with covers have already been upgraded with KMC's budget and are being operated in Ward 27. The vehicles modification was carried out at a KMC workshop. The organic waste collection is used for composting at the TEC transfer station, but the non-organic waste is mixed with the other waste brought to the Teku transfer station and loaded onto the transfer vehicles. Consequently, the recycling of valuable materials other than organic waste remains as issue for the future.

Dump truck with covers before improvement
(Mixed waste is loaded through the center opening)

Dump truck with covers after improvement
(A partition has been installed in the center, and openings have been created in the front and rear to allow for separation collection)

Organic waste is loaded in front across the partition.

Non-organic waste is loaded in the rear across the partition

Figure 3-8 Separation Collection Pilot Project in KMC

3.3.2.4 Ward Office Role in Collection and Transportation

The ward office comprises five elected representatives (one ward head and four representatives) and 20 to 50 employees, based on the ward size. While primarily tasked with tax collection, it also collaborates with KMC's waste management department to oversee waste collection within the ward. A public health supervisor responsible for monitoring waste collection, tracking KMC's road sweepers' attendance, and managing equipment such as handcarts has been designated.

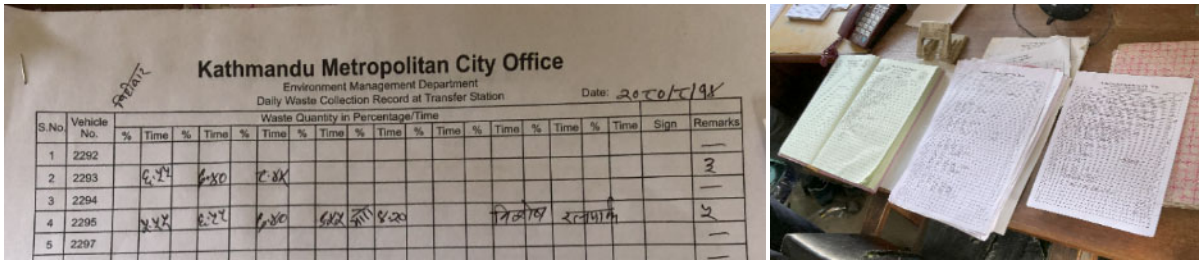
In ward 23, situated in the central city area, the ward office is proactively procuring rickshaws and hiring waste collection workers for collection and transportation services. This initiative arises from the challenge posed by narrow alleys, making it impractical for KMC's dump trucks to navigate these areas.

Figure 3-9 Ward23's Waste Collection and Transportation Service in KMC

3.3.3 Secondary Transfer by KMC (Direct Management)

3.3.3.1 Waste Collection Amount, Secondary Transfer Amount

The KMC operates the Teku transfer station, receiving waste collected by its own vehicles. The number of incoming vehicles recorded manually at the administration building's entrance. Based on record as of December 1, 2023, and a rough calculation of the waste collection amount derived from the vehicle type and number of trips listed in the record, waste collection is estimated to be approximately 105 tons/day. In addition, according to the interview with KMC, KMC collects about 100 tons/day.. Although a weighbridge exists in the Teku transfer station, it has been non-operational due to extended breakdowns, with no allocated budget for repairs.



Records of incoming of the Teku transfer station (the time of incoming is recorded for each vehicle and the number of trips is calculated. Two types of record forms are prepared, one for records of collection and transportation vehicles coming in and one for records of secondary transfer vehicles going out).

Figure 3-10 Records of Incoming and Going of Teku Transfer Station

3.3.3.2 Secondary Transfer Equipment

The secondary transfer vehicles owned by the KMC are shown in Table 3-8.

Table 3-8 Secondary Transfer Equipment in KMC

Equipment Name	Capacity	Number of Vehicles
Secondary Transfer Dump Truck (A.L.)	15 m3	5
Secondary Transfer Dump Truck (Eiechaer Tipper)	10 m3	5
Secondary Transfer Dump Truck (TaTa)	7.5 m3	4
Wheel Loader (JCB)	-	3
Backhoe	-	2

Source: KMC

3.3.3.3 Implementation Method for Secondary Transfer

At the Teku transfer station, waste is initially piled on the ground upon arrival and transshipped to secondary transfer vehicles using a backhoe loader. Despite having a drop-off platform, it remains inactive due to complaints from nearby residents about waste scattering. An understanding was reached between KMC and residents in response to previous protests against waste accumulation during landfill closures. The conditions include (1) operating the facility only during daylight hours, (2) not using platforms, transshipping waste on a Secondary Transfer Dump Truck, and (3) refraining from collecting waste fees from nearby residents. Currently, KMC does not collect waste fees, and any future fee collection won't apply to the Teku transfer station vicinity. In addition, measures are being taken to cover the truck bed with a sheet to prevent waste scattering during transportation from the transfer station.

Teku Transfer Station (General View)

Platform (not used)

Transshipment to secondary transfer vehicles using a backhoe.

The cargo bed is covered with a sheet to prevent waste scattering.

Figure 3-11 A View of Teku Transfer Station in KMC

3.3.4 Collection and Transportation and Secondary Transfer by Private Business Operator

3.3.4.1 Management System for Private Business Operator

The SWMA2068 and SWMR2070 outline a licensing system for private business operators, supervised by the

municipality, to enter the waste management sector. However, in areas without waste collection services, several private operators are active. Despite this, KMC has not issue licenses to them, considering them part of the informal sector. KMC acknowledges this issue but faces a bottleneck due to a frozen privatization plan for waste management in the Kathmandu Valley, drafted by the federal government before the shift to federalism.

The privatization plan's background is provided below:

<Background of privatization plan for waste management in the Kathmandu Valley >
In 2011, a concession aimed to divide the Kathmandu Valley into three parts (1) KMC and surroundings, (2) LMC and surroundings, and (3) BKM and surroundings) was planned and bid by SWMTSC. Although contractors were identified (①: Nepwaste Pvt. Ltd. ② & ③: Clean Valley Co.), no contract has been signed to date. This delay is attributed to the 2015 constitution introducing local autonomy, leading to challenges like the transfer of the coordinating body to the IBR of Nepal after SWMTSC's functions ceased and changes in mayors for each municipality.

KMC states that the plan needs formal discontinuation. As part of future planning, KMC is considering dividing the municipality area into seven zones and selecting private business operators for each of the six areas. This aims to encourage the consignment of private business operators for each area, excluding the central municipality area where KMC directly provides waste collection services.

3.3.4.2 Solid Waste Management Association of Nepal (SWMAN)

The Solid Waste Management Association of Nepal (hereinafter referred to as "SWMAN") was established to unite numerous collection and transportation operators. Presently, 74 operators in the Kathmandu Valley actively participate in SWMAN. The association plays a vital role in coordinating the service areas of its members, conducting surveys and studies, and organizing training sessions.

The activities described in SWMAN's Annual Report (2021/22) and planned activities in 2022/23 are listed below. In addition to the activities undertaken in 2021/22, the organization is planning a national symposium (with potential participants from municipalities, waste management professionals, private business operators, etc.) and the implementation of a program to promote source separation and recycling, targeting a frequency of twice a month.

Outline of Activities in 2021/22
・ Coordinating competition and service areas among members by working committee ・ Conducting unannounced audits of member's collection and transportation work and unannounced audits of member's secondary transfer vehicles at the Sisdol old landfill site by monitoring committee. ・ Conducting a survey of the operation of the Sisdol landfill site and donating medications to the hospital near the landfill site. ・ Conducting clean-up campaigns on rivers in Kathmandu Valley (Bagmati River, Bishnumati River, etc.), Ring Road, etc. ・ Conducting study tours of recycling plants on World Environment Day. ・ Conducting domestic travel for research and study (visits to biogas plants in Dhahran, Itahari, and Damak in January 2022). ・ Preparing and distributing calendars, pamphlets, and other educational materials.

Annual Report published at the Annual Meeting in 2021/2022

SWMAN aims to emphasize source separation and promote recycling to minimize final disposal and maximize the efficient use of valuable materials. However, the association encounters challenges, including difficulties in negotiating with local residents for securing land for waste transfer and recycling facilities, business investment risks due to the lack of official municipal approval for waste collection and transportation, securing funds for facility development, and the implementation of suitable technology. In interviews conducted by JST, the association conveyed specific requests to both the municipality and the federal government: (1) provision of land, (2) formal approval through a licensing system, and (3) assistance with investment costs and technology implementation.

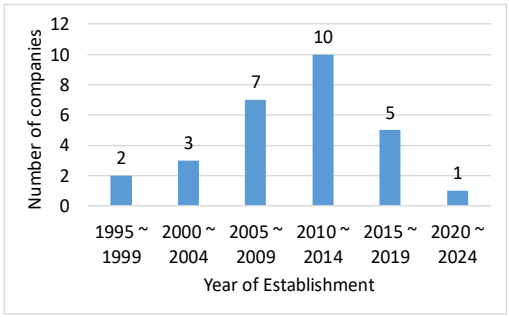
3.3.4.3 Activity of Collection and Transportation Company in KMC

The collection and transportation companies that provide waste collection services in the KMC are listed in Table 3-9. Interviews were conducted with 30 of collection and transportation companies as identified through the hearing with the SWMAN mentioned above. These companies are not limited to KMC, but also operate in other municipalities in the Kathmandu Valley. In the KMC, the majority of the companies are active in Ward, where the private business operators provide waste collection services, as described in 3-3-1. However, some companies indicated that they also operate in the Ward where KMC provides collection services by direct management. As a result, the business areas of the municipality and the private business operators are not clearly divided.

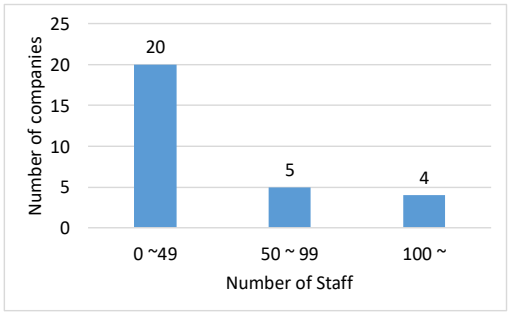
The year of establishment and number of employees for the interviewed 30 companies are shown in Figure 3-12. The establishment of collection and transportation companies providing waste collection services in KMC increased from 2005 to 2014, but thereafter the number of newly established companies decreased. The expansion

of private business operators offering collection services in line with the rise in the number of companies, implying that the area of collection services by direct management of KMC has been reduced. On the other hand, the development of the Kathmandu Valley Waste Management Privatization Plan in 2011 and the establishment of SWMAN in 2016 to coordinate the areas of management work among the companies may have reduced the number of newly established companies.

In addition, most of the companies have less than 50 employees. These companies are not able to secure the land for a transfer station, making it difficult for them to transport their waste efficiently. In addition, as discussed below in 3.3.4.4, waste collection vehicles are parked on riversides and under bridges. And sorting of recyclable materials is conducted on the truck beds, posing sanitary concerns in a public place.



Year of establishment of collection and transportation companies active in KMC



Number of employees of collection and transportation companies active in KMC

Source: JST

Figure 3-12 Year of Establishment and Number of Employees of collection and transportation companies active in KMC

According to interviews conducted with each company, their collection target are household and business waste, which are municipal wastes. Additionally, they also provide road sweeping on major roads as part of their services. Some companies also collect industrial waste from factories and medical waste from medical institutions. The fees are set at about 275 - 550 Rs./month for household waste under a contract, based on the number of household members. For business waste, the fees about 2,150 - 12,200 Rs./month, for industrial waste, about 4,200 - 15,400 Rs./month, and for medical waste, about 4,200 - 21,500 Rs./month. The fees are determined based on the weight or volume of the waste. The estimated waste collection amounts obtained from interviews with each company are shown in Table 3-9. Companies typically provide rough estimates of the waste collection amounts, based on truck capacity and the average number of trips, as they do not use truck scales to weigh their waste collection vehicles.. In addition, it should be noted that this is a rough estimation by the companies, as they do not separately manage the waste collection amounts from KMC and the other municipalities.

Table 3-9 Collection and Transportation Company active in KMC

Company Name	Service Area (Ward No.)	Waste Collection Amount from KMC (tons/day)
1. Action Waste Pvt. Ltd.	10,29, 31	9

Company Name	Service Area (Ward No.)	Waste Collection Amount from KMC (tons/day)
2. Bahuudeshyiya Cleaning Service Pvt. Ltd.	3,4,5,6,12,13,14,15,16,19,20	6
3. Baneshwor Women Environment Sewa Pvt. Ltd.	10,31,32	4
4. Batabaran Samrakshyak Aviyan	No Reply	0
5. Best and Perfect Cleaning Services Pvt. Ltd.	No Reply	16
6. Bhuwaneshwari Meta Investment Pvt. Ltd.	14,15,26	5
7. Bouddha Jorpati Cleaning Aayog Pvt. Ltd.	5,6,8	2
8. Clean Environment Conservation Nepal Pvt. Ltd.	9,19,29	7
9. Clear Cut Sewa Pvt. Ltd.	22	5
10. Creative Sar Safai Pvt. Ltd.	6	43
11. Environmental Conservation Initiative Nepal Pvt. Ltd.	16,26	27
12. Gautam Sarsafai A to Z Home Service Pvt. Ltd.	11	8
13. Green City Sanitation Pvt. Ltd.	16	1
14. Hatteymalo Clean City Pvt. Ltd.	13,14, 15	26
15. Janajagaruk Batabaran Sangrakchan Pvt. Ltd.	9,10,31,32	48
16. Kantipur Sisdole Batabaran Sewa Pvt. Ltd.	13, 14, 15	16
17. Manohara Sewa Pvt. Ltd.	9, 32	14
18. Nepal Batabaran Shrijana Pvt. Ltd.	14	12
19. Nepal Pholbari Sewa Pvt. Ltd.	8,9,10,11,12	14
20. Nepal Pollution Control and Health Society Center	No Reply	2
21. Nepco Sewa Pvt.Ltd.	14,15,23,28,29	4
22. Nepsemac Sewa Pvt. Ltd.	3,4,5,13,14,26	41
23. Pariwartan Sewa Pvt. Ltd.	6,7,8,15,17,18	32
24. Practical Waste Solution Pvt. Ltd.	7,8,9,29,30	26
25. Rajak Scrip Traders and Suppliers	No Reply	3
26. Sirjanship Sewa Pvt. Ltd.	2, 4, 9,12, 13,14,15,24,25,26	6
27. Swachchha Samaj Sudhar Bikash Kendra Pvt. Ltd.	26	8
28. Thamel Mobile Cleaning Service Pvt. Ltd.	26	5
29. Waste Concern Pvt. Ltd.	32	10
30. Woman Environment Group	2,3,10,11	5
Total		405

Source: JST

3.3.4.4 Secondary Transfer by Collection and Transportation Company in KMC

A transfer station owned by NEPCEMAC Sewa Pvt. Ltd., a major collection and transportation company in the Kathmandu Valley, is shown in Figure 3-13. The company has about 340 employees and provide waste collection services in several municipalities in the Kathmandu Valley, including KMC and LMC. As with the Teku transfer station in KMC, the waste is stacked on the ground and loaded into secondary transfer vehicles using heavy equipment. In consideration of the impact of waste scattering and odors on the surrounding environment, all the work is conducted indoors.

Figure 3-13 NEPCEMAC Pvt. Ltd.'s Transfer Station

On the other hand, as shown in Figure 3-14, most of the small-scale companies park their waste collection vehicles on riversides or under bridges, and sort recyclable materials on the truck beds, then transport the waste to the landfill site without transshipping the waste to transfer vehicles. These practices lead to issues of unsanitary work in public places and inefficient waste transportation.

Figure 3-14 Waste Collection by Small Scale Companies

3.4 Intermediate Treatment and Recycling

3.4.1 Sorting Treatment

Intermediate treatment activities in KMC are mainly handled by collection and transportation companies. Upon delivering collected waste to their transfer stations, workers employed by these companies undertake the sorting of recyclables. The categories of recyclables vary slightly among companies, but generally include plastics, PET bottles, cardboard, metals, and glass (such as beer bottles). The sorted recyclables are typically sold to collection companies, with some companies also sorting and recycling food waste at their own composting facilities.

On the other hand, KMC has started sorting recyclables at the Teku transfer station since November 2023. During the transshipment of primary collected waste to secondary transfer vehicles, several workers employed by KMC engage in sorting recyclables. As of December 2023, although PET bottles, plastics, paper, cardboard, and metals are targeted for sorting, the efficiency of this process, in its early stages, appears to be lower compared to the sorting

conducted by collection and transportation companies. As of March 2024, KMC has begun sorting of organic materials alongside the introduction of new composting activity. Figure 3-15 shows organic material separation work at the Teku transfer station.

Figure 3-15 Organic material separation work

3.4.2 Other Intermediate Treatment

A methane gasification facility designed for organic waste has been established at the Teku transfer station with support from the European Union (EU). While test operations are feasible, the facility is not always operational. According to KMC, the reason for not running the facility is that the equipment is broken in the power generation part and could not be repaired. The methane gasification facility is illustrated in Figure 3-16.

Figure 3-16 Methane Gasification Facility in KMC

As mentioned above, it is confirmed that almost no intermediate treatment, apart from sorting, is implemented in KMC. However, recognizing the significance of reducing the final disposal amount, KMC expresses interest in implementing a Waste to Energy plant (hereinafter referred to as "WtE"). In May 2023, KMC formally requested assistance from ADB for the installation of a WtE. According to the result of meeting with ADB held in March 2024, the request from KMC is considered as one among several, and no activity is expected in the near future.

3.4.3 Recycling

3.4.3.1 Municipality

KMC promotes recycling activities at the household level and distributes compost bins to residents. Some households engage in source recycling by installing composting containers on rooftops or in their yards. Figure 3-17 shows an example of household recycling practices.

Figure 3-17 Example of Household Recycling

As of December 2023, KMC employees are sorting recyclables from the collected waste at the Teku transfer station. However, the sorted recyclables are not currently sold; instead, they are stored at the facility. KMC is currently exploring options for recycling the sorted materials. Although a composting facility existed when the Teku transfer station was built, as of December 2023, it was taken out of service and demolished due to complaints about unpleasant odors from neighboring residents. However, as of March 2024, composting activities have resumed at a part of Teku transfer station from the viewpoint of reducing the final disposal amount. The composting facility serves as a pilot implementation of the technology applied at BKM. It is planned to be implemented around Banchare Danda landfill site in the future, but the details have not yet been determined.

3.4.3.2 Private Recycling Company

Recycling in KMC is mainly conducted by private recycling companies. During the interview survey, recycling factories shown in Table 3-10 are confirmed. These factories recycle products such as plastic and metals.

Table 3-10 Summary of Recycling factories (KMC)

Company Name	Pindeshwori Plastic Recycling Company Pvt Ltd	Shree Gadimai Plastic Udyog	Guheswori Rolling Mills Pvt Ltd
Staffs	15	20	50
Recycle Item	PET bottle, Plastic film and bag and other plastic	All plastic items	Metals (copper, brass, bell metal etc)
Product	Recycled plastic pellets	Recycled plastic pellets	Copper and Steel plate
Destination	Local market	Local market	Local market

Source: JST

As an example, NEPCEMAC Pvt. Ltd., a major collection and transportation company, owns a composting facility where organic materials are composted. In addition, Nepal Valley Engineering & Auto Works Pvt. Ltd., a smaller plastics recycling company, manufactures plastic hoses using mainly polyethylene waste plastics. Examples of private sector recycling practices are shown in Figure 3-18.

Figure 3-18 Example of Private Sector Recycling Practices

3.4.3.3 Plastic Recycling Association

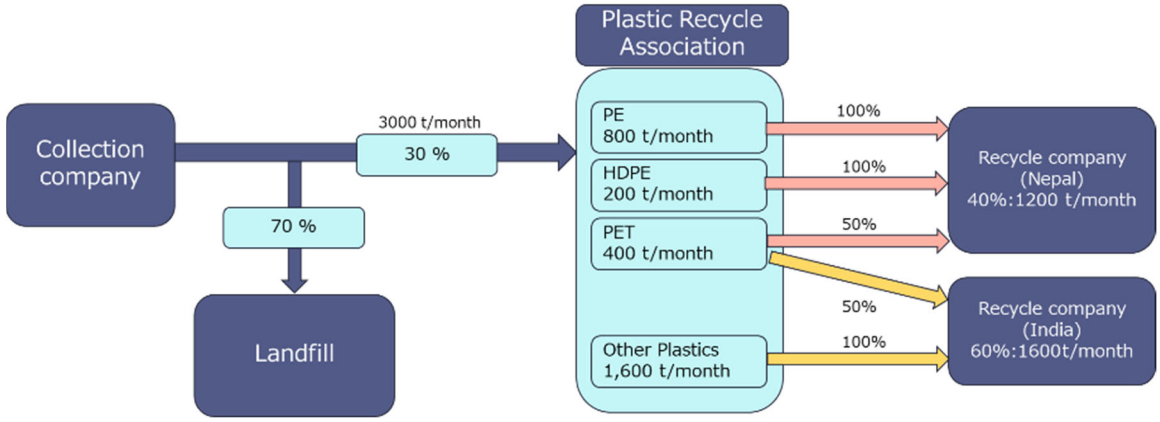
Many private business operators engaged in plastic recycling, including PET bottles, are members of the Plastic Recycling Association. A summary of the Plastic Recycling Association is shown in Table 3-11.

Table 3-11 Summary of Plastics Recycling Association

Item	Description
Number of member companies	124 collection and transportation companies, 26 recycling companies, 150 companies in total
Scope of coverage	Kathmandu Valley
Target materials	Polyethylene (PE), high-density polyethylene (HDPE), PET bottles (PET)

Source: Prepared by JST based on interviews with the Plastic Recycling Association

Based on interview findings, it was confirmed that the daily plastic collection across the Kathmandu Valley amounts to approximately 100 tons. About 40% of the collected plastics are recycled in Nepal, while the remaining 60% are exported to India. The recycling process flow of the Plastics Recycling Association is shown in Figure 3-19. Itis important to note that the association did not provide information regarding resources other than plastics.



Source: Prepared by JST based on the interviews with the Plastic Recycling Association

Figure 3-19 Recycling Flow of the Plastics Recycling Association

3.4.3.4 Distribution of Recyclables by Informal Sector and Recycling Companies

The distribution of recyclables collected by waste pickers and collection workers involved in solid waste management facilities and on the streets of four target cities are confirmed. The survey targeted stakeholder involved in the collection, brokerage and recycling stages of recyclables, divided into five surveys. Figure 3-20 shows conceptual image of survey for recycling and Table 3-12 shows target and number of surveys of recycling.

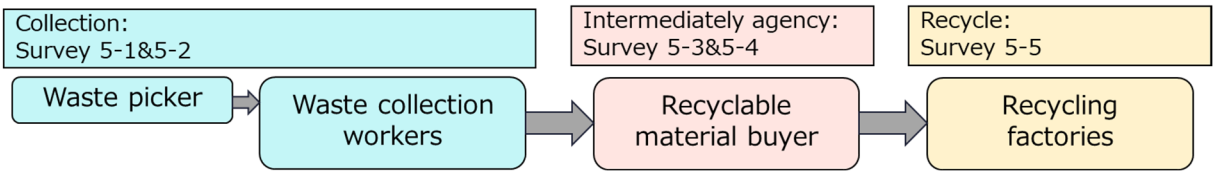


Figure 3-20 Conceptual Image of Survey for Recycling

Table 3-12 Target and Number of Survey of Recycling

Survey	KMC	LMC	BKM	PMC	その他	計
Survey 5-1 Waste picker (person)	5*1	5*1	5*1	5*1 5*2	5*3	40
Survey 5-2 Collection worker (person)	5	5	5	5	-	20
Survey 5-3 Buyer (small)	5	3	2	1	-	10
Survey 5-4 Buyer (Big)	1	2	1	1	-	5
Survey 5-5 Recycling factories	3	-	1	1	-	5

*1: Conducted at transfer station, *2: Conducted at landfill, *3: Conducted at Banchare Danda landfill site

Source: JST

In KMC, it is confirmed through interview surveys that recyclables collected by waste pickers, collection workers at Banchare Danda landfill site, Teku transfer station, and street, household are sold to recycling factories and exporters through buyers. The main recyclables distributed are PET bottle, plastic film and bag, other plastics,

paper, and carton. Additionally, there is a case that electrical products are distributed. No significant differences in selling price for each recyclable are identified within the Kathmandu valley. Table 3-13 shows the selling prices of collected recyclables within KMC.

Table 3-13 Selling prices of collected recyclables (KMC)

Item	Waste pickers		Collection workers	Buyer (small)	Buyer (Big)
	Landfill	Transfer station			
PET bottle (Rp./kg)	15	10	10	Not provided	Not provided
Plastic film and bag (Rp./kg)	12	Not provided	5	Not provided	Not provided
Other plastics (Rp./kg)	13	Not provided	8	Not provided	Not provided
Can (Rp./kg)	25	30	20	Not provided	Not provided
Metals (Rp./kg)	40	100 to 105	35	Not provided	Not provided
Glass bin (Rp./kg)	1.5	1	0.5	Not provided	Not provided
Paper (Rp./kg)	10	10	10 to 12	Not provided	Not provided
Carton (Rp./kg)	9	12	15	Not provided	Not provided

Source: JST

Interview surveys were conducted with five small buyers who has offices and one big buyer who does not have an office. Purchases amount by buyers are shown in Table 3-14.

Table 3-14 Purchases amount by buyers (KMC)

Item	Buyer (small)					Buyer (Big)
Company name	Gudu Traders	Bholanath Group	Briendra Traders	MK Traders	Munna Traders	Suraj Kawadi Collection Center
Number of staffs	4	6	4	22	4	50
Target recyclables	PET bottle, Plastic film and bag and other plastic, paper, carton etc.					Plastic
Amount (t/month)	5	7	4	20 to25	5	200

Source: JST

3.5 Final Disposal

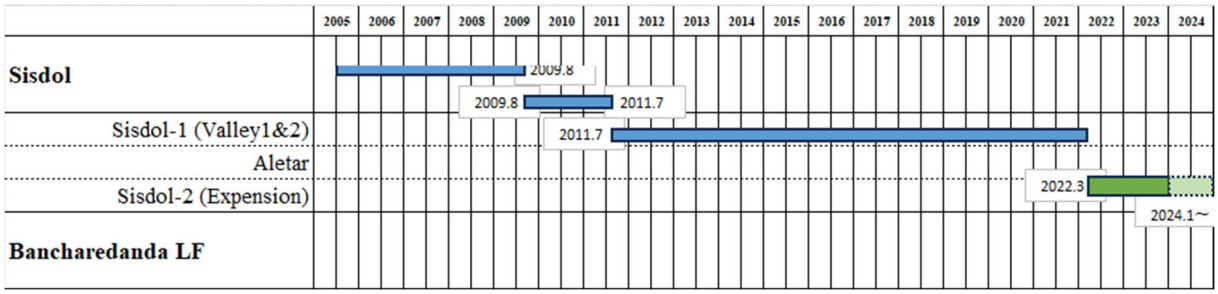
3.5.1 Summary of Final Disposal in Kathmandu Valley

In 2005, the Sisdol old landfill Phase 1 commenced operations as a pilot project within the Study on Solid Waste Management for the Kathmandu Valley (hereinafter referred to as "CKV Study"). Utilizing the semi-aerobic landfill method known as Fukuoka, it was followed by the subsequent operation of the Aletar old landfill adjacent to Sisdol old landfill (this Aletar old landfill had been operated for about two years during the transition from Sisdol Phase 1 to Sisdol Phase 2) and the Sisdol old landfill Phase 2. Due to delays in the initiation of the Banchare Danda landfill site, the Sisdol old landfill exceeded its intended capacity in accommodating waste. Figure 3-21 shows the location of Sisdol old landfill and Aletar old landfill.

Source: JST

Figure 3-21 Location of Sisdol Old Landfill and Aletar Old Landfill

The Banchare Danda landfill site, constructed with funds from the federal government, became operational in March 2022. Currently, 23 municipalities, including 18 in the Kathmandu Valley, mainly KMC, and 5 municipalities around the Kathmandu Valley, are engaged in final disposal activities. Figure 3-22 shows the transition of landfill sites used by municipalities in the Kathmandu Valley.



Source: Prepared by JST based on the data collection survey in CKV Study and interviews with KMC

Figure 3-22 Transition of Landfills in the Kathmandu Valley

3.5.2 Sisdol Old Landfill Site

3.5.2.1 Summary of Facilities

As of December 2023, the top of the landfill has been covered with a final soil cover. Despite it being the dry season, leachate was observed on certain slopes where the final soil cover had not been applied. KMC expressed concerns about potential hazards during the rainy season, anticipating waste collapse, and the environmental pollution caused by leachate runoff. Under these circumstances, the safe closure of the Sisdol old landfill site is urgent. Figure 3-23 shows an overview of the Sisdol old landfill site.

Figure 3-23 Current Situation of Sisdol Old Landfill Site

3.5.2.2 Safety Closure

Table 3-15 outlines the main issues and proposed improvements at the Sisdol old landfill site. The safety closure process would necessitate at least reshaping of the steeply slope to the appropriate slope and the removal of some of the waste in this process. A comprehensive study is essential to determine the extensive works required, taking into account safety measures and associated costs.

Table 3-15 Major Problems and Proposed Improvements at the Sisdol Old Landfill

Problem	Proposed Improvement
Collapse hazard in high, steep waste layers	Change of slope shape and construction of soil cover to ensure structural stability. -> Extensive civil works including disposal of removed waste and safety measures will be required.
Water pollution to rivers and surrounding areas due to leachate	Construction of soil cover and collection and treatment of leachate to control leachate generation. -> Land needs to be secured for a leachate channel or pond, but there is not enough land on site, so this will need to be considered.
Others	Gas vent pipes, rainwater drainage channels, fencing, etc. are considered as possible safety closure measures.

Source: JST

3.5.2.3 Landfill Status

Although the initial operational period for Phase 2 of the Sisdol old landfill site was approximately seven years, it has been in operation for over a decade, surpassing the original plan. Landfilling has also extended onto the closed

Phase 1 area and the leachate pond. As of December 2023, the Phase 1 landfilling area is not conducive to the functioning of the semi-aerobic landfill method.

3.5.3 Banchare Danda Landfill

3.5.3.1 Summary of Facilities

The Banchare Danda landfill site, designed and constructed by the MoUD, is mainly managed by KMC after commencing operations. The landfill is generally operated properly for sanitary landfill purposes, with daily soil cover and leachate management. However, there is room for improvement in systematic operations, such as waste compaction, landfilling plans, and soil cover spreading, though these are not major issues. The condition of the landfill layer in March 2024 indicated the waste is stacked more extensively and higher than in December 2023, giving the impression that the landfill is progressing faster than in December 2023. Therefore, proper landfilling planning (landfilling procedures, compaction, amount of soil cover, etc.) is an effective measure. Table 3-16 and Figure 3-24 show a summary of the facilities at the Banchare Danda landfill site.

Table 3-16 Summary of Facilities at Banchare Danda Landfill Site

Item	Description
Landfill Area	2.7 ha (measured by satellite images)
Remaining Years	Hearing results indicate 4-5 years, but the MoUD is planning to extend life by raising landfill level.
Major Facilities	Liner sheet (not visually confirmed), gas venting pipe, leachate drainage pipe, leachate adjustment pond, leachate circulation facility (piping for circulation), internal roads, administration building, truck scale (out of order), heavy equipment parking lot *Storm water drainage facilities and fences could not be confirmed.

Source: JST

Figure 3-24 Summary of Facilities at the Banchare Danda Landfill Site

The EIA for the construction of the Banchare Danda landfill site was approved in 2009. Conditions as shown below

were stipulated for approval, yet as of December 2023, these conditions remain partially unimplemented, causing issues with surrounding residents.

1). Introduction of source segregation

2). Development of an access road

3). Establishment of a clinic with 15 beds for the local community

4). Development of bio-fuel facilities to supply bio-fuel to the surrounding residents

The landfill site has faced operational interruptions since its commencement in March 2022 due to opposition from nearby residents. In June 2022, waste transportation to the landfill was impeded significantly by residents protests. Environmental measures, such as covering the bed of secondary transfer vehicles with a sheet, soil covering, and chemical spraying at the landfilling area, have been implemented to address concerns of residents living in the vicinity and along the transportation road.

3.5.3.2 Equipment

The Banchare Danda landfill site is equipped with the equipment listed below. These items, excluding a truck scale, are utilized for landfill operation. Table 3-17 shows equipment related to landfill operations and Table 3-18 shows equipment used for purposes other than landfill operations.

Table 3-17 Equipment Used (Landfill Operations)

Item	Bulldozer	Backhoe	Wheel loader
Owner	KMC	KMC	LMC
Number	2	2	1
Situation	Available	Available	Available
Photo			—

Source: JST

Table 3-18 Equipment Used (Other than Landfill Operations)

Item	Truck Scale	Sprinkler truck
Owner	KMC	KMC
Number	1	1
Situation	Unavailable	Available
Photo		

Source: JST

3.5.3.3 Operation Rules

During waste acceptance, the number of incoming vehicles is manually recorded due to the truck scale being out of order and unavailable for use. The driver of each incoming vehicle submits the distributed coupon to staff at the landfill site's entrance, and staff record the information on a designated form. Incoming vehicles are classified into six categories, as shown in Table 3-19. Two types of coupons, blue and green, distinguish vehicles based on whether their size exceeds or is below 8 tons. Figure 3-25 shows the recording status of the incoming vehicles.

Table 3-19 Record Classification of Incoming Vehicles

Number	Type	Remarks
1	Private Vehicle Large (8 tons or more)	-
2	Private Vehicle Small (Less than 8 tons)	-
3	KMC Vehicle	3 types (A.L. Truck, Eciher tipper, TATA tipper)
4	LMC Vehicle	-
5	Other Municipality Vehicle	-
6	Not Including	Forgetting to bring a coupon, etc.

Source: Prepared by JST from records of incoming vehicles to the landfill

Figure 3-25 Record of Incoming Vehicles

Random checks are conducted on the contents of incoming waste, and penalties are levied on individuals who knowingly attempt to dispose of ineligible items.

During landfill operations, a sufficient daily cover is applied at the end of each day's work. Environmental measures, including chemical spraying to prevent odors and insect infestation, are implemented. While there are some issues such as adhering to the landfilling plan and inadequate waste compaction, the Banchare Danda landfill site generally follows sanitary landfill practices. The key points of the operational rules for the Banchare Danda landfill site are outlined in Table 3-20.

Table 3-20 Operational Rules for the Banchare Danda Landfill Site

Item	Description
Commencement of service	March 2022
Municipalities	23 municipalities
Operating entity	KMC

Item	Description
Incoming waste	General waste (industrial and medical wastes are not accepted)
Amount of incoming waste	Approx. 1,600 tons/day
Acceptance Time	5 am－2 pm
Acceptance Fee	Charged to private collection and transportation companies (450 Rs. for over 8 tons, 350 Rs. for less than 8 tons)

Source: Prepared by JST based on interviews with KMC

3.5.3.4 Operation system

The maintenance of the Banchare Danda landfill site is primarily handled by KMC. Apart from one wheel loader procured at LMC's expense, KMC bears all other costs related to equipment, personnel, and operations. Although waste was received from 23 municipalities, in December 2023, waste from BKM has been accepting from February 2024. There is no official agreement clarifying the division of responsibilities among them. Based on interviews with KMC, it is evident that KMC is dissatisfied with the prospect of being the sole operator among municipalities, but acknowledges its inevitability due to the financial constraints of other municipalities.

3.5.3.5 Involvement of the Informal Sector

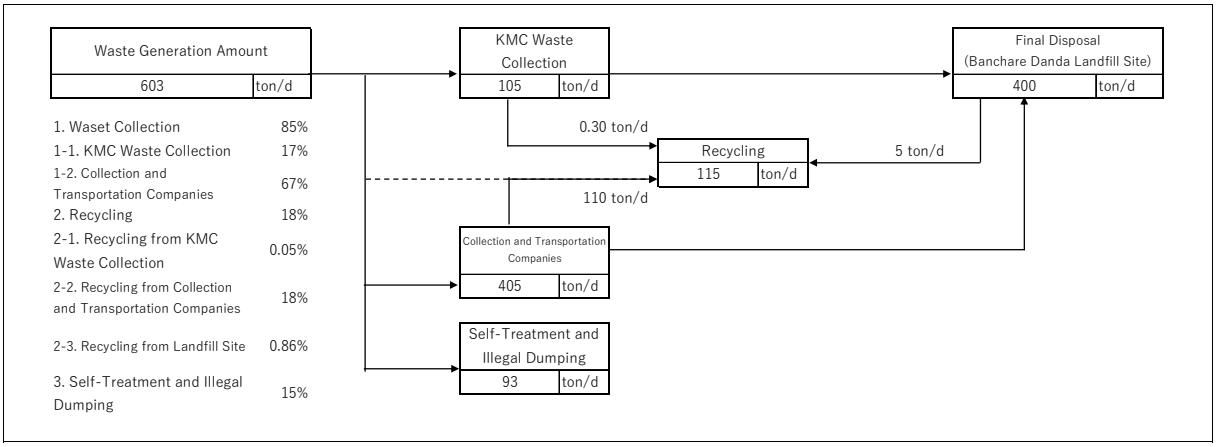
Several informal waste picker groups, totaling more than 100 people, operate in the vicinity of the landfill area. KMC permits the activity of waste pickers as a means to reduce landfill amounts, but currently, there is no registration or other regulatory framework in place.

3.5.3.6 Bank Raising of Landfill Area

The Banchare Danda landfill site has plans for bank raising to extend the landfill's lifespan. The MoUD will design and construct the bank raising. For additional details on the landfill's bank raising plan, the JST has requested relevant documentation from the MoUD multiple times, however, it is not provided. Due to the rapid progress of landfilling mentioned above, early implementation is expected.

3.6 Municipal Waste Material Flow

The waste material flow of KMC is shown in Figure 3-26. Of the municipal waste generated in KMC, about 85% of the waste is collected by KMC and collection and transportation companies, while about 15% of the waste is self-treated and illegally dumped. About 18% of the waste is recycled after collection, and about 66% of the waste is landfilled at the Banchare Danda landfill site. The assumptions made in developing the flows are shown below.



Note: Totals may not match due to fractional rounding
Source: JST

Figure 3-26 Municipal Waste Material Flow in KMC

- Waste Generation: Population (1,231,000 people) * Unit generation rate (0.490kg/person/day) (Referred to as 3.2.1)
- Waste Collection: The total of (a) and (b) below.

  (a). KMC Waste Collection: Estimated based on interviews with KMC and records of incoming vehicles at the Teku transfer station (Referred to as 3.3.3.1)

  (b). Collection and Transportation Company: Estimated based on interviews with the collection and transportation companies in KMC ((Referred to as 3.3.4)
- Self-Treatment and Illegal Dumping: The amount was defined as the generation amount minus the waste collection amount.
- Recycling: The total of (c), (d) and (e) below.

  (c). Recycling from KMC Waste Collection: The values were obtained from interviews with KMC.

  (d). Recycling from Collection and Transportation Companies: The collection rate by collection and transportation companies in the Kathmandu Valley (68%) and the recycling rate by collection and transportation companies (18.4%) as estimated in WB2021 were used as reference values. Based on the fact that the collection rate by collection and transportation companies in KMC was estimated to be 67% in the Survey, the recycling rate by collection and transportation companies in KMC was set at 18.2% (=18.4*67/68).

  (e). Recycling from Landfill Site: Based on interviews with waste pickers active at the Banchare Danda landfill site, the amount of recyclable material collected per waste picker per day was estimated to be 139 kg/person/day. Based on interviews with KMC, the number of waste pickers active at the Banchare Danda landfill site per day was estimated about 150 persons per day. The amount of recyclable material recovered from the Banchare Danda landfill site per day (21 tons/day) was determined by multiplying 139 kg/person/day by 150 persons/day. The ratio of the waste incoming amount from KMC (about 400 tons/day) to the waste incoming amount to the Banchare Danda landfill site (about 1600 tons/day) was

multiplied by the 21 tons/day to arrive the recycling amount from the incoming waste originating from KMC.

- Final Disposal: The amount was defined as the collection amount minus the (c) and (d).

3.7 Equipment Maintenance

The Environmental Management Department within KMC oversees a workshop for the maintenance of collection and transportation vehicles, as well as heavy equipment. This workshop is equipped with tools for inspections and simple repairs, such as spare parts replacement and basic welding work. However, more complex repairs involving engines, electrical systems, and hydraulic systems are outsourced. On a daily basis, five to six collection vehicles and secondary transfer vehicles require inspection and repair due to malfunctions in components like springs, engines, brakes, clutches, and others. Currently, there is no established practice of conducting periodic inspections; instead, breakdowns are addressed on a case-by-case basis.

For vehicles provided by China in 2010, obtaining spare parts is challenging, as direct contact with manufacturers is difficult, and these parts are not available in Nepal. For example, out of the 50 small dump trucks (Changun) provided by China, 30 are still operational, while 20 are used to source spare parts, with many of their bodies left on the grounds of the Teku transfer station.

Vehicle maintenance space

Spare parts storage

Figure 3-27 Vehicle Maintenance Workshop in KMC

3.8 Public Awareness

3.8.1 Initiatives by Municipality

The Community Mobilization Branch at KMC is responsible for public awareness initiatives, including providing environmental education in schools, conducting home composting training during community meetings, and installing and maintaining waste bins in public facilities such as parks. KMC is focusing on waste reduction at the source, procuring over 10,000 home composting bins for distribution within the community. Households are encouraged to compost organic waste and utilize it for vegetation on rooftops or in their yards.

3.8.2 Interview Survey on Households and Businesses

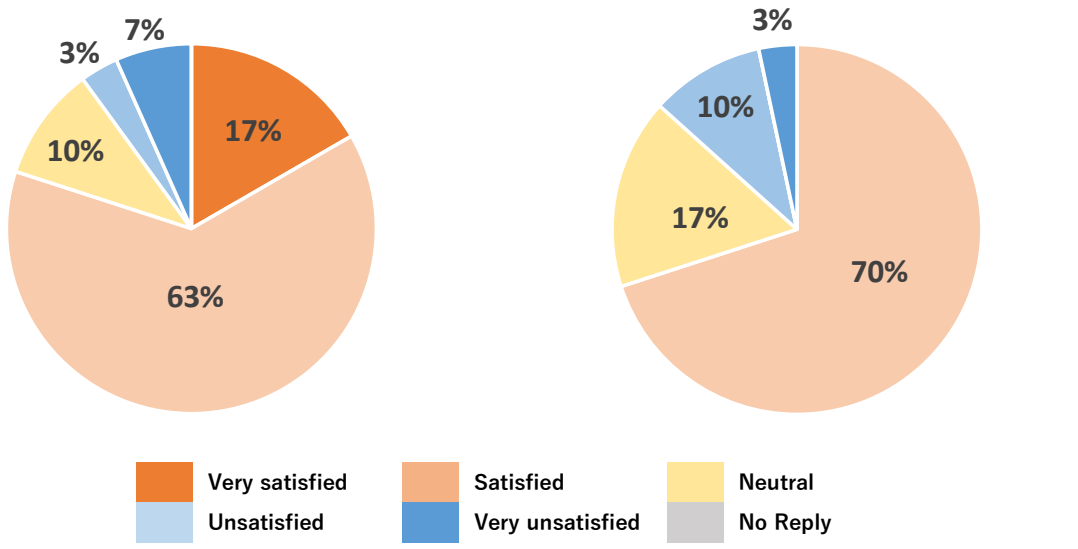
In the Survey, interviews were conducted with households and businesses to confirm the rate of satisfaction with waste collection services and their requests to the government and collection and transportation company. A summary of the survey is shown in Table 3-21.

Table 3-21 Outline of Interview Survey on Households and Businesses

Survey Period	From December 2023 to January 2024		
Survey Target	KMC	Areas where KMC provide waste collection services by direct management	Households: 15 Businesses: 15
		Areas where collection and transportation companies provide waste collection services	Households: 15 Businesses: 15
	LMC	Areas where LMC provide waste collection services by direct management	Households: 15 Businesses: 15
		Areas where collection and transportation companies provide waste collection services	Households: 15 Businesses: 15
	BKM	Areas where BKM provide waste collection services by direct management	Households: 15 Businesses: 15
	PMC	Areas where collection and transportation companies ,which are contracted out by PMC, provide waste collection services	Households: 15 Businesses: 15
Survey Method	Interview		

Source: JST

The results of the satisfaction survey in KMC are shown in Figure 3-28. The percentage of respondents who were satisfied with the collection service was 80% in areas where KMC provides collection service by direct management, and 70% in areas where collection and transportation company provide collection service. It indicates that households and businesses are highly satisfied with the collection service. The main reason for the high level of satisfaction was that the collection is conducted according to the schedule, which is the same for both the service by direct management of KMC and the service by collection and transportation companies. Another reason mentioned for satisfaction with the service by direct management of KMC was that there was no fee charged for this service. KMC does not collect fees from the areas where KMC provide waste collection services by direct management, and overall waste management by KMC is funded from the municipality's general fund.



Service by Direct Management of KMC　　Service by Collection and Transportation Companies

Source: JST

Figure 3-28 Satisfaction Rate on Waste Collection Service in KMC

As for requests to municipality and collection and transportation company, it was confirmed that "introduction of separation collection and promotion of recycling" was a common request for both the service by direct management of KMC and the service by collection and transportation companies (Table 3-22).

The main reasons mentioned were reduction of final disposal amount and effective utilization of recyclable materials. This indicates the high level of interest in waste management and the predisposition to introduce separation collection.

Table 3-22 Requests to Municipality and Collection and Transportation Companies in KMC

Main reasons	Service by Direct Management of KMC	Service by Collection and Transportation Companies
Introducing source separation and promoting recycling	25/30 (83%)	17/30 (57%)
PR for raising public awareness	3/30 (10%)	1/30 (3%)
Changing waste collection operation	2/30 (7%)	2/30 (7%)
No Reply	0/30 (0%)	10/30 (33%)

Source: JST

3.9 Municipal Waste Management System

3.9.1 Ordinances/Local Act

KMC has enacted the KMC Environment and Natural Resources Protection Act 2077 (A.D. 2020) as a local act pertaining to solid waste management. This ordinance also covers environmental protection, biodiversity conservation, and the preservation of forest and green spaces.

The Act outlines waste management responsibilities, waste prevention measures, waste segregation requirements, licensing procedures for waste management operations, and the involvement of private business operators and communities. Moreover, the Act allows generators of hazardous, industrial, and medical waste to request municipal management of residues after proper treatment, with potential fees involved. KMC can collect waste management fees based on factors such as quantity, weight, nature, and other stipulations.

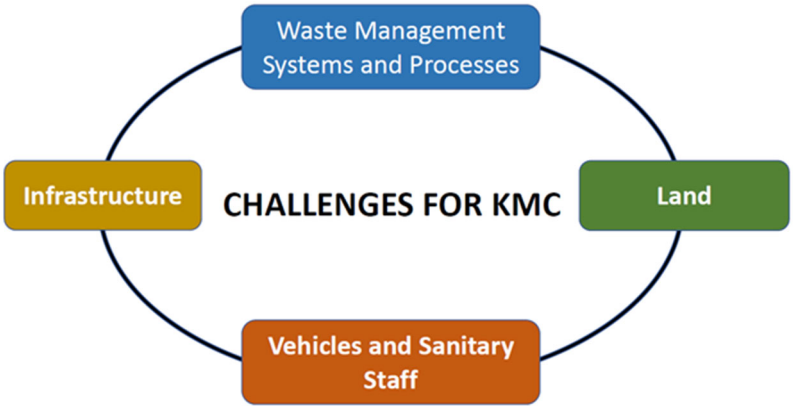
The Act mandates waste generation reduction for individuals, organizations, and institutions, with the municipality responsible for promoting waste reduction, reuse, and recycling. Source separation is considered an obligation of the municipality.

The ordinance prohibits engaging in business related to waste management without obtaining a permit from KMC.

3.9.2 Policy and Plan

KMC lacks a formal policy and plan for waste management. KMC acknowledges that the suspended privatization plan for waste management in the Kathmandu Valley, coupled with the lack of coordination with collection and transportation companies, poses challenges to the formulation of a new policy and plan.

Despite this, the Mayor's advisor for waste management has drafted a concept paper addressing waste management in KMC. The proposal identifies challenges in waste management for KMC, as depicted in Figure 3-29. The draft emphasizes a shift to separate collection, transitioning from door-to-door collection to a system focused on separate collection. It also addresses the procurement of waste collection vehicles and the development of intermediate treatment facilities.



Source: KMC's draft concept paper on waste management.

Figure 3-29 Waste Management Challenges in KMC

3.9.3 Financial System

KMC does not collect waste management fees directly from residents, even though it provides waste collection service in some areas. KMC does not set a tariff, and collection and transportation companies independently collect fees from households based on their contractual arrangements. On the other hand, at the Banchare Danda landfill site, collection and transportation companies are charged tipping fees according to the tariff set by KMC. The initial plan and the actual revenue for FY2020 and FY2021/22 in KMC are shown in Table 3-23. The actual revenue for

FY2020/202 significantly fell below the initial revenue plan, due to the impact of Covid-19. On the other hand, for FY2021/2022, the actual revenue exceeded the original revenue plan.

Table 3-23 Revenue in KMC

Unit: Rs.

Item	FY2020/21		FY2021/22	
	Initial Plan	Actual Result	Initial Plan	Actual Result
Budget from the Federal Government	1,979,182,790	2,096,667,519	2,445,464,000	2,443,558,000
Budget from State Government	440,235,000	71,696,000	147,577,000	147,577,000
Tax*1	2,621,710,210	2,277,084,485	2,582,535,000	3,861,494,362
KMC's Own Revenue	9,266,500,000	12,120,858,734	11,333,200,000	14,815,874,603
Donation*2	15,000,000	2,877,529	10,000,000	-
Total Amount	14,322,628,000	16,569,184,267	16,518,776,000	21,268,503,965

Source: Based on KMC's Budget Book 2020/21, 2021/22
Note: *1 Land registration fees, VAT, vehicle tax, entertainment tax, advertising tax, etc. *2Land and housing rental fees, parking fees, administrative service fees, various application fees, tourism-related fees, fines, bank interest, etc.

Table 3-24 shows budget amount and settled amounts for FY 2020/21 and FY 2021/22. In both fiscal years, the execution rate of the investment budget is low, indicating a deviation from the planned budget execution. The investment budget includes budgets for building construction and renovation, land development, water supply and road maintenance, as well as environmental protection and sanitation. However, there is no budget line item designated specifically for waste management.

Table 3-24 Budget in KMC

Unit: Rs.

Item	FY2020/21			FY2021/22		
	Budget Amount	Actual Expenditure	Execution Rate	Budget Amount	Actual Expenditure	Execution Rate
Operating Budget	5,425,301,000	3,521,630,472	65%	6,502,090,000	4,285,834,146	66%
Investment Budget	9,725,085,000	2,079,344,357	21%	9,656,834,000	2,843,091,210	29%
Loans, etc.	371,128,000	85,000,000	23%	357,946,000	180,000,000	50%
Total Amount	15,521,514,000	5,685,974,829	37%	16,516,870,000	7,308,925,356	44%

Source: based on KMC's Budget Book 2020/21, 2021/22

Despite detailed information being available in KMC's Budget Book, the data is not organized by department, making it challenging to extract information specifically related to waste management. The Environmental Management Department also encountered difficulties accessing its own budget and had to ask the Finance Department to extract the budget information related to waste management. This suggests that budget and cost management related to waste management might not be properly implemented.

Chapter 4 Waste Management in Lalitpur Metropolitan City

4.1 Outline of Lalitpur Metropolitan City

4.1.1 Population

The population of LMC based on the census data from 2011 and 2021, along with the official estimation in 2011 by the CBS are shown in Table 4-1. The CBS estimation adjusts the population based on the current municipal boundaries. The population in LMC is increasing at an average annual change rate of 0.32% from 2011 to 2021. However, the growth trend is comparatively slower than that observed in Lalitpur District. This suggests that, while the overall population in the metropolitan area surrounding LMC is increasing, the growth is more notable in the municipalities surrounding LMC, which are considered satellite areas, as opposed to within LMC itself. Lalitpur Metropolitan City is one of the target areas for the Survey.

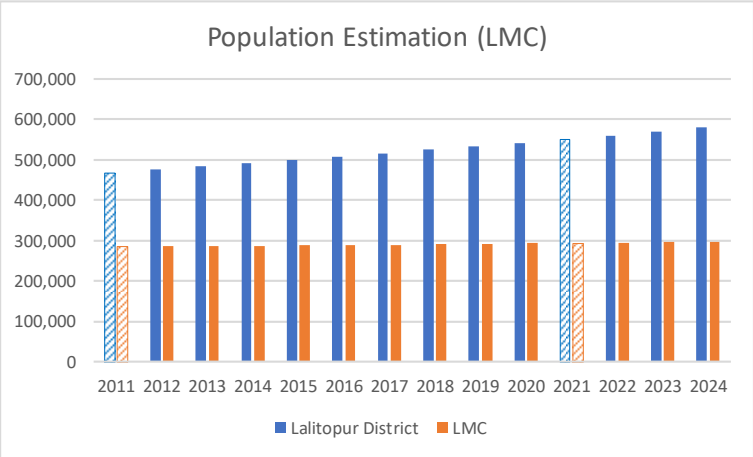
In interviews conducted by JST, LMC estimates the population of LMC in 2024 to be about 285,000 and there would be a floating population of about 60,000 such as tourists, thus a total is assessed as of about 346,000. Although the residential population estimated by LMC is slightly down from the residential population estimated by the 2021 census of about 294,000, it is not a large difference, and is a reasonable estimate considering the possibility of population shifts to satellite areas and other factors.

Since the floating population is an important factor contributing to the municipal waste generation amount, the estimation of municipal waste generation amount in LMC in the Survey report is calculated based on the population (about 346,000 people) taking the floating population into account and with the amount multiplying the unit generation described later in this report.

Table 4-1 Basic Information of LMC

Administrative Classification	Census 2011*1	Estimation by CBS 2011*2	Census 2021*3	Average Annual Population Change Rate*4	Area
Lalitpur District	468,132	-	551,667	1.66%	Approx. 397 km^2
LMC	226,728	284,922	294,098	0.32%	Approx. 36 km^2

Sources: *1: National Population and Housing Census 2011 (CBS), *2: Population of 753 Local Units (CBS), *3: National Population and Housing Census Provincial Report 2021 (CBS), *4: Average annual population change rate over a 10-year period when comparing Estimation by CBS 2011 and Census 2021.

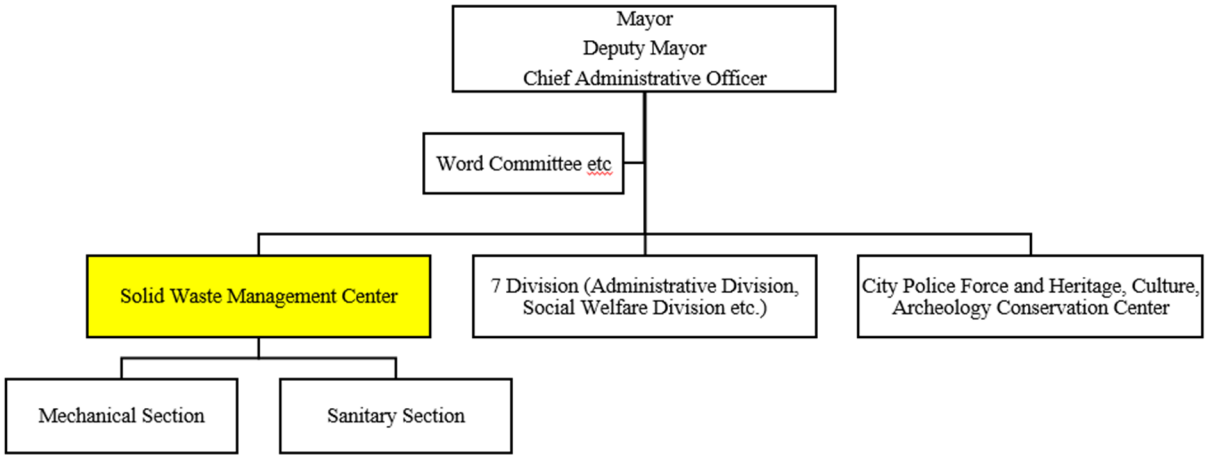


Source: JST (2011 and 2021 (gray): Population from Census; 2012-2020 and after 2022: Estimation by JST)
Note: 2011 and 2021 (hatched) are CBS estimates and census populations. 2012-2020 and 2022 onwards are JST estimates.

Figure 4-1 Estimation of Population in LMC

4.1.2 Organizational Structure

The organizational structure of LMC is shown in Figure 4-2. The Solid Waste Management Center, responsible for waste management, comprises a total of 183 employees, as shown in Table 4-2.



Source: LMC

Figure 4-2 Organizational Structure of LMC and Departments in Charge of Waste Management

Table 4-2 Number of Staff in the Solid Waste Management Center

Employment Position or Rank	Number of People
Center Director	1
Center Chief	1
Assistant	1
Chief Driver	1
Driver	25
Mechanic	2
Assistant Mechanic	5
Technical Assistant	6
Site Foreman	5
Road Sweeper / Planting Operator	136
Total Amount	183

Source: LMC

4.2 Municipal Waste Generation Amount and Waste Composition

4.2.1 Waste Generation Amount

The results of waste amount surveys conducted in LMC are shown in Table 4-3. According to the ADB survey in 2013, the unit generation rate of municipal waste in LMC was estimated at 0.372 kg/person/day. On the other hand, WB2021 estimated the unit generation rate of municipal waste in LMC to be 0.418 kg/person/day. This Survey estimates the municipal waste generation amount in LMC with reference to the most recent survey (WB2021). On the other hand, LMC estimates the waste generation amount by themselves for the purpose of the waste management plan formulation, etc. The waste generation amount is set at 139 tons/day by multiplying the unit of generation at 0.40 kg/person/day and the estimated population by the LMC. Based on the fact that the unit generation rate set by LMC is reasonable in comparison with the results of other surveys conducted in the past, the amount of municipal waste generation in LMC is used in the Survey applies the estimation made by LMC (139 tons/day).

Table 4-3 Unit Generation Rate of Municipal Waste in LMC

Item	ADB2013*1	WB2021*2 (REI-CLDP/BRBIP-AF 2021)	LMC(2024)
Unit generation rate of municipal waste	0.372kg/person/day	0.418kg/person/day	0.40kg/person/day

Source：*1Solid Waste Management in Nepal Current Status and Policy Recommendations (ADB, 2013), *2REI-CLDP/BRBIP-AF, 2021 REI-CLDP/BRBIP-AF, 2021

4.2.2 Waste Composition

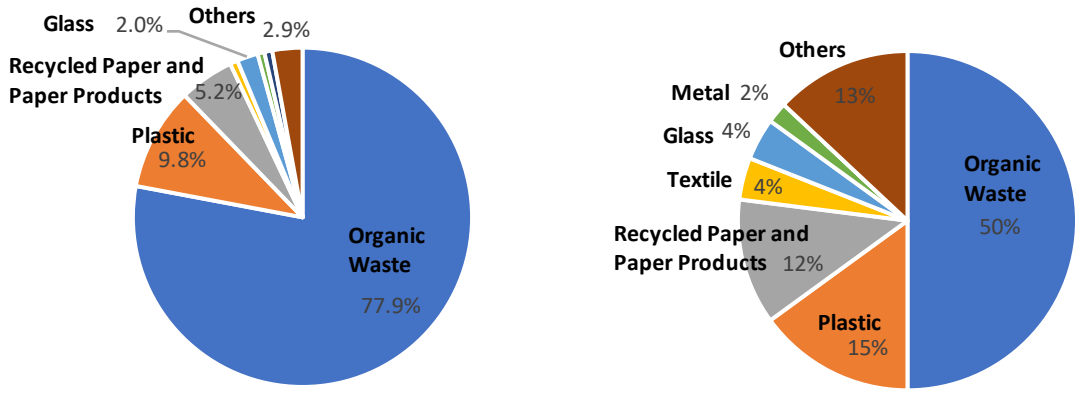
In LMC, a household waste composition survey was conducted by ADB in 2013, and another survey at the transfer station ("LMC2022") was conducted by LMC (Table 4-4 and Figure 4-3). Organic waste accounts for approximately 78% of the composition of LMC's household waste, while organic waste accounts for about 52% (in 2020) of KMC's household waste (see 3-2-2). Although there is a difference of about 7 years between the two surveys, it can be said that the percentage of organic waste contained in LMC's household garbage is high. The composition of household waste reveals that organic waste accounts for about 78%, a higher ratio compared to KMC. However, at the transfer station, the proportion of plastics and used paper and paper products is higher due to the inclusion of business waste, resulting in only 50% organic waste.

Table 4-4 Waste Composition in LMC

Waste Type	Survey Results (by Weight)	
	ADB 2013*1 (Household Waste)	LMC 2022*2 (Municipal Waste)
Organic Waste	77.94%	50%
Plastic	9.81%	15%
Recycled Paper and Paper Products	5.23%	12%
Textile	0.74%	4%
Glass	1.99%	4%

Metal	0.66%	2%
Rubber	0.75%	N/A
Other	2.86%	13%

Sources: *1: Current status of solid waste management in Nepal and policy recommendations (ADB, 2013); *2: LMC2022 (undisclosed)



ADB2013*1(Household Waste) LMC2022*2(Municipal Waste)

Sources: *1: Current status of solid waste management in Nepal and policy recommendations (ADB, 2013); *2: LMC2022 (undisclosed)

Figure 4-3 Waste Composition in LMC

4.3 Collection and Transportation and Secondary Transfer of Municipal Waste

4.3.1 Overview of Collection and Transportation in LMC

An overview of waste collection and transportation in LMC is shown in Table 4-5. Similar to KMC, waste collection services in LMC are offered by both LMC itself and collection and transportation companies. The waste collection by collection and transportation companies is not performed under a contract or license granted by LMC. These companies provide their services under individual contracts with residents and businesses. The estimated waste collection amount in LMC is about 116 tons/day, with a collection rate of about 84% of the generation amount. As for the area coverage of collection services, directly managed collection, provided regular collection services to the entire service target area (the urbanized area in the center of the municipality), which will be discussed later. On the other hand, collection and transportation company services do not provide sufficiently frequent collection services to slums and rural areas with small population densities where fees cannot be collected.

Table 4-5 Overview of Collection and Transportation in LMC

Item	Direct Management	Private	Total Amount
Generation Amount	N/A	N/A	Approx. 139 tons/day
Ward to be Serviced	10	19 (some directly managed mixed)	29
Waste Collection Amount	Approx. 52 tons/day	Approx. 64 tons/day	Approx. 116 tons/day
Collection Rate	N/A	N/A	Approx. 84%

Source: JST

LMC provides direct management services to the entire area in ten wards out of 29 wards (No.6-No.9, No.11- 12,

No.16- 17, No.19-21), located in the municipality center, and to specific target areas in seven wards (No.5, No.10, No.13~1, No.18, No.22-24, and No.26-29). The remaining twelve wards are served by collection and transportation companies. However, some operators indicated that they also operate in the wards where LMC provides full service in the central municipality. Areas served by LMC's collection services are shown in Figure 4-4.

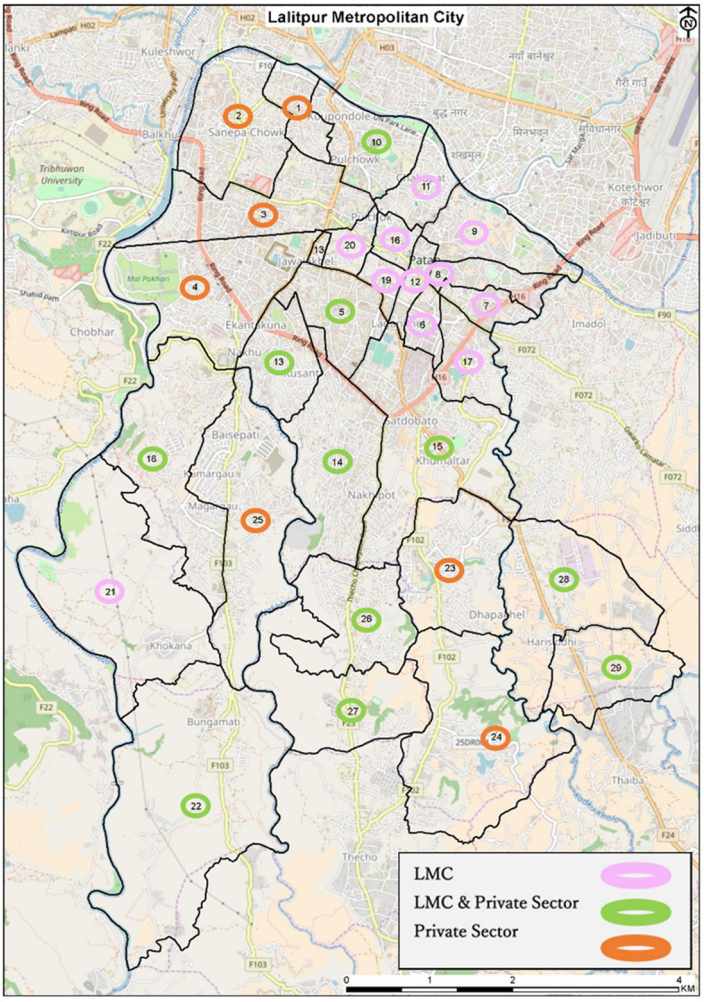


Figure 4-4 Waste Collection Service Area in LMC

4.3.2 Collection and Transportation by LMC (Direct Management)

4.3.2.1 Implementation Structure

The waste collection and transportation personnel of LMC include 25 drivers, 36 collection workers, and approximately 100 road sweepers. The department chiefs and assistant chiefs are overseeing the operation of waste collection and transportation.

The collection and transportation vehicles owned by the LMC are shown in Table 4-6.

Table 4-6 Collection and Transportation Equipment in LMC

Equipment Name	Capacity	Number of Vehicles
Dump Truck	3m3	15
Tractor	2.3m3	1
Compactor	5m3	2
Container Carrier	3m3	1
Road Sweeper	-	2

Source: LMC

4.3.2.2 Collection Method

LMC's waste collection targets include household waste, commercial waste, and road sweeping waste. It has also contracts with some public and private hospitals for the collection of medical waste. Collection and transportation activities commence as early as 5:00 a.m. to avoid traffic congestion, with most collection work completed before the commuter rush (9:00-10:00 a.m.). Dump trucks and tractors are utilized for collecting and transporting household waste using the bell collection method, similar to KMC. Separate collection is not conducted, and there are no specified containers for discharge. Container collection and fixed-point collection are not practiced for household waste, as they lead to complaints from residents. Collection services are provided three days per week.

Waste collection begins early in the morning.

Residents load waste directly onto trucks.

Figure 4-5 Collection and Transportation of Household Waste in LMC

Business waste and road sweeping waste are collected concurrently with the bell collection of household waste, following a methodology similar to KMC. Additionally, fixed-point collection is employed in commercial areas within the municipality center. However, due to the absence of containers for discharge, the waste becomes scattered and unsanitary. Loading work is carried out manually, which poses issues in both hygiene and efficiency. LMC performs daily waste collection from these fixed points.

Primary waste collection is being done by using rickshaws.

Manual loading of waste is being done.

Figure 4-6 Collection and Transportation of Commercial Waste in LMC

4.3.2.3 Role of Ward's Office in Waste Collection and Transportation

In LMC, similar to KMC, ward-based waste collection service is provided. For example, in Ward 12, waste collection is carried-out using three-wheeled motorcycles because many alleys have narrow roads, preventing the LMC's dump trucks from entering. Waste separation occurs on designated days of the week, as outlined in Table 4 7. Organic waste is collected twice a week, plastic bottles once a week, and all other types of waste once a week. Plastic bottles and plastics are sold to recycling buyers. However, there is room for improvement, as organic waste is brought to the Kalibot transfer station and then transported to the Banchare Danda landfill site without being utilized.

Table 4-7 Separation and Collection in Ward 12 in LMC

Day of the Week	Time	Waste to be Discharged
Sunday	6:00-9:00	Organic Waste
Tuesday	6:00-9:00	Plastic Bottle
Wednesday	6:00-9:00	Organic Waste
Thursday	6:00-9:00	Separate and Discharge Waste Other than the Above (Diapers, Sanitary Napkins, Metal/Wire/Electronics, Selected Branches, and Paper).

Source: LMC

Figure 4-7 Separation and Collection in Ward 12 in LMC

4.3.3 Secondary Transfer by LMC (Direct Management)

4.3.3.1 Waste Collection and Secondary Transfer Amount

LMC has allocated a portion of land for the LMC Environmental Division office and a parking lot for collection and transportation vehicles, serving as a transfer station (Kalibot transfer station). This station receives waste collected by LMC and the Ward. Based on information obtained from interviews with the LMC on the capacity, number of collection and transportation vehicles, and average number of trips, a rough estimation of the waste collection amount, is about 52 tons/day. At the transfer station, informal waste pickers extract plastics, cardboard, and other valuable materials.

4.3.3.2 Secondary Transfer Equipment

Secondary transfer vehicles owned by LMC are shown in Table 4-8.

Table 4-8 Secondary Transfer Equipment in LMC

Equipment Name	Capacity	Number of Vehicles
Dump Truck	10m3	9

Source: LMC

4.3.3.3 Implementation Method for Secondary Transfer

The loading method for secondary transfer vehicles is the same as in KMC, using heavy equipment to transship waste that has been stacked inside the facility. To prevent the scattering of waste during transportation, the truck bed of the secondary transfer vehicle is covered with a sheet.

Transshipment of waste to secondary transfer vehicles using wheel loaders.

Pulling out of valuable materials by informal waste pickers

Figure 4-8 A View of the Kalibot Transfer Station in LMC

4.3.4 Collection and Transportation and Secondary Transfer by Private Business Operators

4.3.4.1 Management System for Private Business Operators

Similar to KMC, LMC does not manage private business operators through a licensing system. Private business

operators provide services under individual contracts with residents.

4.3.4.2 Activity of Collection and Transportation Company in LMC

Collection and transportation companies in LMC are listed in Table 4-9. Interviews were conducted with six companies identified through interviews with SWMAN. Some of these companies provide services not only to LMC, but also to KMC and other municipalities in the Kathmandu Valley. In addition, within the LMC area, the companies are active not only in Ward where the private sector is supposed to provide waste collection services as described in 4-3-1, but also in Ward where the LMC provides collection service by direct management. There is no clear division of work areas between the LMC and the collection and transportation companies. According to interviews with companies, the types of waste collected are mainly household and business waste, and they also provide road sweeping on major roads as part of their services. Some of the companies also collect industrial waste from factories and medical waste from medical institutions. The fee per household is set at about 250 to 400 Rs./month under a contract based on the number of household members, while they collect based on the weight or volume of the waste for business, industrial and medical. In many cases, rates for household waste are calculated based on a basic fee and an additional fee based on the number of household members. Some companies set different rates for the basic fee depending on the region, such as central city, semi-central city, and suburban areas. The estimated waste collection amounts obtained from interviews with each company are shown in Table 4-9. Since the companies do not use truck scale to weigh their waste collection vehicles, therefore they responded with a rough estimate of the waste collection amount based on truck capacity and average number of trips. In addition, it should be noted that this is a rough estimate by the companies, as they do not manage separately the waste collection amounts from LMC and the other municipalities.

Table 4-9 Collection and Transportation Companies in LMC

Company Name	Service Area (Ward No.)	Waste Collection Amount from LMC (tons/day)
1. Bahuudeshyiya Cleaning Service Pvt. Ltd.	3, 5, 14, 15, 19, 20	9
2. Bhuwaneshwari Meta Investment Pvt. Ltd.	14	6
3. Nepco Sewa Pvt.Ltd.	2,3,4,5,13,14,18,19,20,21,22, 25	6
4. Nepsemac Sewa Pvt. Ltd.	9,14,15, 28,29	28
5. Sirjanship Sewa Pvt. Ltd.	5,7,9,14,15,17,23,24, 26	11
Total Amount		64

Source: JST

4.3.4.3 Secondary Transfer by Collection and Transportation Company in LMC

Figure 4-9 illustrates a transfer station owned by Srinjanship Sewa Pvt. Ltd., which provides waste collection services in LMC. To mitigate the impact of waste scattering and odors on the surrounding environment, all the work is conducted indoors.

Figure 4-9 Srinjanship Sewa Pvt. Ltd.'s Transfer Station

4.4 Intermediate Treatment and Recycling

4.4.1 Sorting Treatment

Intermediate processing in LMC is similar to that in KMC, mainly carried out by collection and transportation companies. After collecting waste and transporting it to their transfer station, workers hired by these companies sort the recyclables. While the types of recyclables may vary slightly between companies, they mainly include plastics, PET bottles, cardboard, metals, and glass (beer bottles, etc.). The sorted recyclables are sold to collection companies, with some exceptions. Some of the collection and transportation companies interviewed by JST sort and recycle food waste at their own composting facilities.

In LMC, several waste pickers from the informal sector sort resources at the Kalibot transfer station, mainly PET bottles, plastics, paper, cardboard, and metals. LMC is not aware of the final destination for these sorted materials. Figure 4-10 shows an overview of sorting operations at the transfer station.

Figure 4-10 Sorting Activity in Kalibot Transfer Station

4.4.2 Other Intermediate Treatment

Intermediate treatment in LMC is limited such as sorting of recyclable materials by waste pickers at transfer station.

4.4.3 Recycling

4.4.3.1 Municipality

Similar to KMC, LMC promotes household composting, having distributed approximately 8,300 compost bins through the Rooftop Compost program. In addition, as mentioned earlier, LMC collects valuable materials at its relay facilities.

4.4.3.2 Private Recycling Company

Recycling activities in LMC are mainly carried out by private recycling companies. One of the transfer stations owned by NEPCEMAC Pvt. Ltd. sorts plastics, PET bottles, cardboard, metals, and glass, which are then sold to buyers. Organic waste is also sorted, and the company produces compost at its own composting facility or sells it to pig farms. Figure 4-11 shows the status of material sorting by the private collection and transportation company.

Figure 4-11 Recyclable Sorting by NEPCEMAC Pvt. Ltd.

Similarly, Shirjanship Sewa Pvt. Ltd. sorts its resources at its transfer station and sells them to buyers. The company owns a composting facility on their land, but, as of December 2023, the facility is not in operation due to opposition from the surrounding community. Figure 4-12 shows the status of material sorting by the company and their composting facility.

Figure 4-12 Recyclable Sorting and Composting Facility by Shirjanship Sewa Pvt. Ltd.

4.4.3.3 Distribution of Recyclables by Informal Sector and Recycling Companies

In LMC, it is confirmed through interview surveys that recyclables collected by waste pickers, collection workers at Banchare Danda landfill site, transfer station, street, and household are sold to recycling factories and exporters through buyers. Main recyclables distributed are PET bottle, plastic film and bag, other plastics, paper, and carton. Additionally, there is a case that electrical products are distributed. No significant differences in selling price for each recyclable are identified within the Kathmandu valley. Table 3-13 Selling prices of collected recyclables (KMC)Table 4-10 shows the selling prices of collected recyclables within KMC.

Table 4-10 Selling prices of collected recyclables (LMC)

Item	Waste pickers		Collection workers	Buyer (small)	Buyer (Big)
	Landfill	Transfer station			
PET bottle (Rp./kg)	15	10	10	Not provided	17
Plastic film and bag (Rp./kg)	12	10	5	Not provided	Not provided
Other plastics (Rp./kg)	13	12	8	Not provided	Not provided
Can (Rp./kg)	25	Not provided	20	Not provided	35
Metals (Rp./kg)	40	Not provided	35	Not provided	44
Glass bin (Rp./kg)	1.5	Not provided	0.5	Not provided	Not provided
Paper (Rp./kg)	10	10	10 to 12	Not provided	18
Carton (Rp./kg)	9	12	15	Not provided	15

Source: JST

The interview surveys are conducted with three small buyers who has offices and two big buyers who does not have an office. Purchases amount by buyers are shown in Table 4-11.

Table 4-11 Purchases amount by buyers (LMC)

Item	Buyer (small)			Buyer(Big)	
Company Name	Bajrayang Traders	Satya Traders	Om Sai Ram Traders	Aarav and Arnab Traders Pvt. Ltd.	S.P Scrap Collection and Suppliers
Number of Staffs	11	3	10	15	10
Target Recyclables	PET bottle, Plastic film and bag and other plastic, paper, carton etc.		Carton	PET bottle, steel	PET bottle, Plastic film and bag and other plastic, paper, carton etc.
Amount (tons/month)	8 to 9	Not provided	90	29	4

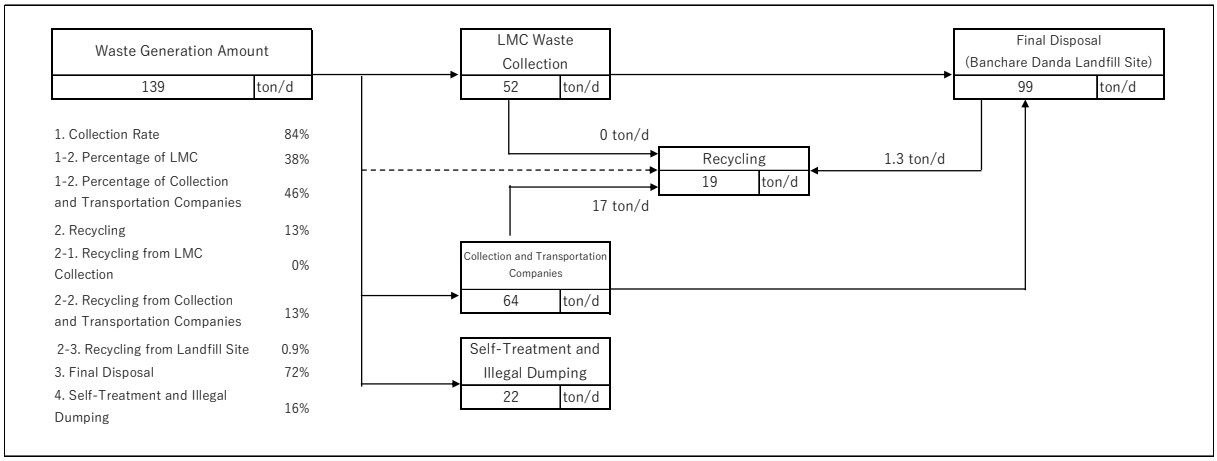
Source: JST

4.5 Final Disposal

The final disposal for LMC is carried out at the Banchare Danda landfill site. Regarding the operation of the Banchare Danda landfill site, LMC provided one wheel loader and has no additional cost burdens. Details of the Banchare Danda landfill site are shown in Section 3.5.3.

4.6 Municipal Waste Material Flow

The waste material flow of LMC is shown in Figure 4-13. About 84% of the waste among the municipal waste generated in LMC is collected by LMC and collection and transportation companies, while about 16% of the waste is self-treated and illegally dumped. About 13% of the waste is recycled after collection, and about 72% of the waste is landfilled at the Banchare Danda landfill site. Assumptions made in developing the flows are shown below.



Note: Totals may not match due to fractional rounding
Source: JST

Figure 4-13 Municipal Waste Material Flow in LMC

- Waste Generation: Population (346,000.people) * Unit generation rate (0.40kg/person/day) (Referred to as 4.2.1)
- Waste Collection: The total of (a) and (b) below.

  (a). LMC Waste Collection: Estimated based on interviews with LMC (Referred to as 4.3.3)

  (b). Collection and Transportation Company: Estimated based on interviews with the collection and transportation companies in LMC ((Referred to as 4.3.4)
- Self-Treatment and Illegal Dumping: The amount was defined as the generation amount minus the waste collection amount.
- Recycling: The total of (c), (d) and (e) below.

  (c). Recycling from LMC Waste Collection: The values were obtained from interviews with LMC.

  (d). Recycling from Collection and Transportation Companies: The collection rate by collection and transportation companies in the Kathmandu Valley (68%) and the recycling rate by collection and transportation companies (18.4%) as estimated in WB2021 were used as reference values. Based on the fact that the collection rate by collection and transportation companies in LMC was estimated to be 46% in the Survey, the recycling rate by collection and transportation companies in LMC was set at 12.5% (=18.4*46/68).

  (e). Recycling from Landfill Site: Based on interviews with waste pickers active at the Banchare Danda landfill site, the amount of recyclable material collected per waste picker per day was estimated to be 139 kg/person/day. Based on interviews with LMC, the number of waste pickers active at the Banchare Danda landfill site per day was estimated at about 150 persons per day. The amount of recyclable material recovered from the Banchare Danda landfill site per day

(21 tons/day) was determined by multiplying 139 kg/person/day by 150 persons/day. The ratio of the waste incoming amount from LMC (about 99 tons/day) to the waste incoming amount to the Banchare Danda landfill site (about 1600 tons/day) was multiplied by the 21 tons/day to arrive the recycling amount from the incoming waste originating from LMC.

- Final Disposal: The amount was defined as the collection amount minus the (c) and (d).

4.7 Equipment Maintenance

Maintenance of the LMC's collection and transportation vehicles is carried out in the parking lot of the Environmental Department. However, due to the dual use of part of the parking lot as a transfer station, there is not enough space for vehicle maintenance work. The workshop is equipped with tools for inspections and simple repairs, such as spare parts replacement and basic welding. However, repairs involving engines, electrical systems, and hydraulic systems are outsourced.

4.8 Public Awareness

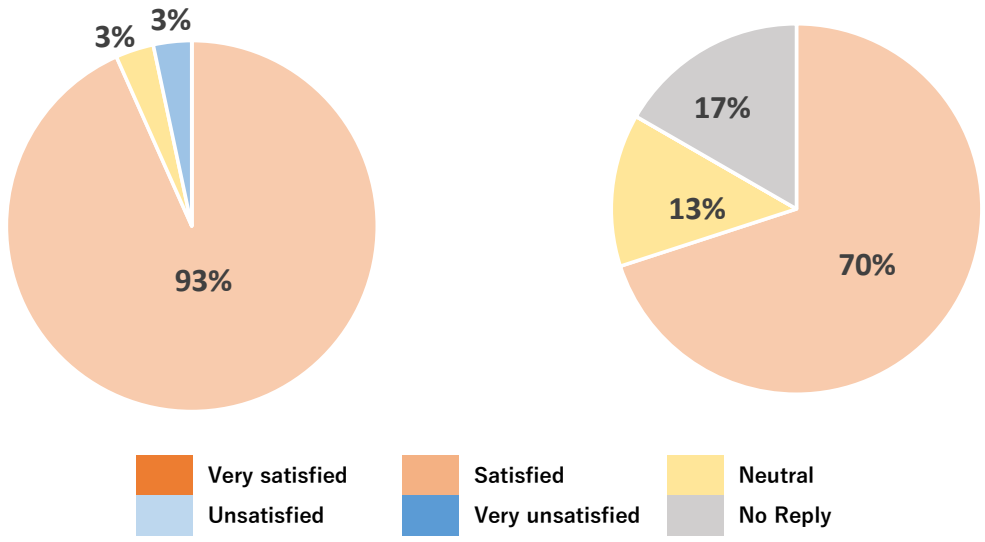
4.8.1 Initiatives by Municipality

In 2015-2016, with support from the WB, LMC attempted to promote source separation for organic waste and others by distributing about 25,000 waste bins in total (red and blue) to households free of charge. However, the capacity for collection and transportation could not keep up, leading to a lack of adoption of source separation. LMC has persisted in providing training to women's groups in the community and is emphasizing the reduction of organic waste at the source.

4.8.2 Interview Survey on Households and Businesses

In the Survey, interviews were conducted with households and businesses to confirm the rate of satisfaction with waste collection services and their requests to the government and collection and transportation company. (See 3-8-2 for outline of this interview survey)

The results of the satisfaction survey in LMC are shown in Figure 4-14. Similar to the KMC, the percentage eof respondents who were satisfied with the collection service was 93% in areas where LMC provides collection service by direct management, and 70% in areas where collection and transportation company provide collection service, namely households and businesses are highly satisfied with the collection service. The main reason for the high level of satisfaction was that the collection is conducted according to the schedule, which is the same for both the service by direct management of LMC and the service by collection and transportation companies.



Service by Direct Management of LMC　　Service by Collection and Transportation Companies

Source: JST

Figure 4-14 Satisfaction Rate on Waste Collection Service in LMC

Similar to the KMC, as for requests to municipality and collection and transportation company, it was confirmed that "introduction of separation collection and promotion of recycling" was a common request for both the service by direct management of KMC and the service by collection and transportation companies, recognizing the high level of interest in waste management and the predisposition to introduce separation collection (Table 4-12).

Table 4-12 Requests to Municipality and Collection and Transportation Companies in LMC

Main reasons	Service by Direct Management of LMC	Service by Collection and Transportation Companies
Introducing source separation and promoting recycling	27/30 (90%)	21/30 (70%)
PR for raising public awareness	2/30 (7%)	4/30 (13%)
Changing waste collection operation	0/30 (0%)	0/30 (0%)
No Reply	1/30 (3%)	5/30 (17%)

Source: JST

4.9 Municipal Waste Management System

4.9.1 Ordinances/Local Act

LMC has enacted the LMC Solid Waste Management Act 2075 (A.D. 2019) as a local act governing solid waste management.

The Act addresses various aspects of waste management, encompassing waste management responsibility, waste generation reduction, waste segregation, licensing for waste management operations, and private sector/community involvement. The municipality is responsible for managing waste generated within LMC and is

mandates to establish rules for facility maintenance, collection and transportation. While the generator is primarily responsible for managing hazardous and industrial waste residues, the Act allows these generators, including medical waste generators, to request municipal management of residues after proper disposal by the generator, if necessary, subject to a fee. Fees may be collected based on the amount, weight, nature, and other provisions of the waste.

Waste generation reduction is obligatory for individuals, organizations, and institutions in LMC, and the municipality is tasked with implementing measures to promote waste reduction, reuse, and recycling. The municipality is obligated to separate waste into organic, inorganic, and other types, as shown in Table 4-13.

Although this is different from the actual operation, operating a business related to waste management without obtaining an LMC permit is strictly prohibited..

Table 4-13 Classification of Wastes as Indicated in the LMC Act

Ordinary Waste			Hazardous Waste	
Organic Waste	**Inorganic Waste**	**Others**	**Medical Waste**	**Industrial Waste**
Kitchen Waste, food residue, paper, skin of fruits and vegetables, leaves, weeds, dust	Goods made of plastics, cardboard, paper packaging paper, glass, metals, shoes, slippers, and old fabrics	Construction related waste, animal, and birds waste	Expired medicines, Syringe, Needle, sharp objects and equipment, gloves, mask, severed body parts, blood bags, bandages	Chemicals, poisonous gas, ashes, heavy metals, mercury, lead, paints, pesticides, chemical fertilizer, polish

Source: LMC Solid Waste Management Act, 2075(2019 A.D.)

4.9.2 Policy and Plan

In LMC, a waste management M/P (5-year plan) was prepared by the Community Development Program Nepal (CDP Nepal) in 2018 with the support of the WB. This M/P aims to achieve Zero Waste by introducing the 5Rs (Reduce, Reuse, Recycle, Recover/Reclaim and Refill/Landfill) with a target year of 2023/2024, focusing on minimizing the final disposal amount. Table 4-14 shows a summary of LMC's waste management M/P. However, this M/P has not been formally approved by the LMC and has not been implemented.

Table 4-14 LMC Waste Management M/P Overview

Item	Outline of Policies
Vision	Transformation into a beautiful and clean municipality.
Purpose	Achieve Zero Waste by introducing the 5Rs (Reduce, Reuse, Recycle, Recover/Reclaim and Refill/Landfill).
Strategy	・Promote composting and its use at home. ・Promote separation of waste at the source. ・Ensure waste collection management. ・Reduce collection and transportation costs by reusing waste. ・Establish composting facilities and sell composting to generate income. ・Establish recycling centers. ・Promote the use of reusable waste. ・Ensure that factories and hospitals take responsibility for hazardous waste management. ・Prohibit the manufacture, sale, and use of inappropriate waste. ・Build partnerships among communities, allied organizations, government agencies, nongovernmental organizations, and private business operators.

Source: 5 Year Master Plan for Solid Waste Management of Lalitpur Metropolitan City Fiscal Year 2018-19

Apart from the 5Rs, it also stipulates that the sixth R involves developing necessary regulations such as laws, rules, and work policies. In addition, to realize the M/P, measures to reduce the amount of each type of waste are proposed, as shown in Table 4-15.

Table 4-15 Measures to be Achieve in LMC Waste Management M/P

No	Type	Recycled Products	Reuse	Related Institutions to Collaborate with
1	Organic Waste	Biogas for Household Use (Low-Cost Use)	For cooking at home Use in hotels and facilities	Community Community based organization (CBO), NGO, INGO Related facilities Private Sector Government Agencies Aid Agencies, etc.
		Compost	Use in home gardens and agricultural products Use outside the region	
2	Plastics	Fuel	For vehicles, etc.	
		Plastic Bins	Waste containers, Waste collection containers, etc.	
3	Paper	New Paper Products	Notebooks, books, newspapers Greeting cards, educational stationery, etc.	

Source: 5 Year Master Plan for Solid Waste Management of Lalitpur Metropolitan City Fiscal Year 2018-19

4.9.3 Financial System

LMC does not directly collect waste management fees from residents, even though it provides waste collection services in some areas. The required cost of LMC's waste management is disbursed from the general budged of LMC. It is noted that LMC include the waste management fee as part of the property tax (Property Tax). The amount collected is 30Rs./month per household and 300Rs./month per business. This fee is also collected from residents in areas that do not receive LMC's collection service, and these residents pay the fee to collection and transportation companies, resulting in an unfair double payment of the waste management fee. Collection and transportation companies contract with individual residents and businesses to provide collection services, and LMC does not establish a tariff for private waste collection services.

LMC's initial revenue plan for FY2023/24 is shown in Table 4-16.

Table 4-16 Revenue Plan in LMC (2023/24)

Unit: thousand Rs.

Item	Revenue Plan
Budget from Federal Government	1,424,751
Budget from State Government	217,252
LMC's Own Revenue	5,110,000
Other	751,500
Total Amount	7,503,503

Source: Based on LMC's Budget Book 2020/21, 2021/22

The LMC's budget and actual expenditure for the fiscal year 2023/24 is shown in Table 4-17. The LMC's Budget

Book incorporates a budget for waste management within its investment budget. The investment budget related to waste management allocates 18,600,000 Rs. for "Development and Revegetation of Landfill Site," "Program for Improvement of Waste Management and Environmental Sanitation," and "Maintenance of Waste Management Office". However, the operating budget lacks a breakdown by sector, encompassing personnel and fuel costs. The investment budget has an execution rate of 43%, which is less than half of the allocated budget.

Table 4-17 Budget in LMC (2023/24)

Unit: thousand Rs.

Item		Budget Amount	Actual Expenditure	Execution Rate
Operating Budget		2,312,654	2,004,964	87%
Investment Budget		4,888,665	2,101,890	43%
	Waste Management	18,601	18,601	100%
	Other than Waste Management	2,083,289	895,814	43%
Loans, etc.		302,184	27,265	9%
Total Amount		7,503,503	4,134,119	55%

Source: Based on LMC's Budget Book 2020/21, 2021/22

Chapter 5 Waste Management in Bhaktapur Municipality

5.1 Outline of Bhaktapur Municipality

5.1.1 Population

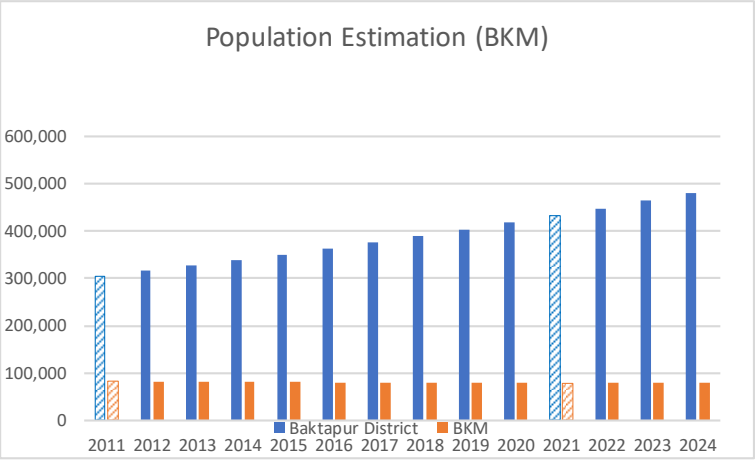
The census population data for BKM (2011 and 2021), as well as the 2011 population within the current municipalities' boundary published by the CBS of Nepal are shown in Table 5-1. The population in BKM has experienced a decrease at an average annual population change rate of -0.32% from 2011 to 2021. On the other hand, the population in Bhaktapur District has shown an increase with an average annual population change of 3.56%, surpassing the rates observed in other municipalities in Nepal. One potential reason for this trend could be the relocation of the population from the municipality center to satellite areas in the suburbs, mirroring the pattern observed in KMC. This phenomenon is reminiscent of the population growth seen in surrounding municipalities in Kathmandu District. BKM is among the targeted areas for the Survey.

Table 5-1 Basic Information of BKM

Administrative Classification	Census 2011*1	Estimation by CBS 2011*2	Census 2021*3	Average Annual Population Change Rate*4	Area
Bhaktapur District	304,651	-	432,132	3.56%	Approx. 119 km^2
BKM	83,658	81,748	79,136	-0.32%	Approx. 7km^2

Sources: *1: National Population and Housing Census 2011 (CBS), *2: Population of 753 Local Units (CBS), *3: National Population and Housing Census Provincial Report 2021 (CBS), *4: Average annual population change rate over a 10-year period when comparing Estimation by CBS 2011 and Census 2021.

For the purpose of this report, the population in BKM was estimated using the average annual population change rate (-0.32%) for BKM, as shown in Table 5-1. The estimated population in BKM for 2024 is approximately 78,000. The estimation of municipal waste generation amount in BKM in the Survey report is calculated by multiplying the population at about 78,000 by the unit generation rate described below.

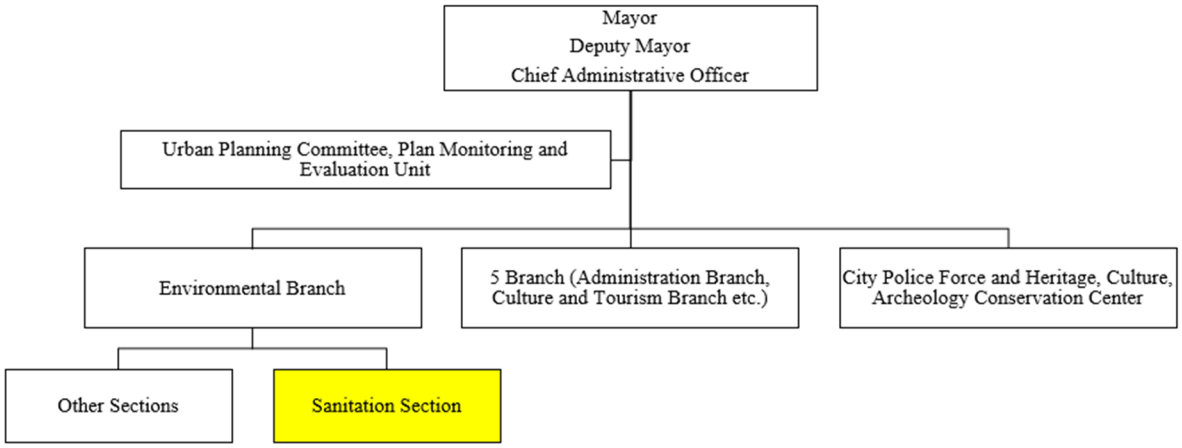


Source: JST (2011 and 2021 (gray): Population from Census; 2012-2020 and after 2022: Estimation by JST)
Note: 2011 and 2021 (hatched) are based on CBS estimation and census populations. 2012-2020 and 2022 onwards are based on survey team estimation

Figure 5-1 Estimation of Population in BKM

5.1.2 Organizational Structure

The organizational structure of BKM is illustrated in Figure 5-2. The Sanitation Section is responsible for waste management, comprising a total of 152 employees, as detailed in Table 5-2.



Source: BKM

Figure 5-2 Organizational Structure of BKM and Departments in Charge of Waste Management

Table 5-2 Number of Staff in the Sanitation Section

Employment Position or Rank	Number of People
Section Chief	1
Ward Supervisor	10
Driver	13
Laborer	24
Final Disposal	2
Road Sweeper / Planting Operator	90(Of these, 57 are regular road sweepers, 21 are non-regular road sweepers, and 12 are collectors of valuable materials)
Toilet Cleaner	7
Compost Manufacturing	5
Total Amount	152

Source: BKM

5.2 Municipal Waste Generation Amount and Waste Composition

5.2.1 Waste Generation Amount

The results of waste amount surveys conducted in BKM over the past few years are shown in Table 5-3. According to the ADB survey in 2013, the unit generation rate of municipal waste in BKM was estimated to be 0.345kg/person/day. On the other hand, WB2021 estimated the unit generation rate of municipal waste in BKM to be 0.385kg/person/day. The Survey calculates the municipal waste generation amount in BKM, referencing the unit generation rate (0.385kg/person/day) in the most recent survey results, WB2021. As for the area coverage of collection services, the collection service is basically provided throughout the municipality, but the frequencies are less frequent for the suburban areas compared to the municipality center.

Table 5-3 Unit Generation Rate of Municipal Waste in BKM

Item	ADB2013*1	WB2021*2 (REI-CLDP/BRBIP-AF 2021)
Municipal Waste Intensity	0.345kg/person/day	0.385kg/person/day

Source：*1Solid Waste Management in Nepal Current Status and Policy Recommendations (ADB, 2013), *2REI-CLDP/BRBIP-AF, 2021 REI-CLDP/BRBIP-AF, 2021

The estimated municipal waste generation amount, calculated by multiplying the population (78,000 people) in BKM in 2024 by the above mentioned unit generation rate (0.385kg/person/day), is about 30 tons/day.

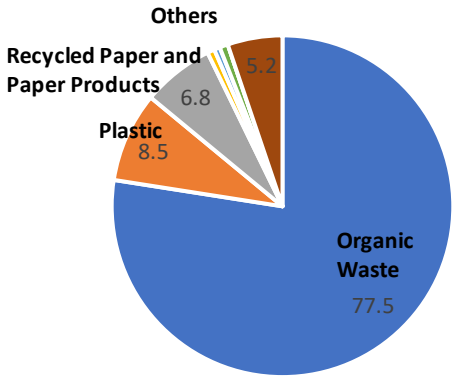
5.2.2 Waste Composition

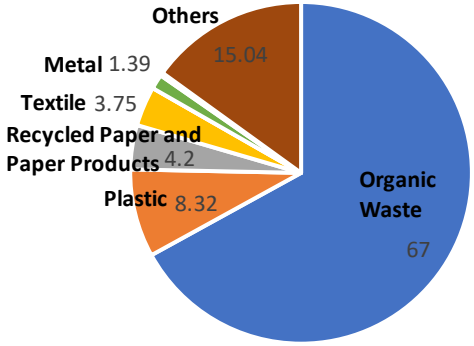
In BKM, ADB conducted a composition survey of household waste in 2013, and a waste composition survey was carried out at the BKM landfill site ("BKM2017") by BKM in 2017 (Table 5-4). The composition of household waste reveals a high percentage of organic waste, around 78%, similar to LMC. However, at the BKM landfill site, the percentage of "others" has increased due to the inclusion of business waste. Unlike the trend observed in KMC and LMC, there is no increase in the proportion of plastics, used paper and paper products, etc., despite the presence of business waste. This could be attributed to the possibility that plastics, recycled paper and paper products flow directly from the source to recycling, facilitated by source separation at households and businesses, as elaborated later.

Table 5-4 Waste Composition in BKM

Type Composition	Survey Results (by Weight)	
	ADB 2013*1 (Household Waste)	BKM 2017*2 (Municipal waste)
Organic Waste	77.48%	67%
Plastic	8.52%	8.32%
Recycled Paper and Paper Products	6.79%	4.2%
Textile	0.69%	3.75%
Glass	0.55%	N/A
Metal	0.79%	1.39%
Rubber and Leather Products	0.00%	0.30%
Other	5.19%	15.04%

Sources: *1: Current status and policy recommendations on solid waste management in Nepal (ADB, 2013); *2: BKM2017 (undated)





Sources: *1: Current status and policy recommendations on solid waste management in Nepal (ADB, 2013); *2: BKM2017 (undated)

Figure 5-3 Waste Composition in BKM

5.3 Collection and Transportation and Secondary Transfer of Municipal Waste

5.3.1 Overview of Collection and Transportation in BKM

Table 5-5 provides an overview of collection and transportation in the BKM. Unlike KMC and LMC, BKM directly manage waste collection for the entire municipality; no collection and transportation companies provide waste collection services in BKM. The estimated waste collection amount in BKM is about 24 tons/day, with a collection rate of approximately 81% of the generation amount.

Table 5-5 Overview of Collection and Transportation in BKM

Item	Direct Management	Private
Generation Amount	Approx. 30 tons/day	
Ward to Be Serviced	10	
Waste Collection Amount	Approx. 24 tons/day	
Collection Rate	Approx. 81 %	

Source: JST

Note: The waste collection amount is estimated by JST based on interviews with BKM.

5.3.2 Collection and Transportation by BKM (Direct Management)

5.3.2.1 Implementation Structure

The personnel responsible for waste collection and transportation in BKM consist of 13 drivers, 24 collection workers, and approximately 90 road sweepers (57 full-time and 33 part-time). Additionally, 10 ward inspectors are assigned to supervise waste collection and transportation operations in each ward.

The collection and transportation vehicles owned by BKM are detailed in Table 5-6.

Table 5-6 Collection and Transportation Equipment in BKM

Equipment Name	Capacity	Number of Vehicles
Dump Truck	3.9m3	11
Dump Truck (Small)	1.34 m3	6

Source: BKM

Dump Truck

Dump Truck (Small)

Figure 5-4 Collection and Transportation Equipment in BKM

5.3.2.2 Collection Method

BKM collects household, business, and road sweeping waste; similar to KMC and LMC. Collection and transportation operations commence as early as 5:00 a.m. to avoid traffic congestion, with most collection work completed before the commuter rush (9:00-10:00 a.m.). However, in the central municipality area, road sweepers are engaged in daytime road sweeping work.

Similar to KMC and LMC, BKM uses dump trucks for bell collection, replacing traditional bells with a public awareness message to residents. Approximately 40% of households participate in source separation, with varying degrees of cooperation across different regions. While source separation has taken root in newly introduced waste collection service areas, it has not been successful in regions where mixed collection was already established or in central municipality areas with a frequent influx of people. In addition, due to the limited capacity of the current waste collection system, separated waste is collected on the same day and in the same vehicle, leading to the mixing of organic waste and other waste during collection and transportation, even though they are roughly separated in the bed of the truck.

Figure 5-5 Collection and Transportation of Household Waste in BKM

Business and road sweeping waste are collected concurrently with bell collection of household waste, and road

sweepers also collect business waste in the commercial areas of the municipality center.

5.3.2.3 Role of Ward's Office in Collection and Transportation

In BKM, ward inspectors oversee waste collection and transportation operations in each ward, collaborating with the ward office for the collection of waste management fees.

5.3.3 Secondary Transfer by BKM (Direct Management)

5.3.3.1 Waste Collection Amount, Secondary Transfer Amount

A rough estimation of waste collection amount, based on information obtained from interviews with BKM on capacity, number of collection and transportation vehicles, average number of trips, etc., is about 24 tons/day. BKM has been conducting final disposal at the Banchare Danda landfill site since around February 2024, and has closed the landfill site along the Hanumante River, which had previously been used for final disposal. The round-trip distance between BKM and the Banchare Danda landfill site is about 80 km, which significantly increases the time and cost of transporting waste to the landfill site, so BKM has begun secondary transfer using one dump truck and one compactor (Figure 5-6). BKM uses a part of the land of a sewage treatment facility along Bhaktapur Road as a transfer station to transship waste from collection and transportation vehicles. BKM owns a parking lot and transfer station for collection and transportation vehicles in Maheshowri, however BKM does not use it as a transfer station due to the small land area and concern for the surrounding environment.

Loading waste on compactor

Dump truck used for secondary transfer

Figure 5-6 Secondary Transfer by BKM

5.3.3.2 Secondary Transfer Equipment

The secondary transfer vehicles owned by the KMC are detailed in Table 5-7. These dump trucks are used for transporting organic waste to BKM's composting plant and non-recyclable residues to the landfill site.

Table 5-7 Secondary Transfer Equipment in BKM

Equipment Name	Capacity	Number of Vehicles
Dump truck	8 tons	1
Compactor	7 tons	1

Source: BKM

5.4 Intermediate Treatment and Recycling

5.4.1 Composting

In BKM, organic waste separated during the direct collection and transportation process is utilized for composting. A composting facility in the eastern part of BKM receives about 2 tons/day of organic waste. All personnel - eight full-time and six half-time staff, totaling fourteen employees – are employed by BKM. The compost produced at the facility is sold to nearby farmers and others for 20 Rp. per kg. This composting facility is operating effectively, and no major problems, such as odors, have been observed. Figure 5-7 shows an overview of the composting facility.

Figure 5-7 Composting Facility (1) in BKM

Composting activities are also taking place at transfer stations owned by BKM. While the scale of these composting facilities is smaller compared to the facility mentioned above, and their management systems are less robust, it is evident that BKM is making efforts to minimize the final disposal amount. Figure 5-8 shows the status of these composting facilities.

Figure 5-8 Composting Facility (2) in BKM

5.4.2 Other Intermediate Treatment

No intermediate treatment, other than sorting, is conducted in BKM.

5.4.3 Recycling

5.4.3.1 Private Recycling Company

Recycling in BKM is conducted by private recycling companies. During the interview survey, recycling factories shown in Table 5-8 is confirmed. This factory recycles products to produce, such as compost, etc.

Table 5-8 Summary of Recycling factories (BKM)

Company name	Doko Recycles Bhaktapur
Staffs	57
Recycle item	PET bottle, Plastic film and bag and other plastic, e-waste
Product	Compost, Shredded paper
Destination	Citizen, Local market

Source: JST

5.4.3.2 Distribution of Recyclables by Informal Sector and Recycling Companies

In BKM, it is confirmed through interview surveys that recyclables collected by waste pickers, collection workers at landfill, transfer station, street, and households are sold to recycling factories and exporters through buyers. Main recyclables distributed are PET bottle, plastic film and bag, other plastics, paper, and carton. Additionally, there is a case that electrical products are distributed. No significant differences in selling price for each recyclable are identified within the Kathmandu valley. Table 3-13 Selling prices of collected recyclables (KMC)Table 5-9 shows the selling prices of collected recyclables in BKM.

Table 5-9 Selling prices of collected recyclables (BKM)

Item	Waste pickers		Collection workers	Buyer (small)	Buyer (Big)
	Landfill	Transfer station			
PET bottle (Rp./kg)	Not provided	10	10	Not provided	15
Plastic film and bag (Rp./kg)	Not provided	8	5	Not provided	10
Other plastics (Rp./kg)	Not provided	10	8	Not provided	10
Can (Rp./kg)	Not provided	30	20	Not provided	35
Metals (Rp./kg)	Not provided	35	35	Not provided	30
Glass bin (Rp./kg)	Not provided	0.75	0.5	Not provided	0.752
Paper (Rp./kg)	Not provided	10	10 to 12	Not provided	10
Carton (Rp./kg)	Not provided	12	15	Not provided	10

Source: JST

The interview surveys are conducted with two small buyers who has offices and one big buyer who does not have an office. Purchases amount by buyers are shown in Table 5-10.

Table 5-10 Purchases amount by buyers (BKM)

Item	Buyer (small)		Buyer (Big)
Company name	Khusbu Traders	Jitendra Traders	Doko Recycles Bhaktapur
Number of staffs	Not provided	Not provided	57
Target recyclables	PET bottle, Plastic film and bag and other plastic, can, steel, Glass bottle, paper, carton etc.		
Amount (ton/month)	10	11	26

Source: JST

5.5 Final Disposal

5.5.1 Summary of Facilities

As of December 2023, BKM did not have a permanent landfill site and utilizes an area along the Hanumante River for landfill purpose. However, BKM has started to transport waste to Banchare Danda landfill site since February 2024 due to the complains from nearby residents to river pollution and odors. Operational issue for long transportation distance which is more than five hours per one trip is remained. Regarding the old disposal site BKM utilized until February 2024, in the areas, where landfill operations were conducted, minimal environmental measures, such as daily soil covering and chemical application, were implemented. However, previously dumped waste is exposed about 200 m upstream of the landfill site on the riverbank, raising concerns about the negative impact on the river environment. Residents living near the landfill site have filed complaints with BKM about the operations.

Although BKM recognizes the necessity of a new landfill, it is currently constrained to use the existing landfill site. BKM was hesitant to use the Banchare Danda landfill site due to the distance and ongoing social issues with nearby residents. The old disposal site was closed due to the transportation of waste to the Banchare Danda landfill. Figure 5-9 provides an overview of the BKM old landfill site.

Figure 5-9 Current Situation of old Landfill Site in BKM

5.5.2 Equipment

The BKM old landfill site is equipped with one bulldozer and one backhoe each. Table 5-11 outlines the equipment

used for landfill operations.

Table 5-11 Equipment Used (Landfill Operations)

Item	Bulldozer	Backhoe
Owner	BKM	BKM
Number	1	1
Situation	Available	Available
Photo		

Source: JST

5.5.3 Operation Rules

The BKM old landfill site accepts waste from early morning to mid-morning. After waste pickers extract recyclables, a backhoe levels the dumped waste. The application of daily soil cover follows immediately after the completion of landfill operations.

5.5.4 Operation System

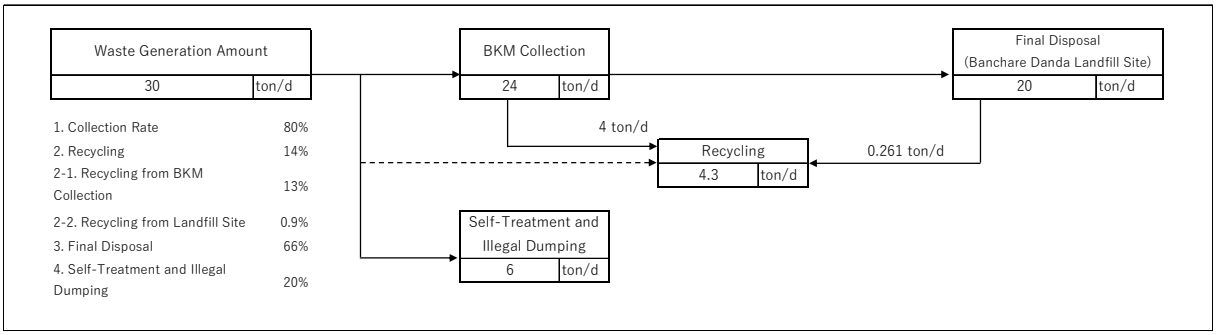
A BKM employee is assigned as the backhoe driver at the old landfill site. This staff member provides instructions to incoming vehicles and applies chemicals to prevent odors and insect infestations.

5.5.5 Involvement of the Informal Sector

Several informal waste pickers participate in the extraction of recyclables, mainly paper and plastics, which are then sold to private buyers.

5.6 Municipal Waste Material Flow

The waste material flow at BKM is illustrated in Figure 5-10. About 80% of the waste of the municipal waste generated in BKM is collected by BKM, while about 20% of the waste is self-treated and illegally dumped, and about 73% of the waste is landfilled at the Banchare Danda landfill site. Assumptions made in developing the flows are shown below.



Note: Totals may not match due to fractional rounding
Source: JST

Figure 5-10 Municipal Waste Material Flow in BKM

- Waste Generation: Population (78,000 people) * Unit generation rate (0.385kg/person/day) (Referred to as 5.2.1)
- Waste Collection: Estimated based on interviews with BMC (Referred to as 5.3.35.2.1)
- Self-Treatment and Illegal Dumping: The amount was defined as the generation amount minus the waste collection amount.
- Recycling: The total of (c), (d) and (e) below.

  (c). Recycling from KMC Waste Collection: The values were obtained from interviews with BKM.

  (e). Recycling from Landfill Site: Based on interviews with waste pickers active at the Banchare Danda landfill site, the amount of recyclable material collected per waste picker per day was estimated to be 139 kg/person/day. Based on interviews with KMC, the number of waste pickers active at the Banchare Danda landfill site per day was estimated at about 150 persons per day. The amount of recyclable material recovered from the Banchare Danda landfill site per day (21 tons/day) was determined by multiplying 139 kg/person/day by 150 persons/day. The ratio of the waste incoming amount from BKM (about 20 tons/day) to the waste incoming amount to the Banchare Danda landfill site (about 1600 tons/day) was multiplied by the 21 tons/day to arrive the recycling amount from the incoming waste originating from BKM.
- Final Disposal: The amount was defined as the collection amount minus the (c).

5.7 Equipment Maintenance

BKM conducts vehicle maintenance in the parking lot at the Maheshowri transfer station. The municipality has tools for inspections and simple repairs, such as spare parts replacement and basic welding work. However, more complex repairs for engines, electrical systems, and hydraulic systems are outsourced.

5.8 Public Awareness

5.8.1 Initiatives by Municipality

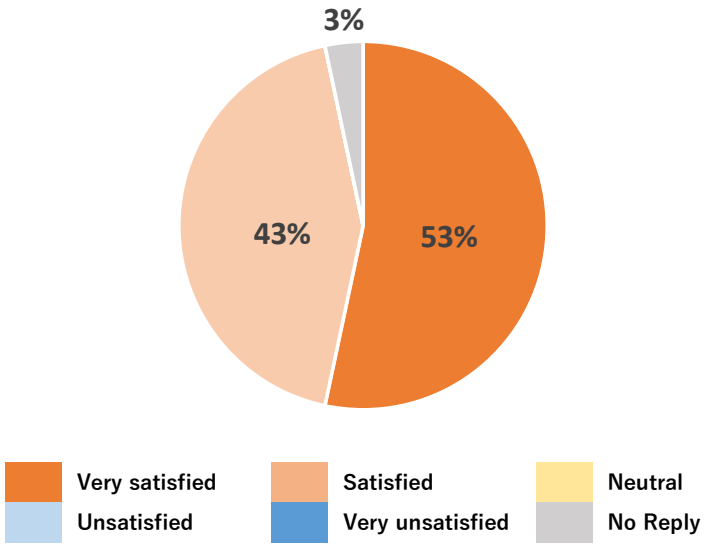
BKM prioritizes composting organic waste to reduce final disposal amounts and encourages widespread waste separation. Currently, approximately 40% of households and businesses are cooperating, and BKM plans to further establish and expand the use of separation and discharge. However, challenges persist in areas where mixed

collection has already been introduced or in central municipality areas with frequent inflows and outflows of people.

5.8.2 Interview Survey on Households and Businesses

In the Survey, interviews were conducted with households and businesses to confirm the rate of satisfaction with waste collection services and their requests to the government and collection and transportation company. (See 3-8-2 for outline of this interview survey)

The results of the satisfaction survey in BKM are shown in Figure 5-11. Similar to the KMC and LMC, the percentage of respondents who were satisfied with the collection service was 96%, namely households and businesses are highly satisfied with the collection service, with a particularly high percentage of "very satisfied". The main reason for the high level of satisfaction was that the collection is conducted according to the schedule, as well as the fact that BKM conducts activities to raise public awareness and promote separation collection and recycling, and that road sweepers hired by BKM collect road waste in the city center during daytime hours.



Service by Direct Management of BKM

Source: JST

Figure 5-11 Satisfaction Rate on Waste Collection Service in BKM

As for requests to municipality, the fact that BKM has already introduced separation collection and promoted recycling, and that the public is highly satisfied with the quality of public awareness activities and collection operations, suggests that there were few responses regarding their requests (Table 5-12).

Table 5-12 Requests to Municipality in BKM

Main reasons	Service by Direct Management of BKM
Introducing source separation and promoting recycling	2/30 (7%)
PR for raising public awareness	0/30 (0%)
Changing waste collection operation	0/30 (0%)
No Reply	28/30 (93%)

Source: JST

5.9 Municipal Waste Management System

5.9.1 Ordinances/Local Act

BKM has enacted the BKM Sanitation Act 2076 (A.D. 2020) as a local act addressing waste management. It aims to maintain the identity of a clean, beautiful, and civilized municipality through sanitation of public places, important heritage sites, and open spaces. The Act encompasses policies for maintaining sanitary conditions in public spaces, in collaboration with the general public and others, going beyond solid waste management.

The Act allows municipalities to implement various waste management measures, including promoting the separation of organic and inorganic wastes, prohibiting the dumping of medical wastes outside designated areas, requiring proper treatment of hazardous wastes by generators, and designating plastic-free zones.

The following behaviors are listed as violations of the ordinance, although it seems that a license from BKM is required for waste management operations. Notably, waste management operations are directly managed by the municipality.

(a) Throwing waste outside the designated time and place specified by the municipality,

(b) Unauthorized use of waste stored in containers or waste collection centers,

(c) Vandalizing, damaging, or removing containers placed in the waste collection center or causing any damage to the collection center,

(d) Involvement in waste management without getting permission according to this Act.

(e) Violating the conditions mentioned in the permit for waste management in accordance with this Act,

(f) Throwing, storing, or piling any kind of harmful material in a waste collection center, container, or waste dumping site,

*The rest after (g) is omitted.

5.9.2 Policy and Plan

BKM currently lacks specific policies or dedicated plans for waste management. In addition, a review of the subsequent status of the waste management action plan prepared by CKV Study did not reveal any specific utilization.

5.9.3 Financial System

BKM imposes a waste management fee of up to 50Rs./month per household and 200-5,000 Rs./month per business. The collection of the waste management fee, along with other tax collections, is managed by the ward office. BKM's original plan and actual revenue for FY 2020/21 through FY 2023/24 are shown in Table 5-13.

Table 5-13 BKM Revenue

Unit: thousand Rs.

Item	2020/21 Actual Result	2021/22 Actual Result	2022/23 Initial Plan	2023/24 Initial Plan
Budget from the Federal Government	530,152	779,500	922,700	922,700
Budget from State Government	32,711	65,422	77,260	77,341
Revenue Bond	85,130	145,132	152,219	152,219
BKM's Own Revenue	185,962	195,000	401,000	424,500
Other	73,289	139,997	378,821	424,000
Total Amount	833,955	1,185,054	1,553,179	1,576,760

Source: Prepared by JST based on BKM's Budget Book

Table 5-14 displays BKM's budget and closing amounts for the fiscal year 2020/21 through 2023/24. While the investment budget includes infrastructure improvements such as buildings and roads, as well as procurement costs for official vehicles and equipment, there is no budget line item designated specifically for waste management. BKM's Budget Book is not organized by department, making it challenging to extract budgets related exclusively to waste management.

Table 5-14 BKM's Budget

Unit: thousand Rs.

Item	2019/20 Expenditure	2021/22			2022/23 Budget	2023/24 Budget
		Budget	Expenditure	Execution Rate		
Operating Budget	809,528	851,895	592,912	70%	1,102,217	1,161,139
Investment Budget	465,584	381,029	278,863	73%	829,783	839,620
Total Amount	1,275,112	1,232,924	871,775	71%	1,932,000	2,000,759

Source: Based on BKM's Budget Book

Chapter 6 Waste Management in Pokhara Metropolitan City

6.1 Outline of Pokhara Metropolitan City

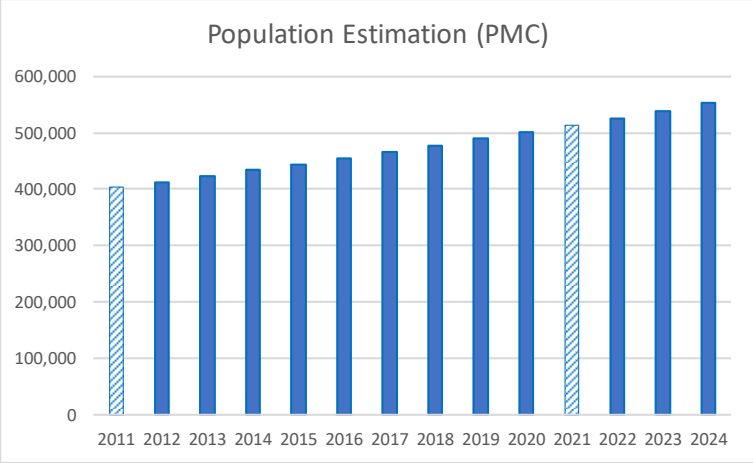
6.1.1 Population

The census population in PMC (2011 and 2021) and the population data as of 2011 within the current municipalities' boundary published by the CBS of Nepal are shown in Table 6-1. The population in PMC is increasing at an average annual population growth rate of 2.45% from 2011 to 2021. In addition, in interviews conducted by JST, PMC estimates that the Floating Population, which flows into PMC from outside the region for various reasons, including tourism, is about 10% of the population. For the purpose of this report, the population in PMC was estimated using the average annual population change rate (2.45%) for PMC shown in Table 6-1. The residential population in PMC in 2024 is estimated to be about 552,000. If about 50,500 people are taken into account as floating population, the population of PMC in 2024 is estimated to be about 607,000 people. Since the floating population is an important factor contributing to the municipal waste generation amount, the estimation of municipal waste generation amount in PMC is calculated by multiplying the population (607,000 people), by the unit generation rate, taking into account the floating population as described later in the Survey report.

Table 6-1 Basic Information of PMC

Administrative Classification	Census 2011*1	Estimation by CBS 2011*2	Census 2021*3	Average Annual Population Change Rate*4	Area
PMC	264,991	402,995	513,504	2.45%	Approx. 464 km^2

Sources: *1: National Population and Housing Census 2011 (CBS), *2: Population of 753 Local Units (CBS), *3: National Population and Housing Census Provincial Report 2021 (CBS), *4: Average annual population change rate over a 10-year period when comparing Estimation by CBS 2011 and Census 2021.



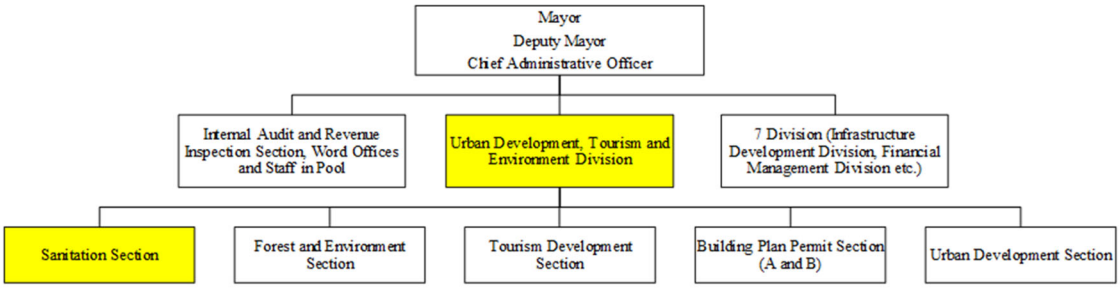
Source: JST (2011 and 2021 (gray): Population from Census; 2012-2020 and after 2022: Estimates by JST)
Note: 2011 and 2021 (hatched) are based on CBS estimation and census populations. 2012-2020 and 2022 onwards are based on survey team estimation

Figure 6-1 Estimates of Population in PMC

6.1.2 Organizational Structure

The organizational structure of PMC is shown in Figure 6-2. The Sanitation Section of the Urban Development,

Tourism and Environment Division is responsible for waste management. The total number of employees in the Sanitation Section is 67, as shown in Table 6-2. The Sanitation Section of the Urban development, Tourism and Environment Division is the counterpart department (hereinafter referred to as "C/P") of the Wastewater Management M/P Development Project in PMC.



Source: PMC

Figure 6-2 PMC's Organizational Structure and the Department in Charge of Waste Management

Table 6-2 Number of Staff in Sanitation Section

Employment Position or Rank	Number of People
Senior Officer	1
Officer	1
Engineer	1
Assistant/Site Supervisor	6
Road Sweepers	5
Total Amount	67

Source: PMC

6.2 Municipal Waste Generation Amount and Waste Composition

6.2.1 Waste Generation Amount

A baseline study ("WB2020") was conducted by the WB in 2020 in PMC, estimating the unit generation rate of household, commercial, and business waste. The study determined the unit generation rate of municipal waste in PMC to be 0.354 kg/person/day. The estimated municipal waste generation amount, multiplying the projected population (607,000people) in PMC in 2024 by the unit generation rate of 0.354 kg/person/day, is about 215 tons/day.

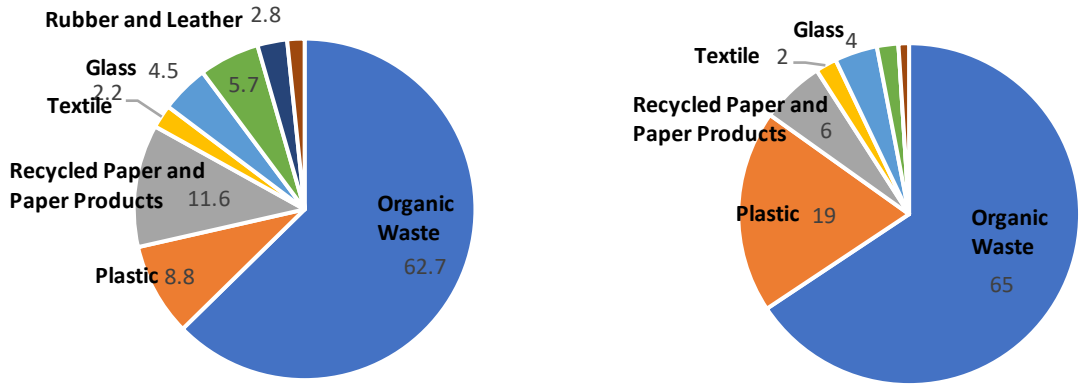
6.2.2 Waste Composition

In PMC, a composition survey of household waste was conducted by ADB in 2013. In addition, a baseline study by the WB in 2020 investigated the composition of municipal waste at the source. The share of organic waste in household waste is approximately 62%, falling between KMC (52%), LMC (78%), and BKM (77%). In the composition of municipal waste, it appears that the proportion of plastics is increasing due to the mixing of commercial waste.

Table 6-3 Waste Composition in PMC

Waste Type	Survey Results (by Weight)	
	ADB 2013*1 (Household Waste)	WB 2020*2 (Municipal Waste)
Organic Waste	62.65%	65%
Plastic	8.80%	19%
Recycled Paper and Paper Products	11.61%	6%
Textile	2.21%	2%
Glass	4.54%	4%
Metal	5.74%	2%
Rubber and Leather Products	2.82%	0%
Other	1.63%	1%

Source: *1Solid Waste Management in Nepal Current Status and Policy Recommendations (ADB, 2013), *2City-level Assessment and Draft Service Improvement Plan for Solid Waste Management for Pokhara Metropolitan City (WB, 2020)



KMC CPC2020*1 (Household Waste)　　WB 2020*2 (Municipal Waste)

Source: *1Solid Waste Management in Nepal Current Status and Policy Recommendations (ADB, 2013), *2City-level Assessment and Draft Service Improvement Plan for Solid Waste Management for Pokhara Metropolitan City (WB, 2020)

Figure 6-3 Waste Composition in PMC

6.3 Collection and Transportation and Secondary Transfer of Municipal Waste

6.3.1 Overview of Collection and Transportation in PMC

Table 6-4 provides an overview of collection and transportation services in PMC. In PMC, only road sweeping is directly managed by PMC, while the collection of household and commercial waste is contracted out to the private sector, as described below. The waste collection amount in PMC is estimated to be about 116 tons/day, with a collection rate of approximately 54% of the generation amount. As described below, regular collection services are available only in the Core Area and some areas of the Outer Area, while regular collection services are not provided in the Rural Area.

Table 6-4 Overview of Collection and Transportation at PMC

Item	Direct Management	Private
Generation Amount		Approx. 215tons/day
Ward to Be Serviced		32
Waste Collection Amount		Approx. 116 tons/day (including road sweeping)
Collection Rate		Approx. 54%

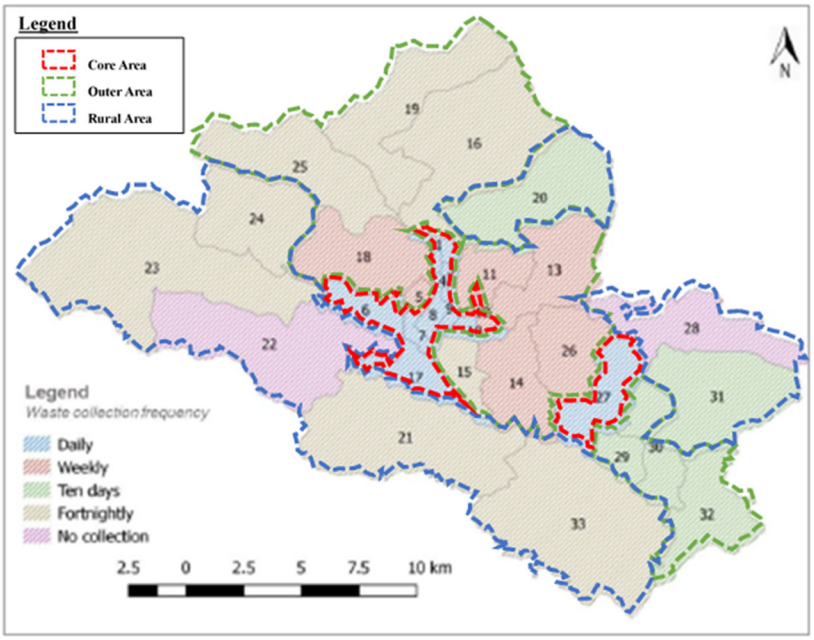
Source: JST

According to the contract between PMC and the private business operators, collection services are stipulated to be provided to all 32 wards in PMC. However, the frequency of collection varies across wards, with daily collection in the central municipality area (considered the Core Area), once to three times a week to every other week in the suburban areas (considered the Outer Area), and bi-weekly or almost no collection service in the rural areas. The percentage of the resident population in each area is detailed in Table 6-5. It appears that collection services are not provided frequently enough for the Outer and Rural Areas. In these rural areas, it is assumed that organic waste is either treated for agricultural use, self-disposed, or subject to illegal dumping.

Table 6-5 Population Distribution by Region in PMC

Item	Core Area	Outer Area	Rural Area	Total
Population	222,634	269,988	59,604	552,226
Municipal Waste Generation Amount	Approx. 79 tons/day	Approx. 96 tons/day	Approx. 21 tons/day	Approx. 195 tons/day
Ratio	40%	49%	11%	100%

Source: National Population and Housing Census Provincial Report 2021(CBS)



Source: JST modification based on WB2020

Figure 6-4 Areas Served by PMC's Collection Services

6.3.2 Collection and Transportation by PMC (Direct Management)

PMC employs 58 road sweepers for directly operated road sweeping. PMC's road sweepers are responsible for transporting the collected waste to fixed points. Transportation from the fixed point to the landfill site is considered the responsibility of the private business operators.

6.3.3 Collection and Transportation by Private Business Operator

6.3.3.1 Management System for Private Business Operator

PMC has established contracts with private business operators for collection and transportation services, outlining the basic work specifications in the TOR. The current contract duration between each collection and transportation operator and PMC spans three and a half years, from January 15, 2023 to June 15, 2026.

A summary of the key items included in the current specifications is provided below. Private business collection and transportation operators are obligated to make an upfront payment of the specified deposit at the commencement of work. The deposit is non-refundable in case of contract dissolution or termination due to circumstances on the contractor's part or default of the work. Contractor's responsibilities include submitting a vehicle dispatch plan, including the frequency of collection service, obtaining approval from PMC, implementing fee collection based on the Tariff (schedule of fees) established by PMC, reporting the monthly collected amount, and procuring and maintaining collection vehicles. Although not explicitly stated in the specifications, private business collection and transportation operators use vehicles with covers that can prevent waste dispersal and odors, as required by PMC. Basically, the system is designed for contractors to provide services under the supervision and direction of PMC. However, the current contract does not address the ownership of the collected waste, the implementation of separation and collection, or the potential for recycling. PMC's responsibilities include the maintenance of waste delivery sites (landfill sites) and access roads, along with the partial refund of the deposit as compensation in the event of fuel price hikes.

<Rights and obligations of private business operators>	<Rights and Obligations of PMC>
1. Provision of services in designated Ward 2. Payment of deposit money to PMC 3. Employee safety coverage (e.g., insurance coverage) 4. Procurement and maintenance of vehicles and other equipment 5. Implementation of fee collection based on PMC's tariff (Tariff) 6. Submit dispatch plan and obtain approval from PMC 7. Ensure employee safety (e.g., distribution of safety gear) 8. Perform work under the supervision of the PMC 9. To implement waste collection at public facilities in accordance with the PMC's appropriate requirements 10. Reporting of monthly fee collections 11. Implementation of operations in the event of a disaster or other emergency 12. Obligation to strive for business improvement and enhancement 13. Issue receipts when fees are collected 14. Participation in training by PMC 15. Obligation to give prior notice (3 months in advance) when terminating a contract	1. Supervision, direction, and assistance for services provided by vendors 2. Access roads to the landfill site, and utilities such as electricity and water at the landfill site 3. Prohibit PMC from terminating the contract for one-sided reasons 4. Secure landfill site and landfill capacity 5. Resolving conflicts with residents living near the landfill site 6. Refund of a portion of the deposit money as compensation in the event of fuel price hikes. 7. Directing and advising vendors to improve their services (If the vendor does not provide the contractual services after two warnings by the PMC, the PMC can seize the deposit and terminate the contract.)

Source: PMC

Under the terms of the mentioned contract, PMC is tasked with negotiating with residents living near the landfill site. During the initial field survey period of the study from December 12 to 14, 2023, PMC's temporary landfill site faced opposition from surrounding residents, preventing the acceptance of waste. Therefore, private business operators were unable to conduct collection and transportation operations after loading their vehicles, leaving them parked in the parking lot with waste. According to PMC, such temporary closure of the landfill site has occurred four times in 2023. Although solutions were implemented each time, no fundamental measures were taken, and PMC encountered challenges in negotiating with neighboring residents. If this situation persists, it could result in a loss of trust from waste generators, posing a risk for private business operators who collect as part of their collection service.

Waste accumulation in the municipality due to the temporary closure of the landfill site

Collection and transportation vehicles parked fully loaded

Figure 6-5 Situation Due to Temporary Closure of Landfill Site

6.3.3.2 Activity of Collection and Transportation Companies in PMC

The collection and transportation operators currently active in PMC are listed in Table 6-6. These operators function under consignment agreements with PMC. Currently, there are six operators managing municipal waste and one overseeing medical waste.

PMC's collection and transportation operators do not possess transfer stations. Instead, their vehicles transport waste directly to the landfill site. The collection and transportation amount was estimated by JST based on the average number of vehicles delivering waste to the landfill site and the average number of trips (times/vehicle day) conducted by each operator. According to interviews with PMC, the estimated incoming collection and transportation amount is about 116 tons/day.

Table 6-6 Collection and Transportation Companies in PMC

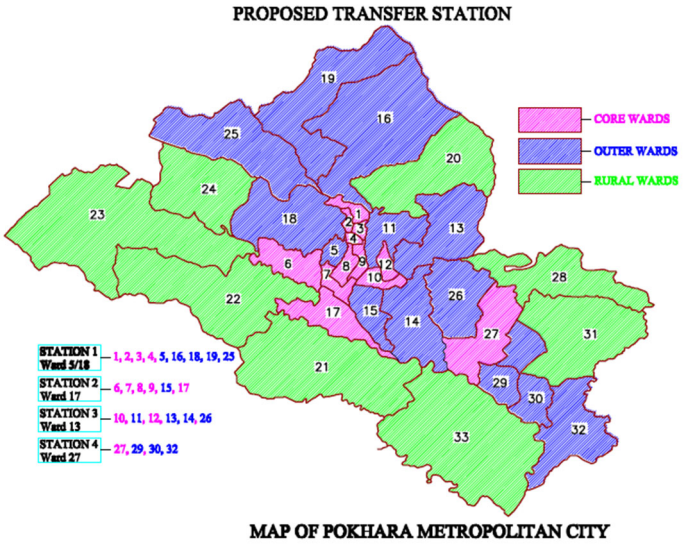
Company name[*1]	Service Area (Ward number)[*1]	Waste Collection Amount (tons/day)[*2]
1. Bhadrakali Waste Management Pvt. Ltd.	6,11,12,13,20	24
2. Nepal Public Health Environment for Development Pvt. Ltd.	1,2,5,18,23,24,25	10
3. Pokhara Phohormaila Byabasthapan Pvt. Ltd.	7,17,21,22	13
4. Waste Management Recycling Pvt. Ltd.	10,14,15	10

Company name*1	Service Area (Ward number)*1	Waste Collection Amount (tons/day)*2
5. Batabaran Sundar Nepal Pvt. Ltd.	3,4,8,9	45
6. Pragati Sansar Nepal Pvt. Ltd.	16,19,26,27,28,29,30,31,32,33	14
7. Waste Service Pvt. Ltd.	The company conducts medical waste collections from medical facilities.	-
Total		116

Source: *1: PMC; *2: Estimates by JST based on interviews with PMC and collection and transportation operators.

6.3.3.3 Secondary Transfer by Collection and Transportation Company in PMC

PMC does not offer secondary transfer services due to the absence of transfer stations owned by private business operators. The current landfill site, located at the southeastern edge of the municipality, which is approximately 20 km in the total travel distance from the municipality center, necessitates travel time between the northwest part of municipality and municipality center and the landfill site. PMC has formulated a (draft) plan for the future development of a transfer station to address this issue, but specific details such as timing and site location have not been determined yet (Figure 6-6). PMC intends to construct four transfer stations in the Core Wards and Outer Core Wards, where collection services are currently provided at a relatively high frequency.



Source: PMC

Figure 6-6 Draft Plan for the Development of Transfer Stations in PMC

6.4 Intermediate Treatment and Recycling

6.4.1 Intermediate Treatment

Currently, PMC lacks a municipality intermediate treatment facility. As part of addressing the urgent need for a new landfill site, plans include the establishment of an intermediate treatment facility.

6.4.2 Recycling

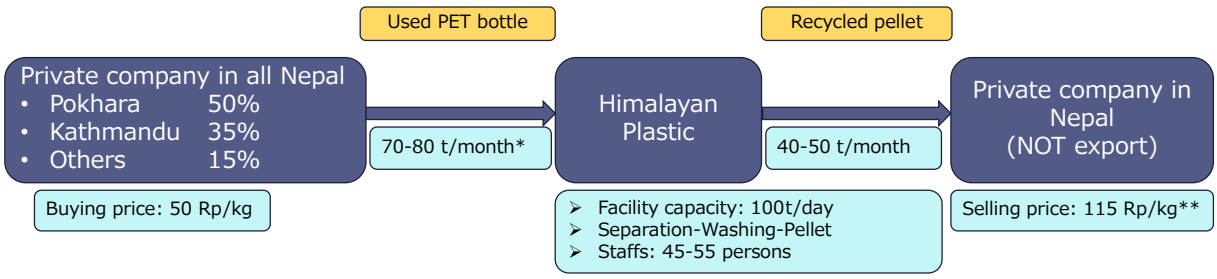
6.4.2.1 Municipality

As of December 2023, PMC does not engage in recycling activities. To prevent waste scattering and sewage leakage onto roads during collection operations, PMC prohibits workers of private waste collectors from collecting recyclables. PMC also prohibits the temporary storage of waste and collection of recyclables on the premises of private waste collectors. Furthermore, in consideration of residents living near the temporary landfill, activities by waste pickers, previously allowed in the closed landfill, are now prohibited in the temporary site.

KOICA and UNDP are in the final stages of selecting contractors for the Green Job Creation to Recycling and Up-recycling project, in collaboration with other donors. The project site is currently under consideration.

6.4.2.2 Private Recycling Company

Himalayan Life Plastic (hereinafter called "HP") and Green Road waste Management were identified as private recycling companies in PMC. HP sells pellets produced from PET bottles collected from various locations in Nepal, including PMC and the Kathmandu Valley, to domestic private companies. While the pellets could be exported to India, HP's policy prioritizes selling them within the country. Additionally, due to PMC's resource sorting policy prohibiting the extraction of valuable materials by collectors, fewer PET bottles are available within PMC, necessitating the purchase of bottles from other regions, even if they are more expensive. Figure 6-7 illustrates HP's processing flow.



Source: JST

Figure 6-7 HP's Processing Flow

No malfunctioning equipment was observed at the recycling facility of HP, and all equipment is functioning properly. Workers are equipped with soundproof headphones and safety gloves to ensure a good working environment. Figure 6-8 shows the current status of HP.

Figure 6-8 Status of HP Company

However, HP expresses concern regarding the absence of a license agreement or official permit with PMC. PMC's prohibition of sorting has also resulted in a decrease in the quantity of PET bottles collected, posing a challenge for HP.

Green Road Waste Management started their business, which is recycles plastic since 2019. According to their Web site, pavement material for road and recycled plastic brick for wall material are produced.

6.4.2.3 Distribution of Recyclables by Informal sector and Recycling Companies

In PMC, it is confirmed through interview surveys that recyclables collected by waste pickers, collection workers at landfill, transfer station, street, and households are sold to recycling factories and exporters through buyers. Main recyclables distributed are PET bottle, plastic film and bag, other plastics, paper, and carton. Additionally, there is a case that electrical products are distributed. The selling price in PMC is slightly higher than selling prices in the Kathmandu valley. Table 3-13 Selling prices of collected recyclables (KMC)Table 6-7 shows the selling prices of collected recyclables in PMC.

Table 6-7 Selling prices of collected recyclables (PMC)

Item	Waste pickers		Collection workers	Buyer (small)	Buyer (Big)
	Landfill	Transfer station			
PET bottle (Rp./kg)	Not provided	50	50	25	35
Plastic film and bag (Rp./kg)	Not provided	40	Not provided	25	Not provided
Other plastics (Rp./kg)	Not provided	35	Not provided	25	25
Can (Rp./kg)	Not provided	Not provided	75	60	65
Metals (Rp./kg)	Not provided	30	30	45	35
Glass bin (Rp./kg)	Not provided	3	3	Not provided	Not provided
Paper (Rp./kg)	Not provided	Not provided	13	18	10
Carton (Rp./kg)	Not provided	10	10	12	12

Source: JST

The interview surveys are conducted with one small buyer who does not have offices and one big buyer who has an office. Purchases amount by buyers are shown in Table 6-8.

Table 6-8 Purchases Amount by Buyers (PMC)

Item	Buyer (Small)	Buyer (Big)
Company Name	Shiva Laxmi Scrap center	Shreeram Scrap center large
Number of Staffs	7	15
Target Recyclables	PET bottle, Plastic film and bag and other plastic, can, steel, Glass bottle, paper, carton etc.	PET bottle, other plastic, can, steel, Glass bottle, paper, carton etc.
Amount (t/month)	4	5

Source: JST

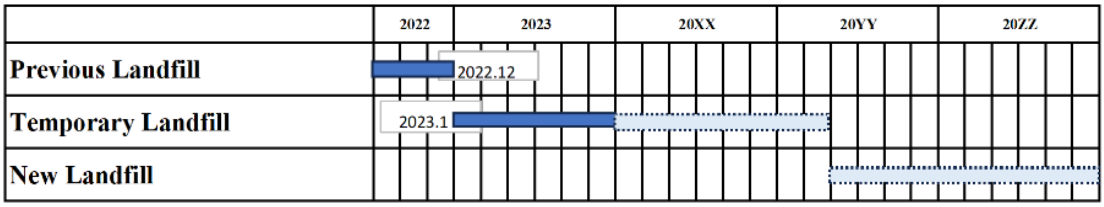
6.5 Final Disposal

6.5.1 Summary of Final Disposal in PMC

From 2011 until December 2022, PMC utilized the old landfill site adjacent to the Pokhara International Airport. However, due to challenges such as bird strikes, making continued landfilling impractical, the landfill activity was halted. Following the completion of landfilling activities, a final soil cover was constructed. Unfortunately, the measures to manage leachate were inadequate, resulting in a confirmed spillage.

Starting January 2023, landfilling activities transitioned to a temporary landfill approximately 20 km away from PMC urban area. Initially planned for temporary use over 6 months, the landfill continues to operate due to the absence of an alternative site and delays in constructing a new landfill. Urgency surrounds the need to cease operations promptly, given the high risk of waste layer collapse and the insufficient landfill area. Local residents also oppose the ongoing use of the landfill.

In response to this situation, PMC is considering a 5-hectare site, located about 5 km from the temporary disposal site, as a potential location for a new landfill. Figure 6-9 shows the history and future plan of PMC final disposal.



Source: JST

Figure 6-9 History of PMC Landfill

6.5.2 Temporary Landfill

6.5.2.1 Summary of Facility

At the temporary landfill site, waste is deposited in a depression formed after a riverbank collapse along the Seti River. Although a year has passed since landfill activities started, the waste has accumulated to significant heights, and signs of collapses and cracks are visible on certain slopes. Safety concerns arise with the ongoing landfill, especially during the rainy season, due to potential waste collapses. Figure 6-10 shows the current status of the temporary landfill site.

Figure 6-10 Status of the Temporary Landfill

According to PMC interviews, the daily intake of waste at the temporary landfill is approximately 100 tons. If the temporary landfill site continues to be utilized, JST estimates that the operational period will be around six months, provided a stable gradient and other safety measures are maintained.

PMC recognized that it will be difficult to continue operation of the temporary landfill until the new landfill commence operation considering the limited remaining capacity. Therefore, PMC is considering the construction and operation of a new temporary landfill additionally. In addition, PMC has expressed to JICA its support for the selection of a suitable site for the new temporary landfill and for operational guidance for its proper and efficient use.

6.5.2.2 Equipment

The equipment used at the temporary landfill site is shown in Table 6-9.

Table 6-9 Equipment Used (Landfill Operations)

Item	Backhoe	Wheel loader
Owner	PMC	PMC
Number	1	1
Situation	Available	Available
Photo		

Source: JST

6.5.2.3 Operation Rules

The temporary landfill accepts waste from early morning to late afternoon, with a daily soil cover applied after the completion of each day's landfilling activity. Resource collection by waste pickers is not permitted, as mandated

by PMC.

6.5.2.4 Operation System

The temporary landfill site is operated by PMC. The temporary landfill site was originally intended to be used only for six months as a provisional measure, but its use has been extended due to delay in identifying the new landfill site. Because of opposition from nearby residents, the PMC is taking precautions in operating the temporary landfill site, such as implementing a thorough daily soil cover. It should be noted that since the start of use in January 2024, the waste collection to the landfill site has been temporarily suspended on four occasions due to opposition from residents.

6.5.2.5 Fire Accident

In April 2024, a fire occurred at the temporary landfill. PMC does not recognize the actual cause. According to press reports, the fire was extinguished within two hours, and nearby residents told smoke and odor.

Waste was not collected for several days after the fire and was piled up in town.

The fire was extinguished successfully by PMC. After that incident, the cover soil has been laid, and operation of waste collection and the temporary landfill site were restarted. Figure 6-11 shows fire situation at the temporary landfill site.

Source: Pokhara News Website

Source: PMC

Figure 6-11 Fire Situation at the Temporary Landfill

6.5.3 Candidate Site for New Landfill

The candidate site for the new landfill is located approximately 5 km away from the temporary landfill, with no residential structures in proximity. Currently utilized as a rice field, the site features a gentle slope and some level ground, making it suitable for landfill purposes. The proposed new landfill site size is 4.8 ha and involves 17 landowners. It is a field with no private houses nearby, and the nearest private house is located about 2 km away. However, the road leading to the candidate site is in poor condition, posing a challenge for the passage of large incoming vehicles. As of December 2023, the candidate site of new landfill was privately owned, and the approval process for land acquisition was underway within PMC. However, the price of the sale proposed by the landowner

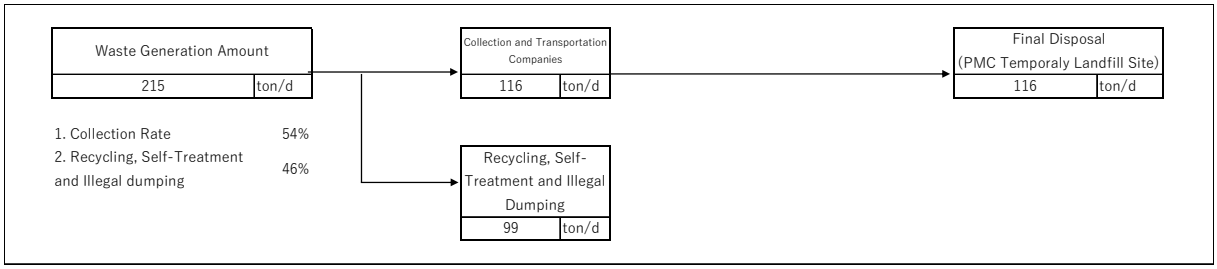
is much higher than the price at which a government agency can purchase the land, as required by law. Therefore, it was confirmed that the land could not be purchased by PMC, the government agency. As of March 2024, PMC has decided to proceed with the project under a PPP (BOT), where the private contractor will implement the repository project, including the land acquisition. PMC already hired a PPP expert and a bidding expert. Figure 6-12 shows the current state of the candidate site for the new landfill.


Source: JST

Figure 6-12 Statue of the Candidate Site for the New Landfill

6.6 Municipal Waste Material Flow

The waste material flow of PMC is shown in Figure 6-13. About 54% of the waste of the municipal waste generated in PMC is collected and disposed by collection and transportation companies, which are contracted out by PMC, while about 46% of the waste is recycled, self-treated and illegally dumped. Assumptions made in developing the flows are shown below.



Note: Totals may not match due to fractional rounding
Source: JST

Figure 6-13 Municipal Waste Material Flow n PMC

- Waste Generation: Population (607,000 people) * Unit generation rate (0.354 kg/person/day) (Referred to as 6.2.1)
- Waste Collection: Estimated based on interviews with PMC (Referred to as 6.3.3)
- Recycling, Self-Treatment and Illegal Dumping: The amount was defined as the generation amount minus the waste collection amount.
- Final Disposal: The amount was defined as the collection amount.

6.7 Equipment Maintenance

The contractor is responsible for the maintenance of the equipment. However, as each collection and transportation operator lack ownership of land for parking their vehicles, PMC provides land for private business operators to park their vehicles.

Figure 6-14 Parking Lot for Collection and Transportation Vehicles in PMC

6.8 Public Awareness

6.8.1 Initiatives by Municipality

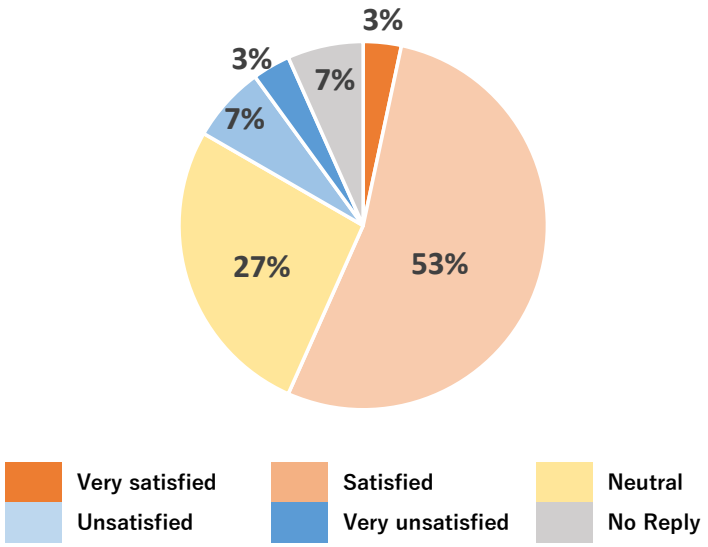
PMC focuses on reducing organic waste at the source and encourages home composting by distributing compost bins.

6.8.2 Interview Survey on Households and Businesses

In the Survey, interviews were conducted with households and businesses to confirm the rate of satisfaction with waste collection services and their requests to the government and collection and transportation company. (See 3-8-2 for outline of this interview survey)

The results of the satisfaction survey in PMC are shown in Figure 6-15. Similar to the KMC, LMC and BKM, less than 10% of respondents in the PMC were not satisfied with the collection service, indicating a high level of satisfaction among households and businesses, but the percentage of respondents who answered “Neutral” was higher than in other municipalities. The main reason for the high level of satisfaction was that the collection is conducted according to the schedule, while some of the “Neutral” responses indicated that collection service is not conducted according to the schedule. Waste collection in PMC is conducted by collection and transportation companies contracted out by PMC. The monitoring on the companies by PMC is not working well.

In addition, PMC has not been able to reach a consensus with residents living near the temporary landfill site, and there have been frequent incidents in which the PMC has had to suspend waste collection at the landfill site due to opposition from residents, and each time this happens, waste collection is stopped, which may have led to a loss of trust by residents in the waste management administration.



Service by Collection and Transportation Companies contracted out by PMC

Source: JST

Figure 6-15 Satisfaction Rate on Waste Collection Service in PMC

As for requests to collection and transportation companies, it was confirmed that "introduction of separation collection and promotion of recycling" is requested most, confirming the high level of interest in waste management and the predisposition to introduce separation collection. However, requests for strengthening activities related to public awareness and improvements in collection operations were also identified (Table 6-10).

Table 6-10 Requests to Collection and Transportation Companies in PMC

Main reasons	PMC
Introducing source separation and promoting recycling	21/30 (70%)
PR for raising public awareness	5/30 (17%)
Changing waste collection operation	3/30 (10%)
No Reply	1/30 (3%)

Source: JST

6.9 Municipal Waste Management System

6.9.1 Ordinances/Local Act

PMC has instituted the PMC Solid Waste Management Rules 2074 (A.D. 2017) as an ordinance governing waste management. These rules were revised and are currently in effect as of 2021.

Regarding waste management, the regulations outline responsibilities, waste generation reduction, waste segregation, licensing for waste management operations, and the involvement of private companies and communities. The municipality holds the responsibility for waste management in PMC, encompassing treatment plants, reuse, composting plants, biogas plants, waste collection, final disposal, and the construction and operation of infrastructure necessary for waste treatment or reprocessing.

Individuals, organizations, and institutions in PMC bear the obligation for waste generation reduction, while

municipalities are mandated to implement measures promoting waste reduction, reuse, and recycling. Municipalities also have the authority to designate waste segregation categories, including organic, inorganic, and other types of waste.

A PMC permit is a prerequisite for any business engaging in waste management.

The management of hazardous, industrial, and medical wastes primarily lies with the generators. However, if necessary, generators can request the municipality to manage the waste, subject to a fee paid to the municipality.

6.9.2 Policy and Plan

PMC has been designated as the "Capital Municipality of Tourism Pokhara" and is committed to promoting "Clean Pokhara Green Pokhara". Recognizing the 3R as an important initiative, the mayor has positioned it as a strategic program to achieve SDGs such as "Goal 13: Climate Action," "Goal 15: Life on Land," and "Goal 17: Partnerships for the Goals". Considering the JCCI proposed by JICA, it is anticipated that PMC will be the target of the project, integrating the environmental sector.

Although the program is currently in preparation, the draft outlines the following for “Clean Pokhara. Green Pokhara”

<Clean Pokhara・ Green Pokhara>

1. Goal: To improve the well-being of Pokhara citizens, environmental sustainability, and living conditions (cleanliness)

2. Objectives:

✧ Green space management and biodiversity conservation

✧ Solid waste management

✧ Promote rooftop greening

✧ Community Participation and Education

3. Clean Green targets: wards, homes, roads, schools

4. Establishment of two committees for implementation: Steering Committee (chaired by the Mayor) and Coordinating Committee.

5. Keywords for implementation strategies: participation, integrated approach, no one left behind, public-private partnership

6.9.3 Financial System

As mentioned above, PMC contracts with seven private business operators for collection and transportation services. These private operators provide their services by collecting fees from residents and business operators based on the tariff specified in the PMC Financial Ordinance (2023-24) (Financial Act), which is established annually by PMC. The PMC Financial Ordinance includes tariffs for various public services and is updated and published annually. The fees for waste management in 2023 are outlined in Table 6-11.

Table 6-11 Fees for Waste Management in 2023/24

Source	Classification	Fee
Home	Urban Area	Premises less than 1,000 square feet: Rs100/month 1,000 to 2,000 square feet: Rs150/month 2,000 to 3,000 square feet: Rs200/month 3,000 to 4,000 sq. ft. lot size: Rs 400/month 4,000 to 5,000 sq. ft. lot size: Rs400/month Lot size above 5,000: Rs500/month
	Other Areas	Rs100/month per household, but Rs80/month for each additional household if two or more households live in one dwelling
Hospitals	Hazardous Waste	Rs40/kg
	Non-Hazardous Waste	Rs20/kg
Office	—	There are about 180 categories of fees based on the type of business and size of the establishment.

Source: JST based on PMC Financial Ordinance (2023-24)

Private business operators remit 20% of the estimated fee collection for waste disposal in their designated areas to the PMC, while retaining the remaining 80% as their revenue. Therefore, if private operators exceed their scheduled fee collections, their revenues will increase, directly impacting the fluctuation in the fee collection rate. On the other hand, this arrangement allows PMC to maintain stable annual revenue.

It is important to note the landfill site does not collect fees for final disposal.

According to interviews with private operators, the fee collection rate from households is close to 100%, while the collection rate from stores is comparatively low. Generally, households are more inclined to comply, motivated by the desire to maintain a positive image within their neighborhood for the long term. On the other hand, stores, being less concerned about their neighborhood's perception, and in cases where a residence and store are combined, may be reluctant to pay fees for both.

The overall revenue for PMC from 2020/21 to 2023/24 is shown in Table 6-12. While the breakdown of revenue in 2022/23 differs from other municipalities, the overall revenue is increasing. The estimated amount paid by the seven private companies to PMC is about Rs17 million/year.

Table 6-12 PMC Revenue (2020/21 to 2023/24)

Unit: thousand Rs.

Item	2020/21 Actual results	2021/22 Actual Results	2022/23 Initial Plan	2023/24 Initial Plan
Budget from the Federal Government	2,471,510	2,737,899	373,781	2,847,219
Budget from State Government	75,707	18,254	74,252	102,362
Tax	553,515	1,533,109	1,330,550	1,466,258
PMC's Own Revenue	1,678,512	1,057,314	4,301,552	2,735,606
Other Revenue	415,756	26,166	0	118,214
Total Amount	5,195,000	5,372,742	6,080,135	7,269,659

Source: Prepared by JST based on PMC's Budget Book.

The overall PMC budget spanning from 2020/21 through 2023/24 is shown in Table 6-13. While the budget for

2022/23 is smaller compared to the other years, the budgets for the remaining three years have increased in alignment with the growth in revenue. While the investment budget includes infrastructure improvements such as buildings and roads, as well as procurement costs for official vehicles and equipment, there is no budget line item designated specifically for waste management.

Table 6-13 Budget of the PMC (2020/21 to 2023/24)

Unit: thousand Rs.

Item	2020/21	2021/22			2022/23	2023/24
	Expenditure	Budget	Expenditure	Execution Rate	Budget	Budget
Operating Budget	2,130,111	2,944,091	2,382,117	81%	1,528,800	3,289,320
Investment Budget	1,530,912	3,520,007	1,787,451	51%	427,200	3,862,198
Loans, etc.	0	0	0	-	751,420	0
Total Amount	3,661,023	6,464,098	4,169,568	65%	2,707,420	7,151,518

Source: Prepared by JST based on PMC's Budget Book.

Despite the presence of detailed information in PMC's Budget Book, the lack of organization by department hinder the extraction of specific budgets related to waste management. Additionally, the Sanitation Section lacks access to its own budget, further complicating the extraction of the budget related to waste management. This suggests that budget and cost management related to waste management may not be properly implemented.

Chapter 7 Support by Donors for Solid Waste Management

7.1 Implemented Supports by JICA

JICA conducted the CKV study from January 2004 to August 2005 to develop A/Ps and transfer technology in municipal waste management. The study covered five major municipalities in the Kathmandu Valley (KMC, LMC, BKM, Timi, and Kirtipur), as well as the Waste Management and Resource Recovery Center (SWMRMC), which was in charge of waste management in the Kathmandu Valley at that time. SWMRC was reorganized into the SWMTSC in June 2011 and expanded its jurisdiction to the entire country. During the CKV study implementation period, secondary transport vehicles were provided to the secondary transfer stations on a non-project grant basis. The project was widely recognized as the Clean Kathmandu Valley (CKV) project due to the synergies generated by Japan's multiple support schemes. Subsequently, a follow-up survey was conducted from November 2015 to March 2017 to confirm the progress of the A/Ps and to provide technical assistance.

In February 2024, a data collection survey was conducted to confirm the current situation and identify needs (report published in 2014). The urbanization of the Kathmandu Valley and the tight landfill site capacity reconfirmed the growing need to reduce the volume of municipal waste. However, the prospect for the development of a long-term landfill site had not yet been established. On the other hand, the situation in which measures are still being implemented based on the A/Ps prepared five years after the CKV survey continued, confirming that Japan's strength in capacity building is firmly rooted in the country.

Although Japanese assistance was suspended after the CKV, the Waste Management Act of 2011 established the principles of private sector involvement and fee collection based on the polluter pays, fee collection has been institutionalized even for waste collection by municipality's direct management in the target municipalities of this survey, and is being practiced in LMC and BKM. Based on the experience with the Sisdol landfill site, which was implemented as a pilot project during the CKV study, the Banchare Danda landfill site was developed independently by Nepal through an expansion of the Sisdol landfill site. The Banchare Danda landfill site was utilized from the feasibility study (FS) conducted during the CKV study. However, the expansion of the Sisdol landfill site and the Banchare Danda landfill site have faced intermittent opposition from local residents in the surrounding area. This indicates issues related to the operational and environmental aspects of the landfill site, as well as the financial difficulties in supporting proper waste management.

7.2 Implemented Supports by Other Donors

Table 7-1 presents the outcomes of recent support from various donors for waste management.

Table 7-1 Other Donors' Assistance in Waste Management

Donor	Project Name	Summary	Period
ADB	Secondary Towns Integrated Urban Environmental Improvement Project	The landfill sites, roads, drainage systems, and water and sewerage systems were constructed in Biratnagar, Birganj, and Butwal.	2011-2019
ADB	Integrated Urban Development Project	The project has constructed landfill sites, roads, and water supply and drainage facilities in four municipalities: Dharan, Janakapur, Nepalganj, and Siddharthanagar.	2012-2019
WB	Nepal OBA Solid Waste Management Project	Strengthening waste management was implemented in five municipalities: Tansen, Dhankuta, Gorahi, PMC, and LMC.	2013-2017
WB	Assessment of SWM Services and Systems in Nepal	This is a survey of the state of waste management throughout the country and provides a comprehensive overview of the issues that need to be addressed by the national, state, and municipalities.	2020
WB	Municipality-Level Assessment and Draft Service Improvement Plan for Solid Waste Management for Pokhara Metropolitan City	The report is a detailed study and analysis of the current status of waste management in PMC, and points out the need for an M/P, the importance of separation of emission valves, and the need to enact ordinances.	2020
WB	Analysis of Solid Waste management of the Kathmandu Valley	Current situation of waste management in 18 municipalities (including KMC, LMC, and BKM) in the Kathmandu Valley is summarized, and future directions are provided.	2021
WB	The Nepal Urban Governance and Infrastructure Project	The project will cover 17 municipalities, including PMC, and will include the construction of roads, drainage, water supply, and septic tanks.	2021-2025
KOICA	Green Job Creation through Recycling and Upcycling Project in Pokhara Metropolitan City	To foster enterprises through recycling and upcycling, support new business providers, and conduct public awareness activities in PMC.	2023-2029

Source: Prepared by JST

7.3 Planned Supports

7.3.1 WB

Actual input and direction of support as well as potential for collaboration identified in discussions with WB are described below.

Actual Input and Direction of Support	・ Three surveys in the waste management sector were conducted in 2020-2021. Another baseline survey is underway to check the status after COVID-19.
Potential for Collaboration	・ Those three survey targets plastic waste and covers four cities; KMC and LMC, which is also target of JICA Survey. MoUD is the target agency for support for federal ministries. ・ For MoUD including support for SWMTSC, it is envisioned to provide (1) support for policy development, (2) support for preparation of Technical Standard, and (3) capacity development for municipalities. ・ However, since both studies (WB and JICA) are still in the baseline survey stage, therefore discussion on coordination and overlap will be made after the projects are scoped specifically.

7.3.2 UNDP

Actual input and direction of support as well as potential for collaboration identified in discussions with UNDP are described below.

Actual Input and Direction of Support	・ UNDP focuses on support for local municipalities, with the main areas of support being collection, recycling, and RDF conversion of plastics, and treatment of hospital waste (autoclaving). ・ Support to MoFAGA in developing a strategy to control plastic waste is being conducted, and a draft report has been submitted to MoFAGA in September 2023. ・ In recent years, in collaboration with KOICA, a Recycle & Up-cycle project was launched for PMC.
Potential for Collaboration	・ Since UNDP targets local municipalities, the potential for duplication is low. ・ For PMC, since UNDP focuses on support for the private sector related to recycling, JICA is expected to provide support to PMC in administrative support and the development of a landfill site.

7.3.3 ADB

Actual input and direction of support as well as potential for collaboration identified in discussions with ADB are described below.

Actual Input and Direction of Support	・ The LMC Mayor requested gasification and melting as an emergency project to achieve zero waste. The KMC also received a request for WtE in May 2023.ADB considers these requests as one of many requests. ・ Since PMC plans to proceed with the waste management project through PPP, ADB plans to support the tourism project in PMC. ・ A project for gasification and melting in the DBO scheme is under consideration to be implemented in Biratnagar. The implementer is expected to be an Indian company. ・ ADB is providing technical support to SWMTSC in 2012 for organizational development and strengthening in response to the SWM Act 2011. ・ In addition, a number of other projects in the waste management sector are being planned and implemented.
Potential for Collaboration	・ ADB plans to support SWMTSC once the budgetary measures by MOF and the establishment of the organization are in place. ADB considers DUDBC as one of the main C/P agencies. ・ ADB is of the view that it can cooperate with JICA on the Countermeasures presented by JICA (i.e., (1) formulation of national waste reduction policy, (2) development of guidelines for municipalities to formulate action plans, and (3) support for SWMTSC). ・ Since ADB is implementing and planning many waste management-related projects, consultation will be necessary in each case. ・ ADB pointed out that in waste management in Nepal, MoFAGA specializes in administrative aspects and MoUD in technical aspects, and that the division of roles between the two ministries is an issue. ・ ADB is working with AEPC (Alternative Energy Promotion Center/ Ministry of Energy) in Dharan municipality, and ADB advised that AEPC is an important institution when considering WtE.

7.3.4 KOICA

In PMC, KOICA and UNDP are working on a "Green Job Creation to Recycling and Up-recycling Project" and are currently in the final stages of selecting a contractor and determining the project site. The municipality comprises approximately 200 communities, with 5 in the Core area, 4 in the Outer area, and 3 in the rural area. This project is a community-based recycling and waste reduction initiative that includes education, awareness, and job creation. Besides awareness and education, the project aims to generate employment. The project outline is as follows:

Title: Green Job Creation Project through Recycling and Upcycling in PMC (2023-2029 / 10.76 mil US$)

Key Objectives:

To contribute to the local circular economy and SDGs by recycling and upcycling municipal waste through capacity building of municipalities, promotion of MSMEs (Micro-, Small- and Medium-sized Enterprises) and policy frameworks.

Corporative Objective:

- Establish a framework to develop sustainable recycling and upcycling enterprises that contribute to the green economy.
- Establish a Green Venture Zone (GVZ) to provide business incubation support (financial, technical, market linkages) to new and existing RU (Recycling and Upcycle) companies.
- Promote behavior change regarding waste awareness, recycling, and upcycling among a larger population, including children and adults.

Specific details will be confirmed during the implementation phase of the project, but synergistic effects can be expected through collaboration with JICA's 3R efforts.

7.4 Donor Support on Target Organizations

The status of support in the field of waste management by each donor, including JICA, to the target organizations of this Survey (MoUD, KMC, LMC, BKM, and PMC) is shown in Table 7-2. In 2012, ADB provided support to SWMTSC for organizational strengthening.

For KMC and LMC in Kathmandu Valley, the WB is conducting a basic study focusing on waste plastics, and considering to provide assistance in this area. Prior to this basic study, the WB is conducting a basic waste management study in 2021 for 18 municipalities in the Kathmandu Valley, including KMC, LMC, and BKM. As for PMC, KOICA and UNDP are currently supporting recycling and upcycling by 2029, which is positioned as a project aimed at creating employment in the recycling industry.

On the other hand, JICA has been conducting the CKV survey and a follow-up survey in five target municipalities in Kathmandu Valley (KMC, LMC, BKM, Timi, and Kirtipur) and SWMTSC from 2004 to 2007 to support improvement of waste management in these areas.

Table 7-2 Donor Supports on Target Organizations in Waste Management Sector

Target Organization	Donor	Project Name	Remark
MoUD/ SWMTSC	JICA	CKV Survey and follow-up survey from 2004 to 2007, and data collection survey in February 2024. ● Target: SWMTSC	
	ADB	Organization strengthening on in 2012 Considering support on MoUD including support on SWMTSC	
	UNDP	● Support on development of strategy for waste plastic management in 2020.	UNDP supports local municipalities and in the field of medical waste management.
	WB	Basic survey on waste management focusing on waste plastic from 2023 to present. ● Considering support on MoUD including support on SWMTSC	A consultant (KPMG) is implementing the basic survey on behalf of WB.
KMC	JICA	CKV Survey and follow-up survey from 2004 to 2007, and data collection survey in February 2024.	
	WB	Basic survey on waste management in 2021. Basic survey on waste management focusing on waste plastic from 2023 to present.	
LMC	JICA	CKV Survey and follow-up survey from 2004 to 2007, and data collection survey in February 2024.	
	WB	Project for strengthening waste management from 2013 to 2017. Basic survey on waste management in 2021. Basic survey on waste management focusing on waste plastic from 2023 to present.	
BKM	JICA	CKV Survey and follow-up survey from 2004 to 2007, and data collection survey in February 2024.	
	WB	Basic survey on waste management in 2021.	
PMC	WB	Project for strengthening waste management from 2013 to 2017. Basic survey on waste management in 2021.	
	KOICA & UNDP	Green Job Creation to Recycling and Up-recycling Project from 2023to 2029	
Other municipalities	JICA	CKV Survey and follow-up survey from 2004 to 2007, and data collection survey in February 2024.	Timi, and Kirtipur are included.
	ADB	Project for development of urban environmental facilities from 2011 to 2019.	Biratnagar, Birgunj and other municipalities are included.
	WB	Project for strengthening waste management from 2013 to 2017. Basic survey on waste management in 2021.	5 municipalities including LMC and PMC are included. 18 municipalities in the Kathmandu Valley are included.

Chapter 8 Holding Workshop

The workshop was held on March 13 and 14, 2024. Day 1 was mainly targeted at the working level of waste management, with a session on “Discussion of Current Situation and Issues Identification" in the morning and a "Visit to Banchare Danda Landfill Site” in the afternoon. On the day 2, decision makers from the federal government and municipalities were invited to participate in the “Discussion of Countermeasures” session, where good practices were shared and countermeasures were discussed.

8.1 Schedule of Workshop

The workshop was conducted with the program shown in Table 8-1.

Table 8-1 Program of Workshop

Schedule	Agenda	In Charge Person
March 13 (Wednesday)		
09:00~12:30	Reception	-
	Introduction of Attendees	JST (Alek Poudel)
	Opening Remarks	JICA (Daishiro Murakawa (Deputy Director))
	Waste Management in Nepal	DUDBC (Manoj Nakarmi,(Senior Divisional Engineer))
	Survey Outline and Result for the Federal Government	JST (Yamauchi Hisashi)
	Specific Survey Results	JST (Yosuke Sano)
	Survey Results for KMC, LMC and BKM	JST (Takahiro Kamishita)
	(Short Break)	-
	Current Waste Management Situation, Issues and Countermeasures in PMC	PMC (Netra Timilsina (Sub-Engineer))
	Survey Results for PMC	JST (Takatoshi Arai)
	Role of Private Sector in Solid Waste Management	SWMAN (Bhupal Acharya (Member))
	Question and Answer	JST (Alek Poudel, Yamauchi Hisashi)
	Discussion on Problem Analysis and Identification of Issues in Waste Management in the Target Municipalities and Nepal	JST (Alek Poudel, Yamauchi Hisashi)
	(Photography)	-
12:30~13:30	(Lunch)	-
13:30~17:00	(Travel)	-
	Visit to Banchare Danda landfill site	KMC and JST
	(Travel)	-
March 14 (Thursday)		
09:00~12:30	Reception	JST
	Introduction of Attendees	JST (Alek Poudel)
	Opening Remarks	DUDBC (Narayan Prasad Bhandari (Acting Director General))
	Introduction of Good Practices in Other Projects (Development and Operation of Fukuoka Method Landfill)	JST (Tomoari Swanobori)
	Introduction of Good Practices in Other Projects (Ward Based Approach in Bangladesh)	JST (Arai Takatoshi)
	(Short Break)	-
	Results of Day 1	JST (Arai Takatoshi)
	Good Practice of Waste Segregation Practices in Ward 12 of Lalitpur Metropolitan City	LMC (Sarita Maharjan (Ward 12 Representative))

Schedule	Agenda	In Charge Person
	Good Practice of Recycling Activities (Plastic Bottle Recycling) by Private Sector	Himalayan Life Plastic Pvt. Ltd. (Prakash Bharati (General Manager))
	Discussions on Improvement Measures in Waste Management in the Target Cities and Nepal	JST (Alek Poudel, Yamauchi Hisashi)
	Remarks	JICA (Tomoko Tanaka (Senior Representative))
	Remarks	LMC (Pradip Amatya (Senior Coordinator))
	Remarks	KMC (Nisha Koirala (Environment Engineer）)
	Closing Remarks	PMC (Dhana Raj Acharya (Mayor))
	(Photography)	-
	(Lunch)	-

8.2 Participants of Workshop

In the morning session of day 1, the "Discussion on the Current Situation and Identification of Issues" had a total of 39 participants, mainly from MoUD, DUDBC, MoFAGA, and MoHP at the working level, including waste management officials from the federal government and each municipality. In the afternoon, the "Visit to the Banchare Danda Landfill Site" session had a total of 25 participants from various organizations, including MoUD and DUDBC, as well as waste management officials from each municipality. In the morning session of the day 2, "Discussion of Countermeasures" had a total of 37 participants including decision makers, such as the Acting Director General of DUDBC, the PMC Mayor and Assistant Director, as well as practitioners from each municipality, SWMAN, and donors (UNDP and WB). The list of workshop participants is shown in Appendix 3.

8.3 Summary of Discussion in the Workshop

A summary of the question-and-answer session as well as the discussion is described below.

(1) Role and Involvement of Federal Government in Waste Management in Nepal

- Although the Waste Management Act states that municipalities are responsible for implementing waste management, there is a need for strengthening the involvement of the Federal and State governments and clarifying the division of roles. For example, PMC had to close its old landfill site due to the construction of the Pokhara International Airport, which was implemented as a national project. However, securing an alternative landfill site was not included in the national project and PMC was responsible for this. It would have been beneficial if the Federal government had been involved in the process of securing an alternative landfill site. The low priority given to infrastructure investment in the waste management sector compared to other sectors is an issue. (PMC)
  - MoUD recognizes the need for strengthening the involvement of the Federal or State government to support waste management in municipality. The SWMTSC is currently in the process of launching the SWMTSC and reviewing the existing Waste Management Act (SWM Act) in order to provide strengthening support to municipalities. (MoUD)
  - We look forward to the re-opening of the SWMTSC. Particularly in light of the growing urbanization and tight final landfill site capacity, support is needed for practices by municipalities and private business

operators to reduce waste, strengthen recycling, and improve landfill site development and operation. (KMC、LMC、BKM、PMC、SWMAN)

(2) Importance of Waste Reduction

- The Banchare Danda landfill site is planned to have a 20-year landfill capacity, assuming that source separation will be conducted and recycling and other treatments to reduce the amount of waste will be performed. However, the current situation is that the full amount of waste is being landfilled without any source separation and almost no reduction treatment, raising concern about the landfill capacity constraints. Municipalities using the Banchare Danda landfill site should expedite the implementation of source separation. As the largest contributor to the Banchare Danda landfill, KMC should take the initiative to initiate source separation. As the actual operator and manager of the landfill site, KMC should also take the lead in encouraging other municipalities to do the same efforts. (MoUD)
  - We have initiated pilot projects of source separation partially in areas waste collection provided by direct management of KMC. In areas waste collection provided by collection and transportation companies, KMC attend community meetings between the companies and residents to assist in the implementation of pilot projects for source separation. These activities are planned to be expanded as needed. In addition, a temporary composting facility has been installed at the Teku transfer station to begin recycling organic waste. On the other hand, the issues are it is difficult to expand the composting facility at the Teck transfer station to a larger scale due to lack of land and consensus building with the surrounding residents, and that utilization of valuable resources other than organic waste has not yet been achieved. (KMC)
  - We recognize that the reduction of final disposal amounts is an urgent issue. As a municipality's responsibility, we will continue to make efforts to reduce waste at the source and introduce source separation to promote waste reduction. (LMC)
  - Collection and transportation companies operating in the Kathmandu Valley have succeeded in creating approximately 5,000 jobs (including informal jobs) through its activities in waste management in the Kathmandu Valley. In addition, roughly 20% of the waste collected is recycled, actively contributing to the reduction of the final disposal amount. (SWMAN)
- PMC is conducting final disposal at a temporary landfill site as an emergency measure in response to the closure of the old landfill site due to the Pokhara International Airport construction project mentioned above. Although PMC is working urgently to secure a new landfill site, there is no prospect of acquiring land for the site. On the other hand, the remaining capacity of the temporary landfill site will not be sufficient until the new landfill site is operated, so it is necessary to secure a new temporary landfill site. Therefore, the PMC recognizes that reducing the final disposal amount through the 3Rs is an issue. In order to further enhance its value as a tourist city, PMC intends to create a clean city under the slogan "Green Pokhara Green Pokhara," which includes strengthening waste management, and improvement of waste management is a priority issue.

The development of the Green Venture Zone (GVZ), which is currently under planning, is expected to reduce the final disposal amount by promoting reuse and recycling. On the other hand, the development of landfill sites has been an issue for some time. (PMC)

(3) Improvement of Banchare Danda landfill site

- The Banchare Danda landfill site was developed as a sanitary landfill site, but from what we observed during our inspection of the Banchare Danda landfill site, it is questionable whether the site is properly maintaining its function. For example, inadequate compaction, excessive soil cover, failure of pumps to circulate leachate to the landfill site, and control of waste pickers and other persons entering and leaving the landfill site. (PMC)
  - We recognize that the current situation does not allow the landfill site to maintain its function as a sanitary landfill site, and that its operation needs improvement. In addition, since the Banchare Danda landfill site is operated by KMC, the cost of facility repairs and maintenance should be borne by the municipality, including KMC. (*The Banchare Danda landfill site has not been formally handover from MoUD to KMC.) For example, leachate overflow has been a problem, as pumps used to circulate leachate back to the landfill have failed, causing leachate to accumulate in the leachate control pond. MoUD has repaired the pumps five times and has borne the cost, but the cost should be borne by KMC. (MoUD)
  - Although the Banchare Danda landfill site is shared by 24 municipalities in and outside the Kathmandu Valley, only KMC is currently responsible for the operation of the site. We would like to request that the other municipality that jointly use the site share the cost fairly. (KMC)

Chapter 9 Common Issues on Waste Management and Analysis of Needs

9.1 Analysis of Issues in Each Field of Waste Management

Common issues (6 items) in waste management at the national level and in the four municipalities studied (KMC, LMC, BKM, and PMC) were identified and analyzed.

9.1.1 [Issue-1] Responding to Changes in Federal Government Policies and Systems, and Strengthening Federal Government Leadership

The details of this issue are described below.

- Since the constitutional revision in 2015, waste management policies have changed dramatically; the SWMTSC has been suspended and the NWMCC, for which MoFAGA acted as secretariat, has been unable to conduct any substantive activities. As a result, technical assistance and guidance to municipalities has not been available.
- The responsibility for waste management at the national level was transferred from MoFAGA to MoUD by a November 2023 Federal government (Office of the Prime Minister and Council of Ministers) notification.
- Since MoUD does not have an organizational structure in place to have jurisdiction over waste management, consideration is being given to forming an organization to be in charge and staffing it as needed. In conjunction with this, discussions are underway to reopen the SWMTSC.
- KMC, LMC and the Waste Management Association of Nepal (SWMAN: NGO composed of private business operators for collection and disposal) express optimism for the resumption of SWMTSC.

9.1.2 [Issue-2] Development of Waste Management Plans based on Objective Data

The details of this issue are described below.

- KMC, BKM, and PMC have not developed waste management M/Ps and have not been able to introduce planned waste management measures and implement facility improvements. KMC and BKM are introducing separation collection, compost production, and other measures in the absence of an integrated strategy and plan for waste management. For LMC, a waste management M/P (target year: 2023/24) was developed in 2018 with the support of WB, but it has not been approved and has not been activated. Besides, it is only conceptual, such as the establishment of strategic items, and lack of specific actionable details.
- Although truck scales are in place at the Banchare Danda landfill site and the Teku transfer station, they are not in use, and incoming vehicles are managed manually. It would be beneficial to the municipalities involved if the truck scale could be put back into operation and the data could be managed centrally in the cloud and shared with the municipalities involved.
- Some of collection and transportation companies in the KMC and LMC have their own transfer stations. Since these collection and transportation companies also collect waste from other surrounding municipalities,

it is not possible to accurately determine the waste collection amounts specific to KMC and LMC. Furthermore, collection and transportation companies provide collection services without contracts or licenses with KMC or LMC. The actual activities, such as collection areas and waste collection amounts, are also not reported to the KMC and LMC.

- In the four municipalities, measures such as separation collection are being implemented according to the needs of the moment, while the future vision of waste management remains unclear. In addition, the KMC and LMC do not have sufficient data on waste collection amounts and the collection areas of collection and transportation companies, making it difficult to set appropriate targets and measure their effectiveness. Each municipality is required to formulate a waste management M/P or A/P covering the entire municipality based on waste management data, introduce and deploy waste reduction and recycling based on the plan, improve facilities and equipment, promote private sector consignment, clarify administrative responsibilities, and implement budget measures, by securing budgets based on those plans.
- PMC was designated as the "Capital Municipality of Tourism Pokhara" and will promote "Clean Pokhara Green Pokhara"(See 6.9.2 for outline). The program will work with communities to promote waste management and greening, and is consistent with JICA's "JCCI" initiative in terms of comprehensive improvement in a wide range of environmental areas. It is possible to envision support for PMC that integrates the environmental sector.

9.1.3 [Issue-3] Improvement of Waste Collection Service in Cooperation with Private Business Operators and Introduction of Separation Collection

The details of this issue are described below.

- Due to the promulgation of the new Constitution in 2015 and changes in the nature of local government, the concession contract for the waste management project in Kathmandu Valley was suspended mid-contract. As a result, there is a mix of direct and private waste collection in KMC and LMC without any coordination. Besides, collection and transportation companies are providing waste collection services without any licenses or contracts from the government side. Currently, KMC is preparing to bid for the outsourcing to the private sector by dividing the municipality's area into about seven areas. Privatization under administrative control would be a major improvement, but would require administrative support to manage, guide, and monitor the private sector.
- In BKM, the landfill in the city was closed in January 2024 and the waste will be hauled to the Banchare Danda landfill site. This has made the transportation distance longer, thus increasing the need for a transfer station.
- In KMC, waste collected by KMC is transshipped at the Teku transfer station and transported to the Banchare Danda landfill site. The platform is not used and is being loaded onto dump trucks with a backhoe. Also, truck scale is not used.

- In PMC, waste collection is conducted by private sector. PMC has contracts with seven collection and transportation companies. The collection and transportation company collects a fee from the waste generators and pays a portion of the fee to the municipality. However, according to interviews with collection and transportation companies, the problem is that the collection rate is low (50-60%).
- KMC and LMC have introduced separation collection of valuable materials in some wards. This activity is positioned as a model for municipalities nationwide.
- The PMC prohibits collection and transportation company workers from collecting valuable materials during collection operations and from temporarily storing waste on the collection and transportation company's land. As a result, recycling plants in the municipalities are experiencing shortage with the amount of PET bottles collected.
- In Nepal, where industry (arterial and recycling industry) is limited, policy support and guidance by the government is considered essential to promote recycling, including securing markets. Therefore, there is a need to develop intermediate treatment facilities (resource recovery facilities (MRF), solid fuel from waste (RDF), composting, biogas conversion, etc.) for both the treatment of organic waste and the recovery of valuable resources.

9.1.4 [Issue-4] Reducing the Environmental and Social Impact of Landfill Sites and Extend their Life Spans

The details of this issue are described below.

- Facility maintenance, operation, and management of the Banchare Danda landfill site exceeded the level seen in LDC countries. On the other hand, problems were identified such as non-management of the waste pickers, excessive soil cover placement, and lack of systematic disposal and compaction based on the disposal plan.
- The EIA for the Banchare Danda landfill site was approved in 2009, involving the Parliamentary Council of Ministries. Conditions were set for the approval, many of them have not been fulfilled. Therefore, MoFE has asked MoUD to conduct a Supplemental EIA in 2019, and it appears that consideration is being sought to include relocation of the site.
- In the four target municipalities, a shortage of landfill capacity has emerged, and there is a need to reduce the final disposal amount. However, municipal efforts to reduce waste are limited, with most initiatives led by collection and transportation companies that informally collect recyclable materials. Some large-scale companies sort valuable materials at transfer stations. On the other hand, there are also small-scale companies that sort valuable materials on collection vehicles in unsanitary conditions under bridges or in vacant lots. If municipalities could coordinate among these companies, accept waste collection from the small-scale companies at the facilities operated by the large-scale companies, and sort the valuable materials, it would be possible to efficiently and hygienically collect the valuable materials and reduce overall waste volume. As for municipality, household composting is being promoted but its impact on waste reduction remains limited. It

is necessary to promote source separation and public awareness, and this effort should involve ward representatives to expand the collection of valuable resources and composting of organic waste.

- The Sisdol old landfill site, although reinforced, has a steep slope that is partially bare of waste, and leachate runoff was observed. Considering environmental impact and safety, the site should be closed as soon as possible.
- The PMC has been using the riverfront in the Lame Ahal area as a temporary landfill site since January 2023, but cracks have been observed on the surface of the landfilled waste, making it unsafe. The new landfill site is planned to be developed through PPP, but it will take at least several years before it is ready for operation. A new temporary landfill site should be secured until the new landfill site is in place.

9.1.5 [Issue-5] Appropriate Regional Waste Management

The details of this issue are described below.

- 24 municipalities currently deposit waste at the Banchare Danda landfill site. The MoUD oversees facility construction, while the operation and management fall under the responsibility of KMC. Although LMC provides some equipment, there is currently no formal agreement between the municipalities. KMC has confirmed its willingness to engage with the MoUD to establish clear delineation of responsibilities and cost-sharing for the project.
- Despite the NSWMP2079 suggesting coordination among municipalities by the provincial government for the introduction of a regional waste management system, there is no evident implementation of such coordination. Regarding the MoUD, considerations for a cluster system and integrated management of the Kathmandu Valley are under discussion, with future involvement anticipated.

9.1.6 [Issue-6] Strengthening Leadership of Responsible Organizations for Industrial and Medical Waste

The details of this issue are described below.

- The responsibility for both industrial and medical waste disposal is considered to originate at the source; neither of the two ministries is directly responsible for waste disposal. The MoHP has developed guidelines for hospital waste separation in alignment with WHO standards, distributing them to all hospitals.
- A significant issue identified is the lack of treatment facilities for medical waste in Nepal, mainly autoclaving. It has been observed that waste separated within hospitals is often mixed during the collection and treatment stages.

9.2 Identification of Needs of Relevant Organizations

The major needs for waste management that were expressed by relevant organizations in the Survey are listed below. This section also shows the relationship between the needs of relevant organizations and the 6 common

issues listed in 9-1 above.

Organization	Needs	Common Issues					
		1	2	3	4	5	6
MoUD/ DUDBC	● Development of guideline for operation and management for municipalities nationwide (including leachate treatment).	●			●		
	● Development of technical standard for intermediate treatment and recycling for municipalities nationwide.	●		●			
	● Introduction of source separation			●			
	● Growth of the venous industry that accepts organic waste and valuable materials.			●			
	● Comprehensive guidance on the entire process from waste generation to treatment and disposal, including recycling, based on the premise of source separation and the 3Rs, which are implemented based on an understanding of waste generation amounts and waste composition.	●					
KMC	● KMC expects SWMTSC about the following items.						
	➢ Development of access roads to the Banchare Danda landfill site (route from Tinpiple to Sisdol)				●		
	➢ Raising the embankment of the Banchare Danda landfill site, leachate treatment, etc.				●		
	➢ Coordination among ministries and relevant organizations to solve waste management issues (e.g., sharing responsibility among municipalities for improvement of the Banchare Danda landfill site operations, etc.).					●	
	➢ Resolving social issues with residents living near the Banchare Danda landfill site				●		
	● Development of composting facilities for the treatment of organic waste collected through source separation. However, since it is difficult to secure sites in the city, it is necessary to secure sites in the surrounding area.			●			
	● Market acceptance exist for non-organic waste collected through source separation, such as PET, but currently non-recyclable items (some hard plastics, colored glass bottles, etc.) need treatment.			●			
	● Appropriate management of the Banchare Danda landfill site, leachate treatment, and data management using truck scale are needed.		●		●		
	● Closure measures for the Sisdol old landfill site are required, such as slope shaping and stabilization, vegetation, leachate treatment, and site use planning.				●		
	● Development and implementation of a business plan based on waste amount data is needed.		●				
LMC	● Improvement of waste management requires ensuring circular economy and financial sustainability.			●			
	● The SWMTSC is expected to take the lead in (1) raising awareness and education, (2) recognizing the importance of landfill sites, and (3) strengthening recycling, especially composting.			●	●		
	● The SWMTSC should be an independent organization that is not affected by changes or modifications in line ministries.	●					
	● There is an urgent need to approve and issue a Waste Management Act. This act will address the social issues of the Banchare Danda landfill site by delineating responsibilities among the relevant organizations (Federal government, state government, and municipality), as stipulated in the Waste				●		

Organization	Needs	Common Issues					
		1	2	3	4	5	6
	Management Act. ● There is a need to reduce the final disposal amount by introducing source separation and promoting recycling as required in the EIA for the initial Banchare Danda landfill site. ● Although the promotion of privatization has not progressed for a long time, it is expected that the application of the new SWM Act (e.g., clarification of the responsibilities of government agencies) will resolve this issue.			●	●		
BKM	● There are problems related to landfill sites (long distances to landfill sites, high costs, lack of vehicles, etc.), and there is an urgent need to reduce waste amount. ● Land needs to be secured for recycling operation. ● Reuse and recycling of plastic waste are needed. ● Procurement of compactors that can compact and transport waste is needed. ● Waste treatment facilities need to be addressed because residents are opposed to them due to odor issues.			● ● ● ●	● ● ●		
PMC	● Pilot project for appropriate site selection and operation of new temporary landfill site, measures related to medical and industrial waste. ● Waste reduction through source separation and 3Rs is necessary. ● Resumption of SWMTSC ➢ There is a gap between existing laws and regulations and the current situation. The SWMTSC needs to take the lead in updating laws and regulations on e-waste, industrial waste, medical waste, etc. ➢ Training for municipalities is required. ● The PPP project for the new landfill site assumes to be a facility that includes WtE (Bio-gas and power generation). ● Support for improving the operation of temporary landfill sites and the development of new ones is needed.	●		●	● ● ● ●		● ●
SWMAN	● PMC expects SWMTSC about the following items. ➢ The SWMTC should be an independent organization, not under the umbrella of a ministry. Previously, it was placed under the umbrella of the MoLD and was difficult to access. ➢ The Waste Management Act/Policy should include a provision on site acquisition for treatment facilities. ➢ The Waste Management Act/Policy should emphasize a focus on private sector utilization. ● The introduction of 3Rs and development of recycling industry (venous industry) are important. ● Contract or license with municipality for waste collection services.	● ● ●		● ● ●			

Note: ●Highly relevant

The "Sewage Management Master Plan Development Project" (2021-2024) is underway in PMC. In interviews conducted by JST, PMC and MoUD/DUDBC expressed the following opinions on the possibility of integrating sewage management and waste management during the implementation phase of the Master Plan.

Organization	Intention about integrated Technical Cooperation Project for wastewater and waste management
PMC	● In discussions with the PMC mayor, the CAO, and the new director of the Urban Development, Tourism and Environment Division, it was agreed that both waste water management and waste management are administrative tasks of the PMC and can be done simultaneously. ● Regarding the possibility of coordination between the Ministry of Water Supply ("MoWS") and its subsidiary DWSSM, and the Ministry of Urban Development (MoUD), PMC does not see any problem with the coordination between MoWS and MoUD. In addition, MoFAGA will coordinate the administrative affairs of the municipality as needed. <Joint meeting between PMC and JICA after the second day of the workshop> The PMC Mayor's response to the integrated technical cooperation project for wastewater and waste management is as follows. ● The report of this survey will be reviewed and a decision will be made. ● Coordination among the relevant ministries will be handled by PMC (MoFAGA, MoUD, MoWS). Advice can be given to the Prime Minister if necessary. ● While it is difficult to add new personnel, a unit for sewage management is being considered to be set up based on the municipality's approximately 150 engineers. Capacity Development is needed.
MoUD/DUDBC	● Wastewater management is under the jurisdiction of MoWS and waste management is under the jurisdiction of MoUD. PMC needs to take the initiative and request the federal government (Mr. Narayan, Acting DG, DUDBC). ● Coordination meeting between the MoWS and the MoUD is necessary. (MoUD)

Chapter 10 Proposal on Own Efforts and Assistance from JICA

10.1 Organization of Key Issues for Each Implementing Entity

Based on the issues and needs analysis described in Section 9, the key issues for each Federal government, Kathmandu Valley (mainly KMC and LMC), and PMC are summarized in the Figure 10-1. The key issues and measures to address them for each entity are discussed in more detail below.

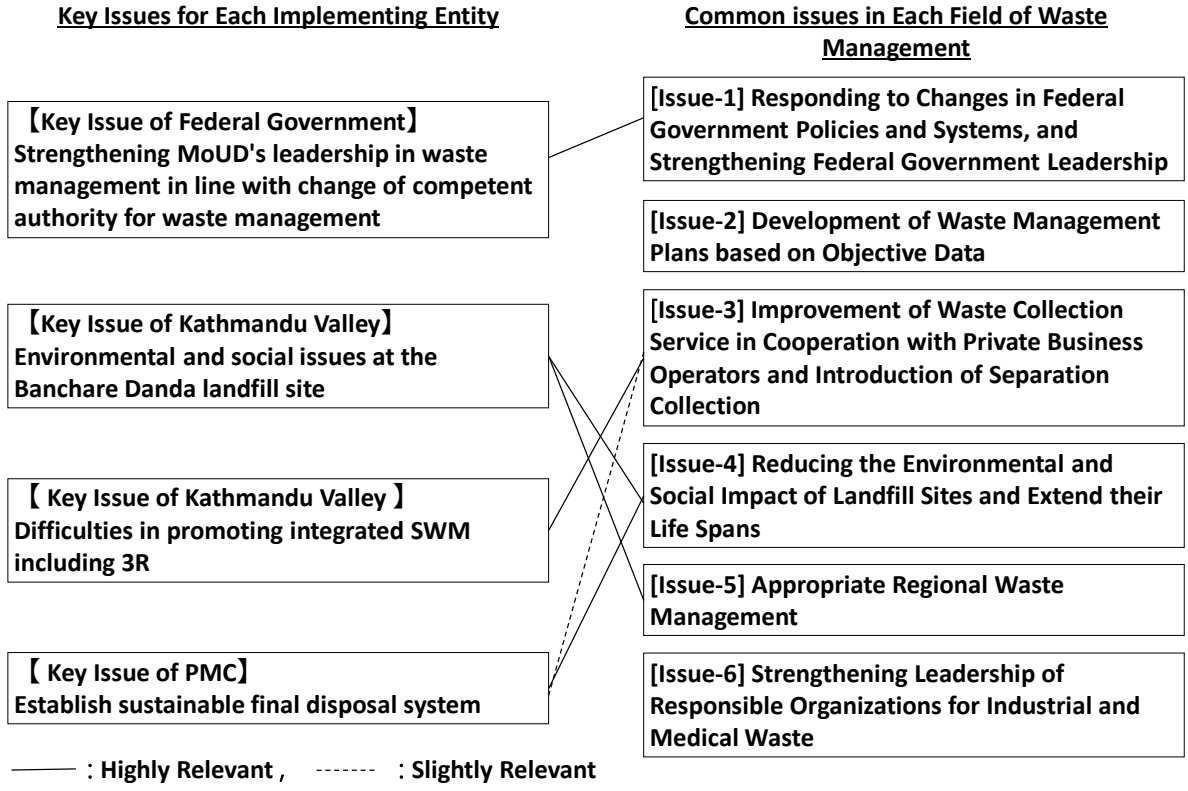


Figure 10-1 Relation between Key Issues for Each Implementing Entity and Common Issues in Each Field of Waste Management

10.1.1 Key Issues and Countermeasures related to Federal Government

In Nepal, the competent authority for waste management was transferred from MoFAGA to MoUD in November 2023. As a result, MoUD will now be responsible for the development of policies, laws and regulations related to waste management, as well as guidance and capacity building for municipality. The key issue for the federal government is to strengthen MoUD's leadership in waste management for municipalities and other entities in line with this change in ministry jurisdiction. Strategies, countermeasures and specific options for the key issues are shown in Figure 10-2. For the key issues, MoUD will be required to develop laws and regulations and guidelines for municipalities and actually provide guidance to municipalities through the SWMTSC.

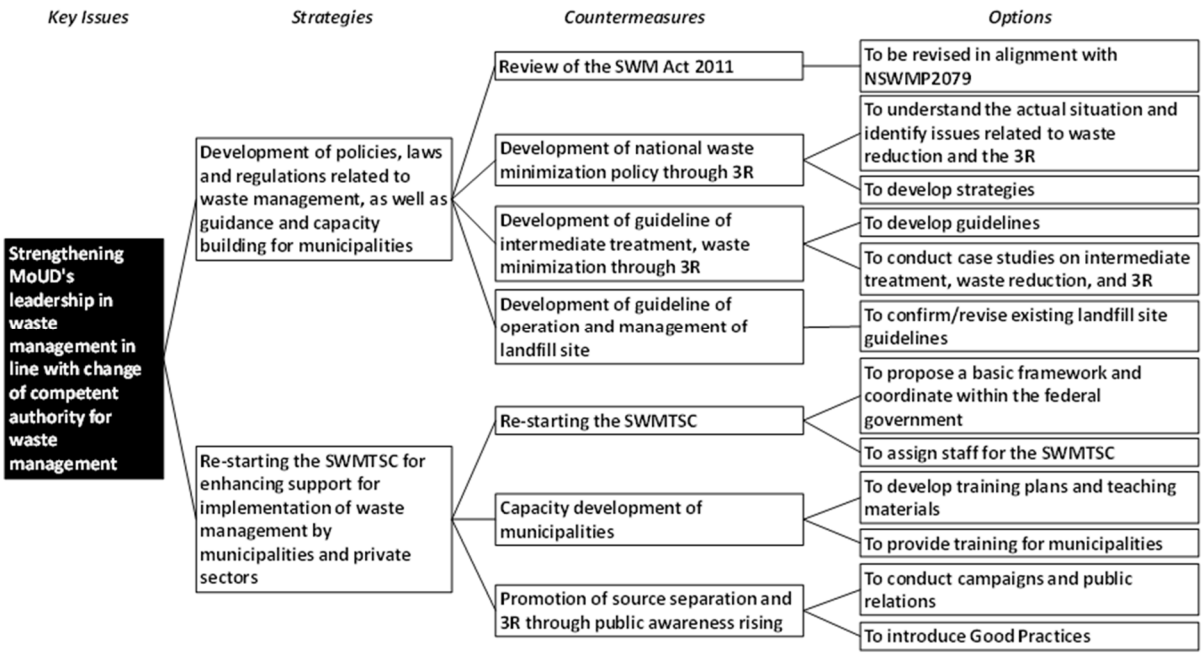


Figure 10-2 Key Issues and Countermeasures related to Federal Government

10.1.2 Key Issues and Countermeasures related to Kathmandu Valley

The Banchare Danda landfill site is the only official landfill site in the Kathmandu Valley. In order to ensure the sustainability of waste management in the Kathmandu Valley, it is essential to (1) solve the problems of this landfill site and ensure its continuous use. In addition, in order to extend the life span of the landfill site as much as possible, it is also essential to (2) implement comprehensive waste management, including the reduction of final disposal amounts through the introduction of the 3R.

The strategies, countermeasures and specific options for these two key issues are shown in Figure 10-3 and Figure 10-4. Regarding the Banchare Danda landfill site, the potential negative environmental impacts of the Sisdol old landfill site and other sites must be reduced, and social problems, such as conflicts with local residents, must be resolved. The Banchare Danda landfill site is operated by KMC with its own funds, without collecting disposal fees from other municipalities. However, in order to ensure sustainable operation in the future, consideration should be given to the equitable sharing of responsibilities among the municipalities that bring in waste.

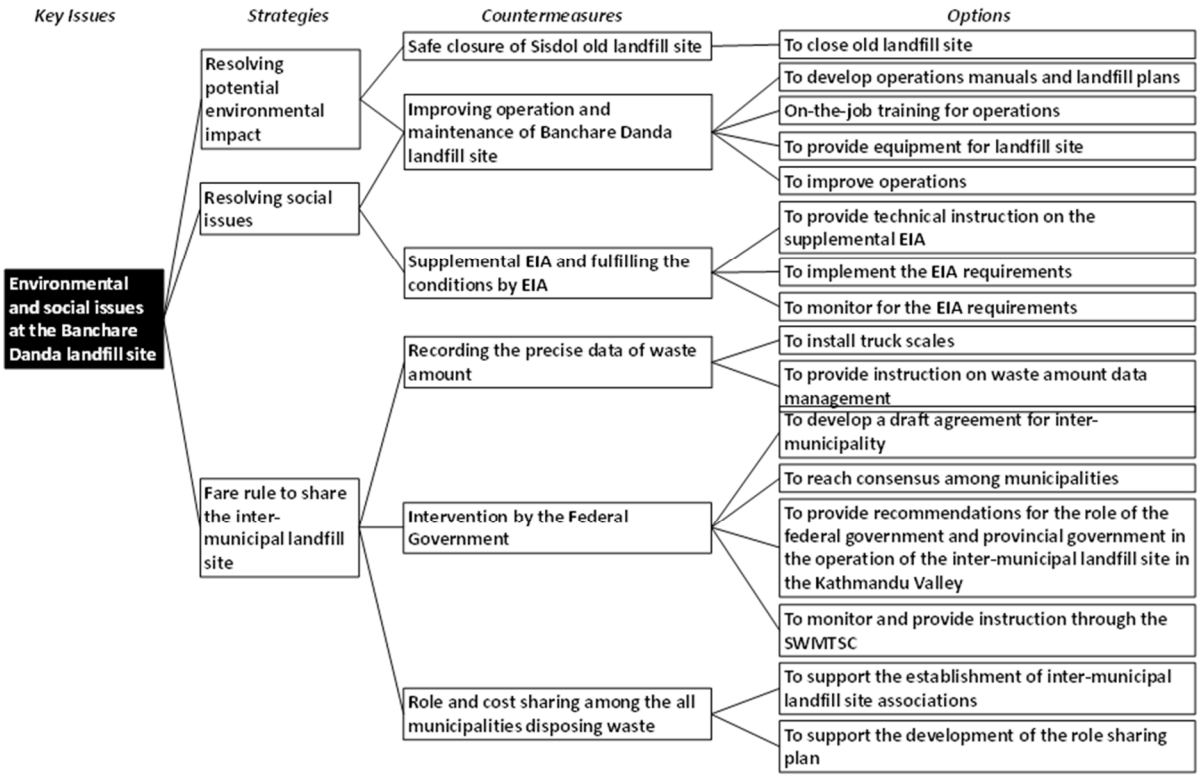


Figure 10-3 Strategies and Countermeasures for Key Issues of Kathmandu Valley (1)

Waste reduction, including the 3R, is essential to extend the life span of the Banchare Danda landfill site. However, collection and transportation companies operating in the Kathmandu Valley are considered the informal sector and do not have formal contracts with the KMC or LMC, and have not been able to establish a cooperative system. Therefore, it is necessary to establish a formal contract and cooperative system with private business operators, and to cooperate with private operators to promote 3R and establish an efficient secondary transfer system.

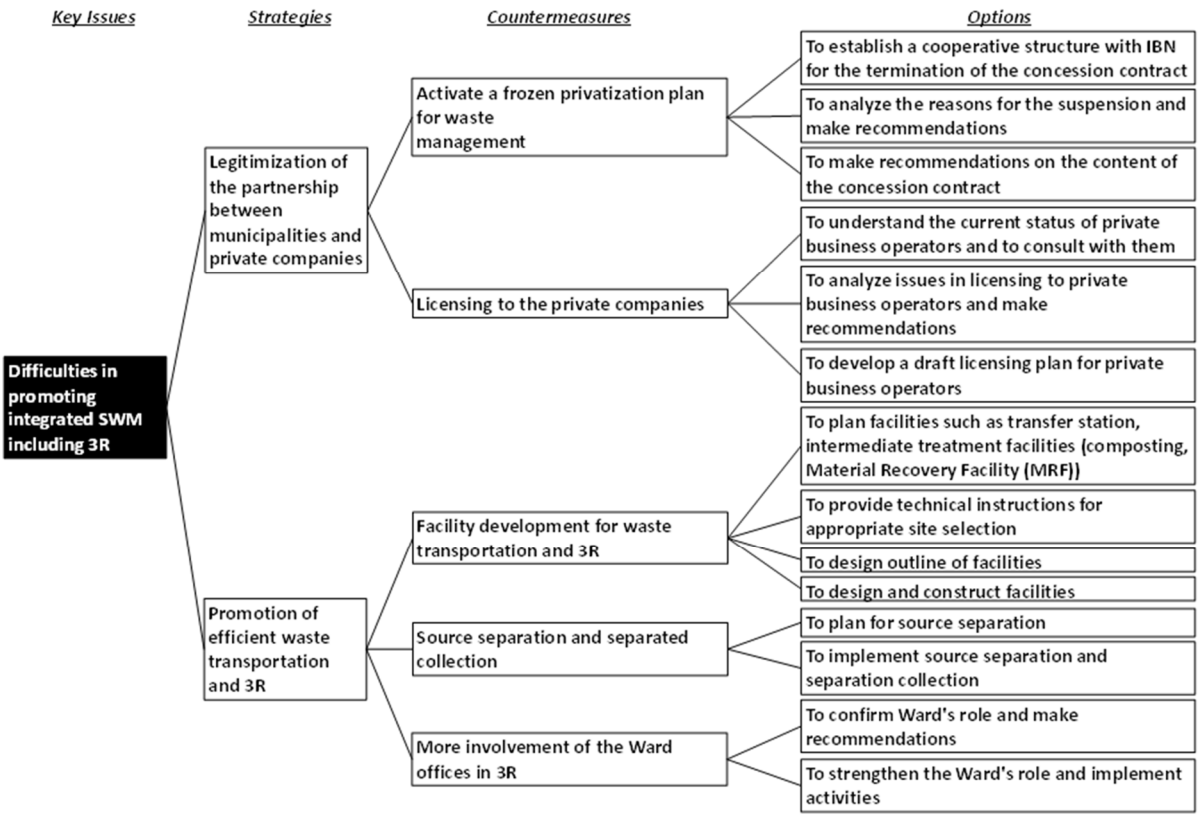


Figure 10-4 Strategies and Countermeasures for Key Issues of Kathmandu Valley (2)

Other than the above, key issues include the development of a master plan for waste management and the systematic implementation of waste management projects based on set targets. Regarding BKM, the efficient transportation of waste to the Banchare Danda landfill site is a key issue.

10.1.3 Key Issues and Countermeasures related to PMC

The biggest problem is that the PMC does not have an official landfill site and disposes of waste at a temporary landfill site. Therefore, the key issue for waste management in the PMC is to establish a sustainable final disposal system. Strategies, countermeasures and specific options to address the key issues are shown in Figure 10-5. In order to solve the issue, it is necessary to (1) reduce the final disposal amount of waste through waste reduction and the 3R, and (2) develop a landfill site as soon as possible. Other key issues to be addressed are: (1) to develop a master plan for waste management and systematically implement waste management projects based on the set targets, and (2) to strengthen the collection and transportation system by private business operators in order to improve the waste collection rate. It should be noted, however, that strengthening collection and transportation should be implemented after the new landfill site is constructed, since increasing the waste collection rate will also increase the final disposal amount.

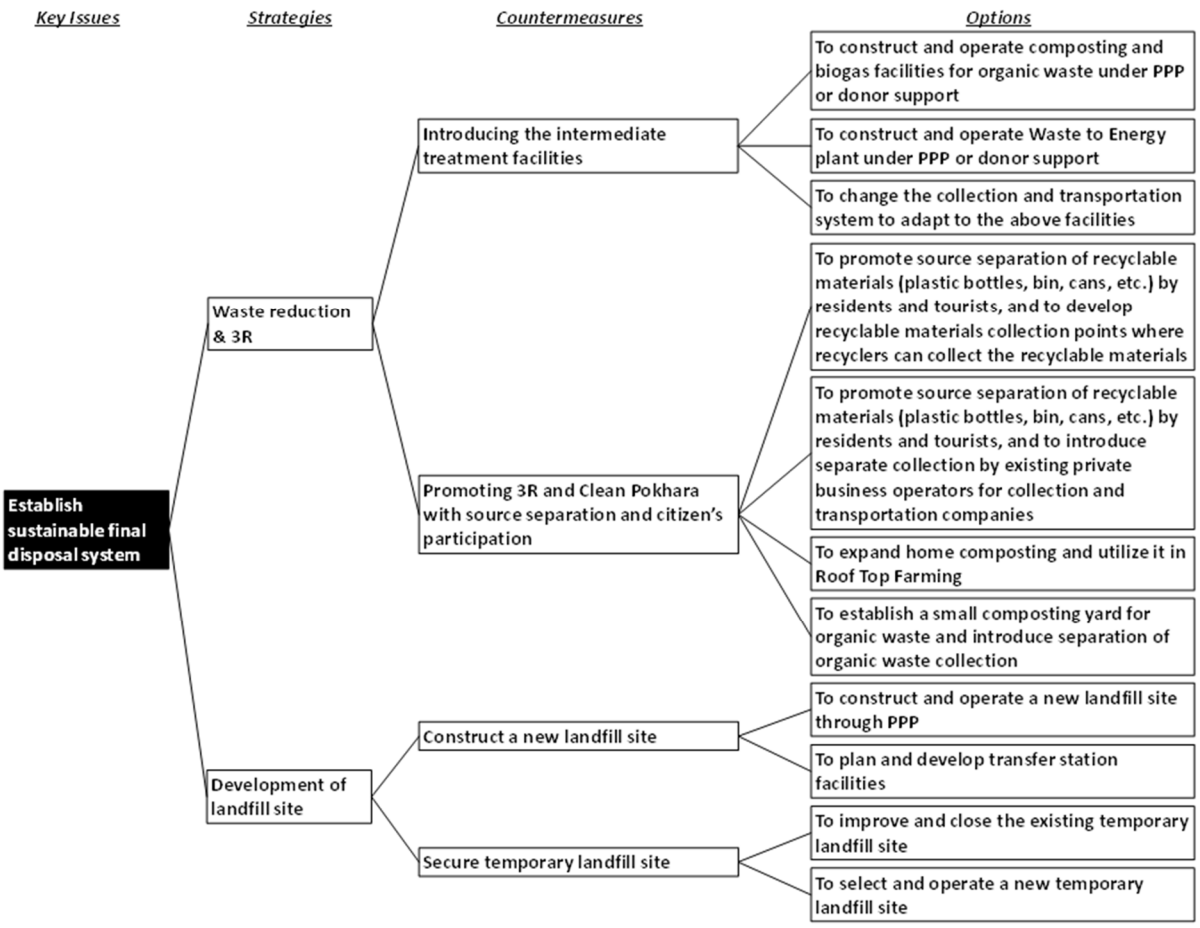


Figure 10-5 Strategies and Countermeasures for Key Issues of PMC

Annex

1. **Schedule of Field Survey**
2. **Focal Persons List**
3. **Participants List of Workshop**

1. Schedule of Field Survey

(1) Schedule of 1st Field Survey

Date			Work Schedule		Accomapny by JICA HQ	Location	
			Team 1	Team 2		Team 1	Team 2
1	25-Nov-23	Sat	Travel (Japan→Nepal)		-	Japan→Kathmandu	
2	26-Nov-23	Sun	Team Meeting, Data Arrangement		-	Kathmandu	
3	27-Nov-23	Mon	MTG (KMC), MTG (JICA Nepal Office)		-	Kathmandu	
4	28-Nov-23	Tue	Site Visit for Banchare Danda L/S and Sisdol L/S		-	Kathmandu	
5	29-Nov-23	Wed	Kick-Off MTG (LMC), Site Visit for LMC T/S		-	Kathmandu	
6	30-Nov-23	Thu	Kick-Off MTG (MoUD), Quotation Opening and Contract Signing of Local Contract Out		-	Kathmandu	
7	1-Dec-23	Fri	Site Visit for KMC T/S, KMC W/S and Private Waste Collection Company	Kick-Off MTG (PMC)	-	Kathmandu	Kathmandu→Pokhara Pokhara→Kathmandu
8	2-Dec-23	Sat	Data Arrangement		-	Kathmandu	
9	3-Dec-23	Sun	Site Visit for LMC Waste Collection, Private Waste Collection Company and Recycling Company		-	Kathmandu	
10	4-Dec-23	Mon	Kick-off MTG (KMC) MTG (Waste Management Adovisor for KMC Mayor)	MTG（Nepal Development Research Institute）	-	Kathmandu	
11	5-Dec-23	Tue	Site Visit for KMC Waste Collection, MTG (Industrial District Management Ltd, KMC's Ward Office)		-	Kathmandu	
			Letter Submitted to BKM Mayor's Secretary	MTG (Local Contractor)		Kathmandu	
12	6-Dec-23	Wed	MTG (MoFE)	Site Visit for Medical Waste Management in Hospital	-	Kathmandu	
13	7-Dec-23	Thu	MTG (Private Waste Collection Company, KMC)		-	Kathmandu	
14	8-Dec-23	Fri	Office Work (Data Arrangement)	MTG (KMC), Office Work (Data Arrangement)	-	Kathmandu	
15	9-Dec-23	Sat	Data Arrangement	Travel (KMC→PMC)	-	Kathmandu	Kathmandu→Pokhara
16	10-Dec-23	Sun	MTG (SWMAN, MoFAGA BKM) Site Visit for BKM L/S	MTG (PMC)	-	Kathmandu	Pokhara
17	11-Dec-23	Mon	MTG (MoHP) Travel (KMC→PMC)	Site Visit for Private Waste Collection Company	-	Kathmandu→Pokhara	Pokhara
18	12-Dec-23	Tue	Site Visit for Private Medical Waste Collection Company, Old PMC L/S, Private Recycling Company		-	Pokhara	
19	13-Dec-23	Wed	MTG (Private Waste Collection Company), Site Visit for PMC L/S and Candidate Site of New PMC L/S		-	Pokhara	
20	14-Dec-23	Thu	Site Visit for Private Waste Collection Company		●	Pokhara	
			Site Visit for Medical Waste Management in Hospital	Site Visit for PMC L/S			
21	15-Dec-23	Fri	Courtesy Call (PMC Mayor), MTG (PMC), Travel (PMC→KMC)		●	Pokhara→Kathmandu	
22	16-Dec-23	Sat	Data Arrangement		●	Kathmandu	
23	17-Dec-23	Sun	MTG (MoICS)	Site Visit for Banchare Danda L/S, Old Sisdol L/S, KMC T/S	●	Kathmandu	
24	18-Dec-23	Mon	Office Work (Data Arrangement)	Site Visit for LMC T/S and T/S of Private Waste Collection Company MTG (KMC Secretary)	●	Kathmandu	
			MTG (MoUD)			Kathmandu	
25	19-Dec-23	Tue	Courtesy Call (BKM Mayor), Site Visit for BKM Compost Facility, BKM T/S		●	Kathmandu	
26	20-Dec-23	Wed	Office Work (Data Arrangement)	Site Visit for BKM Waste Collection Company	●	Kathmandu	
			Courtesy Call (LMC Mayor)			Kathmandu	
27	21-Dec-23	Thu	Office Work (Data Arrangement)	MTG (LMC) Office Work (Data Arrangement)	●	Kathmandu	
28	22-Dec-23	Fri	Office Work (Data Arrangement), MTG (JICA Nepal Office)		●	Kathmandu	
29	23-Dec-23	Sat	Data Arrangement		-	Kathmandu	
30	24-Dec-23	Sun	Office Work (Data Arrangement), MTG (Local Contractor), Travel (Nepa→Japan)		-	Kathmandu→Japan	
31	25-Dec-23	Mon	Travel (Nepal→Japan)		-	Kathmandu→Japan	

(2) Schedule of 2nd Field Survey

Date			Work Schedule		Accomapny by JICA HQ	Location	
			Team 1	Team 2		Team 1	Team 2
1	2024/2/28	Wed	Travel		-	Japan→Kathmandu	
2	2024/2/29	Thu	Working at office (Preparation for Work Shop)		-	Kathmandu	
3	2024/3/1	Fri	MTG（JICA Nepal Office）, MTG（BKM）		-	Kathmandu	
4	2024/3/2	Sat	Preparation for Work Shop		-	Kathmandu	
5	2024/3/3	Sun	MTG（KMC）	Travel	-	Kathmandu	Kathmandu→Pokhara
6	2024/3/4	Mon	MTG（LMC）, MTG（UNDP）	MTG（PMC）, MTG（Himalayan Life Plastic Pvt. Ltd.）	-	Kathmandu	Pokhara
7	2024/3/5	Tue	MTG（ADB）, MTG(DUDBC)	Working at office (Preparation for Work Shop)	-	Kathmandu	Pokhara
8	2024/3/6	Wed	MTG（SWMAN）	Travel	-	Kathmandu	Pokhara→Kathmandu
			Working at office (Preparation for Work Shop)				
9	2024/3/7	Thu	MTG（WB）, MTG（KMC City Planning Commission）		-	Kathmandu	
10	2024/3/8	Fri	MTG(JICA HQ), Working at office (Preparation for Work Shop)		●	Kathmandu	
11	2024/3/9	Sat	Preparation for Work Shop		●	Kathmandu	
12	2024/3/10	Sun	Site Visit (KMC Separate Waste Collection), MTG（MoUD）		●	Kathmandu	
13	2024/3/11	Mon	Preparation for Work Shop		●	Kathmandu	
14	2024/3/12	Tue	MTG（LMC Mayor）		●	Kathmandu	
15	2024/3/13	Wed	Work Shop (Day 1)		●	Kathmandu	
16	2024/3/14	Thu	Work Shop (Day 2), MTG（PMC）		●	Kathmandu	
17	2024/3/15	Fri	MTG（JICA Nepal Office）		●	Kathmandu	
18	2024/3/16	Sat	Preparation of Meeting Materials		-	Kathmandu	
19	2024/3/17	Sun	Preparation of Meeting Materials		-	Kathmandu	Kathmandu→Pokhara
20	2024/3/18	Mon	MTG（MoUD）	Travel	-	Kathmandu	Pokhara→Kathmandu
21	2024/3/19	Tue	Working at office (Preparation of Meeting Materials)	MTG（PMC）, Travel	-	Kathmandu	
22	2024/3/20	Wed	MTG（KMC）		-	Kathmandu	
23	2024/3/21	Thu	Working at office (Preparation of Meeting Materials)		-	Kathmandu	
24	2024/3/22	Fri	MTG（JICA Nepal Office）, Travel		-	Kathmandu→Japan	
25	2024/3/23	Sat	Travel		-	Kathmandu→Japan	

2. Focal Persons List

(1) Meeting Attendees

1. Government Organizations

Name	Position
1. MoUD (Ministry of Urban Development)	
1. Padma Kumar Mainali	Joint Secretary, Urban Infrastructure Division
2. Suman Salike	Senior Divisional Engineer, Urban Development Division
3. Surendra Mohan Shrestha	Director General, DUDBC
4. Narayan Prasad Bhandari	Deputy Director General in DUDBC
5. Madhav Katwal	Civil Engineer in DUDBC
6. Manoj Nakarmi	Senior Divisional Engineer in DUDBC
2. MoFAGA (Ministry of Federal Affairs and General Administration)	
1. Rishi Raj Acharya	Under Secretary, Environment and Disaster Management Section
2. Deekchya Thapa	Section Officer, Environment and Disaster Management Section
3. Jay Ram Upreti	Section Officer, Environment and Disaster Management Division
3. MoFE (Ministry of Forest and Environment)	
1. Madhu Ghimire	Under Secretary (Tech.), Environmental Impact Studies Section
4. MoHP (Ministry of Health and Population)	
1. Dr. Samir Kumar Adhikari	Senior Health Administrator
5. MoICS (Ministry of Industry, Commerce and Supplies)	
1. Khagendra Bahadur Basnet	Senior Divisional Engineer
6. KMC (Kathmandu Metropolitan City)	
1. Nur Nidhi Neupane	Director, Mayor's Secretariat
2. Sunil Lamsal	Advisor to KMC Mayor on SWM
3. Santosh Giri	Advisor to KMC Mayor on SWM
4. Rabin Man Shrestha	Environment Department Head
5. Sanu Maiya Maharjan	Senior Section Officer
6. Ram Prasad Nepal	Civil Engineer
7. Shristi Shrestha	Environmental Inspector
8. Uddhav Raj Nepali	Civil Engineer
9. Sharkardeep Shrestha	Landfill In charge
10. Nurnidhi Neupane	Director, Chief's Secretariat
11. Pramod Adhikari	Secretory in Ward no. 23 Office
7. LMC (Lalitpur Metropolitan City)	
1. Chiri Babu Maharjan	Mayor of LMC
2. Surendra Awale	SWM chief
3. Pradip Amatya	Senior Coordinator
8. BKM (Bhaktapur Municipality)	
1. Sunil Prajapati	Mayor of BKM
2. Dilip Kumar Suwal	Sanitation Section Chief
3. Rabindra Jwakaswa	Environment and Tourism
9. PMC (Pokhara Metropolitan City)	
1. Dhana Raj Acharya	Mayor of PMC
2. Kripa Ranjit	Urban development, Tourism and Environment Division Head

3. Kalpana Baral	Waste Management Section Chief
4. Netra Timilsina	Sub-Engineer, Landfill

2. Social Sector

1. Industrial District Management Ltd	
1. Rajendra Prasad Kandel	Acting Director General
2. Balaju Industrial District	
1. Ramashankar Jayaswal	Manager
3. Solid Waste Management Association Nepal	
1. Dhana Prasad Acharya	President
4. Nepal Recollectors and Recyclers Association	
1. Binod Upreti	Secretary
5. Nepal Development Research Institute	
1. Shankar Shrestha	Executive Director
2. Jyoti Giri	Member

(2) Site Visit Attendees

1. Bir Hospital (Public Hospital in KMC)	
1. Subhadra Jayana	Nursing Officer
2. Durga Bista Khadka	Staff Nurse (IOC and Waste Management)
2. Western Regional Hospital (Public Hospital in PMC)	
1. Kishor Poudel	Waste Service, medical waste private collector
3. Blue Waste to Value Pvt. Ltd. (Waste Collection Company in KMC)	
1. Nabin Biksah Maharjan	Chairman
2. Ronish Shakya	General Manager
4. Srinjanship Sewa Pvt. Ltd. (Waste Collection Company in LMC)	
1. Sabin Raut	Manager
5. NEPCEMAC Pvt. Ltd. (Waste Collection Company in LMC)	
1. Baburam Ghimire	Member
2. Mahendra Dhakal	Plastic Recycling Factory
6. Waste Service Pvt.Ltd (Waste Collection Company in PMC)	
1. Santosh Poudel	Owner
7. Himalayan Life Plastic Pvt. Ltd. (Recycling Company in PMC)	
1. Prakash Bharati	General manager
2. Kiran Kunwar	Business Manager

3. Participants List of Workshop

●: Present, —: Absent

No.	Organization	Position	Name	13th Mar.		14th Mar.
				Morning	Afternoon	Morning
1	MoUD	Architecture	Tulsi R. Kharbuja	●	●	●
2	MoUD	Architecture	Renuka Bhandari	●	●	●
3	MoUD	Architecture	Astha Panta	●	●	●
4	DUDBC	Acting Director General	Narayan Prasad Bhandari	●	—	●
5	DUDBC	Civil Engineer	Madhav Katwal	●	—	—
6	DUDBC	Senior Divisional Engineer	Manoj Nakarmi	●	—	●
7	MoFAGA	Junior Officer, Environment and Disaster Management Division	Gita Devi Parajuli	●	●	●
8	MoFAGA	Junior Officer, Environment and Disaster Management Division	Rosy Bhaila	●	●	●
9	MoHP	Senior Health Administrator	Samir Kumar Adhikari	●	—	—
10	KMC	Environmental Inspector	Shristi Shrestha	●	●	—
11	KMC	Senior Section Officer	Sanu Maiya Maharjan	●	●	—
12	KMC	Civil Engineer	Ram Prasad Nepal	●	●	●
13	KMC	Environment Engineer	Nisha Koirala	●	●	●
14	KMC	CPC Member	Prashun Bajracharya	●	—	—
15	KMC	CPC Member	Baburam Bhattarai	●	—	—
16	KMC	CPC Member	Suraj Raj Kafle	●	—	—
17	KMC	CPC Member	Saraswati Manandhar	●	—	—
18	LMC	Senior Coordinator	Pradip Amatya	●	—	●
19	LMC	Engineer	Puskar Bhattarai	—	—	●
20	LMC	Waste Management (Ward 12)	Sarita Maharjan	—	—	●
21	LMC	Waste Management (Ward 12)	Suraj Maharjan	—	—	●
22	BKM	Sanitation Section Chief	Dilip Kumar Suwal	●	●	—
23	BKM	Ward Chairman (Ward number 5)	Yogendra M.B	●	●	—
24	PMC	Mayor	Dhan Raj Acharya	—	—	●
25	PMC	Chief Administration Officer	Shyam Krishna Thapa	—	—	●
26	PMC	Urban development, Tourism and Environment Division Head	Bharat Raj Poudel	●	●	●
27	PMC	Waste Management Section Chief	Kalpana Baral	●	●	●

No.	Organization	Position	Name	13th Mar.		14th Mar.
				Morning	Afternoon	Morning
28	PMC	Sub-Engineer, Landfill	Netra Timilsina	●	●	●
29	SWMAN	Member	Bhupal Acharya	●	●	—
30	SWMAN	Member	Muna Neupane	●	●	●
31	SWMAN	Member	Sharmila Poudel	●	●	●
32	SWMAN	Member	Kedar Khatri	●	●	●
33	HLP Pvt. Ltd.	General Manager	Prakash Bharati	●	●	●
34	HLP Pvt. Ltd.	Business Manager	Kiran Kunwar	●	●	●
35	World Bank	Senior Operations Expert	Manoj Kumar Lal	—	—	●
36	UNDP	Exploration Specialist	Purnima Bajracharya	●	—	●
37	JICA South Asia Department	South Asia Division2, Deputy Director	MURAKAWA, Daishiro	●	●	●
38	JICA Nepal Office	Senior Representative	TANAKA, Tomoko	—	—	●
39	JICA Nepal Office	Representative	KATO, Kumiko	—	—	●
40	JICA Nepal Office	Associate Program Manager	Bidhya Pokhrel	—	—	●
41	JICA Survey Team	Team Leader / Waste Management Policy, Plan and Situation Analysis	YAMAUCHI, Hisashi	●	—	●
42	JICA Survey Team	Deputy Team Leader / Waste Management (Institutional System, Financial Analysis)	ARAI, Takatoshi	●	—	●
43	JICA Survey Team	Waste Management System	KAMISHITA, Takahiro	●	●	●
44	JICA Survey Team	Waste Management (Waste Collection / Transportation)	SANO, Yosuke	●	●	●
45	JICA Survey Team	Waste Management (Separation / Resource Utilization / Intermediate Treatment / Final Disposal)	SAWANOBORI, Tomoari	●	●	●
46	JICA Survey Team	Local Consultant	Alek Paudel	●	—	●
47	JICA Survey Team	Local Consultant	Anu Dhakal	●	—	●
48	JICA Survey Team	Local Consultant	Sandip Acharya	●	●	●
			Number of Prticipants	39	25	37

MoUD: Ministry of Urban Development, DUDBC: Department of Urban Development and Housing Construction, MoFAGA: Federal Ministry of Public Administration, MoHP: Ministry of Health and Population, KMC: Kathmandu Municipality, LMC: Lalitpur Municipality, BKM: Bhaktapur Municipality, SWMAN: Solid Waste Management Association of Nepal, HLP Pvt. Ltd.: Himalayan Life Plastic Pvt. Ltd., UNDP: United Nation Development Plan.