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IMPORTANT INFORMATION

Definitions

Domestic Sewage: Wastewater generated as a result of household human activities – bathing, cloth washing, excreta flushing, etc.

Interceptor Tank: Interceptor tank is similar to septic tank but has a single chamber and lesser hydraulic retention time (hence smaller size). These are built on-plot as part of small bore/ settled sewerage system. These serve two purposes- 1) retain most of the solids; and 2) dampen peak flows, thus the design of downstream sewerage network can be relaxed.

Slum Area in Uttarakhand

efyu cLrh

efyu cLrh dk rkRi;Z uxj fudk; dh ifjf/k @ lhekvsas ds vUrZxr ,d ,slh vfu;ksftr o mPp /kuRo okyh LoPNrk jfgr clkor ls gS] ftles ioZrh; {ks=ks esa 5 vFkok 5 ls vf/kd ifjokjks ds lewg vFkok eSnkuh {ks=ks esa 20 ls vf/kd ifjokjksa ds lewg fuokl djrs gksa rFkk tgkW U;wukfrU;wu 50 izfr'kr v/kZ&LFkk;h lajpukvks ;qDr 25 oxZ] Hkwfe ij voS/k vf/kdkj rFkk vk/kkjHkwr lqfo/kkvks ds fcuk fuokl djrs gks vFkok Hkwfe ds oS/k vf/kdkj ds lkFk fdUrq vk/kkjHkwr lqfo/kkvksa ds fcuk fuokl dj jgsa gksa A

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Septage: Septage is the liquid and solid material pumped from a septic tank or on-site sanitation facility.

Sewer: A pipe or conduit that carries wastewater or drainage water.

Sewerage: A complete system of piping, pumps, basins, tanks, unit processes and infrastructure for the collection and transport of wastewater.

Sewage Return Factor: A constant denoting the proportion of household water supply returning as wastewater after use. *For example sewage return factor of 0.80 indicates that 80 percent of water supplied returns as sewage.*

Definitions of Household Sanitation Arrangements according to Census 2001

Water closet latrine (WC): The sanitary water flush latrines are those latrines that have water closets fitted with flushing cistern. Such latrines that may be connected to a septic tank or an underground sewerage system will also be recorded as water closet latrines. The faecal matter from these types of latrines is removed without the need for scavenging or manual handling of excreta.

Pit latrine: The latrines attached to the pit that is dug into the ground for the reception of night soil are reckoned as pit latrines.

Other latrine: This category includes service latrines (i.e. those that are cleaned manually); latrines serviced by animals such as pigs, etc. and all latrines other than the pit and the water closet types of latrine.

Abbreviations

CSP	City Sanitation Plan
CBO	Community Based Organization
CPHEEO	Central Public health and Environment Engineering Organization
GOI	Government of India
EO	Executive Officer
NP	Nagar Panchayat
MNP	Muni Ki Reti Nagar Panchayat
NPP	Nagar Palika Parishad
SUDA	State Urban Development Agency
GoU	Government of Uttarakhand
HHs	Households
ILCS	Integrated Low Cost Sanitation Scheme
IUSP	Integrated Urban Sanitation Programme
LPCD	Litres per Capita per Day
MLD	Million Litres per Day
MoUD	Ministry of Urban Development
M&E	Monitoring and Evaluation
NGO	Non-Governmental Organisation
NUSP	National Urban Sanitation Policy
O&M	Operation and Maintenance
RWA	Residence Welfare Association
STP	Sewage Treatment Plant
ULB	Urban Local Body
USPCB	Uttarakhand State Pollution Control Board

WC Water Closet

General Information about Muni ki Reti Nagar Panchayat

Sl. No.	Particulars	Description
1	Chair Person	Shri Uttam Dass
2	Executive Officer	Shri Anand Singh Mishrwan
3	Ward Members	7
4	Establishment Year	1 Dec. 1950
5	Population (As per census 2001)	7881
6	Estimated Population (2011)	12000
7	Area in Sq. Km.	6
8	Households (2001)	1020
9	Households at present	2350
10	Height Index	365 M
11	Road length (Tar road)	2.50 Km.
12.	Road C.C.	24.66Km.
13.	Drain	3.50km.
14.	Distance from Delhi	245 Km.
15.	Distance from State Capital	45 Km.
16.	Distance from district head Quarter	60 Km.
17.	Distance from railway head	5 Km.
18.	Sanitary Staff (Permanent)	9
19.	Temporary	8
20.	Total number of public Toilets	71

CHAPTER 1

1. Overview

The Urban Sanitation Strategy in India envisages that all Indian cities and towns become totally sanitized, healthy and livable and ensure and sustain good public health and environmental outcomes for all their citizens with a special focus on hygienic and affordable sanitation facilities for the urban poor and women.

The goals of the National Urban Sanitation Policy are as follows:

Generating awareness about sanitation and its linkages with public and environmental health amongst communities and institutions.

Promoting mechanisms to bring about and sustain behavioural changes aimed at adoption of healthy sanitation practices.

Awareness generation and behaviour change in the field of Sanitation.

Open defecation free cities.

Integrated cities wide sanitation.

Improved public health outcomes and environmental standard.

Solid waste collection and its safe disposal

No adverse impacts of city wastes on surrounding areas

In the light of the above objectives and goals of National Urban Sanitation Policy City Sanitation Plan has been prepared for the town Muni ki Reti of the State of Uttarakhand.

1.1 Introduction

Muni Ki Reti is a fast developing town of the state of Uttarakhand along Haridwar –Dehradun. City is growing as a transition town and works as central place for tourist purpose. It is a small town area surrounded by many big industrial & tourist places as Tapovan, Dhalwala, Swrgashram etc. Baseline survey, situational analysis of sanitation, consultations and discussions with stakeholders and detailed analysis of technical options reveals the following details-

City level strategic technical options for sanitation that are economically and the geographically feasible

A brief analysis of institutional and legal issues

A communication strategy has also been prepared for consideration of training and other capacity building, awareness generation, consultative and mobilization actions to achieve the foresaid objectives of the City Sanitation in the town.

1.2 Brief City Profile

1.2.1 Historical Background

Muni ki reti town has an area of 6 sq. kms having a population of 7,881 as per 2001 census the current population of the city has been estimated about 12,000 with the annual growth rate of 10% . The city was declared an Urban Local Body (ULB) in 1949. The city ULB is known as Nagar Panchayat (class IV city) as it falls in the category of cities having population limit of 20,000. There are seven municipal wards in the city and whole city is divided in to two clusters for the sanitary purpose functions.



Picture 1.1 showing River Ganga and Tourist Places of the town Muni ki Reti

1.2.2 Economic Profile of the City

The city Muni ki reti is a Nagar Panchayat (NP, hereinafter). It is a small town area surrounded by many Industrial area and villages. It is an important tourist centre for the nearby area. City is growing as a transition town and works as central tourist hub. A number of project are running from tourist point of view in the town such as Marine Drive, Ashtha Path, Ghats on Bank of River Ganga and many other tourist facilities. The main economy of the town is from tourism sector. It is the beginning point of Char Dham Yatra. There is a floating population of about 10,000 per day. Town also covers the area of Kumbha and Kanwar pilgrims. In the month of Srawan thousands of people passes through the city to go to Neelkantha Dham. Town is the main parking point for Neelkantha Dham.

City is also close to two important tourist and religious attractions of the State namely Haridwar and Rishikesh through which the holy river Ganga is passing. Both the places have worldwide attraction of tourists and pilgrims throughout the year. Road connecting to the airport and Chardham Yatra is passing through the city Muni ki Reti.

1.2.3 City Demographic Profile

The population of the city Muni ki reti was 7881 as per the census 2001. At present the estimated population is 12000 at the rate of 10% growth rate per year. Number of the households in the city is about 2000 on the basis of a family size of about 5 person per family .The city is having a floating population of about 10000 to 15000 per day. The NP is looking after all the city sanitation activities. As far as the city population growth trend concerns the city population was 4550 in the year 1991 while it has grown to about 7881 in the year 2001.

Table -1.1 showing Population growth trends (1991-2011)

S.No.	Year	Population	Decadal Growth Rates
1	1991	4551	About 15 %
2	2001	7881	About 10 %
3	2010-011	12000	About 10 %

Table -1.2 showing ward wise population and area (1991-2011)

S.No	Name of ward	Area (Sq Km)	Population 2001	Estimated Population 2011	House hold 2001
1	Satrughan ward	1.00	1185	2250	116
2	Bhagan gad ward	1.15	1128	1709	177
3	Ganga chetra ward	0.95	1121	1133	164
4	Shisumwada ward	0.70	1205	1131	105
5	Veshnav devi Mandir ward	0.8	1133	2224	205
6	Swami narayan Basic School ward	0.70	1068	1453	126
7	Dyanand asram ward	0.70	1041	2100	127
	Total	6	7881	12000	1020

Table -1.3 showing projected population based on various % growth rates

S.No	Year	Assumed decadal growth Rates (%)	Projected Population	Projected commuters/Floating population	Total population
1	2011	30%	12000	50000	62000
2	2014	50%	12000	7500	90000

Town has about 10000 per day floating population this add to the existing population to reach at about 22000. About 50 % equivalent population is considered for calculating floating population.

1.2.4 Linkages and Connectivity

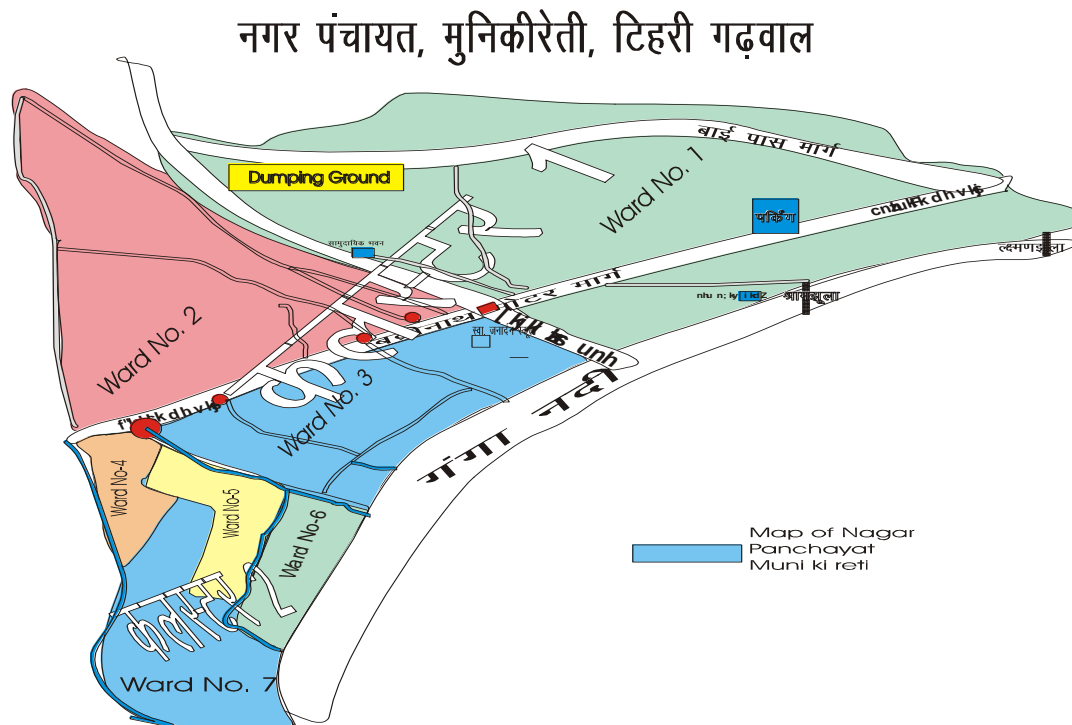
Muni ki reti is one of the river side town and important tourist place in Uttarakhand State. It is located on the national highway NH-58 at a distance of about 45 km and well connected to the Dehradun, capital city of the state of Uttarakhand on the main Dehradun- Haridwar road.



Picture 1.2 showing Parking Place for tourists at Muni ki reti

Dehradun Airport known as Jolly Grant is only 20 km away from Muni ki reti which gives importance to the city. The holy city; Rishikesh and Haridwar are located at about 2 km and 27 km away from the town through which holy river Ganga is passing through.

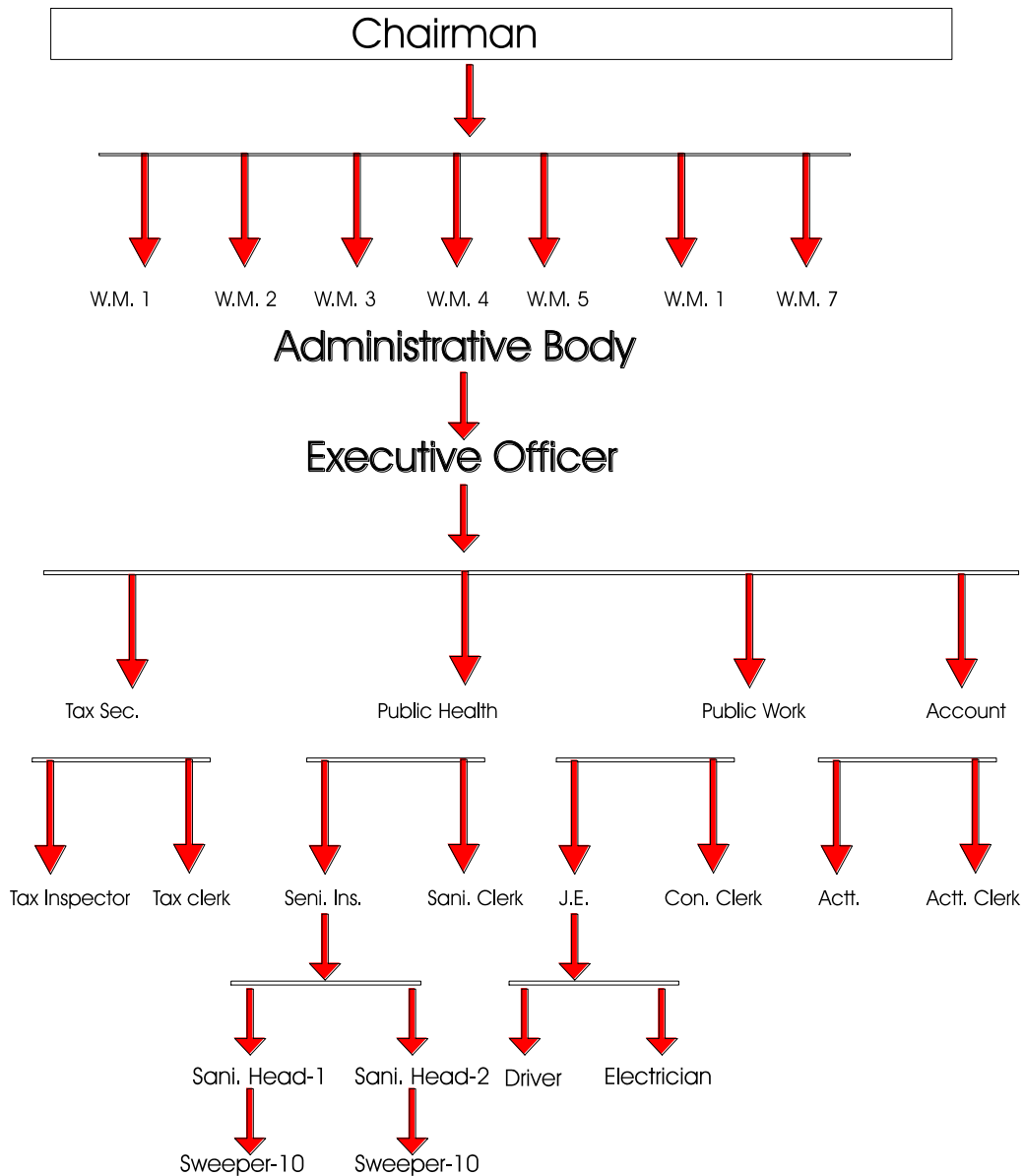
Map of Muni ki reti showing two clusters of the city



1.2.5 Political and Administrative Set-up

Governance structure of NP Muni ki reti is divided in to two wings i.e. elected wing and administrative wing. In the elected wing there is an elected ward member (councilor, locally called parshad) from each ward and three nominated councilors all the councilors are headed by chairperson. The chairperson; who is directly elected by the people is the chairperson (Adhyaksha) of the NP. The Nagar Panchayat Administration is headed by the Executive Officer (EO) who is assisted by the subordinate staff. The main duties under MNP include sanitation, SWM, health, repair and construction of roads, construction and maintenance of surface drains, street lightings etc. The hierarchical structure of Governance set up has been shown in the figure below.

Elected Body



Muni ki reti classified as class IV town and has a Nagar Panchayat. The MNP was established in 1949. The MNP has 7 wards and 7 elected members, led by a chairperson that is directly elected by the people. The administrative functions are led by Executive officer (EO). As MNP is a class IV town; i.e. town having population less than 20,000 therefore the number of official are also very less. The EO is supported by staff members including health, revenue and accounts. There are about 25 permanent employees under MNP. The MNP is responsible for provisions of services as sanitation,

street-lighting, maintenance of roads, parks, and recreational facilities. Main sources of revenue generation for MNP are property taxes, license fees and rent for market buildings.

1.2.6 Sanitation Scenario of the City

As per the secondary data collected from MNP, out of total 1551 households 1300 households (about 90%) have their own latrines with septic tank whereas the primary survey data analysis shows about 85% households having their water closet type latrines draining in to their own septic tanks /interceptor tanks/ have mixed i.e. single and twin pit latrine system in their houses. About 30 households are using public/community toilets and about 20 households are practicing open defecation in the city these are the families belonging to BPL category. About 10% households have twin pit type latrines, while 5% households lack access to any household sanitation facilities. There are no arrangements for safe disposal and cleaning of on-site installations. At 1 or 2 places cases of unsafe disposal in to nallas and open drains were observed during the primary survey. There is no data available on issues of health and hygienic practice due to unsafe disposal and other sanitary lacuna in the city. MNP has lack of staff engaged in sanitation services; also there is lack of technical persons in the staff therefore MNP needs to strengthen institutional capacities to develop, implement and to sustain the attained objectives of the city sanitation plan. The town has 20 regular sanitation employees but due to a huge number of daily visitors there are more requirements of the public toilets and sanitary staff. Many hotels and restaurants, hospital and nursing homes are also generating additional waste in terms of vegetable, foods and shop waste. Total waste generated per day is about 06-10 MT. About 150,000-200,000 people visit the place in a month for Yatra and other business activities city have a load of about 5000-10000 daily commuters. In future more waste will generate thus the city needs support in the management of sanitation facilities. As far as the number of sanitary assets is concerned with the NP there is only one Tata 407 with the ULB to transport the waste to the dumping site. Number of dustbins are also very less to serve the existing and floating population in all seven wards. The collected waste is dumped near Kharashrot at by pass road in Muni ki reti further, there is little data available on health impacts of sanitation and hygiene practices in the city.

The Baseline survey conducted by the Nagar Panchayat has shown the willingness of the household for having individual or public toilets with proper community sanitation facilities management.



Picture 1.3 showing encroachment at parking place

Cleaning of open drains on the roadsides is the major problem in all the wards that has been found during the survey that has to be taken care of on priority basis similarly the problematic issues of spreading flees; mosquitoes and other pathogenic insects and germs have been found during the survey regarding the health issues in most of the wards. About 60% households were found willing to pay user charges during primary survey for availing better facility regarding SWM and other sanitation services. Lack of sanitation staff and technical assets are big hurdle to be overcome to provide better sanitation facility without this sustainability in city sanitation cannot be expected from the other sanitation services provided in the city area. The challenge before the city is to respond to the local situation by carrying out a series of activities following the principle of the National Urban Sanitation Policy. Following a number of steps including Baseline Survey, Situational Analysis, consultations and discussions with stakeholders, and detailed analysis of technical options, this report includes Techno-economic analysis of Strategic City level Sanitation Technical Options; and a brief analysis of institutional and legal issues.

1.2.7 City Sanitation Planning Process in Muni ki reti

The city Muni ki reti, in the state Uttarakhand is becoming important due to one of the major tourist attraction place and river Ganga. The city is one of the beginning points for Char Dham Yatra. To study the existing and future requirement for city sanitation, urban local bodies conducted a base line city sanitation survey under the supportive directions provided from UDD (Urban Development Directorate, Dehradun) in the month of July & August 2010. Technical assistance was provided from the urban development directorate officials and experts to collect the information on current sanitation situation and problems related to the issues mentioned in the NUSP 2008. The urban

development directorate has been the supporting hand to MNP to develop the city sanitation plan for the city. The survey was based on 30% sampling of households, covering all kinds of units as shops, other commercial units, houses, public & semi public institutions etc. to collect the update information from all the 7 wards of the city. The survey format was based on the 'National Urban Sanitation Policy' (NUSP) 2008 to cover the issues from all possible fields for total city sanitation. As Muni ki reti has not been covered under any other city level sanitation programme therefore ULBs is enthusiastically handling the city sanitation plan development and implementation. The main works are related to street cleaning, solid waste management, and maintenance of public toilets. As ULB lack necessary technical capacity to understand and manage the issues under sanitation therefore there is a need to strengthen this capacity. There are a number of issues ranging from coverage, quality, infrastructure, awareness, institutional role clarity, financial aspects and human resources that are affecting the status of urban sanitation in the city. The city sanitation plan intends to address these issues.

1.2.8 Need for the City Sanitation Plan

City is facing following problems in context of city sanitation therefore there is an urgent need to prepare city sanitation plan followed by its implementation for making city 100% clean .Lack of awareness is the major cause for solid waste and garbage collection problems in the city that has to be taken in notice on priority during the implementation and training stage. Being a hilly area the place is sensitive for land sliding and other natural calamities. Improper management of solid waste can lead to health, environment, and avoidance by the tourist kind of problems in future therefore the city sanitation plan has been prepared on the guidelines given in the national urban sanitation policy 2008. Major problems of the city includes

- solid waste accumulation in the neighbourhood local
- Obstruction in flow of rain water due to improper dumping of domestic waste
- Endangering lives of labourers
- Waste destroying and chocking open roadside drains
- Garbage causing soil pollution and destroying plants leading to environment degradation
- Dumped garbage and Plastic waste harmful for the residents
- Disposal at convenience and on Road sides
- Forest at stake



Picture 1.4 Showing problems of garbage disposal & stray animals in the town

Improper waste disposal is leading to landslides. The challenge before the city is to respond to the local situation by carrying out a series of IEC and awareness generation activities. In context of above background to achieve 100% sanitation task in the town it is imperative to prepare a city sanitation plan depending on the existing sanitation condition, future demand and need in local context. To give a proper shape to the city sanitation plan the guidelines of the NUSP has been followed under the supervision of ULB.

CHAPTER -2

2.1 National Urban Sanitation Policy (NUSP)

The Vision of the NUSP is:

All Indian cities and towns become totally sanitized, healthy and livable; and ensure and sustain good public health and environmental outcomes for all their citizens with a special focus on hygienic and affordable sanitation facilities for the urban poor and women.

To transform Urban India into *community-driven, totally sanitized, healthy and livable cities and towns*, the policy sets out the following goals:

A. AWARENESS GENERATION AND BEHAVIOUR CHANGE

B. OPEN DEFECATION FREE CITIES

C. INTEGRATED CITY-WIDE SANITATION

1. Re-orienting Institutions and Mainstreaming Sanitation

2. Sanitary and safe disposal: 100% of human excreta and liquid wastes must be disposed of safely

3. Proper Operations and maintenance (O&M) of all sanitary installations

The policy envisages the preparation of *State Sanitation Strategies* within the overall National Policy framework. In turn, cities are expected to prepare their city-wide sanitation plans that need to be prepared in a consultative and participatory manner, and using an incremental approach to addressing the issue of sanitation in a comprehensive city-wide manner.

Source: NUSP, 2008.

2.1.1 Strengthening Institutional Arrangements, Participation and Effective Communications

The existing institutional and administrative system shows the lack of technical capabilities and involvement of community furthermore the MNP does not have quantitatively and qualitatively sufficient work force to ensure sustainable delivery of better sanitation services in the town. The recruitment of skilled workforce is needed to be addressed urgently to manage the things appropriately.

As per the primary survey held in the town most of the people were found willing to pay for the quality services if provided to them with the involvement of private party. Also there were lacks of awareness about the impact of unhygienic environment and improper disposal of waste on health and

environment. Therefore a workable strategy has been given in the action plan and being followed for implementation of the CSP. This strategy involves household ladies and other representatives from every nook and corner of the society to change their mind sets and understanding their incentives to change behaviour and practices.

A strategy has been made to engage the community representative at lowest level to monitor the sanitation standard in their locality. This strategy will not only help in changing the mindset of the people but also will help in effective implementation of city sanitation plan. Various means has been outlined for generating awareness amongst urban households on sanitation and its linkages with health, economic productivity and the environment along the facilitating behaviour change towards adoption of safe sanitation practices among households.

As city is facing lot of problems in covering all the dimensions of city wide sanitation therefore locally suited technology options, enhancement of institutional capacities, involvement of skilled work force for better management and implementation and a functional communication strategy is urgently required in the town .

Following steps are recommended for efficient implementation of Muni Ki Reti city sanitation plan

- Discussion and presentation of the most suitable technical options for the city-wide sanitation
- Development and implementation of strategic action plan at ward level to ensure the better level of service provided
- Involvement of mohalla swachata samities for solid waste management
- Arrangement of training, workshops, capacity building programme and other IEC activities for NP staff members, councilors, sanitation department employees and task force members
- Various awareness generation means must be followed to aware the common people of the society about city wide sanitation
- Arrangement of open area discussion, meetings must be held with common people and their representatives at ward level.
- Identification of gaps in legislative rules and recommendation for its amendments
- Strengthen institutional set-up to ensure sustainable sanitation service delivery
- Design of M& E system

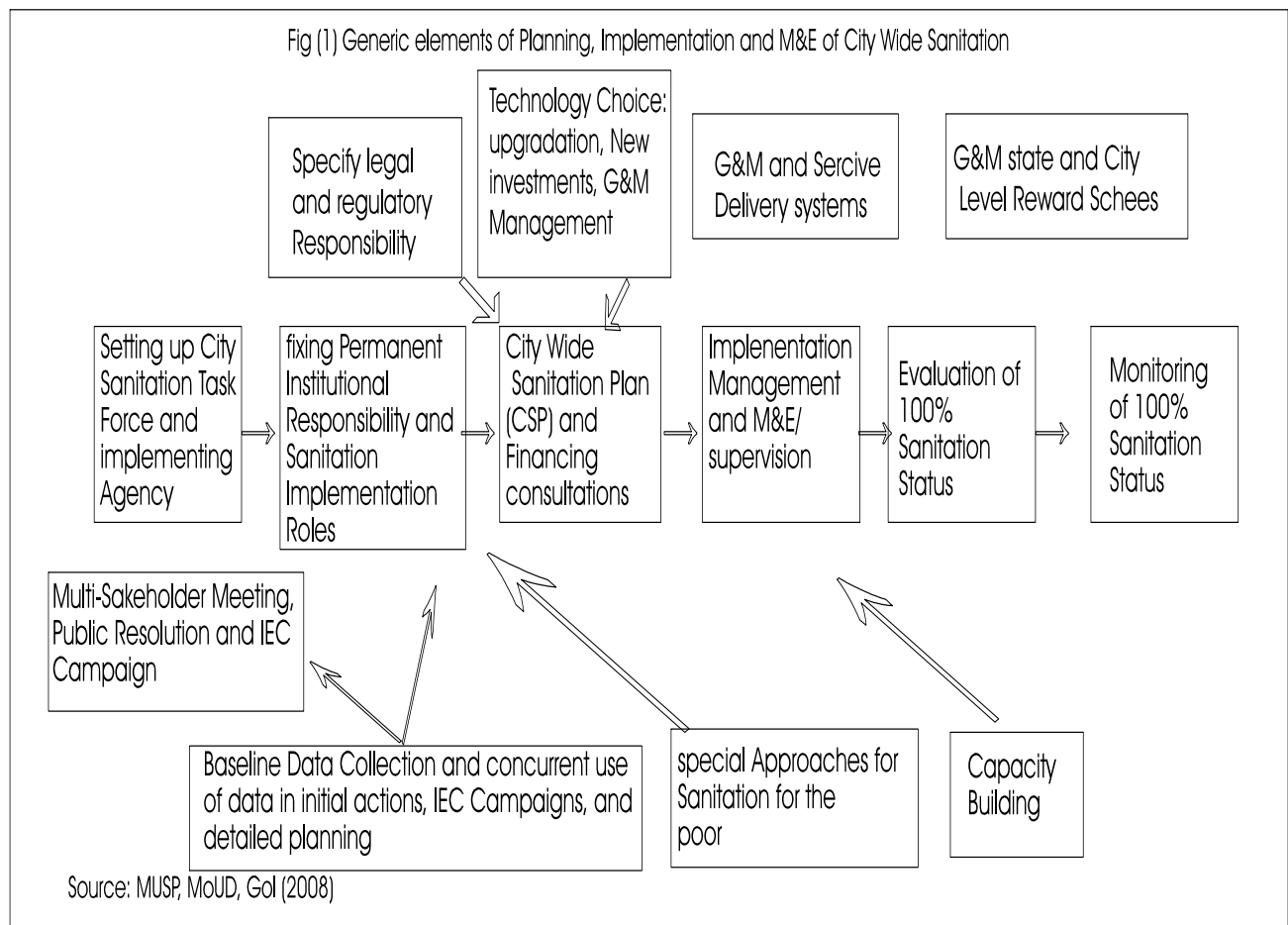
- Implementation of city sanitation plan

2.1.2 City-Wide Sanitation: Components and Technology Options

This chapter briefly describes the NUSP vision and CSP framework. This is followed by a brief description of existing environmental sanitation situation of the town, proposed NUSP (sewerage and sewage treatment scheme) and potential choices for upgrading.

2.1.3 NUSP Vision and City-Wide Sanitation Planning

The National Urban Sanitation Policy envisions – ‘All Indian cities and towns become totally sanitized, healthy and livable and ensure and sustain good public health and environmental outcomes for all their citizens with a special focus on hygienic and affordable sanitation facilities for the urban poor and women’.



As a starting point to achieving this vision, the policy provides a framework for city-wide sanitation. Generic elements of planning, implementation and M&E are presented in Figure. The purpose of the framework is to assist Urban Local Bodies, NGOs, community based organizations, citizens and

private sector agencies through a series of steps toward achieving the goal of 100 percent sanitation in the city.

The CSP framework emphasizes that- though apparently linear, the process needs to be highly iterative and draw in inputs from one series of steps to another. Preparation of city-wide sanitation plan is an important step in the process. The purpose of the step is to build various scenarios for technology options and choosing the most suited one. It is important to deliberate on pros and cons of each option before final selection.

The CSP framework outlines tasks that the States and ULBs will need to undertake:

“States will need to determine time-frames and deadlines to achieve the goals mentioned in the National Urban Sanitation Policy and will need to spell out a detailed roadmap, including the incremental targets for achievement of goals. For example, to achieve the goal of open defecation free (ODF) by year 2011, a detailed plan for extending access will need to be formulated and implemented in a time-bound manner. All such steps will need to be spelt out and operationalized under the CSPs. While some of the activities in the sanitation plan may be possible to complete with little financial resources e.g. better utilization of existing facilities, improved management systems for septage cleaning, awareness generation; etc. whereas others e.g. reconditioning or laying new sewers, may be more resource-intensive. The CSP will need to be prepared keeping in view what the city can afford and finance. It will be better as far as possible to improve the effectiveness of existing facilities before embarking on expensive new investments. Further, thinking about the whole city, and not just some portions or just some facilities, will be necessary to achieve the goals in a comprehensive and systematic manner.”

2.2 Key Sanitation Policy Issues

After evaluation of NUSP following key issues have been identified:

2.2.1 Poor Awareness

Sanitation has been accorded low priority and there is poor awareness about its inherent linkages with public health.

2.2.2 Social and Occupational aspects of Sanitation

Despite the appropriate legal framework, progress towards the elimination of manual scavenging has shown limited success, little or no attention has been paid towards the occupational hazards faced by sanitation workers daily.

2.2.3 Fragmented Institutional Roles and Responsibilities

There are considerable gaps and overlaps in institutional roles and responsibilities at the city levels.

2.2.4 Lack of an Integrated City-wide Approach

Sanitation investments are currently planned in a piece-meal manner and do not take into account the full cycle of safe confinement, treatment and safe disposal of waste.

2.2.5 Limited Technology Choices

Technologies have been focused on limited options that have not been cost-effective and sustainability of investments has been in question.

2.2.6 Reaching the Un-served and Poor

Urban poor communities as well other residents of informal settlements have been constrained by lack of tenure, space or economic constraints in obtaining affordable access to safe sanitation. In relation to “Pay and Use” toilets, the issue of subsidies inadvertently reaching the non-poor should be addressed by identifying different categories of urban poor.

2.2.7 Lack of Demand Responsiveness

Sanitation has been provided by public agencies in a supply-driven manner, with little regard for demands and preferences of households as customers of sanitation services. In order to address the above issues, there is a need to go for the city sanitation plan which will be based on the following issues:

- Institutional Roles and Responsibilities
- Awareness Generation for changing mindsets
- City-wide Approach
- Technology Choice
- Reaching the un-served and poor
- Client focus and Generation of Demand
- Sustained Improvements

2.3 Policy Goals

The overall goal of this urban sanitation policy is to transform Urban India into community driven, totally sanitized, healthy and livable cities and towns As per National Urban sanitation Policy the specific goals are:

2.3.1 Awareness Generation and Behaviour Change

Generating awareness about sanitation and its linkages with public and environmental health amongst communities and institutions; Promoting mechanisms to bring about and sustain behavioural changes aimed at adoption of healthy sanitation practices

2.3.2 Open Defecation Free Cities: Achieving Open Defecation Free Cities

All urban dwellers will have access to and use safe and hygienic sanitation facilities and arrangements so that no one defecates in the open. In order to achieve this goal, the following activities will be undertaken:

Promoting access to households with safe sanitation facilities (including proper disposal arrangements);

Promoting community-planned and managed toilets wherever necessary, for groups of households who have constraints of space, tenure or economic constraints in gaining access to individual facilities; Adequate availability and 100 % upkeep and management of Public Sanitation facilities in all urban areas to make the areas free from open waste, defecation and other environmental hazards

2.3.3 Integrated City-Wide Sanitation Re-Orienting Institutions and Mainstreaming Sanitation

Mainstream thinking, planning and implementing measures related to sanitation in all sectors and departmental domains as a cross-cutting issue, especially in all urban management endeavors; Strengthening city and local institutions (public, private and community) to accord priority to sanitation provision, including planning, implementation and O&M management; Extending access to proper sanitation facilities for poor communities and other un-served settlements.

2.3.4 City Sanitation Strategic Technical Options

This report aims in achieving the goal of city wide total sanitation through available technical options. Based on various technical, financial, and other available infrastructure facilities in the town following city-wide sanitation technical options are suited

1. Fully On-site Sanitation: Septic tanks or Twin Soak Pits

2. Fully off-site Sanitation: Settled (Small bore) sewerage
3. Part on-site (Septic tanks or Twin Soak Pits) / part off-site (Conventional Sewerage)
4. Simplified Sewerage with Decentralized Wastewater treatment

2.3.5 Financial statement for integrated city wide open defecation free city

Muni ke Reti is fast developing city and an important tourist places. During kanvan yatra session thousands of people come here for religious activities. Muni ki Reti is a starting point of char Dham yatra. In all the season a huge number of tourists come here. A large number of visitors and tourists put a demand for public toilets, parking places, good O & M of the public amenities provided. The one of the important objective of CSP to provide sufficient toilets near parking places as well as in other city areas to discourage the open defecation cases in the town. City is the transition point where the holly river Ganga flow from Hilly area to plain area provides importance to the city. The estimates for construction cost of toilets needed in the town are given in the table for next 5 years.

Table 2.1 showing construction cost of public Toilets in different wards

S.N.	Particulars	Cost of work			
		Unit	Qty	Rates	Amount
1	Construction of 40 seater hitech toilet in different parking places for tourist and different wards of MNP including sewerage connection and water connection.	No.	40	65000.00	2600000.00.00
2	Supply and fixing of awareness board in bank of river bank for making city defigation free (2000 m length@50 m length each)	No.	45	3500.00	157500
				Total Rs	2757500.00
	Contingency T& P 10%				275750.00
				Grand Total	3033250.00
				Say Rs	30.33 Lacs

*(Rates is taken as per P.W.D.chief engineer letter no.332/10 dated 03-7-010 for preparing primary estimate of buildings in uttrakhand)

2.3.6 Sanitary and Safe Disposal

100% of human excreta and liquid wastes from all sanitation facilities including toilets must be disposed off safely. In order to achieve this goal, the following activities shall be undertaken:

Promoting proper functioning of network-based sewerage systems and ensuring connections of households to them wherever possible;

Promoting recycle and reuse of treated waste water for non potable applications wherever possible will be encouraged.

Promoting proper disposal and treatment of sludge from on-site installations (septic tanks, pit latrines, etc.)

Ensuring that all the human wastes are collected safely confined and disposed of after treatment so as not to cause any hazard to public health or the environment.

2.3.7 Proper Operation and Maintenance of all Sanitary Installations

Promoting proper usage, regular upkeep and maintenance of household, community and public sanitation facilities;

Strengthening Nagar Panchayat (NP) to provide sustainable sanitation services delivery In the City Sanitation Plan of Muni ki Reti city following would be the key activities:

- Collecting baseline data and concurrent use of data for implementation
- IEC Campaigns and detailed planning
- Setting up City Sanitation Task Force and Implementing Agency
- Multi-Stakeholder Meeting,
- Public Resolution and IEC Campaign
- Fixing Permanent Institutional Responsibility and Sanitation Implementation Roles
- Specify legal and regulatory Responsibility
- Technology Choice: up gradation, new investments, O&M Management
- Evaluation of 100% Sanitation Status

- Monitoring of 100% Sanitation Status
- State and City Level Reward Schemes
- City Wide Sanitation Plan (CSP) and Financing – consultations
- Special Approaches for Sanitation for the Poor
- Capacity Building roadmap, including the incremental targets for achievement of goals.

CHAPTER-3

Waste Water Management

3.1 Liquid Waste Management / Waste Water management/ sewerage and sewage treatment scheme

As per the secondary data analysis from ULB Muni ki reti, average daily water supply is 70 Lpcd. As per the sewage return factor of 0.80 (80 percent of the water supply of Lpcd) the existing waste water generated is about (based on the population figure of about 10,000 persons) the total waste water generation is about 0.560 mld. ($10,000 \text{ persons} * 70 \text{ Lpcd} * 0.80 \text{ return factor} * 1 / 10,00,000$). Nallas are getting choked due to improper and direct disposal of waste therefore bad smell in the surroundings, threats to health, bad aesthetic vision and ultimately a bad image of the city is spreading about the city and administration. Drainage facilities must be proper in the town especially near parking area, markets, and hotels to manage the bulk amount of waste water. As the town is not industrial in nature therefore the grey water problem is not very serious in the town. The main component of the municipal liquid waste includes sullage and the liquid waste from the open road side drains.

The roadsides open drains were found choked at few places due to collection of road garbage and solid waste and polythene waste. This situation creates problem during rainy season as due to choking of drains the rain water could not find its way for flow and causes water logging at few places in the locality.

Domestic liquid waste / waste water is ultimately made to discharge in to the open nallas through big open drains in the town. At few of the places where people have open spaces in front of their houses they have channelized their kitchen waste water in to their kitchen garden for irrigation purpose as all the road has not been supplemented with roadside open drains.



Pictures 3.1 showing drainage problem of the town Muni ki Reti

3.2 Sewerage Management

Sewer System is in 80% area of Municipality but Sewage treatment Plant is far away from the city. This town is a satellite town of Tehri District which is the pilgrimage hub. Being as a tourist place lots of tourist comes here to bath in holy Ganga. In yatra season lacs of devotees come to visit Neel Kanth Dham. At present pollution control board and Ganga pollution Department are working on sewerage. They are preparing a project under **Ganga action plan in muni Ki Reti**. Muni ki reti town has all the modern amenities such as Schools / Colleges, Telephones, Electricity, Drinking Water, Primary Health Centre, Hospitals, Small Scale industrial units and Commercial Trade Centers. Therefore it is necessary to provide Sewerage and Sewage Treatment plant in Muni Ki Reti Town. The provision of Sewer System and sewage Treatment works has been done on the latest design Criteria/Norms and in accordance with the provisions in the Manual of Sewerage and Sewage treatment CPHEEO, Ministry of Urban Development, Govt. of India. Important and Major Norms /Standards are as under.

Design of effluent disposal facilities for the collection, treatment and disposal of wastes is dictated primarily by the estimated organic loadings to be handled. In developing such estimates, it is necessary to determine on a unit basis not only the flow or volume of waste but its strength and composition too. With respect to flow, peak flow rates must be known in order to determine the required hydraulic capacities of sewer, pumping stations, treatment plants and effluent disposal facilities. Similarly, strength and composition must be known in order to determine the degree and type of treatment required to produce effluent of acceptable quality. A study of waste volumes and its characteristics are a preliminary necessity to the development of Design Criteria.

As a preface to a detailed discussion of flow determine, attention must be directed to the three important components of waste water volume. Of these, the first consists of sanitary sewage, the second industrial waste, and the third consists both, the sub surface water which enters through manhole openings and unauthorized drain connections. The third component is termed seepage, depending on the means of access, either infiltration or storm inflow. It is necessary to consider the total sewage volume in terms of peak, average non peak flow in accordance with the rate of water supply, in order to determine in normal loading to be imposed on major units of a treatment plant, hydraulic capacity required for sewage, pumping stations & rising mains etc. Unit or per capita sewage flow are conventionally determined from a study of a recorded flow data and population served. Then with the basic data of present flow at hand future changes are to be projected and suitable future design allowance are determined.

A reliable figure regarding per capita flow of sewage to the population served cannot be arrived at from field tests only, however efforts have been made to assess the sewage flow considering other connected factors, they indicated that the per capita sewage quantities within India are estimated to be between 70% to 90% of the established per capita water supply allowance. Hence for design purpose the quantity of sewage expected to be obtained from residential areas within the Corporations, is estimated to be 80% of the established per capita water allowance and has been adopted for design purposes. It is very desirable, for promotion of the economy and welfare of the town, that the municipal sewerage system be capable of receiving all liquid industrial wastes, which would otherwise create a health hazard or public nuisance. Certain type of industrial wastage, however, will require pretreatment up to certain standard as specified by the Indian Standard Institutions & Public Health Engineering Manual (Govt. of India) in order to provide protection to the sewerage System. In area to be provided with separate sanitary sewer, it is neither necessary nor desirable that hydraulic capacity be provided in the sanitary sewer for all of the water consumed and wasted by the industries.

Sizeable quantities of industrial water consumption are for cooling purpose & steam generation and because the waste water from such process is generally not objectionable, it can be discharged safely into the open storm drains etc. Under such circumstances it is expected that 50% of the industrial water consumption will be discharged into the sewerage system. This value has been found in general to be reasonable allowances for large industrial areas where suitable regularity controls are applied. While planning any sewerage system it is primary importance to provide a safe and effective disposal for the wastes to be collected. The various factors governing the disposals of the wastes to establish in the general terms and in the context of present knowledge, reasonable effluent quality criteria for the various wastes discharges.

The following factors have been taken into account for waste discharge criteria:-

- (i) The water quality levels that are to be maintained in the receiving waters depend upon the uses of these waters in down stream.
- (ii) For every beneficial use of receiving waters, there are certain water quality requirements which must be met to assure that the water will be suitable for that beneficial use.
- (iii) The waste assimilative capacity of receiving water is limited and the addition of waste materials may change their chemical, physical and biological characteristics without necessarily creating significant adverse effects on the beneficial water use
- (iv) The formulation of waste discharge requirement should be designed so as to
 - (a) secure that degree of care in the planning and operation of works for the treatment and disposal of sewage and industrial wastes as will adequately protect the public health and other beneficial uses of waters, and
 - (b) At the same time permit the legitimate planned usages of those waters for receiving suitably prepared wastes so that an orderly growth and expansion of cities and industries may be possible.

The sewerage system has been designed on the basis of without making provision for any storm water. The storm water that will find its way into the system shall be by - passed into the storm water drains. A provision for sewage treatment plant has also been proposed. For sewage treatment various options are examined, out of which treatment plant based on membrane based technology is to be constructed.

The design period has been taken as 30 years after accounting for a lag period of 2 to 3 years.

Base year has been taken as 2013. Middle stage and design stage has been taken as year 2025 and 2040 respectively.

3.3 Projected Population of Muni ki Reti for Financial Assessment

Population of Muni Ki Reti town based on the year 2001 census is 7881. Projection of Population for different stages of the scheme has been done by the standard prescribed method. The base year population has been taken 16000 and the design population taken 25000. The design rate of water supply has been taken as 135 liters per capita per day with 15 percent extra for wastage as adopted for water supply system.

Table 3.1 showing total projected population of the area Muni-ki-Reti & Dhalwala.

AREA	2010	2025	2040	2060
Rishikesh	90651	120308	152426	175206
Muni-ki-Reti	9648	12804	16222	18647
Dhaluwala	22406	34453	47205	63735
Veerbhadra	15391	20654	25989	29747
Visthapit colony	7587	10116	12757	14464
Tapovan	12500	16625	21000	24160
Total	158183	214870	275599	324959
Camping & Floating Population	12311	16229	20683	23785
Rishikesh@60%of total Muni-ki-Reti I@40%	8208	10814	13789	15856
Total camping & floating population	20519	27034	34472	39641
Total	178702	241904	310071	364600

As per census 2001, population of Muni-ki-Reti is 7880. Muni-ki-Reti falls in Distt. Tehri Garhwal on Badrinath road and is about 3 Kms from Rishikesh. There are many Ashrams. Keeping its close vicinity to Rishikesh and its religious importance, population of Muni-ki-Reti in beginning, middle and designed years have been projected as per criteria taken for Rishikesh, and are as under.

Table 3.2 showing projected population of the town

Year	Projected Population from Table no. 1	Increase in 15/20 years
2010	9648	-
2025	12804	3156
2040	16222	3418
2060	18647	2425

Table 3.3 showing projected population of the town

Year	Increase in four year	Projected Population
2010	-	9648
2014	$3156 \times 4 / 15 = 842$	$9648 + 842 = 10490$
2029	$3418 \times 4 / 15 = 911$	$12804 + 911 = 13715$
2044	$2425 \times 4 / 15 = 647$	$16222 + 647 = 16870$
2064	$2425 \times 4 / 20 = 485$	$18647 + 485 = 19132$

Table 3.4 showing projected population of the town

Year	Camping & floating Population from Table no.1	Increase in 15/20 years
2010	8208	-
2025	10814	2606
2040	13789	2975
2060	15856	2067

Table 3.5 showing Projection of Camping & Floating population for the year 2014, 2029, 2044 & 2064

Year	Projection of floating & camping population	Projected Population from table no.3	Total Population Col.(2+3)
1	2	3	5
2014	$2606 \times 4/15 + 8208 = \mathbf{8905}$	10490	19395
2029	$2975 \times 4/15 + 10814 = \mathbf{11607}$	13715	25322
2044	$12067 \times 4/15 + 13789 = \mathbf{14340}$	16870	31210
2064	$2067 \times 4/20 + 15856 = \mathbf{16270}$	19132	35402

Above table has been prepared considering the population projection and growth rate in between the years and frequent flow of permanent population as well as camping/floating load of population of Rishikesh and nearby areas. The year of commencement of this project has been taken as 2014 the initial, 2029 middle and 2044 design year. Accordingly population has been projected for design purposes.

3.4 Financial Statement for Safe Disposal of Waste and Sewerage Management

Table 3.6 showing financial estimate for Sewerage Management

S.N.	Particulars	Cost of work			
		Unit	Qty	Rates	Amount
1	Supply and laying of sewer line NP3 300 mm diameter and special lowering into trenches including supply of all material, labour, T&P etc. required for proper completion of work.	Running meter (Rm)	3100.00	2500.00	7750000.00
2	Supply and lying of branch sewer line in Municipal area especial lowering into trenches including supply of all material, labour, T&P etc. required for proper completion of work.	Rm	1000.00	1500.00	1500000.00
3	Construction of sewer chamber man hole covers an including complete work including supply of all material, labour, T&P etc. required for proper completion of work. ($3000+1000=4000/15=267.00$)	No.	267.00	6750.00	1802250.00
4	Reconstruction of damaged cc road including supply of all material, labour, T&P etc. required for proper completion of work. ($3000+1000=4000 \times 1.20=4800.00$)	Sqm	4800.00	1065.00	5112000.00
	Maintenance for one year 1 year 5% extra			Total Rs	16164250.00
					8082125.0
				Total Rs	16972462.50
	Contingency T& P 10%				1697246.25
				Grand Total	18669708.75
				Say Rs	186.69 Lacs

DPR of Muni ki reti **Sewerage and Sewage extantion work** is estimated to Rs. 186.69 Lacs Rates has been taken as per P.W.D.chief engineer letter no.332/10 dated 03-7-010 for preparing primary estimate of buildings in uttrakhand

Total numbers of wards in municipal area are 7. Out of these 7, 4 wards have water logging problem due to their location near bank of river. As a matter of fact during the year 2010 the upcoming flood has caused the submersion of all these 4 wards. These are

1. Swami Narayan Basic School ward
2. Veshno Devi Dharamshala ward
3. Ganga Shetra ward
4. Satrugan ward

3.5 Septage Management

There is no septage clearance vehicle with the ULB as all the households are having their own septic tank/twin pits/single pit system and the clearance of pits is whole sole responsibility of the households. The MNP does not maintain record of septic tank user households and there is no monitoring of septage clearance. There is very little information available regarding the cleaning of tanks / pits through private cleaners this situation reflects that most of the tanks are not cleaned on regular basis. There is no record available with the ULB regarding the cleaning of the septic tanks. It shows that there is no proper septage management arrangement in the town at Nagar Panchayat level and it needs adequate attention to keep the environment safe and clean.

CHAPTER- 4

Drainage System

4.1 Existing scenario of the drainage system in the Town

Muni ki reti is a small town which is surrounded by hilly area. Ganga River is passing through the city. To clean the Ganga River it is necessary to maintain the drainage system of the city. Some of the open drains are flowing in the river in absence of proper drainage system. Muni ki reti have seven wards of these seven four wards are located on the bank of river Ganga.



Picture 4.1 showing Existing Scenario of the Drainage System in the Town

At present the drainage is flowing through the existing drains, which are not adequate and constructed in the unplanned way. Most of the water flows on roads and on other vacant lands of the town. Existing open drains are choked with the openly dumped garbage creating problem mosquitoes, flees, and other diseases. Out of the seven wards four wards are located in catchments area and face problem of water logging in rainy season. Therefore there is urgent need to rectify this problem for city sanitation.

4.2 Drain cleaning

There are open channels along the major road of the town to drain the rain water these open channels are locally known as “gulls”. The total length of the smaller open drains in the city is 3.5 kms. These drains are cleaned manually time to time. The waste collected from cleaning of these drains is carried with the help of tractor trolley to the dumping site near Kharashrot. There are open drains in parking area which remain choked due to open disposal of waste and open defecation by

tourists and pilgrims at the time of yatra season and in season of kanwar in month of sawan due to heavy load on the existing public and community toilets.

4.3 Necessity for Providing Drainage Scheme

As stated in above paragraphs muni ki reti is situated on the bank of river therefore to make the river pollution free proper drainage system is very essential. The proper drainage facility in the town is also essential to improve the health conditions of the people of the town and to protect the roads of the entire town. The roadsides open drains were found choked at few places due to garbage collection by trace passers and tourists. There is improper collection of solid waste and polythene waste. This situation creates problem during rainy season as due to choking of drains the rain water could not find its way for flow and causes water logging in the locality.

Domestic liquid waste / waste water is ultimately made to discharge in to the open nallas through big open drains in the town. At most of the places where people have open spaces in front of their houses they have channelized their kitchen waste water in to their kitchen garden for irrigation purpose as all the road has not been supplemented with roadside open drains.

4.4 Population Projection

The Muni Ki Reti town is administrated by Nagar Panchayat Muni Ki Reti. The future expansion of the town can only take place towards south west and to some extent towards east along National Highway. The town is divided into two drainage zone on either side of railway track.

Table 4.1 showing projected population summary

S.No.	Stage / year	Projected Population		Total
		Population	Floating population	
1.	At the Stage year 2010	12600	100000	22600
2.	In the middle of design period 2025	17500	15000	325000
3.	At the ultimate stage year 2040	24500	20000	44500
4.	At the end of the master plan period 2060	41900	25000	66900

The proposals under the detailed project report have been framed on the basis of latest norms standards / design criteria contained in the U. P Jal Nigam Lucknow No. 3001 (PPRD- Design criteria/30 of date 19/1/1979 and No. 351/PPRD-Desin Criteria/2dated 19/2/1986 and the guidelines contained in the manual of Sewerage of Urban and Sewage Treatment 3rd edition-2001, CPHEEO Ministry of Urban development, Govt. of India, New Delhi. Main and prominent norms are summarized below. The proposal have been worked out for design period of 30 years, the base year has been adopted as 2010 middle stage, Ultimate stage and the end of Master plan period after 50 years have been adopted as 2025, 2040, and 2060 respectively.

4.5 Design Criteria

The design criteria are based on the different practices adopted in this country and as per experience gained by the department in executing such schemes. The details are as below:

1. Run Off :- Run off for designing of storm water drainage system has to be calculated on the basis the Rational formula as below-

$$Q = C.I.A.$$

Where Q = the maximum rate of runoff form the drainage area in cusecs (cubic feet per second)

C = the runoff coefficient of the ratio between the maximum rate of runoff and the average rate of rainfall during the time of concentration.

I = the average rain fall intensity in mm per hour for the period of maximum rain fall off a given frequency of occurrence having a duration equal to the time of concentration.

The drainage area A in hectare can be measured from Topographical plan or maps however proper values of C and I must be estimated from the recorded data and experience.

(A) Run off Coefficient:-

The value of c will depend upon general soil condition of the area, typical rain fall characteristics condition of surface and degree of land development both present and future the various values of runoff coefficient to be adopted conditions is given as below :-

Runoff Co efficient Of different Surfaces

Table 4.2 showing various runoff co-efficient for types of surfaces

Type of surfaces	Runoff co-efficient
Water tight roof surfaces	0.7 to 0.95
Asphalt pavement in good order	0.85 to 0.90
Stone of brick pavements in cement mortar:-	
(Good quality)	0.75 to 0.85
(Good jointed)	0.50 to 0.70
(Good quality)	0.40 to 0.50
Macadam Roadways	0.25 to 0.60
Gravel Roadways and Walks	0.15 to 0.30
On paved surfaces railroad and vacant lots	0.10 to 0.30
Parks, Gardens, lawns meadows (depending upon the surface slops and soil characteristics)	0.25
Wooden areas of forest land depending as before	0.01 to 0.20

In a particular locality of certain if A, A2, A3, etc. are the different types of surface areas having C1, C2, C3, etc. as their runoff co-efficient the over all runoff coefficients for the locality would be

$$A_1 C_1 + A_2 C_2 + \dots + A_n C_n = A_o = C$$

$$A_1 + A_2 + \dots + A_n$$

Since in large towns it will be difficult to calculate value of runoff coefficient as above it is suggested that the following table based on per area density be taken as runoff coefficient.

Table 4.3 showing Runoff Coefficient for Different Types of Localities

S.No.	Type of locality	Average approximate density Persons/Acre	Runoff Coefficient
1	Extreme suburban areas with widely, detached houses	20 to 50	0.35
2	Suburbs with detached houses	50 to 100	0.45 to 0.55
3	Localities with semidetached houses	150 to 200	0.65
4	Closely built up areas	200 to 250	0.75
5	Highly congested areas	More than 250	0.85 to 0.90

This runoff coefficient has to be selected after considering the future development town.

1. a. Intensity of Rainfall:-

The average rainfall intensity is derived from records of local rainfall rates and the times concentration i.e. the time required for runoff from the remotest part of the drainage area reach an inlet and these flow through the drain to the point under consideration.

Duration of storm vs intensity of rainfall curve for all storms for different period occurrence is given in annexure I for different towns this will be different and shall be prepare from the rainfall data available at the nearby meteorological station.

b. Time of Concentration

The time of concentration is the time allowed for water to reach at the head of the section of the drain. In general this has to be taken as 30 minutes except while the drain is very close by in which case it should be taken as 20 minutes. This includes 15 minutes time within the house premises. The time required in the drain is calculated with the velocity of 1m per second.

The intensity of rainfall for calculating the runoff for any area is then taken from the curve such that the duration of rainfall for calculating the runoff for any area is then taken from the curve such that the duration of rainfall is equivalent to the time of concentration for such storm will produce the maximum runoff in that area. The intensity I for any particular time of concentration is different period of concurrence. Normally a rainfall with period of occurrence as once in two year is taken for design until unless some specific site conditions required it otherwise.

2. Flow Formula

The velocity in the storm water drain is calculated in the basis of Chezy's Formula.

$$V = \frac{1}{n} (R)^{2/3} \times (S)^{1/2}$$

Where V= mean velocity in meter per second

R= Mean Hydraulic radius

S= Slope of hydraulic gradient

n= Coefficient of roughness

n is Co-efficient whose value is given as below:-

A. Brick Work

Well laid brick work	=	0.013
Average brick work	=	0.015
Rough brick work	=	0.017

Normally figure of 0.015 is reasonable and is adopted in brick work.

B. Concretes with surface as indicated below:-

(i) Formed no finish	0.013	-	0.015
(ii) Trowel finish	0.012	-	0.014
(iii) Granite good section	0.015	-	0.019
C. (i) Dressed stone in mortar			
	0.015	-	0.017
(ii) Random stone in mortar			
	0.015	-	0.020
(iii) Cement rubble masonry plastered			
	0.016	-	0.020

In case of earthen section it is taken as 0.0225

3. Velocity:-

Maximum velocity inside drain should be not exceeding 2.0 meter per second. The minimum velocity should not be less than 0.7 meter per second. In case of internal storm water drains depending upon the topography the minimum value could be 0.4 m/sec.

4. Cross Section

Normally trapezoidal cross section with side slope as 1. land having center portion depressed so that when the discharge is low flow may be limited to center portion has to be provided. Where the soil conditions fairly good side slope of 1.5:1 vertical to horizontal could also be adopted. In some cases where site condition dictates otherwise rectangular or semicircular section could also be used.

5. Free Board

15 cm free board should be provided above the flow level on main roads 225 mm high. Parapet on the face towards roads has to be constructed above the ground level in a length of 1.5m giving up a gap of 30 cm for access of water in to the drain.

6. Wheel Holes

Weep holes have to be spaced at 1.5 meter horizontally and vertically and should be size 8X 5cm having dry brick ballast 20x20x30cm padding.

7. Drain Section

Normally the specification for drain should be 1:6:12 cement concrete with brick ballast 8 cm thick at bottom and brick on the edge flooring in cement mortar 1:6 the sides should be of dry on edge, at the top bull nosed bricks in cement mortar 1:6 have to be provided. Flush pointing to be done with cement mortar 1:3.

8. Drop in Bed

When a branch drain joins a main drain the discharge in the main drain or the bed of shape of a drain changes from steeper to flatter at any section the size of the drain after that section has to be made bigger. In case where the depth is increased to provide larger of flow then care should be taken that the highest flood level on out going drain should remain lower or at the most same as the maximum highest flood level of the incoming drain or otherwise a vertical drop in the bed of the drain has to be provided. A vertical drop up to 4 cm should be accomplished by giving steps in the brick pitching itself. The bed and sides of the drain 30 cm up stream and 60 cm down stream of the drop should be provided with half brick masonry in cement mortar. In cases where drop is more than 4 cm, it should be provided by constructing vertical masonry wall

9. Change in Velocity

The change in velocity inside the drain should not occur abruptly. For every increase in velocity by 0.3 meter per second the distance along the drain should be 4.5 metre.

10. Fall of a Branch Drain in to Main Drain

Where the fall from a branch drain to a main drain is above 15 cm 4cm cement concrete flooring over 10 cm. Lean concrete should be provided in the main drain bed in length equal to the width of water surface in the branch drain plus 30cm.

The bed and side of the drain on up stream side of any culvert should be provided with half brick masonry in cement mortar 1:4 for at least 1 meter length and the side plastered with cement mortar

1:4 also where branch drains meets main drain the bed and sides of the main drain should be provided with half brick masonry in cement mortar 1:4 for 1 meter length symmetrical about the branch drain and the sides of the main drain be plastered.

11. Drain Beginning and Drain Curves

The bed and sides of a drain at beginning and at sharp curves shall be provided with half dry brick pitching and plastered over with cement mortar 1:4 a curtain wall at the end of the drain shall also be provided to prevent accruing and undermining in drain.

12. Out Fall Drains

At curves brick masonry breast wall in cement mortar 1:6 shall be provided. The highest flood level of the outfall drain shall be kept at least 3-6 above the highest flood level of the Nallas in to which the storm water would be discharged, however attempt should be made to keep it as much as possible.

13. Culverts

The minimum span of the culverts should be 60cm with minimum over all depth of either 30 cm or depth of water plus 15 cm free board below bottom of slab which ever is more irrespective of the design requirement. The length of culvert has to be as per U.A.P.W.D practice which various from 32 ft. minimum to 38 ft. maximum. The culverts have to be designed as I.R.C. code.

4.6 Parameters

- 1) The area of entire town, from where the rain water may come will be 291 hectare as per map prepared of the town by doing actual survey.
- 2) Contour survey has been done and maps showing levels will be used for designs.
- 3) The rainfall data used in the design of this scheme is of 25 years obtained from meteorology Department of India.

Table 4.4 showing rainfall data to be used in the design

Month	Rainfall (mm)	Relative Humidity	Temperature		
			Max	Min	Ave.
January	46.9	91	19.3	3.6	10.9
February	54.9	83	22.4	5.6	13.3
March	52.4	69	26.2	9.1	17.6
April	21.2	53	32	13.3	22.7
May	54.2	49	35.3	16.8	25.4
June	230.2	65	34.4	29.4	27.1
July	630.7	86	30.5	22.6	25.1
August	627.4	89	29.7	22.3	25.3
September	261.4	83	29.8	19.7	24.2
October	32.0	74	28.5	13.3	20.5
November	10.9	82	24.8	7.6	15.7
December	2.8	89	21.9	4.0	12.0
Average Annual	2025	76	27.8	13.3	20.0

Maximum rainfall occurs from June to September, i.e. total average rainfall for monsoon period is 1749.70mm (Based on the rainfall data for 25 years available from the website www.dehradun.nic.in) since total number of rainy days are not known in these months, following assumptions are considered as (June 10 days, July 10 days, August 20 days and September 14 days). Total rainy days on monsoon climate are 64 days. Hence intensity of rainfall is $1749.7/64=27.33$ mm say 30 mm. Intensity of rainfall is always taken from maximum rainfall will occur as maximum in 1 hour, so the design discharge is taken as 30 mm/ hour. It is also supported by the data of climatological table of Govt. of India (Annexure A) as it shows maximum rainfall in one day as 487 mm, and it is supposed that it occurred in 16 hours so it worked out 30 mm per hour.

4.7 Planning for Designing

As per contours available topography and existing geographical features of the town. The entire area of the town may be divided into two districts for drainage purpose. Main consideration is for parking places, because thousands of people come here in Kanvan season in month of July August.

Firstly open drains in the parking area will be covered with R.C.C .for prevention of open defecation. Specifically in the parking area the existing open drains will be converted in to closed sewerage system with proper sewage treatment management to avoid the pollution of holy river Ganga in the town and to make city neat and clean.

water logging area in the town shall be upgraded by increasing the level of the road to avoid the water logging problem in the town

4.8 Shape and Type of Section

The comparative economics of different shape and types of drains has been shown in the chapter of design criteria. The composite section trapezoidal cut rectangular in shape in found to be the most economical section and has been adopted. The sizes of sections have been worked as per Manning's formula given in Technical Note.

The drains will be constructed in 1st class brick work in cement mortar 1:4, above 10 cm P.C.C in 1:3:6 to support the sides and base. The plastering of the drain surface in 1:4 cement mortars will be done on inner surface of the drain. The plaster will be 12 mm thick on section having velocity more than 2 mts/ sec. The plaster will be rendered smooth so that the value of rugosity coefficient may be less. The slope of slide walls has been kept as 1:1.

4.9 Structural Design of Drains

The structural design of drains is based on following assumptions, but the actual parameters be ascertained at the time of execution and corresponding adequate changes be ensured.

- 1) It is assumed that water table is sufficiently below the lowest G.L. i.e. about 6m below G.L. and there will be no uplift pressure due to ground water.
- 2) Drains will be constructed in the green verge of the roads and no surcharge due to wheel load will come on the drains.
- 3) Unit weight of dry soil taken as 1.5 tonnes/ cu.m.
- 4) Void ratio is taken as 0.75
- 5) Saturated unit weight of soil assumed as 1.94 tonnes / cu.m
- 6) Maximum coefficient of sliding friction between soil and foundation concrete = 0.7

- 7) The soil considered to be Sm-Sc type for which the values of angles of internal friction $\phi = 35^\circ$ and cohesion is taken as 0.914 t/m². Bearing Capacity has been taken as 10.75 t/m²

Other important points to be kept in mind are adhered to during execution, are given as follows:-

In all such reaches where drainage discharge varies from beginning to end, it is advised to proportionally reduce the average width (designed for height discharge in the reach), keeping invert R.L. same and slope same.

4.10 Land

Land is available by the side of near Highway for construction of drains. Land is also available along the other roads of town where drains are proposed. The drain constructed earlier will be dismantled and new designed drains will be constructed. In view of above no provision for cost and acquisition of land is being made in this estimate.

4.11 Schedule of Rates

For estimates of cost of proposed works, rates of labour and materials approved by the Superintending Engineer IXth circle, Uttaranchal Jal Nigam Dehradun have been incorporated in working out the item rates of different works. The rates for road cutting and reinforcement as approved by Uttarakhand Government have been incorporated. The cost of shifting of telephone, electricity and water pipeline has been incorporated on the basis of rates that are being charged by these departments.

4.12 Period of Completion of Works

The period of completion of the proposed works has been provided as two years in view of the quantum of works involved and the position of allocation of funds.

4.13 Maintenance

The drainage works after execution, will be maintained by the existing staff of Nagar Palika Parishad, Muni Ki Reti.

4.14 Funding

The funding of proposed works will be made by Government of India / Uttaranchal Government to Uttaranchal Jal Nigam. Considering that the proposed works are of social nature and are not likely generate any revenue, the assessment of economics is not feasible.

4.15 Conclusion

This estimate is for prevention of water logging and to check damage of roads by construction of Storm Water Drains and outfall drain for ultimate disposal of storm water in to Ganga River. The total estimate amounting Rs177.16 lacs and is being submitted for approval and allotment of funds. All the rates are taken as per PWD schedule of rates applicable in uttrakhand state.

4.5 Financial statement for water logging area for drainage

S.N.	Particulars	Cost of work			
		Unit	Qty	Rates	Amount
1	<u>Maintenance of road</u> Excavation for foundation in all sort of soil including leads and lifts & roper disposal of all excavated materials as directed by the engineer in charges. (Rate for 1.00 sqm are Total length of road=1150.00x4.00=4600sq mtr)	Cum	4600.00	30.00	138000.00
2	P.C.C. in proportion of 1:4:8 with cement, coarse sand and 40 mm gauge hard stone ballast including supply of all material, labour, T&P etc. required for proper completion of the work Rate as per S.I. No. 176	sqm	4600.00	450.00	2070000.00
3	P.C.C. in proportion of 1:2:4 with cement, coarse sand and 20 m.m. gauge stone ballast including supply of all material, labour, T&P etc. required for proper completion of work. S.I. No. 178	sqm	4600.00	615.00	2829000.00
4	<u>Maintenance of road</u> construction of side drain having c ;c1;4;8 in base and c;c 1;2;4 in top and brick work in side and plastering 1;3cs	Rm	3000.00	610.00	7500000.00
5	Covering of open drains in parking places by R.C.C covering for making open defecation free places .Length=950x1.5x.15=213.75cum	Cum	213.75	10884.00	2326455.00
				Total Rs	16105455.00
	Contingency T& P 10%				1610545.50
				Grand Total	1771600005.00
				Say Rs	177.16 Lacs

CHAPTER 5

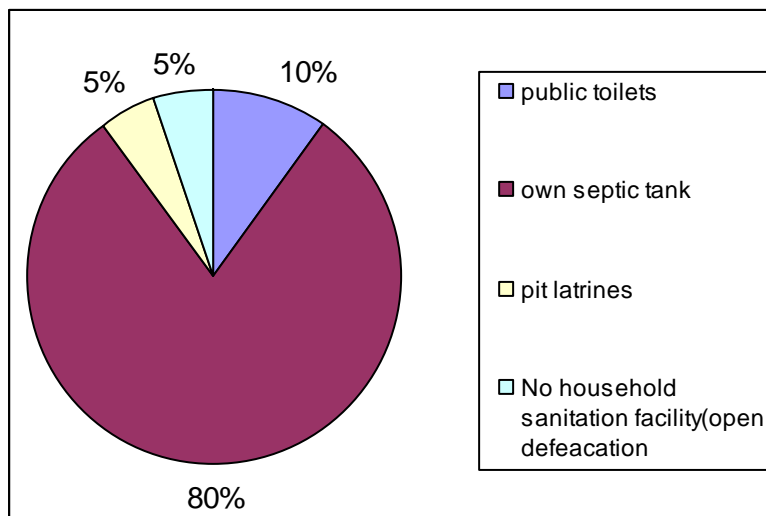
5.1 Existing Sanitation & Environmental Scenario in Muni ki reti

There are problems of waste management in the town as the town is growing in terms of its population and tourism sector. About 50,000 people visit the town in normal days while about 150,000 to 200,000 people visit the town in yatra season in a month. As per the primary and secondary data analysis total waste generated per day in MNP is about 06 to 10 MT.

5.2 Household Sanitation

As per the analysis of the collected primary and secondary data in 2010 based on 30% sampling it was found that nearly 80 % households had access to individual toilets facility. The split of this 80% indicates that about 75 % households accessing latrines having own septic tanks about 5% households have pit type latrines and less than 10% households accessing other (public) latrines. Out of the total about 5 % population lacked access to any household sanitation facilities. This group of households usually practiced open defecation, nonetheless, a few used public toilets.

Figure 5.1 showing % of way of defecation in the town



As per the ULB figures the number of households using public toilets is about 25 while number of households practicing open defecation is about 20 but actual figures that comes out in primary survey is more than this. As the above figure shows that about 5% HHs were found performing open defecation in the town this figure goes high during the yatra season and in summers when a large number of tourists visit the place. Also this figure is high due to daily commuters and temporary migrants.

5.3 Sanitation Scenario for the Floating Population in the Town

Town Muni ki reti is an important place due to its nearness to the holly Ganga. On an average about 5000 People visit the town daily for tourist point of view and other works etc. out of all these the temporary visitors are the main group of the people who performs open defecation along the parking area and bus station near river side and in nearby area. ULB has about 70 public toilets but due to heavy load of daily commuters and visitors this amount of toilets are highly inadequate furthermore the O & M of this toilet is not well therefore most of the floating population used to avoid these toilets. All this lead to performance of open defecation and open urination. The problem is more prominent near parking and bus station area of the town. Providing sufficient number of public conveniences are urgently required for keeping the city and public places clean in the town as the town is also have the path of river Ganga therefore this problem should also be tackled on priority so as to avoid any kind of pollution of river Ganga due to such kind of nuisances.

Table 5.1 showing estimated waste generation trends for next 6 years

S.N.	Particulars	Population Growth							
		2001	2010	2011	2012	2013	2014	2015	2016
1	Population	7881	10000	12000	13500	15000	16000	17000	20000
2	Per capita waste generated(kg)	0.25	2.253	0.259	0.262	0.253	0.259	0.282	0.267
3	Quantity of MSW Generation in Ton +30% extra(Kg)	2.615	3.388	3.514	3.644	3.788	3.916	4.06	4.209

But due to extra load of daily commuters and tourist this waste generation goes much higher than this. Generation of waste also varies in a year as in summers the influx of tourist increases while during few other months the number of pilgrims increase the waste generation in the town.

5.4 Public and Community Sanitary Arrangements

On an average nearly 5000 visitors visits the town for various purpose this figure includes all the visitors, daily commuters etc. As a growing town adequate public / community sanitary facility is an urgent need of the town as the problem of open defecation is increasing day to day importantly along the area of parking places and bank of river Ganga and it is becoming difficult to stop this kind of nuisance because most of open defecation is being practiced very early in the morning. Providing adequate public / community sanitary conveniences is therefore a critical requirement for maintaining sanitation in public places.



Picture 5.1 showing public toilets in the town Muni ki Reti

ULB have 35 seated public toilets at parking places. But this is not adequate as per the floating population in the area. An adequate number of public and community toilets are recommended on the specific location and at specific distance to stop the cases of open defecation and to achieve one of the important objectives of the city sanitation plan.

CHAPTER -6

6.1 Solid Waste Management

SWM is looked after by EO (Executive Officer) directly, sanitary workers, supervisors work under the EO. All the workers reports to supervisors or directly reports to EO if asked to do so. The total strength of sanitary staff is 25. 3 Mohalla Swachata Samitis are working in the town having total 7 employees this number is likely to increase with the coverage of the entire seven wards in the town. The organization structure of health / SWM department of NP Muni ki reti is given in introductory chapters.

Table 6.1 showing details of sanitation workers and supervisors

Totals No. of wards	Population of census 2001	Permanent staff	Temporary staff/Daily wages	Total workers	Supervisor
7	7881	9	8	17	2

Municipal rules for prohibiting littering of waste openly will be strictly followed with initiation of storage of waste at source in segregated manner. For this wherever possible two separate bins will be provided to the people delivering waste in segregated manner for initial 3-6 months of CSP implementation, private sector, NGOs and other government aided agencies shall be encouraged to provide bins to the households to the extent possible in lieu of advertisement rights in the bins

No land available for the landfill site

Problem of open defecation is more prominent near parking area

Encroachment on roads by the unorganized market shops and informal sectors

Problems of open defecation by the pets and stray animals

Various IEC campaign and awareness generation activities will be arranged to educate and to motivate the citizens in keeping the city clean.

Waste segregation at source

No open defecation

Encouragement of bio-composting

No use of polythene etc. will be covered under these campaigns.

CSP proposes to introduce door to door collection on daily basis as well as daily two times sweeping on the streets. As there is no land available for a big landfill site in the town therefore clusters based approach can be adopted for secondary storage of waste. Day to day collection and immediate transportation arrangement will be made to avoid multiple and manual handling of waste in the town. All the waste collected from all the secondary storage points is proposed to be transported in covered hydraulic vehicles / containers on day to day basis avoiding poor aesthetic and manual and multiple handling of waste. It is proposed to start backyard composting wherever it is possible in the town. For rest of the bio- waste private agency can be involved for bio- composting. Final disposal of residues from the treatment plant and inert waste will be done on the land available in the clusters.



Pictures 6.1 showing problems of SWM/ drainage in the town Muni ki reti

6.2 Problems of waste generation and disposal in the town

Including the residential source as main waste generator in the town many hotels and restaurants, Ashram and nursing homes are also generating additional waste in terms of vegetable, foods and shop waste and hazardous waste. In future more waste will generate thus the city needs support in the management of sanitation facilities. Total about 20 dustbins big and small has been placed in all

seven wards. The collected waste is dumped near kharasrot on badrinath road on by pass area (land of Nagar Panchayat). The trenching ground facility is available in the city but this is temporary.

As far as the number of sanitary assets is concerned with the MNP there is only one TATA vehicle with the ULB to transport the waste to the dumping site. Further, there is little data available on health impacts of sanitation and hygiene practices in the city.

The Baseline survey conducted by the Nagar Panchayat has shown the willingness of the household for having individual or public toilets with proper community sanitation facilities management.



Picture 6.2 showing Problems of waste generation and disposal in the town

Cleaning of open drains on the roadsides is the major problem in all the wards that has been found during the survey that has to be taken care of on priority basis similarly the problematic issues of spreading flees; mosquitoes and other pathogenic insects and germs have been found during the survey regarding the health issues in most of the wards. As per the primary survey a good amount (about 60-70%) of the respondents were found willing to pay user charges for availing better facility regarding SWM and other sanitation services.

Lack of sanitation staff and good technical assets are big hurdle to be overcome to provide better sanitation facility without this sustainability in city sanitation cannot be expected from the other sanitation services provided in the city area. The challenge before the city is to respond to the local situation by carrying out a series of activities following the principle of the National Urban Sanitation Policy.

6.3 Methodology adopted for characterization and quantification of waste

30% HHs based survey was done from all types of income groups. Average quantity of waste generated and its type was asked to them. The HHs were enquired about how they dispose of waste and problem of open littering and unattended waste in the area. Based on the above steps; average per capita household waste generation in the city was calculated.

The CSP also addresses institutional, financial, health and legal aspects to make the entire system sustainable which include –

Strategy to enhance the capacities of existing levels of municipal staff along with the number of staff need to be increased / curtailed Mechanisms for financial sustainability to support and sustain the proposed SWM systems

Strategy of IEC for ensuring the community participation

Mechanisms to improve MSWM through Public Private Partnership by involving private entrepreneurs

Legal framework and byelaws to introduce punitive measures and incentives to enforce the recommendations and MSWM rules.

In absence of appropriate systems, inadequate institutional arrangement and poor financial health of urban local bodies, city is following rudimentary methods of waste disposal. Waste is often disposed on the streets by the households, shops and establishments, the municipalities / ULBs by and large collect the waste through street sweeping and deliver the waste to secondary storage site where the waste is temporarily stored in the open spaces or in the masonry bins under unhygienic conditions. This waste is thereafter transported, often in open tractors or trucks using manual labour and taken to dumping site.

6.4 Waste Generation

The total number of households in Muni ki reti is about 2000 and based on the primary and secondary survey and as per capita waste generation, it is estimated that about 6-10 metric tonnes (MT) of domestic solid waste is generated every day. It includes the waste from households, market shops and other institutions waste and waste from other local sources.

As per the solid waste management DPR for dehradun, per capita waste generation

As per the solid waste management DPR for dehradun, per capita waste generation can be considered as 205 gms /capita/day. Based on the primary survey and discussion with the ULB officials revealed that waste generation rate varies between 0.12 and 0.60 kg per capita per day therefore for the study purpose an average of about 0.250 kg per capita per day waste generation can be considered for the city. As per the primary and secondary survey analysis, the town generates about 6-10 MT of waste per day out of which about 50% waste is compost able, 30% is recyclable in nature and rest 20% is inert materials. As per the primary and secondary data analysis MNP only vehicle made two trips per day having a carrying capacity of about 1.5 Ton therefore transporting on an average 2.5 – 3.0 MT waste per day rest of the waste is cleared out from time to time. Total quantity of waste generated for the current year and for the design year projected population has been shown in the table below.

Table 6.2 showing generation of waste per day for the projected year

Year	current Year 2010	Design Year 2014
Projected population including equivalent floating population	12000	15000
Per capita waste generated from residential area Kg/day	1800Kg/day	2250Kg /day
Total waste from residential area mt/day	0.18 Mt/day	0.225 Mt/day

For commercial areas quantity of biodegradable and recyclable waste can be assumed as 70% MT and 30% MT respectively

6.5 SWM PERFORMANCE INDICATORS

6.5.1. Household coverage

The door to door collection, coverage of SWM services in terms of percentage of household is not being carried out in Muni Ki Reti NP.

6.5.2. Efficiency of collection of MSW

It has been estimated only about 50-60% about only 2-3 Tons of MSW is being collected per day on an average, out of the total 6-10 tons of waste generated.

6.5.3. Extent of segregation of MSW

The value for this indicator is almost nil as there is virtually no segregation of waste at any level of MSW management waste is collected, kept and disposed off in mixed form in the town.

6.5.4. Extent of MSW recovered

The extent of MSW recovered is very less as there is no system working through proper channel in this regard. Only the informal sector (that too is very little) people are helping in this line as a part of their livelihood. There is no processing operation in the SWM chain.

6.6 Proposal for improving SWM systems

The MNP authorities have been directed to setup the waste processing and disposal facilities on their own or through a private agency or NGO. Municipality has a trenching ground for disposal of waste.

6.6.1 Prohibit Littering: ensure source segregation of recyclables and storage of waste at source

MSW rules 2000 have laid down the compliance criteria in this regard "littering of municipal solid waste shall be prohibited in cities, towns and in urban areas notified by the state government". MSW rule 2000 is follows in municipality.

6.6.2 Quantity of waste to be treated and land filled

Out of the total recyclable waste generated per day , a major portion of 80- 90% will get salvaged for recycling it will reduce the quantity of the waste to be sent to the landfill site or to composting. Further major portion of the inert / construction waste i.e. 80% -90% can be used to fill low lying areas. Similarly a reasonable amount of biodegradable waste i.e. 30-40% initially would reach the compost plant or can be used for backyard composting in kitchen gardens; in parks or vacant open spaces areas in the locality. As there is problem of land available for large landfill site, cluster based approach will be adopted to make arrangement for inert waste disposal

6.6.3 Awareness programmes for segregation of waste

In order to encourage the citizens to keep the city clean, municipal authority shall organize awareness programmes for segregation of waste and shall promote recycling or reuse of segregated material. The municipal authority shall under take phased programme to ensure community participation in waste segregation for this purpose , regular meetings and discussions shall be arranged by the city sanitation task force members / representatives from local RWA , NGO's and active social workers of the town

6.6.4 Citizen's participation and involvement / community participation

Citizen's participation and involvement is must for solid waste management for this purpose SHGs have been proposed at ward level to join the housewives, students, shopkeepers and other people for the segregation and management of waste at domestic level. Community participation can be ensure by following three actions

By organizing awareness generation programme through various IEC activities

By issuing directions to the citizens through local resources and channels

Adopting enforcement measures to ensure compliance

6.6.5 Measure for Households

MNP must issue direction to citizens, prohibiting littering of waste on the streets, open spaces, water bodies, drains etc. and direct them to store the waste generated at source in two bins, one meant for biodegradable waste and another for recyclable waste. Various illustrative and awareness generation programme can be arranged to make the people aware about biodegradable and recyclable waste types , pamphlet , posters and hoardings can be used to generate awareness among people regarding identification of these two types of waste.

6.6.6 Types of waste to be put in the bin meant for food wastes and bio-degradable wastes

- 1- Food wastes of all kinds, cooked and uncooked, including egg shells, bones
- 2- Flower and fruit waste including juice peels and house –plant wastes
- 3- Sanitary towels/toilet papers and tissue papers
- 4- Disposable diapers and incontinence pads
- 5- Ashes

6.6.7 Types of recyclables wastes to be kept for collection by informal sector for processing

- 1- Paper and plastic of all kinds
- 2- Cardboard and cartons
- 3- Old stored news papers waste
- 4- Plastic and metallic containers
- 5- Packaging material waste of all kinds
- 6- Glass and metallic waste
- 7- Rags, rubber, pouches, sachets and tetra packs (rinsed)

The NP may also take up a massive and regular awareness campaign to educate the citizens not to litter and practice source segregation of recyclable waste and biodegradable waste. There should be two domestic bins for this purpose.

Table 6.3 showing expected benefits of managing garbage in segregated way

S.N.	Variable	Managing garbage in a mixed way	Managing garbage in a source segregated way
1	Aesthetics of the collection	Mixed waste poor aesthetics	segregated waste better aesthetics
2	work condition	Mixed of west leads hazards and unhygienic work condition	segregation of west hygienic work condition
3	Sale Value	Mixing of RW with BW low sale value	source aggregated west better sale value
4	Tips of secondary Collection point	Mixing of west many trips	segregation of west one trip lesser resource / time

			wastage
5	Better environment condition	Poor environment	Improved environment condition

6.6.8 Handling Domestic Hazardous Waste

The citizens may also be advised not to deposit domestic hazardous waste such as used batteries, discarded medicine, paints, pesticides etc. in the bins meant for biodegradable and recyclable material and instead keep the same separately as and when generated and deposit the same at the domestic hazardous waste collection centre or to be hand over to the private agency collector

6.6.9 List of domestic hazardous waste

- Aerosol cans
- Batteries from flashlights and button cells
- Bleaches and household kitchen and drain cleaning agents
- Car batteries , oil filters and car care products and consumerable
- Chemicals and solvents and their empty containers
- Cosmetic items ,chemical based
- Injection needles and syringes after destroying them both
- Insecticides and their empty containers
- Light bulbs , tube –lights and compact fluorescent lamps (CFL)
- Discarded medicines
- Paints , oils , lubricants , glues , thinners , and their empty containers
- Pesticides and herbicides and their empty containers
- Photographic chemicals
- Styrofoam and soft foam packaging from new equipment

- Thermometers and mercury containing products

6.6.10 Promoting Segregation of Waste at Source

It is important to avoid –

Hindrance in waste processing as well as using up landfill space profitable use of recyclable materials could be made by salvaging it at source for recycling to save national resources and also save the cost and efforts to dispose of such wastes

The NP may therefore draw up a regular program of conducting awareness campaign in all the wards utilizing, ward committees, RWAs, NGOs etc. Simple literature may be developed for bringing in the awareness which may be publicized through media using cable net work and group meetings in different areas through NGOs.

The sanitation supervisors may also create awareness during their fields' visits.

The following measures may be taken by the NP Muni ki reti towards segregation of recyclable waste

Mobilizations of agencies to take up the work of organize rag –pickers and upgrade them as door step waste collectors. This can be done by offering them part time work of 4 hours for door to door collection of both biodegradable waste as well as recyclable waste. They may be allowed to collect a less amount/ charge of Rs 10- 20 per month from every house and take away the recyclable material which they collect each day to earn extra amount for their living. As an option, the collection cost could be recovered from the beneficiaries in the form of user charges or sanitation tax by the NP or paid by the NP from its budget to the NGO as deemed appropriate by the NP based on mutual negotiation

The NP may actively associate resident associations, CBOs and NGOs in creating awareness among the people to segregate recyclable material at source and hand it over separately to the waste collector. The upgraded rag pickers on becoming door step waste collectors may be given an identity card by NGOs organizing them so that they may have acceptability in society. The NP may notify such an arrangement made by the NGOs and advise the people to cooperate.

6.6.11 Incentives Measures to Promote Source Storage and Segregation of Waste at Source

Recognizing the community engaged in segregation

Rewarding key partners, groups, people on special occasions

6.6.12 Types of Domestic Bins to be used

Use of plastic or metal containers with lid is advised for the storage of food / bio-degradable/wet waste and a similar size bin or bag with or without lid may be used for recyclable material.

Two containers of 12-15 litre capacity for a family of 5 members would ordinarily be adequate. Household may keep larger containers or more than one container to store the waste produced in 24 hours having a spare capacity of 100% to meet unforeseen delay in clearance or unforeseen extra loads.

NP may provide two containers to every BPL and low income group household for keeping recyclable material separately from food waste to promote segregation and storage of waste at source at the household level. This provision will be for initially one year. It is advisable that households invest in the source storage containers themselves later.

NP may take assistance from the private firms for providing bins to the households by getting advertisement rights through the bins

6.6.13 Provisions of Community Bins for Posh Colonies

A private association of flats /multi-storeyed buildings etc. may be directed to provide a set of covered community bins of 100 litres capacity for 20-25 houses and advise the members of their society / association for storage of biodegradable and non-biodegradable domestic waste in these community bins separately to facilitate collection of such waste by the NP from the designated spot

6.6.14 Provisions of shops /offices /institutions /workshops/ Ashrams for unexpected extra loads

There are about 1000 shops and about 100 religious ashrams in the town. All the establishments as Shops, workshops, offices and industries in the city reported by the NP may be directed that:

They should refrain from throwing the solid waste / sweeping etc. on the footpaths, streets, open drains and open spaces

They should keep their waste on-site as and when generated in segregated manner and in a suitable container until the time of door step collection

The size of the container should be adequate to hold the waste they normally generate in 24 hours with 100% spare capacity to meet unforeseen delay in clearance

They should keep domestic hazardous waste separately as and when produced and dispose of as per directions given by the NP

The association of large commercial complexes should provide one or more containers of the size that may be prescribed by the NP with match with the waste collection and transportation system of the NP for the storage of waste by their members

The association should direct their members to transfer their waste in to the community bin before the prescribed time on a day- to- day basis. The association should consult the NP in the matter and finalize the type of bins to be used and the location where such community bins /should be placed to facilitate easy collection of such waste.

6.6.15 Provision for Hotels and Restaurants:-

There are about 50 hotels and restaurants in the town. All the hotels and restaurants may be directed that they should refrain from throwing their dry and wet solid waste / sweepings on the footpath, streets, open spaces or drains.

They should also refrain from disposal of their waste in to municipal street bins or containers

They should store their waste on-site in sturdy containers of not more than 100 litre capacity each

They shall keep hazardous waste listed above separately as and when produced and dispose it off as per the directions of the NP. In case of large hotels and restaurants where it may not be convenient to store waste in 100 litre or smaller size containers they may keep large containers matching with the primary collection and transportation system of the NP.

6.6.16 Vegetable and Fruit Market

There are vegetable and fruit market in the city, the vendors throw the waste on the footpath and roads of the market and create unhygienic condition

The NP may provide large size containers of 400 cubic meters with lid for storage of waste at suitable locations within the market on full cost /partial cost recovery as deemed appropriate. This may be done through PPP mechanism



Picture 6.3 showing encroachment on the bus parking in the town

6.6.17 Street Vendors

Street vendors generate a lot of waste at the roadside eating joints. A drive may be undertaken to educate street vendors and they may be directed not to throw any waste that generate during their activity. Their handcarts must have a shelf or canvas or a portable bin below for storage of waste generated in the course of business

6.6.18 Provisions for marriage halls/community halls

Lot of waste is being generated when marriage or social functions are performed at these places and unhygienic conditions are created Secondary storage and transportation system of the NP should be provided by these establishments at their cost and the site of their placement should be beard by these establishments or they should pay to the NP for these facilities for easy collection of waste. NP may also charge the appropriate waste collection fee for functions being held at such locations

6.6.19 Provisions for Fish/ Meat market shops

The town is prohibited to sell the meat and other non vegetarian items.

6.6.20 Provisions for Hospitals /Nursing homes / Health care centre

These establishments may be directed that they should not throw any ordinary solid waste on footpaths, streets or open spaces / nallas

They should keep colour coded bins or bags as per the directions of the govt. of India, Ministry of Environment contained in Bio Medical Waste (Management and Handling) Rules 1998, and follow the directions of CPCB and state PCBs from time to time for the storages of biomedical waste. The

storage of bio-medical waste should be done strictly in conformity with directions contained in govt. of India aforesaid notification

NP along with the department of health should ensure that hospital authorities either set up their own treatment systems or make arrangements to tie up with the common waste treatment facility
Collection of biomedical waste is not in the purview of the municipal authority but later shall collect only the segregated general waste from health care establishments

If any health care establishment is found to mix biomedical waste with general waste being provided to the municipal system may be penalized as per the Biomedical Waste (Management & Handling) Rules 1998

Another container with a lid for storage of food waste and other waste fit to be disposed of into the municipal domestic waste stream shall also be provided by them.

6.6.21 Provision for Construction and Demolition Waste

Construction and demolition waste is generally deposited just outside the premises on the streets or open spaces causing hindrance to the traffic and adversely affect the aesthetic of the city

To keep the city free from haphazard disposal of debris, directions may be given that no person shall dispose of construction waste or debris on the streets, public spaces, footpath or pavements or in the nallas

Construction waste should not be stored in open spaces or on the roads without prior permission from the NP the collection should be in such a way so that it could not hamper the traffic, the waste does not spread on the road and does not block the surface drain or storm water drain

MNP may do this through PPP mechanism on cost recovery basis

To begin with private party to make a provision of 30 skip containers and 3 skip lifters to introduce this facility in the city

6.6.22 Provision for Garden Waste

Citizens having lawn plots may be directed not to throw the yard waste outside their premises.

They should in the first instance attempt home composting in the garden itself or they should enter in to a contractual arrangement with the NP to collect the yard waste

They should store the yard waste in a large jute bags and transfer the same in to a municipal system on a weekly basis on payment

The generation of such waste should as far as practicable be regulated in such a way that it is generated only a day prior to the date of the collection of such waste and should be stored in the premises and kept ready for handling over to the municipal authorities or the agency that may be assigned the work of collection of such waste by the NP For removal of garden waste, cluster wise or zone wise arrangements may be made and one vehicle may be allotted to each zone to cover the premise producing garden / yard waste on a weekly basis.

The NP may contract out this service on full cost recovery basis. The names of the households and commercial establishments having private gardens may be listed in each ward and brought under the contractual arrangement.

6.7 Primary collection of waste from the door step

The waste stored at the source of waste generation in a segregated manner need to be collected on a day to day basis at pre-informed timings

This is a very important function that the municipal authorities must perform effectively to improve the system of solid waste management in the city

The MSW rules 2000 give the following direction for the primary collection of waste Organize house to house collection of municipal solid waste through any of the methods , like community bin collection (central bin), house to house collection ,

Collection on regular pre-informed timings and scheduling by using bell ringing or musical vehicles (without exceeding permissible noise levels)

Devising collection of waste from slums and squatter areas or locally including hotels restaurants, office complexes and commercial areas

Waste from slaughter house, meat and fish markets, fruit and vegetable markets which are biodegradable in nature, shall be managed to make use of such waste for bio composting

Biomedical waste and industrial waste should not be mixed with municipal solid waste and such waste shall follow the rules separately specified for the purpose

Collected waste from residential and other areas shall be transferred to community bin by hand – driven containerized cart or other smaller vehicle horticulture and construction or demolition waste of

debris shall be separately collected and disposed of following proper norms. Similarly waste generated at dairies shall be regulated in accordance with state laws

Waste garbage, dry leaves shall not be burnt stray animals shall not be allowed around waste storage facility or at any other place in the town and shall be managed in accordance with the state laws

The municipal authority shall notify waste collection schedule and the likely method to be adopted for public benefit in a city or town

It shall be the responsibility of waste generator to avoid littering and ensure delivery of waste in accordance with the collection and segregation system to be notified by the NP

To meet the above mandatory directions it is necessary for the NP to provide a daily service to all household shops and establishments for the collection of putrescible organic / food bio-degradable waste as well as recyclable / non –biodegradable waste from the doorstep. The service must be regular and reliable. Domestic hazardous waste is produced occasionally so such waste can be collected from the doorstep people on 1 or 2 specified days of the week in separate containers or could be directed to deposit such waste at special domestic hazardous waste collection centre that may be set up in the city by the ULB and be given wider publicity The following arrangement may be made by the NP for primary collection of waste

6.7.1 Door to door collection from household

To take initiatives to make the city bin less city the system of direct collection of waste in to transport vehicles may be adopted in few wards doing away with street bins and that area may be designated as “bin less area”. Rest of the ward may have door to door collection through containerized tricycle where waste may be collected from the door step on a day to day basis and deposited in covered containers placed at strategic locations in each ward.

Initiative for the door to door collection through motorized vehicle can be taken from the area having high population density, wards having important roads and commercial streets, having better accessibility of vehicles for door to door collection, major tourist transition areas, and proximity to the treatment plant to enable easy access to avoid large movement of the tipper vehicle.

On the basis of above parameters initially about 500 HHs can be selected for the bin less waste collection and transportation of the waste. Considering that all 500 HHs can be covered by the one

motorized vehicle one vehicle is required for door to door collection of waste in the area selected for the bin less area. One spare motorized vehicle can be kept for the door to door collection

Out of the 7 wards the NP is recommended to make arrangements for door to door collection of waste in rest of the wards through containerized tricycle. The NP may divide each ward in to units of 125 to 200 houses depending on the density of the houses and access to roads and lanes. An average of 100 households per private waste collector worker is suited for waste collection

Similarly the commercial streets can be divided in units of 100 to 150 shops and establishments (depending on the size of the establishments)

One part time worker per unit may be assigned for door to door collection of waste every day in the morning between 8 am to 11 am or at any time that may be convenient to the households and 9 am to 12 am in the commercial areas

6.7.2 Method to be adopted for organizing door to door collection

Part time workers may deploy in all the 7 wards by the NP through RWAs, NGOs or private sector preferably in all the wards by upgrading the rag pickers or engaging the existing private sweepers working in several colonies and housing areas. The city is establishing mohalla swachata samitis as per the state provisions, which shall be further, strengthen and involved in the door to door collection of waste

The waste collector should ring the bell announcing his arrival at the place of his work and start collecting the waste from the door step. The people may be directed that on hearing the bell, they should put their domestic biodegradable waste as well as recyclable waste in to the separate compartment of the handcart of the waste collector or hand over the waste to him.

At places where it is not convenient for the householders to deposit the waste in the handcart, on account of their non availability at home when waste collector arrives in their area, they may leave their domestic waste in domestic bins or bags just outside their house on the street in the morning so as to enable the waste collector to pick up the waste and put it in to the handcart

Private sector /NGOs may be involved to provide door to door collection of waste through motorized vehicles in all the 7 wards. Mohalla swachata samitis / private agency /NGO may be allowed to collect user fee charges on the prescribed initial rates which may be increased time to time. MNP shall take strict measure to discourage littering of waste on the streets and motivate households to subscribe door to door collection system

As the town Muni ki reti is only 45 kms away from the capital city Dehradun and being a tourist place therefore with the future expansion of the capital city the Muni ki reti will also gain momentum in terms of its population and economic growth. The decadal growth of 10% also shows the importance of the town. This shows a very prominent change in the city permanent population moreover due to various development activities in and around the city number of daily and monthly visitors are growing at a considerably rate as a matter of fact about 5000-10000 visitors are visiting the city daily.

There is no notified slum under Nagar Panchayat to be taken care of although some weaker section area and group of houses has been identified in the city during the house hold survey of the city.

6.7.3 Need of Manpower and Supervisory Staff

As there is lack of work force with the NP, therefore there is a need to employ additional staff. This can be done by arranging staff through permanent basis or on contractual basis.

About 160 (at the rate of 2 per 300 HHs) sanitary workers need to be appointed for door to door collection. This can be done by Mohalla swachata samities or by involving private agency / NGOs etc. The cost can be recovered through imposing user charges or service charge on the beneficiaries

6.7.4 User Charges / Service Charges

In lieu of providing door to door collection service following rates can be prescribed from different groups of beneficiaries. By taking a standard size of 5 members per family number of households could be put at about 2000.

If there will be financial support available from Gol and State Government , the CSP can be prove to be a mile stone in achieving the ultimate goal through various objectives. It will not only improve the city sanitation picture but also improve the environmental, health, aesthetics and living quality of the city as a whole.

Table 6.4 showing Ward wise details of the shops

Ward No.	Name and location of ward	House hold 2001	Total No. of Shops	Numbers of vegetables and fruit shops	Numbers of school/other institute	Numbers of Bank/Govt institute	Numbers of Hospitals/ Nursing Home/ clinic	Numbers of Hotels & Restaurant
1	Satrugan ward	116	110	06	05	04	02	15
2	Bhagan gad ward	117	25	10	04	04	02	06
3	Ganga chetra ward	164	45	05	04	1	1	20
4	Shisumwada ward	105	50	10	3	-	2	5
5	Veshnav devi Mandir ward	205	45	10	2	-	1	10
6	Swami narayan Basick School ward	126	30	5	2	-	1	10
7	Dyanand asram ward	127	35	10	2	-	2	10
	Total	1020	340	56	22	9	11	71

6.7.5 Legislation/penalty provision to tackle the Problem of littering of waste

Although littering of waste in street openly is a punishable offence as per the municipal rules 2003, however about 40-50% waste generated per day can be seen deposited openly either at open spaces or around the bins placed for collection. No door to door collection facility, far distance of bins location, ignorance etc are the major causes of open littering of waste. This kind of indiscriminate disposal of waste on the streets causes nuisance to the people, clogging of surface drains etc. MNP

shall make the provision of penalty for those who will found indulged in this kind of activity. The amount can be decided by the ULB itself or as per the state level rules.

6.8 Segregation of recyclable waste

There is no practice being followed for segregation of waste at source by the residents in the city. Only waste is partially segregated to sale it at shops or to kabadiwalas. Rest of the recyclable materials is disposed off by the residents along with the organic waste in the mixed form. Rag pickers collect the waste to earn their livelihood. There are no separate arrangements for collection of construction and demolition waste

6.9 Street sweeping

Total road length of the Town Muni ki reti is about 30 kms including NH-58 connecting capital city of the state to the nearest Swargashram & Tapovan. All the roads are swept manually in the town on the daily basis. Street sweeping is carried out in about 60% municipal areas in the morning time between 7:30 am to 9:30 am. About 15-18 sweepers remain engaged in the sweeping activity during the morning time. There is lack of night sweeping practice in the town even on the major streets. As per the primary data collected from the market areas the market waste is collected in the morning time daily, between 7:30 am to 9:30 am. The sweepers' collect the waste in the form of piles along the roadside and later on put it in to the bins or being collected by the MNP waste collector vehicle/ cart. As per the Municipal rules the street sweeping must be done twice in a day that is in the morning as well as in the evening but this practice is not being followed due to lack of workers with the MNP. As per the primary survey the interior areas of the town is not been swept on daily basis there the frequency of sweeping remains once in 2-3 days Recently the use of plastic has been banned in the town but its strict implementation is yet to be enforced in the town. The roads are being swept by the sweepers once in a day i.e. in the morning time but there is provision of sweeping the road twice in a day as per the Municipal Rules 2003. The workers have to deploy for this arrangement of street sweeping under city sanitation plan. The problems of water logging were found in the few wards where roadside water logging conditions have been registered during the primary survey.

6.10 Market waste

There are 4 market areas having about 300 shops in the town. About 150 number of informal kind of shops and thellas are there in the town. The market waste is collected and disposed in the similar way as of the household waste. Bins are placed at strategic points in the main market areas, where

the waste is generally thrown. The road sweepings from the market areas are also deposited in to these bins. As per the primary data collected from the market areas the market waste is collected in the morning time daily, between 7:30 am to 9:30 am. The sweepers collect the waste in the form of piles along the roadside and later on put it in to the bins or been collected by the NP waste collector vehicle/ cart.

6.11 Secondary Collection of Waste

Sanitation workers collect the road and street waste on the roadside from where the waste is being picked up and stored at secondary storage point or to the nearest collector bins. There is lack of work force at present also there is no provision for substitute of workers due to this sweepings does not take place on holidays. Most of the sweepers use short handled brooms that are not an efficient tool for sweeping on roads. Long handled brooms will be promoted in the town and training will be provided to the sanitation workers to make them efficient in using the tools to increase the level of sanitation services provided by them. Traditional hand carts and tricycles without bins are used for collection of waste from the streets in an inefficient manner. The no. of vehicles/ tools for workers/ safety measures kit etc is not adequate rendering the workers unable to give their optimum output. There is no synchronization between primary collection and secondary storage of waste. Due to manual handling of waste at depot the workers deposit the waste on the ground instead of directly transferring the waste in to the container this results in unhygienic condition around the container and necessitates multiple handling of waste

Assume one bin per 50 household as a convenience in access / distance of the bins in locality wherever daily door to door collection is not possible

As per the primary data collected the 30% sampling basis , about 70% waste is thrown openly , 25% in to the masonry bins placed by the NP and only 5% people collect the waste in their house but in mixed form.

Table 6.5 Details of waste storage depots

Ward No.	Name of ward	Present no. of bins	Requirement of bins
1	Satrughan ward	4	20
2	Bhagan gad ward	6	8
3	Ganga chetra ward	3	20
4	Shisumwada ward	4	12
5	Veshnav devi Mandir ward	3	12
6	Swami narayan Basick School ward	2	10
7	Dyanand asram ward	3	8
	Total	25	90

Based on the primary survey data analysis about 60% households says that the waste from the collection points and bins are carried out by the municipal sanitary workers on day to day basis. about 37% respondents says that the bins and collection points are not cleared on day to day basis while only 3% respondents accepted that the waste is cleared once in 2-3 days. In ward number 5, 6, and 7 complains of persistent storage of garbage and foul smelling were registered during the survey. Wherever door to door collection is being practiced it is by the informal sector as the rag pickers and waste collector they chooses the sellable item from the collected waste and left the residual waste openly in the scattered way therefore ultimately it also add to the open waste disposal in the area. There is lack of synchronization between primary and secondary collection / storage.

There is no system of segregation and storage of waste at source a large proportion of the population throws the waste on the streets, drains, water bodies and nallas.

Open waste collection practice shows the lack of awareness about harms of this kind of open waste. There were about 15 open collection points from where the solid waste is collected.

The containers placed in different wards for the waste collection are of masonry bins types that are not in practice today. During the primary survey about 20 large and small open collection points has been recognized in various locality.

As at present door to door collection is not in practice in the town therefore it is recommended that this can be done with the involvement of the private agency/ NGOs or any other local agency. As a beginning door to door collection practice can be adopted in 1-2 wards for the phased way implementation initially. A demand based survey to assess the willingness to pay for door to door collection facility has been done based on this a working strategy can be made to initiate the process of door to door collection.

Analysis of about 750 households in all the 7 wards indicate that majority of the households (70 %) dispose garbage in the open or in open drains or nallas (15-20 %) while only a small proportion of households about 10% practice proper disposal of waste i.e. in to the bins or handing over to the waste collector. Primary data analysis reveals that proper use of NP bins is being practiced in only 1 ward where collectively about 15% of the households are using solid waste bins for proper littering in to these bins. Majority of the respondents about 80% has complained about the bad smelling problem in the area due to lack of bins and the farther location of the bins. It indicates the less number of bins per ward as per the requirement and convenience of the people in the locality. As a standard there must be 1 collector bin at every .5 to 1 km distance if there is no door to door collection service has been provided on day to day basis by the MNP. Majority of the respondents out of the total 750 respondents agreed that the MNP collects the waste from bins but not on day to day basis. Only a very less amount about 5% respondents accepted that the bins are cleared on daily basis A bulk amount of respondents about 80% agreed that the bins are being cleared once in 2-3 days NP has given the lack of work force and lack of asset reason behind all this kind of complains regarding solid waste management.

The existing condition of secondary storage of waste is very unsatisfactory as most of the time the waste is collected and keep on lying unattended at various open places in the town Households are responsible for disposing the waste at designated collection points but during the primary survey it was found that at most of the places where NP has placed the bins, nobody is taking pain to put the garbage in to these bins. Most of the time waste can be seen lying outside the bins, even at few places bins were found in neglected and in avoidable situation lying away from the waste. No facility

of processing of municipal solid waste is working in the town, the entire waste is being dumped at the unscientifically selected chunk of land being used as a dumping site in kharasurot area. Out of the total waste generated per day that is about 6-10 MT about 50% household waste is biodegradable waste , about 30% waste is recyclable waste and rest of the 20% waste is inert in nature (based on the criteria been followed in the SWM DPR of Dehradun) .The city does not have an engineered landfill site existing land available at about 2 km away from the town has been marked for this purpose for future arrangement of waste disposal. As an estimate only 40 -50 % municipal waste i.e. 2-3 MT is being cleared by the municipal staff daily. There is lack of capacities with the NP official staff as well as lack of trained skills with the sanitary staff of the NP Muni ki reti to handle the solid waste management technical things. Open waste collection practice shows the lack of awareness about harms of this kind of waste collection among the people in the town. There are about 15 open collection points from where the solid waste is collected. NP Muni ki reti is equipped with 1 Tata ASS for waste collection. The total capacity of all types of containers / bins is about 1 MT which is significantly lesser than the waste generated per day of the city. The containers placed in different wards for the waste collection are of masonry bins types that are not in practice today. During the primary survey about 15-20 large and small open collection points has been recognized in various locality As at present no door to door collection is being practiced in the town therefore it is recommended that this can be done with the involvement of the private agency/ NGOs or any other local agency. As a beginning door to door collection practice can be adopted in 1-2 wards for the phased way implementation initially. A demand based survey to assess the willingness to pay for the door to door collection facility can be done and a working strategy can be made to initiate the process of door to door collection. As per the primary and secondary survey, only about 2-5% population is covered by door to door collection in 2 wards. This door to door collection has been arranged by the households on the cost of their own expenses. At few places a group of rag pickers are collecting waste from the households, and after picking up / selecting the sellable items from the waste rest of the waste has been scattered at the nearby collection point openly in a haphazard manner.MNP has about 50 dustbins having the capacity of 20 litre and 30 litre capacity of the bins. Total capacity of all the containers comes out about 2.5 MT that seems to be not sufficient for the per day waste generated in the town. The situation becomes worse when people do not use these bins properly for waste collection primary survey also reveals that the bins capacity are not sufficient to cater the household in the locality for the waste collection. There is lack of awareness among the people about the significance of the bins for waste collection to maintain the environment clean and hygienic. Therefore MNP urgently recommended to arrange and put the bins at suitable distance so that the people in the locality can make use of them for garbage collection moreover the bins must be cleaned on regular day to day basis to avoid the foul smelling problem in the area.

Analysis of about 750 households in all the 7 wards indicate that majority of the households (70 %) dispose garbage in the open or in open drains or nallas (15-20 %) while only a small proportion of households about 10% practice proper disposal of waste i.e. in to the bins or handing over to the waste collector. Primary data analysis reveals that proper use of NP bins is being practiced in only 1 ward where collectively about 10% of the households are using solid waste bins for proper littering in to these bins. Majority of the respondents in ward number 5, 6, and 7 has complained about the bad smelling problem in the area due to lack of bins and the farther location of the bins. It indicates the less number of bins per ward as per the requirement and convenience of the people in the locality.

There are 4 market areas having about 1000 shops in the town. A number of informal kinds of shops and thellas are there in the town. The market waste is collected and disposed in the similar way as of the household waste. Bins are placed at strategic points in the main market areas, where the waste is generally thrown. The road sweepings from the market areas are also deposited in to these bins

As per the primary data collected from the market areas the market waste is collected in the morning time daily, between 7:30 am to 9:30 am. The sweepers collect the waste in the form of piles along the roadside and later on put it in to the bins or been collected by the MNP waste collector vehicle/ cart. As per the Municipal rules the street sweeping must be done twice in a day that is in the morning as well as in the evening but this practice is not being followed in the town in the excuse of having lack of workers with the NP. This is also important as Muni ki reti is a tourist place and center point of Char dham yatra. Town is a prominent center of kanwar yatra during the month of sawan.

As a standard there must be 1 collector bin at every .5 to 1 km distance if there is no door to door collection service has been provided on day to day basis by the MNP

A less amount of respondents about 10-15% agreed that the bins are being cleared once in a days

NP has given the lack of work force and lack of asset reason behind all this kind of complains regarding solid waste management

6.12 Transportation of wastes

Transportation is being done through traditional way. In most of the cases the waste is manually loaded in the carts / tractor due to lack of synchronization. The waste is collected and handled in a very unhygienic manner from open storage sites and masonry bins collection sites. The transportation work is unscientific and causes nuisance and unsightly appearance. The NP has been using open vehicle for transportation of waste and therefore the compliance of MSW rules 2000 in

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the matter of transportation of waste on a day to day basis in a covered vehicle is not fulfilled and the transportation efficiency is 40% only.

Presently Muni ki reti NP has only one Tata Ass as a vehicle for transportation of MSW. Details of the trips undertaken by the vehicles on a daily basis are as below:

Table 6.6 Showing the Transportation of MSW: Present Status

S.N	Vechile	No.	Total NO. trips per day	Approx qty per trip	Approx qty transported per day(in ton)
1	Tata Ace	1	12	0.3 T.	3.6 T.

The above analysis and the primary field observation shows poor waste collection efficiency that is only about 50%(about 3 Ton) of the waste generated per day(minimum 6 Tons) is being sent to the dumping site while rest of about 50% (3 Ton) of waste remain unattended. The waste is handled manually and carried away by the drivers and sanitary helpers employed by the MNP. Daily 2 trips are performed by theTata Ass for transporting the municipal solid waste. The waste is being dumped on a temporary dumping site near kharasruot area which is about 2 km away from the city.

The transportation of the MSW from the containers to the dumping site is undertaken with the help of 1 dumper placers and 1 tractor trolley. The drivers of the transport vehicles as well as the transport staff are employed by Muni ki reti NP. There is no in-house maintenance workshop for the vehicle and breakdowns are quite common and frequent. An average of 6 trips is undertaken by each vehicle for transporting the MSW.

Based on the calculation minimum 6 MT per day waste should be cleared on a daily basis but primary on-site observation seem to indicate that no more than 4 MT per day is lifted every day this shows the collection efficiency of only about (60%). Informal rag pickers were not seen during the primary survey on the roads generally but they can be seen at the collection points in the locality where they collect the things of their interest from the waste and left the rest of the waste in even more haphazard manner on the roadside The rag pickers / waste collectors, collects plastics, paper, metals, glass etc. from the mixed waste and sell it on the kabadiwala shop to earn their livelihood

6.13 Waste processing

There is no processing of waste generated therefore the entire waste of the city generated found its way to the dumping ground in untreated way.

6.14 Disposal of waste

There is no arrangement of scientific landfill site. There is currently no treatment of waste collected. The MSW collected is dumped at a site near to by pass road in Kharashrot area which is about 2 km away from the main city. The dumping site measures about 1 hectare of area where all the transported city waste is being dumped without any processing. As there is no scientific landfill site therefore the percentage of compliance of the landfill component is zero

Measures about 2 acres of area where all the transported city waste is being dumped without any processing

As there is no scientific landfill site therefore the percentage of compliance of the landfill component is zero



Pictures 6.4 showing manual handling and transportation of waste in Muni ki reti

There are only 30 handcarts and 1 Tata Ash vehicle, trolley with the NP to collect and transport the waste that is highly insufficient. The transportation work is also not carried out on all the days of the year. Due to lack of work force and inadequacy of vehicle and appropriate management for transportation of waste it is not possible for the MNP to transport the entire quantity of waste generated on a day to day basis.

Table 6.7 showing ward wise details of the quantities of waste transported each day

ward no	Name of ward	Population as per 2001	Estimated population 2010	Qty waste generated	Qty of waste Transported
1	Satrugan ward	1185	2250	0.057	0.057
2	Bhagan gad ward	1128	1709	0.043	0.043
3	Ganga chetra ward	1121	1133	0.028	0.028
4	Shisumwada ward	1205	1131	0.028	0.028
5	Veshnav devi Mandir ward	1133	2224	0.056	0.056
6	Swami narayan Basic School ward	1068	1115	0.028	0.028
7	Dyanand asram ward	1040	2100	0.052	0.052
Total			11662	0.292	0.292

6.15 Institutional set up

The details of the Muni ki reti NP conservancy staff engaged in providing solid waste management services is as follows of the total municipal staff of about 30 about 15 are directly related to the solid waste management operation. As the NP is facing the problem of having less number of working staff. The NP has hired about 9 temporary staff to provide the MSW collection and transportation services. Additional manpower / workforce is deployed on day to day basis for special occasions

As per the CPCB guidelines the recommended ratio of sanitary staff per thousand of population should be 2.1 for a city of the size of Muni ki reti. The present ratio in NP Muni ki reti is 1.3 per 1000 population is very less than the suited norms.

Table 6.8 showing details of staffing for public health and conservancy

S.N.	Head	AS per CHPHEEO	MN P status
1.	Total No. sanitary sweeper/ worker (Regulatory & Temporary)	30	20
2	Sanitary supervisors	3	-
3	Sanitary inspector	2	-
4	Sanitary officer	1	-
5	Public health engg./ engg inc.	1	-

6.16 Key issues & deficiencies identified

Based on the primary and secondary survey data analysis following major problems has come out regarding the existing sanitation scenario of the town.

- The problem of water logging was found in the few wards where roadside water logging conditions has been registered during the primary survey.
- There is no system of segregation and storage of waste at source a large proportion of the population throws the waste on the streets , drains , water bodies and nallas
- No door to door collection is in practice in the town

- There is no working system of street sweeping twice in a day i.e. in the morning as well as in the evening time as per the municipal rules. Sweeping is being done only once in a day that is in the morning time.
- The existing condition of secondary storage of waste is very unsatisfactory as most of the time the waste is collected and kept on lying unattended at various open places in the town
- Households are responsible for disposing the waste at designated collection points but during the primary survey it was found that at most of the places where NNP has placed the bins, nobody is taking pain to put the garbage in to these bins. Most of the time waste can be seen lying outside the bins even at few places bins were found in neglected and in avoidable situation lying away from the waste.
- No facility of processing of municipal solid waste the entire waste is being dumped at the unscientifically selected land at kharasurot.
- Out of the total waste generated per day that is about 6-10 MT about 50% household waste is biodegradable waste, about 30% waste is recyclable waste and rest of the 20% waste is inert in nature
- The city does not have an engineered landfill site there is no land available with the NNP for future arrangement of waste disposal.
- As an estimate only 40 -50 % municipal waste i.e. 2-3 MT is being cleared by the municipal staff daily.
- There is lack of capacities with the NP official staff as well as lack of trained skills with the sanitary staff of the NP Muni Ki Reti to handle the solid waste management technical things.
- No land available for the landfill site
- Problem of open defecation is more prominent near parking area
- Encroachment on roads by the unorganized market shops and informal sectors
- Problems of stray animals
- Problems of cleaning of choked open drains, nallas in the town due to unattended solid waste disposed in open areas
- Problem of open urination in the town especially near parking area commercial areas
- Problems of lack of waste collector and bins and illegal way of littering of wastes in tot lots, roads and in open residential as well as in the commercial areas

- Lack of segregation of waste at source, irregular, ineffective and efficient primary collection system. A significant part of the waste is left attended
- Lack of community involvement and private participation
- Problems of disposing solid waste in to open areas, streets, in open drain etc.
- Burning of waste causing health and environment hazards
- Manual handling of waste , from collection to the disposal of waste during the process the sanitary workers are exposed to the waste
- No safety measures been provided to workers who are vulnerable to the health hazards.
- Lack of IEC, capacity building and awareness generation activities in the town to educate people on the ill effects of haphazard disposal of solid waste

6.17 Suggestions

- Sanitation workers engaged in loading the waste should be given masks , loves , jacket , whistle , loves and rain coats for the protection
- Recruitment of the sanitation workers
- To provide improved quality of tools and equipments and ensuring procurement of good quality equipments
- To provide / availability of storage place / sheds for tools and equipments
- There should be prizes / promotional opportunities for sanitary supervisors to motivate them.
- To provide petrol and recharge payment facility to each supervisor
- Arrangement for a substitute sanitary worker when someone falls sick or remains absent
- The street sweeping should not be given on contract
- Create public awareness through various IEC activities
- Provision of weekly off to supervisors
- Have the provision of spot fine for those who litter
- Arrange door to door collection from each house and levy spot fine if no segregated garbage is given

- Make arrangements for controlling the stray animals
- Separate distribution of works of street sweeping and drain cleaning
- Delegate power to sanitary supervisors to levy spot fines and make challans
- Put a ban on the use of plastic
- Imposition of the fine for those who litter

6.18 Future plans of Muni ki reti NP for improving SWM

As NP is working towards use of biodegradable waste for the formation of compost therefore as far as will be possible, bio composting unit will be set up on the land lying vacant in the vicinity of the residential areas and colonies as backyard composting. Efforts will be made to encourage the people and residents towards adopting this bio- composting technique at grass root level so that the deduction of the waste at source can be initiated. As there is non availability of large chunk of land for landfill site, efforts will be made to find the small site on clusters basis. It will not only solve the problem of land but also will reduce the cost of transportation to carry the waste to a distant landfill site. Proper attention will be paid in selecting the clusters based site so that it could not disturb and pollute the environment and aesthetics of the nearby areas. Attempts will be made to dispose only inert waste on the land fill site and not the mixed waste. Cluster based vermi compost plant / EM solution based compost plant will be settled as per the requirement. The recycled kind of waste can be settled out at the private plant/ stations set up in nearby cities as in Dehradun

6.19 financial Statement for transportation and collection of SWM

As per above transportation mode it is true that municipality have not sufficient transportation equipment and vehicle. Being as a vast tourist place in the month of srawan month millions of tourist (Kanwar) came here for going to Neel Khanth Dham and this is the only one parking point for Kanwar .So floating garbage is the main problem faced by the city is challenged so launching CSP may remove this problem as provision below.

Table 6.9 showing the current status of SWM service

Indicators	Norms	MNP
Door to door collection	100%	Nil
Extend of segregation of MSW	100%	Nil
Road length as per sweeper	400-600Mtr	750-1000mtr
sweeper per 1000 population	3	1.5
Adequacy of secondary collection/storage system	100%	Nil
Waste collection performance	100%	60%
Extend of processing MSW	100%	20%
Extend of scientific disposal of MSW	100%	Nil

Table 6.10 showing the current status of SWM service

Year	2001	2010	2014
Population (census and estimated including floating)	7881	12000	15000
Total waste from residential area MT/day	0.11	0.18	0.22
Total commercial waste in Mt. day	0.08	0.12	0.15
Total street waste in MT /day	0.02	0.08	0.10
Total waste generated per day Mt	0.21	0.38	0.47
Per capita waste generated per day Kg/day	0.26	0.31	0.31

Financial status of the town Muni ki reti

Table 6.11 showing the current operation and maintenance expenditure

S.N.	Details	Amount in Rs 000.00
1.	SWM Permanent staff	2529000.00
2	SWM Temporary staff	635000.00
3	Drain cleaning staff	125000.00
4	Fuel (80%)	145000.00
5	Repairs	325000.00
6	Consumables	425000.00
	Totals	4184000.00
	Say Rs	41.84 Lacs

Table 6.12 showing financial estimate for solid waste management

s. no.	Present mode of transport	Total SW disposal	Available at MNP	Requirement	Rate	Unit	Amount
1	TATA ACE having capacity 0.250ton	6.00 Tone	1	2	300000.00	No	600000.00
2	Tractor With Trawly		-	2	500000.00	NO	1000000.00
3	Sewer cleaning Vehicle/ name of vehicle		-	1	1000000.00	No	1000000.00
4	J C B(small) for filling of waste Garbage		-	1	2000000.00	No	2000000.00
5	Hydraulic vehicle for maintenance of street light and caw catcher			2	800000.00	No	1600000.00
						Total Rs	6200000.00
						Say Rs	62.00 Lacs



Picture 6.5 showing Kharashrot dumping site near Muni ki Reti

Till the time there is no organized system of door to door collection of waste generated at household and other level in the town. The people are littering the waste at few selected points in the locality as a matter of their convenience and ease of access these collection points creates bad smelling and polluted environment in the vicinity/adjoining areas

6.20 Financial Statement for Modification of dumping ground of MNP

MNP have its own trenching ground of area 1 hectare. As city is located on the bank of river Ganga and has a major tourist and religious attraction therefore having proper scientific solid waste disposal site is an urgent requirement of the city. At present mismanagement of trenching ground is leading as an attraction point of stray and wild animals on the dumping site. These animals scatter the waste in unhygienic way and create a poor aesthetic vision with poor environment of the vicinity. To make the scientific disposal of garbage, separately as bio-degradable and non bio-degradable waste ULB has prepared a plan to follow the solid waste management rule 2000. Financial estimate for this has been given in the following table.

Table 6.13 showing financial estimate for transportation and treatment of solid waste

s. no.	Present mode of transport	Total Area	Available at MNP	Requirement	Rate	Unit	Amount
1	At By Pass road Khara Surot	1 Hect.	1	1	-	-	-
2	Construction of Treatment Plant for Degradable and non - Degradable waste for scientific disposal of waste and making base for water tight and all scientific provision.	800	-	2	7550.00	Sqm	6040000.00
3	Construction of wire fencing and boundary wall and plantation near side of Dumping point for making site cattle free.	400.00	-		3000.00	No	1200000.00
4	Construction of approach road for approaching up to dumping point including supply of all labour T & P for proper completion of work as per P. W.D. specification of work	400.00	*	*	2000.00	Rm	800000.00
						Total Rs	8040000.00
	Provision of contingency T & P. 10 % of above item						804000.00
						Grand Total	8844000.00
						say Rs	88.44 Lacs

Table 6.14 showing financial estimates for the solid waste management

S.N.	Activity	Particulars of item	Demand as per nouns	Available	Present demand	Unit	Rate	Amount
1	DTDC	Tricycle	5	2	3	No.	7500.00	22500.00
2		Auto Tippers	6	-	6		100000.00	600000.00
3		Hand cards with containers	16	4	12		4500.00	54000.00
4	DTDC commercial area	Tricycle	3		3		7500.00	22500.00
5	Secondary store	waste containers (4 cum)	4	--	4		21000.00	84000.00
6	Dry waste	containers (2 cum)	5	-	5		1500.00	75000.00
7	Commercial area	Litter bins	50	10	40		500.00	20000.00
8	Non approachable area	Community bins	20	5	15		500.00	7500.00
9	container placement	Platform	2	-	2		25000.00	50000.00
10	Street Sweeping	Hand cards	4	-	4		4500.00	18000.00
11		Brooms	200		200		75	15000.00
12		Jacket,	50				250	50000.00

		Gloves						
13		book Kit	50				50	2250.0
14		other instrument	L.S.				15000.00	15000.00
							Total Rs	1035750.00
							Say Rs	10.35 Lacs

Table 6.15 showing ward wise breakdown of solid waste disposal practice

Ward no.	Ward name	Door to door collection	HHs disposing Municipal solid	waste bins HHs disposing in open	waste bins HHs disposing in drain	Total HHs
1	Satrugan ward	20%	10%	20%	25%	116
2	Bhagangarh ward	10%	15%	20%	25%	177
3	Ganga chetra ward	15%	20%	15%	20%	164
4	Shisumwada ward	-	20%	25%	20%	105
5	Veshnav devi Mandir ward	-	15%	40%	20%	205
6	Swami narayan Basic School ward	-	25%	45%	20%	126
7	Dyanand asram ward	-	25%	40%	20%	127

Table 6.16 showing Requirement of sanitary staff for next 5 years in MNP

S.No.	Present Population	Activities	Requirement of sanitary staff	Available at MNP	Demand	Rate per day per employoee	Amount per month
1.	12000	On field sanitation	30	17	13	175	13x175x30=68250
2.	12000	<p>Collection and transportation</p> <p>1. collection from each zone (out of 4 zone) 4x2=8</p> <p>2.For transportation one for each vehicle (4 vehicle x 1)</p> <p>3.Staff for handling waste on dumping ground</p> <p>4.Staff for door to door by swachta samiti (total household 1585 and need 1 for 200 houses)</p> <p>5.Extra staff needed for floating population of about 5000 per day</p>	<p>08</p> <p>04</p> <p>08</p> <p>08</p>	<p>-</p> <p>1</p> <p>-</p> <p>02</p>	<p>08</p> <p>03</p> <p>08</p> <p>06</p>	<p>175</p> <p>175</p> <p>175</p> <p>88(half salary paid by MNP and half is paid by household)</p>	<p>08x175x30=42000</p> <p>03x175x30= 15750</p> <p>08x175x30=42000</p> <p>06x88x30=15840</p>

			05	-	05 (1 per 1000)	175	05x175x30=26250
	Total						210090.00

Total cost for 1 year will be = $210090.00 \times 12 =$ **2521080.00**

Total cost for IInd year with an increment of 10% per year will be = $2521080.00 + 2521080.00 \times 10\% =$ 2773188.00

Total cost for IIIrd year with an increment of 10% per year will be = $2773188.00 + 2773188.00 \times 10\% =$ 3050506.80

Total cost for IVth year with an increment of 10% per year will be = $3050506.80 + 3050506.8 \times 10\% =$ 3355556.00

Total cost for Vth year with an increment of 10% per year will be = $3355556.00 + 3355556.00 \times 10\% =$ 3691111.00

Total cost for 5 years = 15391441.80 say 153.91 lacs

Table 6.17 showing Overall compliance of the MSWM rules 2000 in Muni ki Reti

Ward No.	Name and location of ward	storage at source	Segregation and collection	Door to door storage	Daily street sweeping	Secondary storage	Transportation
1	Satrughan ward	-	-	-	30%	30%	60%
2	Bhagan gad ward	-	-	-	20%	40%	70%
3	Ganga chetra ward	-	-	-	30%	30%	80%
4	Shisumwada ward	-	-	-	20%	20%	90%
5	Veshnav devi Mandir ward	-	-	-	25%	40%	70%
6	Swami narayan Basick School ward	-	-	-	10%	45%	40%
7	Dyanand asram ward	-	-	-	30%	50%	45%
	Total	-	-	-	23%	35%	74%

6.21 Efficiency Redressal of Customer Complaints

As per the primary and secondary survey details, there is negligence among the people for complaining as they perceive it as extra burden and as a poor mindset but whenever complain has been made for some serious problem regarding SWM then they are redressed within 2-3 days.

As a standard there must be 1 collector bin at every .5 to 1 km distance if there is no door to door collection service has been provided on day to day basis by the NP Majority of the respondents out of the total 60% respondents agreed that the NP collects the waste from bins but not on day to day basis they agreed that the bins are being cleared once in 2-3 days. Only a very less amount about 5% respondents accepted that the bins are cleared on daily basis. NP has given the lack of work force and lack of asset reason behind all this kind of complains regarding solid waste management.

Table 6.18 showing SUMMARY OF COST FOR FINANCIAL STATEMENT FOR CSP

S.N	ACTIVITIES	COST(Lacs)
1	Making integrated ward wise toilets and open defecation free holdings in bank of holy river for awareness campaning .(Para 2.3.5 p. No.31)	30.33
2	Maintenance of sewers for safe disposal of waste and Sewerage Management .(Para 3.1.4 p. No.43)	186.69
3	Maintenance of roads and drains in water logging are of different wards. .(Para 4.15 p. No.60)	177.16
4	Safe transportation of waste and collection of waste . .(Para 6.18 p. No.98)	62.00
5	Modification of dumping ground for scientific mode of segregation of bio degradable and non biodegradable waste.(Para 6.19 p. No.101)	88.44
6	financial estimates for the solid waste management (Para 6.19 p. No.117)	10.35
8	Expenditure(establishment cost) for the staff for sanitation(Para 6.21 p. No.101)	153.91
	Total Rs	708.88 lacs
	Says Rs	708.88 Lacs

6.22 Cost sharing for sustenance of CSP

Town Muni ki reti is a small town of the population of about 12,000 and numbers of households are about 2350 therefore the town can share 5% Cost of the project at initial level but later on this share can reach up to 10% depending upon collection efficiency of the ULB with the 10% sharing of the state government. The total project expenditure can be split in to three major head to maintain the sustainability of the plan in future.

Table 6.19 showing sharing of the cost for the sustenance of the CSP

S.N.	Total estimated cost of the project	Cost sharing by GOI	Cost sharing by State Govt.	Cost sharing by MNP
1.	100%	80%	15%	5%

6.23 Requirement of Staff

Staff per 1000 Population:

The present indicators of Sanitary Staff per Thousand population in Muni ki reti is very less i.e. only .005, If we include the contractual staff assuming they are all involved in the SWM activity, the value goes up to .001, which is still lower than the CPCB norm of 2.1 SWM Staff per Thousand of population. The NP is thus understaffed if the compliance with the MSW management rules is the overall objective.

6.24 Summary for SWM

Solid waste generation (2010)

The exact breakup of the Municipal Costs for SWM operations is not available. Approximately Rs 350 per ton is spent on SWM operations per annum (based on 5 TPD and 365 working days). In the existing scenario, with virtually very little compliance with the MSW management rules, this cost is on the higher side for a small city like Muni ki reti. The overall performance of SWM services vis-à-vis the norm is presented in the table

1. Total waste generation

Assuming per person waste generation is 250 gm / day then total waste generation is

$$12000 * 250 / 1000 * 1000 = 3.00 \text{ tonnes / day}$$

Assuming 100 % extra waste from other institutions

$$3 * 100 = 3$$

$$\text{Total waste} = 3 + 3 = 6 \text{ tonnes / day}$$

The total waste generation per day is about 6 tonnes

Although as per the secondary data collected from the MNP about 6-10 tonne waste is generated per day in the town.

2. Door to door collection of waste

To collect the waste from residential areas the tricycles and auto tippers can be used Number of tricycles and auto tippers required

As one tricycle can collect waste from 200 HHs therefore for thousand HHs

$$\text{No. Of tricycles required will be } 2000 / 200 = 10$$

As one auto tipper can collect waste from 1000 HHs therefore **2 auto tippers** will require catering the rest of the population. If use of hand carts is preferred in the town then number of handcarts required will be one hand cart can collect the waste from 50 houses therefore the no. Of carts will be

$$1585 \text{ No. Of households} / 50 = 31.7$$

If the frequency of one handcart usage can be made to twice or the no. of HHs to be catered is assumed half of the actual HHs then this number can be reduced to half

$31.7 / 2 = 15.85$ hand carts will be required

No. of tricycles required for commercial areas

One tricycle can collect waste from the 200 shops

Total tricycles required = $500 / 200 = 2.5$ i.e. 3

For commercial road of about 5 km, about 100 meters road can be served by a litter bin to collect the waste from passer – by therefore

Total no. of the bins required will be = $5000 / 100 = 50$

3. Street sweeping

Total road length in the town is about 10 km including the road length of about 2.5 km of NH-58 . Assuming that one sweeper will sweep 1000 running meter length per day then no. of sweepers required will be

$$10 * 1000 / 1000 = 10$$

To follow the municipal rules of sweeping twice in a day i.e. in the morning as well as in the evening the total no. of workers required will be twice i.e.

$$10 * 2 = 20$$

About 10 % workers can be assumed to appoint at the place of absentees

Therefore total no. of workers required = $20 + 10 = 30$

4. Number of bins required for secondary collection For the area where door to door collection is not possible in the beginning community bins of the capacity of the 40 litres will be provided for every 15 HHs. Based on the primary survey assuming total number of such HHs will be 300 then number of bins and handcarts required will be

No of estimated HHs = 300

No. of bins required = $300 / 15 = 20$

No. of handcarts required to empty those bins = 2

5. Secondary storage of waste at fixed locations on streets

Assuming 55-60% of the total waste generated to be wet waste, and providing containers of size 4 cum having a storage capacity of 1.6 tonne for wet waste and 40% of the total waste generated to be dry waste and providing containers of size 2 cum having a storage capacity of 0.8 tonne for dry waste

Then amount of wet waste will be = $5 * 60/100 = 3$ Tonne

No. of containers required = $3 / 1.5 = 2$

Total no. of containers required of the size of 4 cum = $2 + 2$ (extra for replacement) = 4

Amount of dry waste will be = $5 * 40/100 = 2$ Tonne

No. of containers required = $2 / .8 = 2.5$ i.e. 3

Total no. of containers required of the size of 2 cum = $3 + 2$ (extra for replacement) = 5

6. Transportation of waste from secondary storage points to the landfill site

Two tractors will be deployed for the collection of waste from above containers as well as bulk generators and other sources as per the requirements

No. of tractors required = 2

7. Number of staff required

Present conservancy staff = 10 (5 permanent + 5 contractual)

Conclusion

All the rates are taken in this D.P.R. as per P.W.D. rates applicable in hilly areas. Those rates which were not given in schedule have been taken as per market rate. In preparing the DPR 10% contingency and work charge establishment provision has been made. After allotment of budget the assigned work will be done by the aligned departments separately following the guideline of GOI and Uttarakhand state government time to time. All work is carried out as per PWD specification of work and direction as per GOI and GOU.

Annexure

निजी स्वच्छता के लिए सार्वजनिक स्वच्छता केंद्रों की आवश्यकता



सफाई अभियान चलाया
 ऋषिकेश। गुरुवार को नया मुनिकीरेती व क्लीन हिमालय संस्था के तत्वावधान में संतनगरों के शत्रुघ्न घाट, खारास्रोत नदी, शमशान घाट व जीएमवीएन आदि स्थानों पर सफाई अभियान चलाया गया।
 इस दौरान करीब दस बोरा कचरा एकत्रित किया जिसे क्लीन हिमालयन संस्था की मदद से रिसाइकिलिंग के लिए भेजा जाएगा। नया अधिशासी अधिकारी शांति प्रसाद जोशी ने बताया कि निकाय द्वारा इस बार विशेष पहल करते हुए प्रत्येक सप्ताह के गुरुवार को नगर के विभिन्न स्थानों व गंगा तटों पर सफाई अभियान चलाने का कार्यक्रम शुरू किया है।
 9-7-10

गंगा तटों पर चलाया सफाई अभियान
 8.7.10
 क्लीन हिमालय और नगर पंचायत ने संयुक्त रूप से गंगा तटों पर सफाई अभियान चलाया। उन्होंने स्वामीय लोगों और पटवर्तियों से गंगा को धरि बना रखने में सहयोग देने का अनुरोध किया। गुरुवार को मुनिकीरेती, समझल के शत्रुघ्न घाट से खारास्रोत, शमशान घाट से जीएमवीएन तक सफाई की गई। अभियान में स्वामी सुजन, जितेंद्र, तेजपाल, सुनील, बबलू, मोनु, उदेंत ताल, सतवीर, रिकू, राजेश, मनमोहन, राजेश गोहा, सतन बिष्ट, अना, सोनु, ओमप्रकाश, किशु, रामेश शामिल थे।

गंगा तटों से साफ किया कचरा
 ऋषिकेश। क्लीन हिमालय संस्था और मुनिकीरेती के नागरिकों ने संयुक्त रूप से गंगा तटों पर सघन स्वच्छता अभियान चलाया और पौलीथिन कूड़ा-कचरे का निस्तारण किया।
 बुधस्मतिवार को मुनिकीरेती स्थित शत्रुघ्न मंदिर घाट से स्वच्छता अभियान की शुरुआत की गई। स्वयं सेवियों ने गंगा तटों पर फैला पौलीथिन कचरा, कूड़ा-करकट एकत्रित किया। अभियान गंगा तट पर खारा स्रोत, शमशान घाट होते हुए जीएमवीएन के गंगा रिजार्ट विभाग गृह तक चलाया गया।
 क्लीन हिमालय संस्था की ओर से स्वयं सेवियों ने एकत्रित किए गए कूड़े का निस्तारण किया। अभियान से जुड़े ओमप्रकाश नैटिवाल ने बताया कि स्वयं सेवी गंगा तटों पर प्रत्येक बुधस्मतिवार को सफाई अभियान चलाते हैं। अभियान में नगर पंचायत के अधिशासी अधिकारी एसपी जोशी, सभासद मनमोहन शर्मा, राजेश द्विवेदी, संतन सिंह बिष्ट, नरेश गुप्ता, सोनु, विजय, गंभीर सिंह, महिपाल सिंह, दिलीप सिंह, कुंवर सिंह, संस्था के कार्यकर्ता स्वामी सृजन शिवानंद, जितेंद्र, तेजपाल, सुनील, बबलू, मोनु, छोटेलाल, सतवीर, रिकू रहे।
 वहीं, पवित्र गंगा संरक्षण अभियान समिति की बैठक में नगर निर्गम देहरादून द्वारा पौलीथिन ठन्मूलन और स्वच्छता के लिए चलाए जा रहे अभियान की सराहना की गई।
 बैठक में समिति अध्यक्ष अनीता वशिष्ठ, महिला कमिंस अध्यक्ष राधा रमोला, वृजभूषण, विनय चौहान हेमलता गुप्ता, अनीता, दंडू, विनीता हिमानंद धीपाल, भारद्वाज, सीमा आदि ने गंगा को स्वच्छ करने का संकल्प लिया।

पौलीथिन व गंदी डिपोजिट एव उचितता अभियान चलाते जाते हे कार्यकर्ता
 नगर निर्गम देहरादून द्वारा पौलीथिन ठन्मूलन और स्वच्छता के लिए चलाए जा रहे अभियान की सराहना की गई। बैठक में समिति अध्यक्ष अनीता वशिष्ठ, महिला कमिंस अध्यक्ष राधा रमोला, वृजभूषण, विनय चौहान हेमलता गुप्ता, अनीता, दंडू, विनीता हिमानंद धीपाल, भारद्वाज, सीमा आदि ने गंगा को स्वच्छ करने का संकल्प लिया।

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