Municipality-wide Inclusive Sanitation Plan

(Kirtipur Municipality)





March 2021

List of Acronyms

ADB	Asian Development Bank
CC	Coordination Committee
CIAMP	Capital Investment and Asset Management Program/ADB
CLTS	Community Led Total Sanitation
CLUES	Community-Led Urban Environmental Sanitation
CSO	Civil Society Organization
CWIS	Citywide Inclusive Sanitation
CWIS-P	Citywide Inclusive Sanitation Plan
FSM	Fecal Sludge Management
FSTP	Fecal Sludge Treatment Plant
GDP	Gross Domestic Product
ISO	International Standard Organization
KPI	Key Performance Indicators
KVB	Kathmandu Valley Water Supply Management Board
LCCA	Life Cycle Cost Analysis
MoWS	Ministry of Water Supply
MWASH	Municipal Water Sanitation and Hygiene
MWIS	Municipal-wide Inclusive Sanitation
NGO	Non-Governmental Organization
ODF	Open Defecation Free
SFD	Shit Flow Diagram
SDG	Sector Development Goal
SME	Small and Medium Enterprises
SOP	Standard Operating Procedure
SPV	Special Purpose Vehicle
SS	Sanitation Section
StW	Storm Water
SW	Solid Waste
UNDP	United Nations Development Program
WASH	Water, Sanitation and Hygiene
WB	The World Bank
WHO	World Health Organization
WW	Wastewater
WWTP	Wastewater Treatment Plant
UC	Users' Committee



सिंद नग्न्यालिस Kirtipur Municipality Office of the Municipal Executive



Kirtipur, Kathmandu Bagmati Province, Nepal







Acknowledgments

We are glad to publish Kirtipur Municipal-wide Inclusive Sanitation Plan (MWIS Plan) for wider dissemination and necessary support for the implementation of the plan. This Plan will help all WASH stakeholders and Peoples representatives in the Municipality to understand the current sanitation situation and available alternatives to achieve our sanitation targets by 2030.

We try our best to work out the details for the effective implementation of the MWIS Plan, hence, the vision of improved sanitation in Kirtipur Municipality "Our Kirtipur Prosperous Kirtipur" can be fulfilled by the year 2030.

If there are any good practical suggestions on the proposed activities during implementation, we will certainly accommodate them in the regular annual planning & review meeting.

We would like to thank Water Aid-Nepal and NSR Consult for the financial support and the technical support respectively in preparing this MWIS Plan. We would like to continue this partnership in future as well in its effective implementation, monitoring and evaluation.

At last, we would like to express our gratitude to all Ward Chairpersons and the members of the Taskforce, and Technical personnel who provided relevant information and actively participated in the discussions/meetings/workshops during the process of preparing and finalizing this MWIS Plan.

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Table of Content

1.	Introduction	1
	1.1 Background	1
	1.2 Vision of the Kirtipur Municipality	2
	1.3 CWIS Principles and its relevance in Kirtipur Municipality	2
	1.4 Scope and Limitation of MWIS Plan	3
2.	Methodology	3
	2.2 Situation Analysis	4
	2.3 Set Vision, Strategy, Target setting, and Priorities	5
	2.4 Identify Technical Options, Estimate Cost and develop a Financing Strategy	5
	2.5 Finalize Draft MWIS Plan	5
3.	Sanitation Situation in the Municipality	6
	2.2 Access to Somitation Somitors	6
	2.2 Encline Environment	0
	3.3 Enabling Environment	ð
	3.4 Key Stakeholders	9
	3.5 Key Findings of the Situation Analysis	9
3.	MWIS Improvement Plan	0 .1
	4.2 Building on the Existing Sanitation Service Provision1	1
	4.3 Technology Options	2
	4.4 Implementation Strategy1	3
5.	Cost estimate & financing strategy14	4
6. Re	Institutional Arrangements	5 7

ANNEXURES

1. Introduction

1.1 Background

Kirtipur is an ancient city of Nepal that is located in Kathmandu Valley. It is one of the important historical settlements in the Valley with Newa¹ Cultural Heritage (UNESCO 2008). The Municipality is divided into 10 administrative Wards and covers 14.76 sq. km. area (KM 2019). It is encircled by the Bagmati River in the East, Chandragiri Municipality in the West, Kathmandu Metropolitan City in the North, and Dakshinkali Municipality in the South. The population Census 2011 indicated 19,441 households with a total population of 65,602 in the Municipality (KM 2019). Besides, a large number of students from all over the country have rented to proceed with their higher-level education at Tribhuvan University located in the Municipality. The annual population growth rate for the municipality is estimated at 4% (CBS 2019).



Photo 1: Map of Kirtipur Municipality (Source: construct of the study team)

Proposed TP Locations in the map in Wards 2, 7 and 6

Kirtipur Municipality was declared ODF in 2017. Following the ODF declaration, the sanitation challenge for Kirtipur Municipality has moved from toilet coverage to safely managed sanitation, which requires a different set of knowledge and capacity. Furthermore, safely managed sanitation is an essential element for a safe, smart, and livable city. Likewise, sanitation is critical and central to public health and the dignity and well-being of all the citizens in the city. The Nepal Government's SDG commitment to sanitation is to achieve 74% and 90% of urban households to be connected to the sewer system or access to FSM facilities by 2025 and 2030 respectively for safely managed sanitation. To achieve this, the Ministry of Water Supply of the government of Nepal took initiative and developed the Citywide Inclusive Sanitation (CWIS) Planning Guideline to help local authorities in

¹ Newa is one of the 59th ethnic community recognized by the government of Nepal. Kathmandu valley is considered as an origin of the Newa community.

developing their own CWIS Plan and contribute to achieving the national target. This also helps with consistency in future sanitation approaches nationwide which would further contribute to achieving the national target.

WaterAid Nepal (WAN), with the support of the Bill and Melinda Gates Foundation (BMGF), has been implementing the Sanitation Policy and Financing (SPF) Project in Nepal since November 2019. Its main approach is to help build institutional capacity on Faecal Sludge Management (FSM) for progress towards SDG 6.2 by adopting the principles of Citywide Inclusive Sanitation (CWIS). This includes mainstreaming Gender and Social Inclusion (GESI) while sensitizing policymakers and supporting policies for safely managed sanitation. As a part of implementing the SPF project, M/S NSR Consult is contracted to support the Kirtipur Municipality to prepare the Municipal-Wide Inclusive Sanitation (MWIS) Plan following CWIS principles. The following section will indicate MWIS & CWIS as interchangeable terms in the case of Kirtipur Municipality.

1.2 Vision of the Kirtipur Municipality

Kirtipur Municipality has a unique feature of its traditional Newa cultural heritage. The Municipality has its slogan "JHIGU KIPU, SAMBRIDDHA KIPU," which means "Our Kirtipur, Prosperous Kirtipur."

The vision was first conceived during the Kirtipur fair organized in 2015 and endorsed by the elected body in the Municipality after the local election in 2017.

1.3 CWIS Principles and its relevance in Kirtipur Municipality

CWIS approach (Annex-1) is an evolving concept to effectively address the sanitation challenges, particularly in urban and peri-urban areas. It builds on existing sanitation technologies and practices to achieve a more comprehensive, effective, and sustainable sanitation services. The ultimate aim of the CWIS is to improve public health, generate positive social impact, improve the environmental sanitation, and generate economic impact. To generate such a positive impact, CWIS addresses the entire sanitation service chain for safely managed sanitation in the Municipality. Thus, the CWIS approach resonates with the Vision of the Municipality.

CWIS Service Framework in Kirtipur Municipality has ensured "no one is left behind" with the following core functions and outcomes:

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Table-1: CWIS Core Functions and Outcomes envisaged in the Kirtipur Municipality

System	Responsibility	Accountability	Resource planning &
functions			management
	• Establish a dedicated	Monitoring of CWIS	Application of MIS-
	sanitation cell in the	indicators for	GIS software for
	Municipality with explicit	accountability.	effective planning
	roles and responsibilities	 Sanitation cell/unit 	and decision-
	for effective	guide and implement	making process.
	implementation of the	the proposed	 Coordination with
	CWIS plan.	activities ensuring	the Federal
	• Sanitation regulation with	quality and timely	Government,
	the explicit roles and	completion.	research
	responsibilities of key	• Sanitation cells initiate	institutions, and
	stakeholders for safe	grievance redress	other development
	handling of human waste	mechanisms.	partners for
	along the entire sanitation		resource
	service chain.		mobilization

1.4 Scope and Limitation of MWIS Plan

This plan will address the safe management of human waste (Wastewater Management and Fecal Sludge Management) in Kirtipur Municipality. The plan will be reviewed to address broader issues of Solid Waste, Stormwater, along with the Wastewater and Fecal Sludge Management, gradually depending upon the available human and financial resources.

The Municipality will allocate some budget for MWIS planning & implementation. A Sanitation Section in the Municipality will be established and strengthened to implement the MWIS plan. The sanitation team may seek support from the external experts to provide required technical inputs, where necessary.

2. Methodology

The following steps were carried out to develop the MWIS Plan as shown in Figure-1.



Figure-1 MWIS Planning Steps (Source: construct of the study team)

2.1 Develop an understanding of MWIS & municipal Commitment

Following consent from the Mayor, and in consultation with the Technical Team members, an orientation program on the CWIS/MWIS was conducted to the Mayor, Deputy Mayor, and Ward Chairpersons facilitated by the external experts. In the orientation, the CWIS Concept and its comparative advantages over the conventional sanitation master plan and its importance aligning with the ongoing national total sanitation campaign was highlighted. The orientation program helped develop an understanding of the CWIS approach to address the inclusion of poor & marginalized people, including remote geographical locations for improved sanitation. At the end of the orientation, all participants signed on the joint commitment to formulate an effective implementation of the MWIS plan in Kirtipur (Annex-2).

Following the orientation, a dedicated Sanitation Task Force was formed comprising of sanitation focal person, Senior Engineer/Chief of Planning Section, an Engineer from the Technical Unit and one Ward Chairperson at the Municipality for effective MWIS Planning and consultation within and outside the Municipality.

All ten Ward Chairpersons and some members of the task force visited the Lubhu Fecal Sludge Treatment Plant site in Lalitpur and Nala Decentralised Wastewater Treatment Plant site in Banepa. The observation visits and interaction helped ward chairpersons and members of the Technical Unit to understand the technology and the overall management process for effective planning, O&M, and resource mobilization.

2.2 Situation Analysis

The situation analysis was conducted following qualitative, quantitative survey, field observations, and review of literature & policy documents.

Quantitative survey and analysis:

- HH survey questionnaires from the draft National CWIS Guideline were uploaded into the mobile-based NWASH application & tested,
- A field survey team was formed with a team comprising of a field supervisor, local volunteers (residents of Kirtipur Municipality), and enumerators with technical backgrounds (Civil Engineers). The survey team was trained on the CWIS concept before field mobilization. The Sanitation experts from NSR Consult provided training and orientation on sanitation systems,

new sanitation terminologies, & oriented them to tackle potential issues during household surveys enhancing interview skills, mobile application (real-time data collection), etc.

- HH sample survey comprised of 961 households respondents. The sample households were distributed in all ten wards applying stratified proportional random sampling method & used Google Maps for identification of households.
- The latest Geo-spatial map was used to identify the locations of the sample households with Coordinates (Latitude and Longitude) uniformly in Figure-2: Household sampling points in all ten the settlement areas and a smaller number of sampling points in the open spaces/forest areas.



wards.

- The consultation was made with all Ward Chairpersons before conducting field surveys in • their respective Wards.
- Household data was collected through enumerators using a mobile-based application (App).
- The collected data were uploaded to NWASH App and cleaned for further analysis.
- The households' data has its limitations for example the toilet connections and the pit or septic tank are mostly covered and was difficult to observe inside it. People have limited understanding between septic tanks and holding tanks.

Qualitative survey and analysis:

Draft interview guide for qualitative assessment related to Enabling Environment and Service • Providers were discussed with stakeholders and experts and refined before the Key Informant Interview.

- The study team along with the task force identified key informants/stakeholders and collected information using open-ended structured and semi-structured questionnaires.
- The respondents for qualitative analysis included Kathmandu Valley Water Supply Management Board (KVB), Local Authorities (Mayor, Ward Chairpersons, Technical Team, etc.), Private Sector (Sanitation Workers, Plumber, Contractor), Local Teacher, Tribhuvan University Teacher, Health In-charge in the Municipality, CBOs/Guthi, Media, etc. The notes of the discussions are presented in Annex-3.

In addition to the qualitative and quantitative survey analysis, relevant literature and policy documents were reviewed.

Thus, based on the findings of qualitative, quantitative and review of secondary information, existing sanitation situation and service levels were analyzed and Shit Flow Diagram (SFD) was prepared using SFD Manual². Similarly, City Service Delivery Assessment (CSDA) tool (Annex-5) was used to analyze the enabling environment. The CSDA matrix has revealed the area of improvement and priority action points for improved sanitation.

2.3 Set Vision, Strategy, Target setting, and Priorities

A one-day CWIS Planning Workshop was conducted with the key stakeholders including the Ministry of Water Supply, Department of Water Supply and Sewerage Management, and Kathmandu Valley Water Supply Management Board to achieve improved sanitation in the Municipality. The top-line findings of the situation analysis – the existing sanitation services were shared with the Mayor, Deputy Mayor, Ward Chairpersons, and other key staff members from the Municipality. In the workshop, the participants were able to set their vision, strategy, and targets for sewer and non-sewer systems. The presentation and discussion among the ward representatives, the Mayor from Mahalaxmi Municipality and KVB staff members helped to formulate a strategy and set priority actions to ensure effective implementation of the MWIS plan.

2.4 Identify Technical Options, Estimate Cost and develop a Financing Strategy

Considering the outcome of the Planning Workshop as a guiding principle, the technical team worked out the possible solutions to meet the Municipal commitments and achieve improved sanitation targets set for 2025 and 2030. The team explored the possible sanitation solutions and tentative cost estimates to achieve a 100% safely managed sanitation target in Kirtipur Municipality. Potential revenue streams were discussed to fill up the financial gap during the implementation phase. Project preparation or feasibility study for the decentralized system may be initiated from the municipality but the capital investment is expected from the KVB. For O&M, an innovative business model will be explored through private sector engagement. The Municipality is optimistic to get support from I/NGOs and Civil Society on capacity development activities for effective planning and implementation of the MWIS Plan.

The technical team presented the potential scenario to achieve the target set by Ward Chairpersons by 2025 and 2030. During the consultation meeting, four different technological options: on-site sanitation, onsite with FSM, offsite-central sewer system referring to the master plan of Kathmandu valley developed by KVB, and Decentralized Wastewater Treatment System (DEWATS), were discussed.

2.5 Finalize Draft MWIS Plan

The draft MWIS Plan was prepared following the draft CWIS guideline and discussed with the technical supporting team during its inception. The draft Plan was further refined and finalized

² EAWAG (2018), SFD Manual vol 1 & 2

based on the comments and feedback provided by political representatives, internal & external experts. The draft has indicated some criteria for the selection of different technology options to achieve mid and long-term targets set by the Ward representatives and the Mayor during the MWIS Planning Workshop. Following the endorsement of the final draft by the Municipal Council, a detailed action plan for sanitation will be developed in line with the MWIS Plan.

3. Sanitation Situation in the Municipality

3.1 General

Kirtipur was declared as an Urban Municipality on 27th March 1997 by combining eight Village Development Committees namely Layaku, Chithubihar, Palifal, Bisnudevi, Balkumari, Chovar, Champadevi, and Bahirigaon.



Access to water supply and other infrastructures

Figure 3: Sewered and Non-sewered area of Kirtipur Municipality

Almost every settlement within the Municipality has access to roads, water supply, electricity, and telecommunication networks.

Water Supply Network

The Municipality's two main natural sources of drinking water are the springs at Dudh Pokhari and Sim Jhawahiti located in Ward nos. 4 and 6. In 2021, the Melamchi water supply pipeline was also connected to the Municipality.

The survey data shows that 76% of drinking water is supplied through the piped network, 21% of households depend upon tanker or Jar water, and

Drinking water source											
<u> </u>											
WARDS	1	2	3	4	5	6	7	8	9	10	Total
Other (Jar, T) %	41%	41%	24%	10%	9%	3%	19%	8%	22%	27%	21%
Piped %	58%	54%	76%	84%	84%	93%	81%	83%	76%	73%	76%
Deep GW%	0%	0%	0%	1%	1%	2%	0%	0%	0%	0%	0%
Shallow.GW %	1%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%

less than 1% of households are using groundwater for drinking purposes.

3.2 Access to Sanitation Services

The household sample survey data is used to draw Shit Flow Diagram (SFD). The SFD indicated that 26% of human waste is safely managed and the remaining 74% are unsafely disposed to the natural environment.

Less than 1% of total households are using drinking water from the shallow groundwater source, hence very few households have risk from groundwater contamination due to onsite sanitation.

1. Sanitation system (containment): About 29% of households are not connected to the sewer system. Only 7% of households have septic tanks (impermeable containment with two or more compartments). The information was further verified with the local masons and Sanitation Workers about the types of containments they have constructed in the communities.



Figure-5: Shit Flow Diagram

2. Pit emptying and transportation of FS or conveyance of wastewater: The survey data reveals that 67% of HHs are connected to the sewer system directly or through toilet containments. The government data shows that 30% of the sewer system is blocked (CIAMP 2020). Hence, about 20% of wastewater is likely to have unsafe conveyance whereas the remaining 47% wastewater is safely conveyed to the proposed wastewater treatment plant outfall at Sundarighat, Dhobighat Treatment Plant site. The treatment plant is under construction; hence the wastewater is currently discharged into the Bagmati River without any treatment. About 8% of total households have emptied their toilet, which is 23% of total onsite systems. With appropriate FSM regulations & effective implementation, demand for pit emptying service will increase significantly.

3. Treatment and end-use

There is no wastewater treatment or fecal sludge treatment plant in Kirtipur Municipality. KVB has started the construction of a sewage treatment plant at Dhobighat to cover more than 90% of households in Kirtipur Municipality (CIAMP 2020). In Ward No. 2, a cluster of

Sewer (k	Length m)		Ma	nhole(N	os)	
Total	Blocked	Total	Good	Bad	Blocked	N/A
24.16	7.18	1016	431	431 2		320
	30%		62%		38%	

Table-2: Status of Sewer-line & Manholes (CIAMP 2020)

residential houses (around 200 households) have a separate simplified sewer network to discharge effluent into the soak pits, but the overflow from the soak pit has created nuisance around the site, which is under consideration to be developed as a public park.

3.3 Enabling Environment

Both primary and secondary data were used to assess the Enabling Environment (EE) in the Municipality. Mainly qualitative information that was collected from the Ward Chairpersons, Mayor, and the Technical Unit were analyzed to conduct City Service Delivery Assessment (CSDA).

The CSDA summarizes the status of the enabling environment for sanitation. It shows the institutional barriers to sanitation service delivery, which cause the unsafe fecal waste flows shown in the SFD. It is structured around 3 pillars:

1. *Enabling* - the policy, legal and institutional environment.

2. *Delivering* - the resources and mechanisms available to improve sanitation.

3. *Sustaining* - the operating environment, funding, and personnel needed to provide ongoing and sustainable sanitation services.

The three columns of traffic light colors correspond to the three steps in the service chain described above for the SFD. **Green** indicates that functional sanitation is in place, but standards can be raised; yellow indicates areas where there is at least something to build on, but much progress remains to be made, and red indicates areas where there is little to build on, and it is necessary to



Figure 6: City Service Development Assessment (CSDA) diagram

start from a basic level. Almost 100% of households have their toilets and are either connected to the central sewer network or have constructed containment. But the Municipality still does not have the regulation for pit emptying and safe disposal. Sewer and Non-sewer systems are assessed separately due to the different institutions and regulations involved, levels of development, strengths and weaknesses, and the actions needed to make improvements. Figure 6 has indicated the CSDA graphics for sewer sanitation (see Annex 5 for detailed CSDA framework and key findings). The Table 3 summarises the key findings of situation analysis.

3.4 Key Stakeholders

In Kirtipur Municipality, Kathmandu Valley Water Supply Management Board (KVB)/Federal Government has invested in the sewer system and construction of Wastewater Treatment Plant under the ADB project is ongoing. Few I/NGOs such as WaterAid, OXFAM, Lumanti, ENPHO, etc. have been supporting Kirtipur Municipality in planning, capacity building, and awareness-raising campaigns. Local CBOs like Guthi & Women Groups have emerged to raise awareness on sanitation and have organized regular cleaning campaigns. Sanitation Entrepreneurs Local have established a Solid Waste Management Center in collaboration with the Municipality. There is



Figure-7: Stakeholder's Influence vs Interest

also the largest and oldest educational institution – Tribhuvan University and National Research Institute with the potential to establish a Resource Centre for Sanitation Innovations. The potential roles and responsibilities of key stakeholders are presented in Annex 6.

3.5 Key Findings of the Situation Analysis

The following table summarises the key findings of situation analysis based on qualitative and quantitative analysis.

Variables	Demand-side	Supply-side	EE, Institutional
	(Beneficiary or target population,	(service providers, private	Policy regime
	consumers)	sector, system operators)	(Agencies, regulations)
Capture	All sample HH have access to the private toilet, except one is found sharing a neighbor's toilet. All have a water-seal toilet with a permanent super-structure.	There is a good number of hardware outlets and Sanitation Entrepreneurs in the capital city and is easily accessible from the Municipality.	No specific post ODF initiative. Public toilet guideline has been formulated.
Containment	Most of the settlements and HHs are connected to the sewer network. Though building bye-laws require the construction of a septic tank (ST) for new building construction, there is a tendency to avoid that and few households have converted the structure into an underground water tank (WT). Only 7% of households have ST (impermeable containment with 2 or more compartments). People construct big size impermeable tanks (4%) at low land/settlement areas (Dhalpa) due to the high-water table during the rainy season.	Local masons and building contractors are providing services to construct toilet containment. However, they have little knowledge about the proper technical design of the septic tank. In sloppy land, HHs construct permeable toilet pits whereas in the low land they construct big impermeable containment to avoid leakage of groundwater inside the tank.	Standard design or specification of ST exists under a new building construction permit. The completion certificate is issued only after confirming the construction as per the permit but no legal action for converting ST into WT after receiving the certificate. HR capacity is relatively weak to monitor or effective implementation of regulation & enforcement.
Conveyance or Emptying & transportation	67 % HHs are connected to the sewer network but the wastewater treatment system is under construction in Dhobighat. According to the KVB survey, 30% sewer network is not functioning.	Traditional Sanitation Workers have a good business to empty the pit or maintenance of sewer pipes within & outside the Municipality.	No monitoring on unsafe FS disposal. No provision of licensing or private sector did not approach for a license from the Municipality yet.

Table 3: Situation Analysis and key findings

	33% of households have an onsite system and only 8% have emptied their containments. There is a relatively high demand for pit emptying services in low land areas compared to the settlements on the hill and sloped land.	One vacuum truck owner is operating in the Municipality but there is not yet a formal contract with the Municipal authority. There is no restriction on the services of vacuum tank operators from outside the Municipality.	Less than 1% of the municipality budget has been allocated for the sewer network in the new settlements. Major sanitation fund is expected from KVB
Treatment	There is less public demand for treatment however, local authorities are concerned and interested to provide such services to the community.	Sanitation Entrepreneurs outside the Municipality are also interested to operate a treatment system if DEWATS is constructed in the Municipality.	KVB has been investing to construct a central sewer system with WWTP. WW & FSM regulation is proposed during the Municipal Council meeting (2021).
Disposal/ End reuse	There is no dedicated place for the safe disposal of wastewater and fecal sludge. The Wastewater Treatment Plant is under construction. Until the treatment plant is operational, the sewer will continue to be discharged into the river. Local communities have the traditional practice to use human waste as fertilizer. Hence, there is a potential to reuse the end product of Wastewater or Fecal Sludge Treatment Plant for using as fertilizer particularly maintaining community parks and promote greenery in the Municipality.	Few local agencies have the expertise to install WWTP or FSTP. However, there is a huge number of biogas experts to connect human waste into biogas digesters. There is a possibility to generate biogas from communal WW treatment to be used for restaurants or other small-scale industries.	All waste disposal at the river or open public area. KM follows the Federal Government regulation on waste disposal & environmental pollution but the monitoring is weak. No specific government standard or allowable permit is established yet for residential houses to discharge waste into the river.

3. MWIS Improvement Plan

The Municipality will promote both onsite and decentralized sanitation treatment options depending upon the geographical location, where households cannot be connected to the central sewer system. As a part of the capacity development process, the municipal authorities represented from all ten wards and some members of the Technical Unit have visited the Wastewater Treatment Unit at Nala, in Banepa Municipality and the Fecal Sludge Treatment Plant at Lubhu in Mahalaxmi Municipality to understand comparative advantages and limitations of decentralized sewer & non-sewer systems.

The Municipal Team including the Ward Chairpersons also discussed with the Sanitation Experts on the different sanitation technology options and cost implications for capital investment and O&M (Annex-7).

The key factors to determine appropriate technical solutions are:

- 1. **Improve or expand existing infrastructure** or new investment: KVB & Municipality has invested in the sewer network and is continuing to invest as per the Kathmandu Valley Sewerage Master Plan. This will remain the priority of the Municipality.
- 2. **Population density and coverage**: In an isolated settlement, on-site with FSM or a decentralized wastewater treatment system will be established.
- 3. **Topographical conditions**: In the lowland, innovative climate-resilient sanitation technology will be introduced. In the settlements, where the sewer line cannot be connected to the central treatment system due to its topography, on-site FSM or decentralized wastewater treatment system will be established.

- 4. Availability of land for construction of treatment plant: If suitable public land is available, an appropriate integrated Waste Treatment Plant will be established to treat Solid Waste and Wastewater or FSM.
- 5. Potential for **end-use of the dry solid and effluent as fertilizer**: Technology option with resource recovery will be prioritized.
- 6. **Cost-effectiveness**: Cost recovery will be considered with a viable business modality through private sector engagement for a sustainable operation of a system.

4.1 Vision and Target setting for Improved Sanitation

The vision of the CWIS-P is "Academic and touristic hub by protecting its cultural, natural heritage, clean & green environment through promoting Municipal-wide Inclusive Sanitation and Hygiene, contributing for overall inclusive development and prosperous Kirtipur." It also contributes to the overall vision to develop Kirtipur Municipality. The current sewer network and targets for 2025 and 2030 in the ten wards are proposed as follows. The projected population and households are calculated assuming a 4% annual population increase rate³. In the case of Ward 4, onsite sanitation with the FSM facility will be considered due to its topography and scattered settlements.

Ward No.	Sewer coverage % SS 2021	Рор 2021	НН 2021	Sewer covered HH 2021	Рор 2025	НН 2025	Sewer Coverage gap	Target in 2025	Sewer target HH 2025	Additional HH to be covered 2025	Рор 2030	HH 2030	Target in 2030	Sewer target HH 2030
1	95%	9,929	2,835	2,697	11,616	3,316	619	100%	3,316	619	14,133	4035	100%	718
2	89%	9,959	2,758	2,448	11,651	3,226	778	90%	2,904	455	14,175	3925	100%	1022
3	78%	7,579	2,093	1,631	8,866	2,449	817	85%	2,081	450	10,787	2979	100%	898
4	1%	9,115	2,111	23	10,664	2,469	2,446	15%	370	347	12,974	3004	30%	531
5	39%	10,003	3,000	1,167	11,703	3,510	2,343	70%	2,457	1,290	14,238	4271	100%	1814
6	17%	10,779	2,484	427	12,610	2,906	2,479	65%	1,889	1,462	15,342	3535	100%	1647
7	88%	6,899	2,549	2,239	8,071	2,982	743	90%	2,684	445	9,820	3628	100%	944
8	92%	6,226	2,012	1,857	7,283	2,353	496	100%	2,353	496	8,861	2863	100%	510
9	68%	12,200	4,211	2,864	14,272	4,927	2,063	95%	4,680	1,817	17,365	5994	100%	1314
10	99%	14,412	4,725	4,688	16,860	5,528	839	100%	5,528	839	20,512	6725	100%	1198
Total		97,103	28.777	20.041	113,596	33,666	13 625		28,262	8 221	138,207	40959		10594

 Table 4: Sewer network projected population, target for 2025 and 2030 (MWIS Planning Workshop 2021)

4.2 Building on the Existing Sanitation Service Provision

The household sample survey indicates that more than 63% of existing households are already connected to the sewer network with financial support from the KVB funded by ADB. The KVB is a major stakeholder for sanitation and has targeted 95% sewer network coverage at Kirtipur Municipality according to the Kathmandu Valley Sanitation Master Plan (CIAMP 2020). It has also started the construction of a central Wastewater Treatment Plant with a capacity of 150 mld in Dhobighat, Lalitpur. Thus, in the long run, most of the households will have sewer network service with a central Wastewater Treatment Plant.

Potential households' coverage by DEWATS & FSM

Settlements that are not covered by the central sewer network due to landscape and scattered households, will be covered by onsite sanitation, fecal sludge management, or decentralized wastewater treatment systems. For non-sewer systems, both conventional septic tanks, innovative & affordable climate-resilient sanitation systems will be established. By the end of 2030, the potential coverage for FSM and DEWATS in the Municipality will be 10% to 15% of total households (Table 5).

³ CBS 2019 Environmental Statistics indicated population increase rate in Kathmandu is 4.62%

Table 5: Proposed sewer target by KVB & sanitation gap by 2030.

Ward	Sewer network Target coverage (CIAMP 2020)	Estimated HHs without sewer	Projected HHs in 2030	Potential HHs for FSM & DEWATS	Remark
1-10 (except	100%	<1%	30,792	308	Assuming max 1% of total HHs in seven wards may require pit emptying service.
4,6,7)					
4	44%	56%	3,004	1,682	
6	15%	85%	3,535	3,004	
7	95%	5%	3,628	181	
Total			40,959	5,177	From Table 4 maximum sewer sanitation gap is 5400

4.3 Technology Options

To address the sanitation issues in the local context tentatively, the following technology options shall be applied⁴. The provision of a central sewer system is decided by the Federal authorities under the Ministry of Water Supply and Kathmandu Valley Water Supply and Sanitation Management Board (KVB)

- A. Onsite conventional septic tank
- B. Climate-resilient innovative onsite sanitation technologies
- C. Community-based decentralized treatment system (Biogas, DEWATS, and FSTP)

Ons sep	ite – conventional tic tank	Climate-resilient innovative onsite sanitation technology (aerobic, anaerobic and hybrid) ⁵	Community-based decentralized treatment systems (Biogas, DEWATS & FSTP, integrated with solid waste treatment systems, etc.)				
-	Mainly in scattered settlements and HHs without sewer connections. Potential in Ward 4 and partly in the peri- urban area located in 6 & 7	 Test the innovative affordable aerobic digester to address poor households or HHs having limited space for septic tanks. Suitable to the settlements that are located in low land or high water table. HHs interested to use effluent and compost for agriculture Additional treatment units may be required depending upon the location and end-use of effluent. 	 Particular settlements (5,500 HHs) where the Kathmandu Valley Sewer Master Plan do not cover or planned beyond 2030. May construct in Horticulture premises of GoN for the potential use of effluent and dry solid to be used as fertilizer or soil conditioner. A detailed feasibility study is required to explore wards 2, 7, and 9. Places such as Salyanthan, Balkhu river bank (Ward 2), and Chalnakhel boundaries may be suitable areas for the treatment plant site. Capacity: up to 1,000 HHs for Simple sewer DEWATS & 4,000-5,000 HHs for FSTP. 				
-	Estimated unit cost NRs 25,000 – 100,000 depending upon the construction materials and size of the septic tank.	 Estimated cost NRs 12,000 – 35,000 depending upon the materials, accessories, and fittings. 	 An estimated cost of a decentralized sanitation system is about NRs 33,000,000 includes DEWATS, Covered FSTP, biogas digester, and Caretakers' room/Toilet bath. At least in about 1,500 sq meters. DEWATS and FSTP can also be installed separately. An integrated system with solid waste requires additional land and capital investment. 				

Table 6: Proposed technology options of onsite & decentralized sanitation systems

⁴ Stakeholder consultation meeting March 16, 2021

⁵ https://www.adb.org/publications/insights-innovation-floating-toilets-cambodia

4.4 Implementation Strategy

The Municipality will have an implementation strategy from three aspects: 1) maximum utilization of the existing central sewer system network, 2) decentralized sanitation system where central sewer does not cover with private sector engagement and cost-sharing business model, 3) training and capacity development of key stakeholders on the new sanitation concept, and 3) enabling environment- formulation of WW or FSM regulations, and enforcement. The Municipality will have to collaborate with external agencies for financial and technical supports/capacity-building for effective implementation, operation & maintenance.

The following guiding principles will be considered for an effective implementation process.

- 1 Everyone benefits from safe sanitation services and public investment equitably, with a focus on reaching the poorest.
- 2 Gender & social equity are designed into planning, management, and monitoring.
- *3* Human waste is **safely managed along the sanitation chain** starting from containment.
- 4 Authorities operate with a clear, inclusive mandate, performance targets, resources, and accountability.
- 5 Authorities deploy a range of hardwares, funding, and business models to meet goals.
- 6 Comprehensive long-term planning fosters **innovation**, **pro-poor financing**; informed by analysis of needs, resources.
- 7 **Political-will and accountability** incentivize.

POTETNTIAL ACTIVITIES	Input	Support	ST 2021- 2022	MT 2023- 2025	LT 2026- 2030	Est cost NRs	Remarks				
1. Planning, Institutional, Policy & Regulation											
1.1 Inputs and collaboration for MWIS implementation from Federal & Provincial Agencies.	Fin	KVB				ТВС					
1.2 Formulate sanitation policy, regulation and disseminate (FSM, WW disposal, PPPP model, etc.).	Tech	MoWS, DWSS									
1.3 Establish GIS-MIS database application for effective planning & monitoring –asset management.		MoWS Res Org					Yet to be decided by the authority				
1.4 Develop annual plan with clear roles & responsibilities.	Tech	All key stake holders									
1.5 Simplify licensing service, scheduled desludging and strict enforcement.	Tech	Res Org Private									
1.6 Ensure equity & inclusion of sanitation services	Tech	I/NGOs									
1.7 Establish mechanisms for timely payment of tax, tariff and targeted subsidies to poor and marginalized	Tech	Res Org I/NGOs									
1.8 Innovation & integrated waste management.	Tech Fin	Res Org MoWS									

Table 7: Potential short term, medium term and longer activities

2. Developing							
							target by 2025
Sewer System				86%	95%		HHs 2025:
							28,000
							2030: 39,000
2.1 Update the sewer system database & identify	Tech	Res Org					
potential households for central sewer connection	Fin	KVB					
(1.3)							
2.2 Plan for effective expansion of central sewer	Tech	KVB				6.6	Prioritization &
network, repair and maintenance of the existing	Fin					Arab	phase-wise
system, treatment							cons.
2.3 Detailed project report including business model	Tech	Res Org				3	Integrated FSM
– potential decentralized treatment sites in Ward 2, 6	Fin	KVB,				Crore	& DEWATS
& 7 (Relate with 1)							
2.4 Engage potential private sector (2.3): public, PS &	lech	Mows		1			KM for FSM &
peoples' participation	Fin	KVB					DEWAIS
2.5 Procurement and implementation	Tech	KVB					РРРР
		I/NGO					
Non-sewer system with FSM				14%	5%		Max coverage: 5500 HHs
2.6 Identify HHs at low land area with potential risks	Tech	CBOs					
(1.3)		I/NGOs					
2.7 Awareness campaign to upgrade permeable	Tech	CBOs					
containment that may contaminate ground water &	Fin	I/NGOs					
link with support mechanism (1.8)							
2.8 Study/service for scheduled desludging (1.6)-	Tech	PS					
identify potential households, affordability, potential	Fin	I/NGOs					
PS							
2.9 Detailed project report & business model (Relate	Tech	Res Org					
with 1, 2.3, 2.4)	Fin	KVB,					
3. Sustaining: Capacity development and learning							
3.1 Conduct training need assessment & deliver	Tech	Res Org				30	For
trainings: Sanitation Unit, Private, local masons, User	Fin	I/NGOs				Lakhs	decentralized
committees							system
3.1 Introduce sanitation safety plan – ensure safe	Tech	Res Org					
handling of sanitation services along the sanitation	Fin	I/NGOs					
service chain							
3.3 Encourage wider replication and adaptation of	Tech	KVB, PS,					
good practices in other communities	Fin	NGOs					

Based on the stakeholders' consultation and situation analysis, the following potential short-term, medium-term, and longer-term activities have been identified. The proposed activities are not the exclusive list. Depending upon the financial and human resources, detailed implementation plan will be developed with the necessary adjustments.

5. Cost estimate & financing strategy

The Municipality aims to achieve the SDG target before 2030. Major funding for the central sewer network and treatment plant will be mobilized through KVB and the Federal Government. The remaining estimated 5500 households, which may not be covered by central sewer systems, will be addressed by onsite sanitation and decentralized treatment systems.

In the past, detailed feasibility studies and detailed project reports (DPR) were limited to engineering surveys, design, and cost estimates. This MWIS envisaged conducting business analysis with an

appropriate institutional mechanism before implementation for sustained operation & maintenance. The total estimated cost for the additional sewer network with WWTP is around NRs 6.6 billion.

Sewer network connection	Yr 2025	Yr 2030	Remarks
Target population	28,151	106,484	
Unit cost	21,000	32,000	
Total	591,178,162	3,407,488,000	
Total of sewer network by 2030 (KVB) (i)	591,178,162	3,407,488,000	
Central WWTS -Population served		129,125	
The unit cost of WWTP		20,000	
Cost of Central WWTP (KVB) (ii)		2,582,508,301	ADB, Federal Gov.
Total Sewer Network and Wastewater Treatment NRs (i+ii)	591,178,162	5,989,996,301	NRs 6,581,174,463
Decentralized sanitation system :FSM & DEWATS (Capex)			5500 HHs
Technical inputs (Design, construction supervision)	3,000,000	3,000,000	Municipality, support agencies
Integrated decentralized sanitation system (FSM & WWTP)	14,000,000	3,000,000	Municipality, KVB
O&M cost (Upto 2030) – 7 Yrs of O&M @ 6 lakhs/yr and 8 lakhs one time repair & maintenance		5,000,000	Municipality, User, Private Sector
Investment on sanitation innovation	1,500,000	500,000	Municipality, NIC
Sub Total DEWATS & FSM NRs (iii)	18,500,000	11,500,000	
Capacity Building and Awareness Creation on CWIS NRs (iv)	1,500,000	1,500,000	All key stakeholders
Total cost of decentralized sanitation system NRs (iii+iv)	20,000,000	13,000,000	NRs 33,000,000 ⁶

Table 8: Tentative cost estimate for the proposed sewer and non-sewer systems

By 2025, the central sewer system will require NRs 0.6 billion. The KVB has included in its budget to invest in the central sewer system in the Kirtipur Municipality as a part of the sanitation master plan in the Kathmandu Valley. The Mayor from the Kirtipur Municipality is represented in the KVB and he will put his effort to allocate necessary financial resources and other technical support from the KVB.

The estimated capital investment for infrastructure development including feasibility study and detailed design for decentralized sanitation system is NRs 30 million (3 crores) in total and around NRs 20 million (2 Crore) is required by 2025. A decentralized sanitation system can be constructed under the technical guidance and supervision of the municipality with specific technical inputs from external support. Hence, it can be completed by 2025 so the major resource is allocated within this period to ensure implementation without any delay.

The software programs for awareness-raising and capacity development of local institutions, is estimated at NRs 3,000,000 (10% of Capex) mainly for decentralized sanitation systems, which is mainly the responsibility of the Municipality.

6. Institutional Arrangements

A Sanitation Unit is proposed to be established under the Planning/Technical Section of the Municipality by combining the functions of Solid Waste Management or a WASH Section.

The institutional interface for Kirtipur Municipality follows as mentioned below. The Sanitation Service Provider be the Kirtipur Municipality, or a Private Operator under contract with Municipality or/and Users' Committee following Public, Private, and Community Participation Model.

⁶ Unit cost of decentralized sanitation treatment system estimated NRs 6000



Figure 8: Institutional linkages among key stakeholders

The proposed Sanitation Section under the Municipality is comprised of:

- 1. Chief, Technical/Planning unit: Coordinator
- 2. Senior Engineer
- 3. Focal person environmental sanitation

The envisaged key roles and responsibilities of the Sanitation Section are mentioned below but not limited to:

- 1. The Sanitation Section reports to the Municipal Executive Officer
- 2. Identify potential activities and issues
- 3. Assist the Planning Unit to develop detailed annual activity plans and budget estimates aligning with the CWIS Plan
- 4. Coordinate and communicate with the external agencies
- 5. Update the sanitation progress
- 6. Regularly updates to the political representatives and Mayor

Presently, there is existing CWIS Taskforce comprising of the following members:

- 1. Chief Technical/Planning Unit
- 2. Senior Engineer
- 3. Engineer
- 4. Focal person Sanitation and Hygiene Sub-section
- 5. One Ward Chairperson (Coordinator Sanitation and Hygiene related activities)

The envisaged Roles and Responsibilities of the Taskforce are mentioned below but not limited to:

- 1. Update the sanitation progress and reports to the Mayor/Deputy Mayor/Ward Chairpersons
- 2. Identify potential activities and issues
- 3. Assist the planning unit to develop detailed annual activity plans and budget estimates aligning with the CWIS plan
- 4. Coordinate and communicate with the external agencies

In addition to the Taskforce, the Municipality may form a Sanitation Steering Committee (SSC), to streamline the sanitation. The SSC may comprise of the following members:

- 1. Mayor/Deputy Mayor
- 2. Chief of Planning Section
- 3. Chief of Technical Section
- 4. Focal person Sanitation and Hygiene sub-section
- 5. One Ward Chairperson (Coordinator Sanitation and Hygiene related activities)
- 6. Representative KUKL, Kirtipur Branch Office
- 7. Representatives from the I/NGOs and Development Partners who are involved in implementing sanitation related activities in the Kirtipur Municipality
- 8. Representative from the Water Users and Sanitation Committees if any

Responsibilities of CWIS Steering Committee is highlighted in Annex-6

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