AHK Resource Center

Situation Assessment of Solid Waste Management in Chitral City

Final Report

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FOREWORD

Solid waste management is one of the many environmental issues which are being faced by the residents of Chitral. Existing condition of the sewerage and solid waste management is almost nonexistent and lack environment friendly disposal methods which need study and preparation of suitable strategies for their safe and environmentally friendly collection and disposal methods. Solid waste management is one of the many environmental issues currently attracting the attention of development agencies and NGOs working in the area.

Unfortunately no research study or situation analysis has been conducted in Chitral regarding solid waste management. Therefore, Chitral Integrated Area Development Programme (CIADP) under its health related programmatic activities has initiated this Situation Analysis to map and assess the solid waste management in Chitral Town, as in near future with the opening of Lowari Tunnel the city will experience influx of capital, migrants which will result in creating pressure on its existing setup of solid waste management.

The purpose of this study was to assess the existing solid waste disposal practices at Chitral, to identify environmental issues stemming from the existing practices, to develop an environment friendly strategy in order to minimize the potential environmental impacts and to provide recommendations to CIADP and Chitral District Government (CDG) for taking on ground measures in order to address the problem.

We are grateful to the Governments of Norway and The Netherlands for providing grant to CIADP for undertaking this intervention. Moreover, we are also grateful to the Chitral District Government, Tehsil Municipality Authority, Chitral District Residents, Scrap Dealers and Shop owners for providing the survey team with adequate information that enabled them to formulate this report.

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ABBREVIATIONS

I&SD	Infrastructure & Services Department
NACP	National AIDS Control Program
ADP	Annual Development Plan
AHK	Akhter Hameed Khan
AHKMT	Akhter Hameed Khan Memorial Trust
AHKRC	Akhter Hameed Khan Resource Center
AKRSP	Agha Khan Rural Support Program
CBO	Community Based Organization
CDG	Chitral District Government
CIADP	Chitral Integrated Area Development Program
CSOs	Civil Society Organization
DHQ	District Headquarters
EDO	Executive District Officer
EM	Effective Micro-organisms
EPA	Environmental Protection Authority
EPD	Environmental Protection Department
FD	Finance Department
FGD	Focus Group Discussion
Govt	Government
HHs	House Holds
ICDP	Integrated Chitral Development Program
IUCN	International Union for Conservation of Nature
Kg	Kilo Grams
KIIs	Key Informant Interviews
Km	Kilo Meters

m3	Metric Cube
MS	Medical Superintendant
NGOs	Non Governmental Organizations
O&M	Operations & Maintenance
OPD	Out Patient Department
P&DD	Planning & Development Department
PFC	Provincial Finance Commission
PKR	Pakistan Rupees
PTCL	Pakistan Telecommunications Company Limited
SRSP	Sarhad Rural Support Program
SWM	Solid Waste Management
SWMS	Solid Waste Management System
THQ	Tehsil Headquarters
TMA	Tehsil Municipal Administration
TMO	Tehsil Municipal Officer
UA	Union Administration
UC	Union Council
USAID	United States Agency for International Development
USD	United States Dollar

Executive Summary

Solid waste management is one of the many environmental issues which are being faced by the residents of Chitral. The existing sewerage and solid waste management that includes hospital waste in Chitral is not very satisfactory rather it is almost nonexistent and lack environment friendly disposal methods. The central hub of economic activity of the district is Chitral City, which is located on the bank of Chitral River. The Chitral City is administratively managed by a Town Municipal Administration (TMA), which provides municipal services to the three Union Councils Chitral-I, Chitral-II, and Danin. The stakeholders that include District Government (DG), TMA, and local interest groups strongly feel the need of a sustainable and viable solid waste management system. For a viable and sustainable system design Chitral Integrated Area Development Program (CIADP) commissioned Akhter Hameed Khan Resource Center (AHKRC) to undertake a situation assessment of current solid waste management system in Chitral City.

An assessment study was designed to assess the existing solid waste disposal practices at Chitral. The study has employed multiple methods which include assessment of local situation at city level, union council level, community levels; and household levels with respect to the solid waste management cycle. Social context has been supplemented through a household (HHs) survey in 11 settlements, focus group discussions at union council level, key informant interviews, and stakeholder consultation. The technical context has been brought in through technical team field visits, HHs solid waste analysis, pilot studies, and technical consultation with the TMA.

The situation of solid waste management at household (HHs) levels has interesting trends, the analysis focuses not only on HHs health profile but also looks into the knowledge, attitudes, and practices of general population. The Social Assessment of household survey carried out in Chitral reveals that generally the HHs use Pit Latrine (89.9% HHs) while small proportion (6% HHs) practice open defecation. The waste collection within HHs is measured through the HHs general practice of keeping a waste bin or some specific container for collecting waste within the houses. Encouragingly some 75%HHs do have some kind of container for collecting waste within the house. After waste collection a large proportion of HHs are segregating waste before disposal (85.5% HHs) while only 42% HHs sell some kind of waste to waste dealers and buyers. Moreover HHs general practices of taking waste out of the house premises are quiet encouraging as most of the HHs dispose-off the waste on daily basis, on average HHs travel only for 7.37 minutes to dispose-off the waste. The animal & kitchen waste (77.6% HHs) goes to fields generally and is utilized as untreated fertilizer. While 92.4% HH throw away bones despite the fact that the local waste dealer does offer a sale price of bones, similarly, glass and mirrors are the waste types which do

not degenerate easily and more than 90% HHs throw away the waste glass. Whereas large proportions of HHs are using waste paper and plastic for fire purposes (95.4% HHs and 75.8% HHs respectively). The local waste dealers are collecting and buying reusable material, within these situations generally 76.6% HHs are selling waste iron and brass and other metals to waste dealers.

The HHs generally don't mind (48.6%HHs) making final disposal of waste in river and water sources. It transpires that 73.4% HHs are not aware of the problems caused by irregular and unhygienic solid waste disposal. Generally the households (HHs) are either too satisfied (41.1% HHs) or too dissatisfied (40.2% HHs) with current solid waste management system. More (HHs) are more cognizant of solid waste management system absence in Danin (44.5% HHs) than in Chitral-I (41.8% HHs) and Chitral-II (31.8%). General populations of Chitral city have little awareness about recycling and re-use of waste material. Only 3.2% HHs of the survey sample are families where any family member has received some kind of training for solid waste management. The local community groups strongly feel need of village level awareness campaigns, community mobilization, and TMA accountability in disposing of solid waste. The survey has also shown that secondary collection service; moreover almost all the HHs stated that there is no system for door to door waste collection.

Institutional Assessment reveals that TMA does not have a clear strategy and an action plan to implement solid waste management system in the town. The responsibility for Chitral town's municipal Solid Waste collection, transfer, treatment and disposal rests with the Infrastructure & Services Department (I&SD) of the Tehsil Municipal Administration (TMA), which is understaffed, lacks resources, and is disconnected from provincial and local policy makers. The TMA owned waste collection vehicle collects waste on unplanned and unorganized route due to scattered waste collection points. Residential areas that compromise of almost 90 % of waste collection area are without any solid waste collection system. The HHs survey transpired that generally waste heaps are not collected and there are no such arrangements. A large proportion of HHs (37.7%) during HHs survey has never witnessed any secondary collection arrangement for waste heaps collection.

The waste in un-served areas comprises about 80% of total generated solid waste; which is dumped, burned, or buried illicitly by individuals and haulers throughout the town. The TMA of Chitral Town has rented a 2 Kanal Land on the Chitral River bank, 21 Km North of TMA office. The waste from served areas including hospital waste is dumped on this site for last two years. The dumping Site, peculiarly close to river, composed of both hazardous and normal waste. Waste samples collected from the disposal site include rags, plastic bags, organic materials, glass, plastics etc. The waste sample from dumping site also contains significant amount of hazardous hospital waste including syringes, medicine bottles, and

injections. The Chitral medical facilities waste including DHQs Hospital waste is disposed off without any treatment with ordinary waste, primarily because of missing incineration facilities.

The nearest market for Chitral's waste dealer is Swat with respect to cost recovery. Although many components of Chitral town's waste stream are potentially recyclable, there are very few recycling practices in the city. Public awareness of environmental issues is relatively low, especially relating to recycling and waste management issues.

Given the changing dynamics of population and prevailing waste management practices, it is far more important to not only assess waste composition but also the future volume and density of Chitral Town's municipal population. Given current estimated population parameters and national per capita solid waste standards, Chitral town currently generates about 13 tons of municipal solid waste daily, and is estimated to have a yearly volume of 5,000 tons. It is expected that 7,827 m3 of solid waste will be generated in Chitral by 2031. A small sample study of HHs reveal that almost 36.84% of HHs generated waste is composed of vegetables and organic waste followed by 33.89% leaves and wood. Paper (4.69%) and Plastic materials (3.22%) also have significant contribution to the HHs solid waste.

On overall grounds; the beautiful landscapes, the scenes, environment, hygiene conditions, and water streams of Chitral Valley are being severely damaged due to current Solid Waste Management practices. The current situation depicts that primary collection (HHs level), secondary collection, recycling practices, and final disposal to dumping site is very rudimentary. The current state of Solid Waste Management cannot be concluded as a sustainable and viable system. The Inherent lack of administrative capacity, lack of financial and human resources, and absence of clear vision on part of TMA and civil society organizations, is driving the valley into an environmental degradation that ultimately will be very difficult to reclaim. The TMA lacks resources and technical capacities in catering for this important municipal service. The town needs specialized skills for strategy, plan, and solution devising for Chitral city. The district government and TMA is also a victim of missing institutional linkages with environmental protection authorities, the capacity building measures in town planning, and meager budget allocations from provincial ADP.

The HHs in Chitral suggested some mix of offers that demand improvements at various levels; ranging from enhanced role of government for catering the Solid Waste Management (SWM), specific disposal points selection, government installed waste bins or containers in every street, systems and committees formation, community trainings, and municipal vehicles for waste collection. Given the likely impact of solid waste on social, economic, and environmental conditions of Chitral, an immediate action plan for an integrated solid waste management is needed.

While deriving solutions from the assessment, the study proposes that a consultative process should be specifically initiated to design, devise, and implement a viable solid waste management strategy and plan; capable of an integrated solid waste collection, transportation, and disposal. The plan should be tested through a pilot project designed for a period of one year in selected areas of Chitral. A basic solid waste collection and transportation system is proposed as a starting point which largely relies on the suggestion that various waste collection points will be identified and maintained.

The indicative action Plan is designed to rapidly transform SWM sector functions, operations and implementing institutions with focus on compound sharing. Under the proposed plan, solid waste management system will provide a reliable, sustainable municipal waste collection service to every waste generator in the city, ensuring that all residual waste is transported and disposed of in an environmentally safe and socially responsible manner, and in conjunction with other implementing stakeholders, makes progress in initiating and improving the City's municipal systems. The plan includes two models for intensive Community Awareness/Mobilization, model for developing a new collection, transportation and disposal mechanism, and options for selecting a need based environmentally sound disposal site. Implementing the plan will include procurement of requisite machinery and equipment, training of sanitary staff, procurement and development of land fill site, its operation & maintenance and efforts for its sustainability. The indicative cost of the action plan is Pak Rupees 30.2 Million approximately and can be financed through vertical and non-vertical programs.

1.0 Introduction

1.1 Background

The Chitral District has the population of approximately 450,000 individuals living in 463 settlements scattered in over 32 valleys. Nearly 75% of the settlements are small, with a population of less than 800 individuals (about 100 households) each. About 90% of the population resides in rural areas, while only 10% is settled in the urban area of Chitral Town. Administratively, the district is divided into Two Tehsils and 24 Union Councils. The people are poor and 36% live below the official poverty line. The central hub of economic activity of the district is Chitral City, which is located very close to Chitral River. The Chitral City is administratively managed by a Town Municipal Administration (TMA), who provides municipal services to the three Union Councils Chitral-I, Chitral-II, and Danin. The Chitral River has naturally divided the administrative boundaries of the UCs.

Due to its central location and commercial centers, Chitral City is visited by almost every single tourist and most of residents of adjoining locations. During last decade and with economic development, Chitral City has attracted a host of immigrants from within other areas of Pakistan. The changing population dynamics, new life styles, and tourist influx has created a host of challenges for Chitral's geographic heritage conservation and sustainability. Chitral is one of finest tourist attraction, due to its multi-dynamic socio-cultural and climatic conditions. Sustainable environmental conservation is far more essential for Chitral today, than it had ever been in past, due to increasing geographical significance.

Solid Waste Management is one of the many environmental concerns, currently being faced by the residents of Chitral. The preliminary insights bring this Information that existing sewerage and solid waste management systems in Chitral are almost non-existent, lacking environment friendly disposal methods, and negatively impacting geographical heritage of the valley. The stakeholders including district government (DG), TMA, and local interest groups strongly feel the need of a sustainable and viable solid waste management system. Given Chitral's specific socio-economic context, its climate, and administrative setup it is far more central to develop and design a citizen centered system.

For a viable and sustainable system design Chitral Integrated Area Development Program (CIADP) partnered with Akhter Hameed Khan Resource Center (AHKRC) initiated a situation assessment of current solid waste management system in Chitral City. This assessment is rightly designed to take into account the social systems coupled with technical analysis with respect to Solid Waste Management (SWM) Cycle. The following pages report the current situation at community and service delivery levels

and systematically provides with set of short term and long term curative measure for sustainable solid waste management.

1.2 Objectives of Assessment

The overall objectives of the assessment study are to:

- Assess the existing solid waste disposal practices at Chitral
- Identify environmental issues stemming from the existing practices
- Develop an environment friendly strategy to minimize the potential environmental impacts
- Provide recommendations to CIADP and Chitral District Government (CDG) to undertake on ground measures in order to address the problems

1.3 Scope of Services

As per Terms of Reference the Scope of Services is:

- Visit the area and review the pitfalls in the existing solid waste management practices through observations, survey as well as meetings with the responsible agencies
- Assessment of the quantum of Domestic, Hospital, Industrial, Toxic and hazardous Solid Waste and Sewerage
- Characterize the municipal and commercial solid waste from resource recovery
- Assessment of the Existing Facilities for Sewerage and Solid Waste Collection
- Assessment of the Existing Sewerage Treatment if any
- Assessment of the Existing Solid Waste Disposal System/Facilities
- Identification and selection of potential areas for establishing a landfill site
- Testing of Effluent water if required
- Characterize the hospital waste and determine the segregation potential as well as requirements for an incinerator
- Prepare recommendation and plan for the selected Disposal Method with Preliminary Cost Estimate of the Recommended Alternatives

1.4 Design and Methodology

The study has employed multiple methods which include assessment of local situation at city level, union council level, community levels; and household levels.

1.4.1 Data Collection Methods

Information has been collected through multiple means where findings are triangulated to assess the situations.

- For data collection at City and Union Council levels preliminary assessment criteria's were developed in accordance with scope of assessment. The data collection at City and Union levels

provides technical information in terms of current systems and the efficiency of existing practices.

- For data collection at Union Council level Focus Group Discussions (FGD) and Key Informant Interviews (KII) are conducted. The Focus Group Discussions were conducted with community influential including teachers, UC Councilors, CBO members, farmers and religious leaders etc. At least two KIIs were conducted in each of the 11 sites/settlements from within the three Union Councils (UCs). A total of 22 KIIs were conducted. One FGD was conducted in each Union Council. Moreover, Key Informant Interviews (KIIs) were also conducted with Union Administration (UA/local administration) workers and staff for getting better insights about the pitfalls of current system. This included local sanitary workers, sweepers, supervisors and other staff members. A total of 6 such KIIs were conducted at 11 sites within the three Union Councils (UC Chitral 1, UC Chitral II and UC Denin).
- For data collection at household (HH) level a random sample was drawn through a two stage sampling i.e.; random selection of sites within the three union councils and random selection of household sample within the sample sites. A semi-structured interview coupled with observations was used for primary data collection.
- For data collection at private stakeholder level (hotels, hospitals, schools etc) a participatory methodology was adopted. The field team and technical team have primarily employed an open ended assessment of the current situation in private establishments.

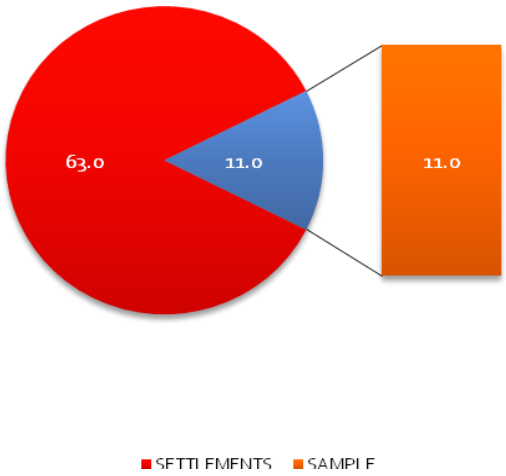


Figure 1 HHs Survey Sampling

DATA COLLECTION METHODS

The Chitral City is divided into 3 Union Councils and 63 village/moza sites/settlements as per HHs data sets of 1998 population census. From the three Union Councils 15-20% settlements per union council were randomly selected which makes 11 randomly selected sample settlements. From each of the sample settlements 20 HHs were selected through left hand rule. The HHs sample adds up to 220 HHs and is drawn from 3 settlements of UC Chitral I, 4 settlements of UC Chitral II, and 4 settlements of UC Danin.

1.4.2 Data Tools & Instruments

The data was collected through use of multiple tools. As a preliminary guide following data collection tools were designed and used for data collection[1]:

- Guide to Technical Survey (environmental engineering assessment)
- Social Survey: HHs Semi-Structured Interview Questionnaire
- Social Survey : Key Informant Interview Guide
- Social Survey: Focus Group Discussion Guide with a solution proposition format

Table 1 Union Council Wise Sample Settlements

	Settlements
DANIN	Danin Gole ,Shadok Danin, Akhonzadaganandeh Jughoor, Goldur Jughoor
CHITRAL I	Makhtoomabad, Hone, Muldeh Chitral
CHITRAL II	Jang Bazar, Zargarandeh, Rehankot, Shaldeen

1.5 Scope & Limitations

The situation assessment largely relies on HHs level survey, field observations, interviews, meetings, and stakeholder consultations. The HHs data was collected in sample sites and cannot be modeled to represent entire population of the town. The field assessment including HHs survey has been conducted during 26th September to 3rd October, 2011. Although study and survey results can be qualitatively generalized for Chitral City, the seasonal differences were not catered for in this study. More importantly peak seasons for tourism cannot be assessed due to limited scope of the study. It is also important to note that the proposed technical solutions are indicative in nature and require detailed feasibility assessments.

1.6 Report Organization

The report is organized while initially giving a foreword of the development agenda and significance of investment in this particular study. The main contents of the report are composed of six chapters followed by Exhibits, Index of Terms, and Annexure:

[1] Data Collection tools are available as Annex

Chapter 1:

This chapter sets the background of the assessment and also states assessment objectives, the methods used reliability of findings and scope of the assessment.

Chapter 2 to Chapter 4:

The Solid Waste Management System (SWMS) assessment is organized into SWM cycle wise chapters. Chapters 2 to 4 cover Social Assessment (Primary Collection), Institutional Assessment (Secondary Collection & Disposal), and Municipal Waste Assessment (Enquiry for Solution Design). Within these chapters the content is organized into a logical and systematic order.

Chapter 5:

Chapter 5 systematically concludes the findings on overall grounds and reads between the findings and throws light on overall generic assessment. This chapter also presents overall recommendations for further actions.

Chapter 6:

Chapter 6 draws heavily on assessment findings and stakeholder consultations and presents concepts for sustainable system design, indicative time lines of solutions and budgetary requirements.

Exhibits, References, Glossary of Terms & Annexure:

The exhibits provide key important background and technical material and aids specific to the study. The report also provides a list of terms used and important attachments.

2.0 Social Assessment

2.1 Chitral City at a glance

Chitral or called as Chetrar in the native language of Khowar. Chitral Town is the capital of the Chitral District, is situated on the western bank of Kabal River (also called Chitral River), in Hindukhush Himalayan region of extreme North-West of Khyber Pukhtunkhwa in Pakistan. The highest peak of Hindukhush **"TERICHMIR"**, 25,289 ft high is visible from Chitral Town. The altitude of the valley is 3,700 ft and has a population of 45,000. Chitral River is lifeline of city and most of the inhabitants are located around its bank. The airport is situated in north part of town which is linked with Islamabad and Peshawar.

Administratively; Chitral City is divided into three UCs Chitral-I, Chitral-II, and Danin and 63 small settlements (villages). There is a large commercial hub in centre of town comprising of about 800 shops and commercial centers. The most clustered HHs and slightly higher population density is seen in settlements which are very close to the central bazaar. The Chitral Town is no different from other parts of the country in terms of house hold size; while there are slight variations between the three union councils of the town. The social survey reveals that UC Danin has on average 7 family members whereas in Chitral-I and Chitral-II on average the HH size is 8 family members.

In Chitral Town the roads are very narrow don't have proper street system and houses built are not planned. Recent reports of AKRSP transpire increasing trends of joint family systems, increase in primary completion rates, and increasing female child primary completion rates. Generally the population's dependency on non farm income sources and the farm-to-nonfarm proportion further reduces settlements near central hub.

2.2 Sewerage & Sanitation System

The household survey indicates that generally the HHs use Flush attached Pit Latrine (89.9% HHs) while small proportion (6.0%HHs) practice open defecation. There are about 80% of houses connected to soak pits while rest of the sewage goes directly to drains. The connectivity of only 1.8% HHs latrines is with some sort of sewerage line somehow indicates a mix system but without connectivity to a proper sewerage line. The general discussions with stakeholders identify that there is no proper sewerage system and all effluents directly flow into small drains which are connected to larger channels and the

ultimate disposal in Chitral River. The use of soak pits by most of the population helps a lot in decreasing environmental impact of effluents.

2.3 Prevailing Health Situations

- The health profile as evident from House Hold Survey reveal that there are certain trends in prevailing diseases. Gastro Intestinal Diseases are frequently occurring where 63.6% HHs generally get affected. The populations living near river are even more at risk of Gastro Intestinal Diseases where 67.5% HHs generally get affected. Since Gastro Intestinal Diseases are mostly water borne diseases. Dumping of waste in water sources has increased the risk of populations living near water sources and river. Although most of the HHs inn Chitral City are covered by piped water supply from Angerghoon; prevailing water borne diseases is alarming and indicates poor sanitation system.
- Dysentery is the second most common occurring disease. Where 31.8% HHs generally get affected. Again being a water borne disease nurturing parasites causing diarrhea makes population living near water sources more vulnerable to risk.
- The solid waste blocking sewerage lines and drains, causing water pools and nurturing mosquitoes and various germs are leaving the populations affected by Malaria, Typhoid, Allergies, Skin Diseases and Hepatitis respectively. The population which does not live near river is more at risk of catching these diseases than the population living near river.

VULNERABILITIES

HHS LIVING NEAR WATER COMPARED TO HHS NOT LIVING NEAR WATER

- **6%** more risk of gastro intestinal diseases
- **3.1%** more risk of dysentery

HHS NOT LIVING NEAR WATER AS COMPARED TO HHS LIVING NEAR WATER

- **16.3%** more risk of Malaria
- **12.5%** more risk of Diarrhea
- **9.5%** more risk of Typhoid
- **4.5%** more risk of Allergy
- **0.4%** more risk of Skin Diseases
- **0.5%** more risk of Hepatitis

2.4 Household Practices

The situation of solid waste management at HHs levels has interesting trends which focuses not only on HHs health profile but also looks into the knowledge, attitudes, and practices of general population.

2.4.1 Waste Collection within HHs

The waste collection within HHs is measured through the HHs general practice of keeping a waste bin or some specific

In all the three Union Councils Household Women or the Girl Child are involved in waste collection within house, primary segregation, and then disposal at nearby location.

container for collecting waste within the houses. Encouragingly some 75.0%HHs do have some kind of container for collecting waste within the house. After waste collection a large proportion of HHs are segregating waste before disposal (85.5%HHs) while only 42.0% HHs sell some kind of waste to waste dealers and buyers. The HHs general practice of taking waste out of the house premises is quiet encouraging as most of the HHs dispose-off the waste on daily basis. The waste is generally disposed off either by household women or the girl child whereas only a small proportion of HHs (3.8% HHs) has assistance of a servant for this purpose.

2.4.2 Prevailing Disposal Practices & Methods

- A large number of HHs (42.0%) dispose-off the waste either in the river or in natural springs and Nullahs. There are approximately 36.4% HHs which are very near to the river and the water streams and all of these HHs are throwing waste directly in the water.
- On average HHs travel only for 7.37 minutes to dispose-off the waste. This indicates that HHs throw the waste very close to their houses, in nearby water streams, in river close to the house, and down from mountains. The maximum distance covered by the HHs is 60 minutes and the minimum distance is zero minutes for disposing waste. It has been observed that there are approximately 34.5%HHs where waste was dumped around the house.

Almost all of the waste paper is burnt and used for fire throughout Chitral.

Plastic/Polythene bags are generally used to light fire; which even becomes more hazardous.

Unlike other parts of country; used glass, mirrors, and plastic bottles are not accepted for resale by local waste dealer in Chitral.

- In all the UCs most of the HHs own pets and animals (e.g. Cow). In this scenario almost all of the grass, fodder, and kitchen waste are fed to animals. Those HHs who themselves do not own pets provide the fodder to neighbors for their animals.
- The animal waste and most of kitchen waste goes to fields generally (77.6%HHs) and is utilized as untreated fertilizer.
- Unlike other kitchen waste the bones (92.4% HHs) are thrown away in the localities despite the fact that the local waste dealer does offer a sale price of bones.
- Glass and mirrors are the waste types which do not degenerate easily and more than 90% HHs throw away the waste glass. Whereas large proportions of HHs (95.4% HHs and 75.8%HHs respectively) are using waste paper and plastic for fire purposes.
- A bigger proportion of HHs (63.1%) throws away combed hair in the river whereas 5.5% HHs just throw away hair in their localities. When looked at closely 68.7%HHs are actually throwing away hair either in residential areas or in the river.

- HHs are of the view that the waste dealers have very low physical presence (0.5%HHs physically covered through a Kabaria). The local waste dealer is collecting and buying reusable material through move around staff. Within these situations generally (76.6% HHs) are selling waste iron and brass and other metals to waste dealers.

2.4.3 Community Knowledge & Attitudes

- A large proportion of the sample (44% HHs) is aware of the fact that the waste is going in the river. Some 22.2% HHs either do not know or are not bothered to know about the final treatment of the solid waste.
- The HHs generally don't mind (48.6%HHs) making final disposal in river and water sources. 24.8% HHs generally don't feel good about the final disposal practices and don't have specific reasons for following it. It transpires that 73.4% HHs are not aware of the problems caused by irregular and unhygienic solid waste disposal. The HHs who have some awareness have views that such a final disposal is resulting into water pollution (6.9%), river & streams pollution (11.5%), and local environmental pollution (6.4%).

Ali Nawaz: Nala/river is the best place to dispose-off the solid waste

- Generally the HHs are either too satisfied (41.1%HHs) or too dissatisfied (40.2% HHs) with current solid waste management system. A closer look reveals that some HHs (57.5%) are somehow satisfied with the current system. This shows that a larger proportion of population is unaware of the system pitfalls and does not know how they are getting affected.
- The HHs who are dissatisfied are of the opinion that they are not left with a choice for an alternate and a better system (35.1% HHs). A very little proportion (3.0%HHs) is dissatisfied because of the fact that generally communities are not aware of proper disposal methods and practices. 20.9%HHs generally do not find the practices to be good enough. 25.4%HHs and 15.7% HHs responded that there is no appropriate SWM system and no responsibilities are taken up at various levels. More HHs are cognizant of system absence in Danin (44.5% HHs) than Chitral-I (41.8%HHs) and Chitral-II (31.8%).

2.4.4 Community Mobilization & CSOs Initiatives

- General populations of Chitral city have little awareness about recycling and re-use of waste material. The FGDs revealed not only absence of such technologies but also absence of any initiatives in a formal manner. However citizens have an interest to know about reuse and recycling methods.

There was no Solid Waste in Chitral; 10 years ago.

A local Informant

- Only 3.2% HHs of the survey sample are families where any family member has received some

kind of training for solid waste management.

- In all the surveyed locations not a single HH indicated any kind of community committee dealing with the solid waste issues and arrangements. In past SRSP had started an initiative at village level but could not sustain it.
- The local community groups strongly feel needs of village level awareness campaigns, community mobilization, and TMA accountability.

2.4.5 TMA Outreach

- Almost all the HHs stated that there is no system for door to door waste collection.
- The HHs survey revealed that generally waste heaps are not taken away and there is no such arrangement. 37.7% HHs responded that waste heaps are never taken away through some secondary collection arrangement.
- The above practice of dumping waste outside houses is stemming from absence of dumpers and waste bins in nearest location. Only 1.8% HHs have some kind of waste bin and dumper in the nearest location or street. Such coverage is available to 5.0% HHs in Chitral-II and 2.0% HHs in Chitral-I. Interestingly approximately all of the waste dumpers/bins are arranged by government and are emptied on daily basis.
- Moreover despite a Union Administration presence in each UC and TMA sanitary staff, only 3.6% HHs are aware of such existence or have been in contact with service providers. The HHs are generally of the view that no sweeper or government representative is assigned to their localities.
- Although the residetial areas are uncovered by service delivery ; the community and HHs in Chitral are of the the view that given the geographical characteristic (hilly area and narrow lanes) some small cart, a cycle, or a small vehicle can visit the localities and service outreach can be maximized . Irrespective of the type of vehicle, most of the HHs are of the view that morning is an appropriate time for secondary waste collection.

3.0 Institutional Assessment

3.1 Institutional Capacities

Throughout the study time frame, the weak nature of institutional capacities and infrastructure within the government sector for waste management was very apparent. This inherent weakness is due, to a large extent, to shortages in both human and financial resources to operate a viable system and provide maximum coverage for service delivery.

The human resources, the technical expertise of the TMA staff is collectively very low. In all of the consultations whether with communities or administrative authorities, there was needs identification for trained and experienced personnel. Failure to address this need will undermine any future waste management initiatives.

Moreover TMA also lacks a clear strategy and an action plan to implement solid waste management system in the town. As of date the situation of solid waste had never been on priority of government and there is no planning and policy for solid Waste at district level.

3.2 Existing Municipal Capacities

3.2.1 Administrative Structure

The responsibility for Chitral town's municipal Solid Waste collection, transfer, treatment and disposal rests with the Infrastructure & Services Department (I&SD) of the Tehsil Municipal Administration (TMA). Currently, the Solid Waste Management unit of I&S department has a staff of about 12 employees which is being supervised by an Admin Officer.

Solid Waste Management Stakeholders

National Level:
Ministry of Environment (Federal EPA)
Ministry of Local Government & Rural Development

Provincial Level:
Ministry of Environment (EPD)
Provincial Planning & Development Department
Finance Department
Health Department
Public Health Engineering
Local Govt. & Rural Development Department

Local Level:
District Government, TMA, Local leaders, communities, UC Nazims, Local councilors

User Groups:
Residential, commercial, institutional, industrial, medical facilities, Slaughter Houses

Waste workers:
Employees of municipal solid waste service, waste pickers (scavengers), Municipal sweepers, private sweepers, domestic workers, janitors

Vulnerable Groups:
Residents living near transfer stations (Filth Depot) or final disposal sites, women or children who are responsible for disposing of household waste, waste pickers

Non-Governmental Organizations:
Local environmental organizations, religious groups, youth groups

Other Stakeholders:
Media, educational institutions

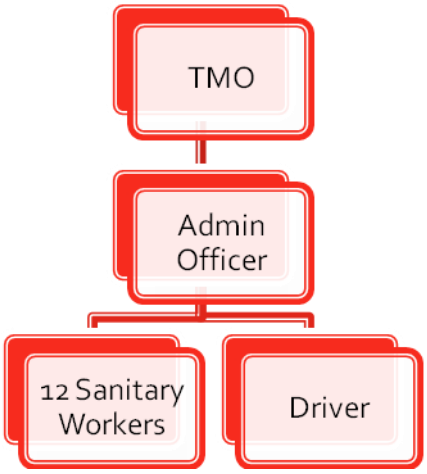


Figure 2 Sanitation Structure

There is an acute human resource shortage as one sanitary worker is serving about 3700 persons against the generally accepted standard of 1:500 persons. All of these sanitary workers are posted in commercial areas which is the only served part of town.

Only 1.8% HHs have some kind of waste bin in the nearest location or street. All of the waste dumpers/bins are arranged by government installed in commercial areas and are emptied on daily basis.

3.2.2 Financial Resource Allocation

The budgets of the TMA do not reflect allocations for solid waste management as a separate head. The TMA has meager own revenues and is largely relying on allocations from district's Annual Development Plan. The only resources allocated to waste transportation on average are PKR 280,000 for last three fiscal years which further averages to approximately PKR 23,500 per month. The inadequate resource allocation points towards negligence of important municipal service and TMAs non existence efforts for resource generation.

3.2.3 State of Service Tools

Hand tools and other equipment used during sweeping and collection by the sanitary workers, are substandard and lack proper design. As such performance of the sweepers does not produce quality results. Consequently sweeping, as a general practice is placed on the sides of the streets and roads, in open heaps. The Brooms have handles of shorter length on account of which sweeping efficiency is reduced; and the sweepers are hardly provided with any replacements for the damaged tools and equipment.

The staff uses five (5) Wheel Borrows/Hand Carts which are of non ergonomic design and small volume capacity. The available hand carts are even not adequate for requirements of current served area. The carried waste gets tipped on the ground instead of a metallic container/trolley. The TMA is equipped with only one Tractor Trolley which has no sufficient capacity to collect entire quantity of waste generated in served areas. Due to difficult terrain certain localities of served area are inaccessible and are generally left uncovered and without waste collection. The vehicle collects waste on unplanned and unorganized route

due to scattered waste collection points. The vehicle is uncovered and causes littering while moving from-to the dumping site.

3.3 State of Service Delivery

The TMA is serving just the commercial area of town and that too is covered partially. Most of the municipal waste, whether being collected by the SWM Department, self disposed, or picked up by private waste workers, ends up filling old depressions, river banks, drainage channels, vacant lots or other such areas throughout the Chitral town urbanized area. Many of the dumping grounds utilized are not that noticeable to most people, due to their small size, hidden and dissipated locations. The damage that these waste heaps cause to the environment and to nearby communities however are serious. The risks are further multiplied by waste which has been set on fire, releasing harmful contaminants into the atmosphere. Almost all bridges, creeks and areas behind hotels and shops facing the river are filled with garbage.

Picture 3 TMA Installed Waste Bin

3.3.1 Service Delivery Coverage

Presently, TMA is serving only bazaar areas. With only 12 sanitary workers the solid waste of shops is being collected and transferred to the tractor-trolley and finally off loaded at the rented dumping site located at the Chitral River bank. Residential areas that compromise of almost 90 % of waste collection area are without any solid waste system. The HHs survey transpired that generally waste heaps are not collected and there are no such arrangements. The house holds on their own sometimes burn and bury waste heaps, but that is also not a prevailing practice. A

Figure 5 Service Delivery Coverage

large proportion of HHs (37.7%) during HHs survey has never witnessed any secondary collection arrangement for waste heaps collection. Moreover, waste bins and dumpers are all together absent from the residential areas. All of the waste bins in commercial area are arranged by TMA and are emptied on daily basis.

As shown in the map, most of the areas excluding central commercial areas are un-served. Part of the reason for this neglect is shortage of equipment and manpower. In addition peculiar location of Chitral is characterized by scarcity of leveled ground.

3.3.2 Communal Storage in Served Area

The communal storage in served area takes place in the form of small street side containers - heaps. The storage practice comes with a few shortcomings ranging from refuse scattering as a consequence of scavenging and wind, nurturing environments and breeding places for larvae and germs, obnoxious odors leading to air pollution. The waste in un-served areas comprises about 80% of total generated solid waste; is dumped, burned, or buried illicitly by individuals and haulers throughout the town. In almost all of the served and un-served area many shopkeepers and commercial entities throw garbage on the river bank. The garbage piles up in narrow places and is disposed off in the river.


Picture 6 Communal Storage (Waste Heaps)

There should be ban on plastic shopping bags, or otherwise it should be highly taxed in Chitral District through proper legislation.

A Local Informant

Picture 7 Waste Dumping in River

3.3.3 Situation of Hazardous Waste

3.3.3.1 SLAUGHTER HOUSE WASTE

The town slaughter house is managed by TMA. A visit to the slaughter house site located north of town at Chitral river bank revealed that it is contributing negatively to the environment by disposing-off solid waste of the slaughtered animals at the river bank (shown in the picture). Solid waste dumped along river bank results in leachate development that in turn pollutes soil and river. Sewage effluent after washing of butchered animals is also disposed off in the river directly through a pipe as shown in picture; thus further polluting the river water. As slaughter house is located upstream of Chitral town all environmental hazards due to its waste disposal practices affect the entire Chitral city.

Picture 8 Slaughter House Effluent Outlet

Picture 9 Slaughter House Waste Disposal

3.3.3.2 HOSPITAL WASTE

There is one DHQ[2] Hospital, three THQ Hospitals, 21 BHUs, 22 CDs and 3MCH, and 6 private clinics in Chitral district. Due to absence of safe treatment system the hospital waste is either burnt or disposed-off by TMA solid waste staff along with domestic solid waste. The TMA tractor visits DHQs hospital twice in a week and collects only 25% of total waste. As to hospital management's estimates the hospital's total waste constitute of 25% hazardous and 75% normal waste, where both types are treated in same manner. Visit at existing dumping site (which is extremely near river) showed a large

Picture 10 Hospital Waste Disposed-off Without Treatment

[2] The DHQ **Ho**spital has 216 staff members including 8 sweepers.

quantity of un-treated hospital waste (as shown in the picture).

The district health department and the DHQ Hospital management show concerns for the hospital waste treatment and have requested government and different NGOs for dumping site and incinerator[3] acquisition. The health department (EDO Health) also strongly demand requirements for incinerators but have not been successful in getting such budget allocations. The DHQ Hospital management is of the view that acquisition of an incinerator is not the main issue; operational maintenance, cost recovery, and recurring costs are the main concerns.

Local community is also concerned about hospital waste disposal practices. Discussions with Zargarandeh village inhabitants showed they were concerned about burning of hospital waste near their village. Hospital waste is characterized as hazardous waste and causes severe environmental effect on citizens. Therefore, its proper and safe disposal is extremely important for the Chitral citizens.

DHQ Hospital is a 200 beds hospital with an annual average budget of PKR 30 Million with a Contingency head of PKR 100,000. The daily OPD influx is 500 individuals where water borne disease account for 60% of the treatments. The hospital is run by a staff of 216 members including 8 sweepers. The hospital management has provided 34 residential quarters & bungalows for staff and doctors. All toilet waste from hospital premises and residential quarters end up flowing in the river.

We have no system for hospital waste; have no incinerator, and no dumping point. We have placed yellow and red colored waste bins in hospital wards for segregation of normal and hazardous waste. But there are no such arrangements outside hospital premises , TMA itself dispose-off all waste in river; which is highly environmental unfriendly.

Nazeer Ahmad MS/ DHQ Hospital Chitral

3.4 State of Recycling Practices

A visit to the main re-cycler of town was made to analyze existing re-cycling and scavenging practices of the town. The site had typical collected/sorted materials such as iron scrap, plastic pieces, large paper cartons, and discarded machinery parts etc. The waste dealer didn't have materials such as plastic or glass bottles etc which are found in other such sites in Pakistan. Discussions held with the owner revealed

[3] The DHQ Hospital already prepared a PC-I for incinerator where financial request is under process.

that the staff only purchases items which could be transport to potential market of scrap. The nearest market for Chitral's waste dealer is Swat with respect to cost recovery. The scrap dealer's list of items does not include Plastic bottles, which are generally found scattered in the valley.

Scavenging is not organized in Chitral and it happens in haphazard manner, where scavengers do collect items that are worth selling to the main facility by roaming in the communities around the town, and exchanging local made Candies to kids to get the worthwhile stuff. Discussions with local inhabitants transpire that the local life style and family structures do not have any potential for increasing scavenging or waste picking. The informal sector currently lacks human resources to take up this economic activity.

Generally HHs refuse bones, plastic and glass, whereas, metals are sold off to middle men serving for scavengers.

Visits to communities around Chitral, existing dumpsites, places under bridges, in creeks and behind main bazaars/commercial entities and other various locations in town also showed meager interest of informal sector in picking plastic /glass bottles and other materials that are usually sought after by scavengers in most places in Pakistan.

Although many components of Chitral town's waste stream are potentially recyclable, there are very few recycling practices in the city. Public awareness of environmental issues is relatively low, especially relating to recycling and waste management issues. Encouragingly the citizens show lot of interest in gaining knowledge and use of recycling methods. Currently, the primary (household) segregation of recyclable components is very low. Downstream markets for recycled fractions are not yet developed in Chitral town. Recycling of specific components can only flourish when there are viable and sustainable markets for such material.

3.5 State of Disposal Mechanism

The town has no sustainable and environmental friendly final disposal system. The TMA does not own a single piece of land which can be used as a disposal site. There is an illegal dumping site in Danin but no complaints had been lodged for corrective measures from citizens and civil society members. The TMA of Chitral Town have rented a 2 Kanal Land on the Chitral River bank, 21 Km North of TMA office. The waste from served areas including hospital waste is dumped on this site for last two years.

TMA owned tractor trolley daily makes 2-3 trips to the dumping site, carrying solid waste from the served area i.e. commercial areas of town. The Sanitary workers collect waste from commercial areas (shops and offices), and make heaps at various locations. Same sanitary workers also clean the drains in the same area by taking out garbage blocking drains, and dispose-off this garbage to the solid waste heaps. These heaps are then transferred to the tractor trolley and disposed off at the disposal site.

The disposal site while visited physically revealed that, the site lies precariously close to the river and is even submerged when river flows in high volumes. Waste samples at the disposal site showed that, it mostly includes rags, plastic bags, organic materials, glass, plastics etc. The waste sample from dumping site also contains significant amount of hazardous hospital waste including syringes, medicine bottles, and injections.

Picture 11 Disposal Site Situation

Figure 12 MAP Showing Served Area and Existing Dumping Site

4.0 Municipal Waste Assessment

4.1 Chitral Town Population

The Chitral town has population growth rate of 2.52% as per 1998 Population Census, which is quite similar to the national average. The population of Chitral was 30,622 individuals in 1998, and is currently estimated at 30,622 individuals. Given the population growth rate and using 1998 as the base year for arithmetic growth method estimation, the population of Chitral is likely to increase to 70,712 individuals in 25 years from now (year 2031). Since Chitral is a tourist attraction, the demographic and socio-economic setup is likely to be changed in unpredictable manners. Given the changing dynamics of population and prevailing waste management practices it is far more important to not only assess waste composition but also the future volume and density of Chitral Town's municipal. Recent history has shown that lifestyle is changing at a brisk pace in Chitral. Due to changing lifestyles and consumption habits, SWM has been increasingly recognized as one of the major environmental issue in Chitral.

Table 2 Chitral Town's Population Projection

YEAR	1998	2011	2016	2021	2026	2031
POPULATION	30,622	42,568	48,327	54,864	62,286	70,712

4.2 Quantum of Municipal Waste

Given current estimated population parameters and national per capita solid waste standards, Chitral town currently generates about 13 tons of municipal solid waste daily, and is estimated to have a yearly volume of 5,000 tons. In absence of a proper solid waste management system and data non availability, such estimates and calculations are based upon current population X 0.3 kg/capita/day solid waste produced.

Due to its population growth and increase in its economic activity, Chitral town's daily generation is destined to accelerate to about 6,600 tons per year by

Current **Per capita waste generation** is 0.3 kg per capital, which is likely to increase by 1.5% every year. The future estimations and projections are based on a compound method.

2021 using 0.325 kg/capita/day, and then to about 9,000 tons per year by 2031 using 3.5 kg/capita/day as shown in graph[4]. This is a massive amount of municipal waste for a remote valley such as Chitral. The local informants are of the view that main bazaar and commercial entities, as well as the DHQ hospital are the biggest contributors to the solid waste. In future this may prove catastrophic, until a plan is devised and implemented at the earliest to cater for this waste.

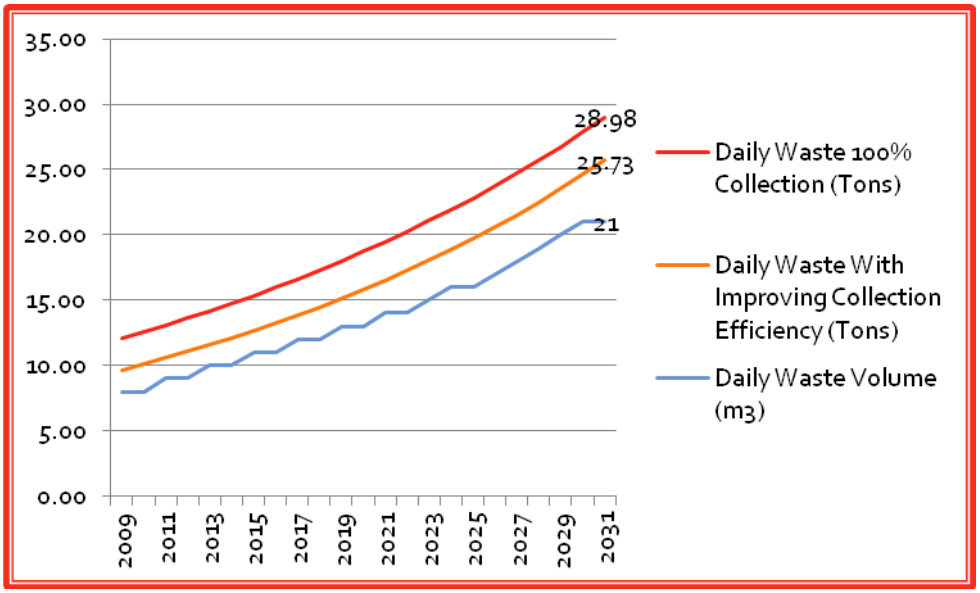


Figure 13 Daily Waste Generation Estimates (Weight)

According to international standards and the density of solid waste generally varies at storage, collection and disposal stages. The values obtained in other cities of Pakistan at the various stages are shown in Table below. There is strong need to design equipment for storage, collection, transportation and disposal of the solid waste of the adopted densities. It is expected that 7,827 m3 of solid waste will be generated in Chitral by 2031 (See Figure Yearly Waste Volume Estimates).

[4] See Exhibit 3

Table 3 Density of Waste at Different Stages

SWM Stage	Density (Kg/m^3)	
	Range	Adopted Value
WHEEL BARROWS/HAND CARTS/TRICYCLE	150 – 300	250
CNG LOADER RICKSHAW	300-350	300
5 M^3 CONTAINERS	400 – 600	400
ARM ROLL TRUCKS	400 – 600	400
TRACTOR-TROLLEYS	400 – 600	400
DISPOSAL	1000 – 1300	1200

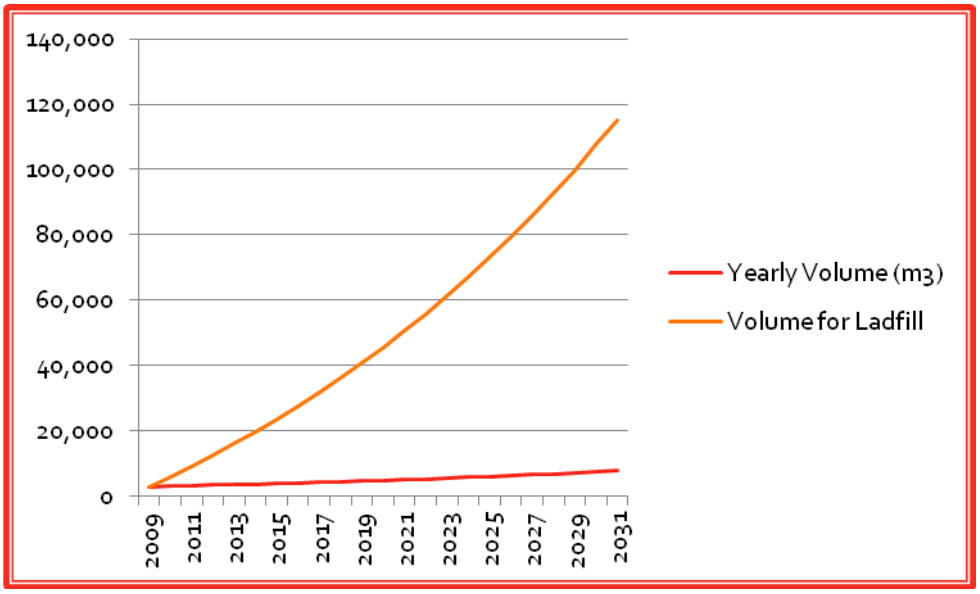


Figure 14 Yearly Waste Volume Estimates

4.3 Physical Composition of Municipal Waste

The HHs survey reveals that the bones and glass are thrown away by more than 90% HHs. The other waste generally thrown by the HHs is hair, kitchen waste (vegetables etc), plastic bags and plastic materials, iron, brass, and animal waste.

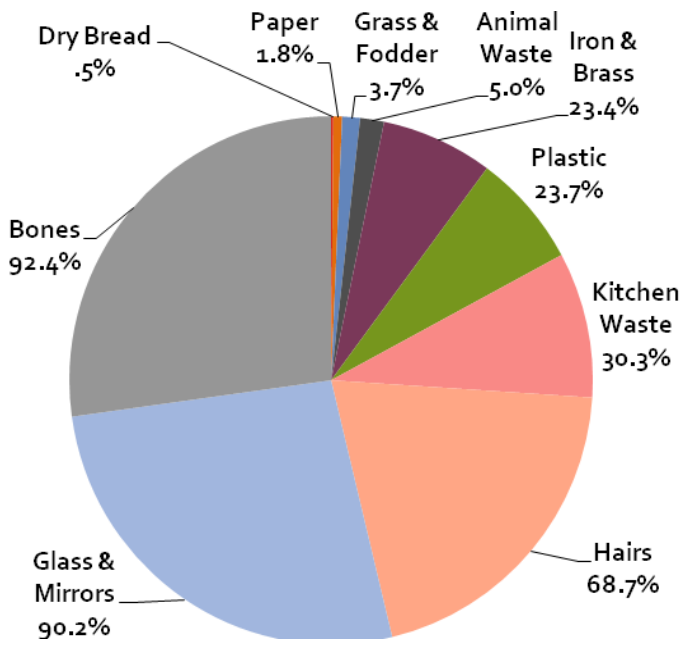
A small sample study of HHs reveal that almost 36.84% of HHs generated waste is composed of vegetables and organic waste followed by 33.89% leaves and wood. The ash content is also high and almost 16.08% of waste is composed of ash. Paper (4.69%) and Plastic materials (3.22%) also have significant contribution to the HHs solid waste.

Table 4 Physical Composition of Municipal Waste

Waste Type	Daily Average Weight					Average	%
	1	2	3	4	5		
VEGETABLE/ PUTRESCIBILE MATTER	150.00	2000.00	33.33	75.00	33.33	458.333	36.84
PAPER	75.00	0.00	33.33	150.00	33.33	58.333	4.69
FABRICS	12.50	0.00	0.00	0.00	0.00	2.500	0.20
PLASTICS	125.00	0.00	0.00	75.00	0.00	40.000	3.22
LEAVES/WOOD	0.00	200.00	866.67	175.00	866.67	421.667	33.89
ASH	0.00	0.00	500.00	0.00	500.00	200.000	16.08
LEATHER/RUBBER	0.00	0.00	0.00	0.00	0.00	0.000	0.00
METALS	25.00	0.00	33.33	0.00	33.33	18.333	1.47
GLASS/CERAMIC	0.00	0.00	0.00	25.00	0.00	5.000	0.40
MISCELLANEOUS	0.00	0.00	0.00	200.00	0.00	40.000	3.22
TOTAL	387.50	2200.00	1466.67	700.00	1466.67	1244.17	100.00

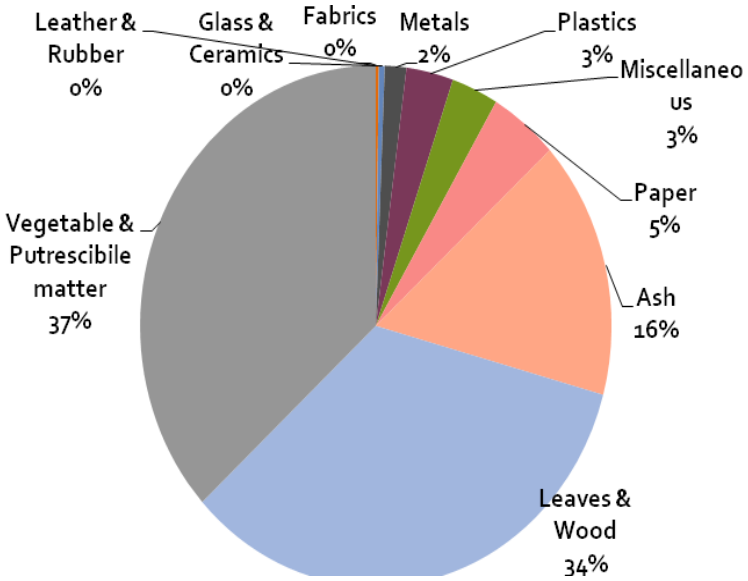
Notes: All Weights in Grams

Data Source: Total 15 HHs and one local hotel data for 5 days collected by AHKRC field team



Bones, Glass & Mirrors, Hairs, and Kitchen Waste constitute the biggest proportions of HHs refuse; followed by plastic and metallic components.

Figure 15 Percentage HHs Refusing Different Wastes



Irrespective of primary segregation; municipal waste is composed largely of kitchen waste, green waste, ash content, and paper respectively.

Figure 16 Physical Composition of Waste

5.0 Conclusion & Recommendations

5.1 Conclusions

The situation assessment unfolds many reasons behind improper solid waste management. These range from rudimentary practices at primary collection, secondary collection, recycling, and at the stage of final disposal. Elder community members of Chitral, are of the view that the situation has worsen over last ten years, primarily due to changing life style and inter-country migrations to-from Chitral. The general communities are socially mobilized and show interest for possible solutions. Despite general interest for better solid waste management practices; there is less awareness about environment friendly disposal methods, recycling, and potential hazards of system insufficiency. Moreover, a great deal of effort is also required in mobilizing and organizing communities for a paid primary collection service.

The local scrap dealer does not have a market for plastic bottles and re-cyclable glass, and thus does not deal in such waste material. There is strong need to link the waste dealers' with such markets which have potential for plastic and glass. Once the dealers are ready to pick such waste from local settlements, the house holds will be automatically derived to increase primary waste segregation efforts. Absence of informal waste workers (waste pickers, scavengers, private cleaners etc) is also aggravating to poor community involvement in environmental upkeep. Local residents are potentially unlikely to participate in this informal economic activity; specific efforts will have to be made to sensitize potential community segments for taking up these roles.

On part of primary and secondary collection services, all residential settlements are uncovered by the TMA and the waste ends in heaps or is burnt by the HHs. The waste disposal in streets and residential localities has considerably increased the risks of populations to parasitic diseases (diarrhea, malaria, allergies etc). The households who live near water/river are frequently attacked by water borne diseases. Approximately 60% individuals seeking medical advice from DHQs Hospital are diagnosed with water borne diseases. There is strong need to extend service to un-served areas.

The TMAs unplanned service delivery is limited to the commercial areas. Even in the served areas the service is sub-standard and ends up in scattered communal storage and filth. The TMA staff is also not environmentally sensitized and treats normal and hazardous waste in similar manner. All type of waste is untreated and ends up in a rented dumping site peculiarly near the river. The hospital waste is also largely untreated due to missing incineration facilities. Within hospital

premises the hazardous waste is segregated from normal waste, but as soon as it leaves hospital premises everything ends up in the dumping site or is partially burnt near residential areas. The hospital budgets have limited contingency allocations and it will be unmanageable to acquire and maintain full fledge incineration facilities. Specific efforts are required to building capacities of TMA staff in environmental friendly services, maintenance and up keep of service tools and facilities, and upkeep of final disposal site. The existing final disposal site is highly sub-standard due to improper location and hazardous effects on local populations, water, and general environment. Moreover the dumping site bears recurring costs in terms of monthly rent and offers a non sustainable and un-viable solution. Acquisition of a landfill site and need based incineration facilities for hospital waste is indispensable.

The assessment transpires that the TMA lacks resources and technical capacities in catering for this important municipal service. The town needs specialized skills for devising and formulating solid waste management strategy and an action-plan for Chitral city. The district government and TMA is also a victim of missing institutional linkages with environmental protection authorities, the capacity building measures in town planning, and meager budget allocations from provincial ADP. It will be highly unmanageable for the TMA to take-up responsibility of all stages of solid waste management. A compound approach can be appropriately applied to Chitral solid waste management system; where primary collection is largely organized by the communities and TMA caters for secondary collection and final disposal. Given the likely impact of solid waste on social, economic, and environmental conditions of Chitral; an immediate action plan for an integrated solid waste management is needed.

Table 5 Chitral Town Solid Waste Management-Key Issues

IMPLEMENTING INSTITUTIONS	- The TMA's SWM Department is poorly resourced and unable to meet its responsibilities. - It is significantly understaffed in the management and skilled labour categories. - Its budget allocation is only sufficient to cover salaries and basic equipment operations for an estimated 25 percent of municipal waste demand.
WASTE COLLECTION	- TMA only collects an estimated 25 percent of the municipal waste. - The balance is being burned, dumped or buried by private individuals and collectors. - Waste generation is increasing; communities will endure increasing waste volumes.
WASTE DUMPING	- All municipal waste is dumped on vacant lots, flood plains, drainage channels,river banks and other open areas throughout the city. - These practices consume, degrade and devalue vast areas of land within the urbanized area, cause significant environmental damage and threaten the health and safety of nearby communities.
COMMERCIAL WASTE MANAGEMENT	- Partial collection in commercial areas - In some places waste is dumped in creeks or directly in river
MEDICAL WASTE MANAGEMENT	- Medical Hazardous waste is either burnt or disposed untreated - There is a strong possibility that hazardous medical waste is being comingled and dumped in the same manner as municipal waste.
RE-CYCLING	- The primary segregation of recycled materials in Chitral town is largely undeveloped - Added to problem is plastic and glass material no one want to pick and sell as there is no market of these wastes
PUBLIC AWARENESS	- Public awareness of environmental and solid waste management issues is low.
FINANCIAL ASPECT	- TMA has no resources to maintain present rudimentary SWM set-up

5.2 Recommendations

The HHs in Chitral offer a mix of suggestions which demand improvements at various levels; ranging from enhanced role of government for catering the SWM, specific disposal points selection, government installed waste bins or containers in every street, systems and committees formation, community trainings, and municipal vehicles for waste collection. Following overall recommendations are being made considering Chitral city's socio-economic and geographic situation as well as existing solid waste management situation:

1) A study should be undertaken to understand waste water disposal system of residential and commercial areas and slaughter house and its impact on clean drinking water, and identification of remedial measures.
2) A consultative process should be specifically initiated to design, devise, and implement and viable solid waste management strategy and plan; capable of an integrated solid waste collection, transportation, and disposal. The plan should be tested through a pilot project designed for a period of one year in selected areas of Chitral. A basic solid waste collection and transportation system is proposed as a starting point which largely relies on the suggestion that various waste collection points will be identified and maintained.
3) The hospital's hazardous waste should be treated before disposal and it is indispensable to allocate resources for incinration facilities. Alternate local made incineration facilities are also viable given the quantum of hospital waste. Once the incineration facilities become available, all health facilities should be directed to route the waste to incneration facilities for treatment. The private clinics should also be included for use of facilities. Given the general awareness of safe methods, outsourcing of

For Chitral Town **Compound Sharing** is indispensable. The Primary Collection should be taken up by the communities whereas Secondary Collection and Disposal should be handled by the TMA.

The principles of 3R (Reduce, Recycle, and Reuse) should be highly encouraged; the CSOs should be partnered for such practices promotion.

DG and informal sector role can be enhanced. The DG can impose a ban on plastic/polythene bags, consult local glass makers for buying waste glass and remolding into new products, linkages can be developed with buyers of waste plastic for re-fabrication in to carpet fiber or cloth.

The TMA can outsource slaughter house waste for local made fertilizers and composting or can use animal waste for producing bio-gas. The use of Fertilizers and pesticides has greater impact on environment, and needs detailed assessment.

Hospital waste is not at all a viable option.

4) Sustainable and viable solid waste managemet system is highly dependant on environmentally safe final disposal mechanism. The TMA/DG should immediately allocate resources for landfill site acquisition. As land is a rare and expensive commodity in Chitral, its procurement should be initiated at the earliest by TMA.
5) Since the communities in chitral lack general awareness for solid waste management and environmentally safe practices; a community mobilization and awareness plan should be launched in partnership with local NGOs and CBOs. Moreover, children and women should be specifically included in the social mobilization component for long term ans sustainable community role plays.
6) Residents of Chitral City are generally of the view that the local solid waste management situation has worsended due to Afghan refugees influx, the irrigation channels are river is largely affected, detailed study and assessments are required for the damages caused by Afghan Refugees to Chitral's environment.
7) The DG and TMA officers and staff need orientation in environment safe solutions, technicalities of municipal services, and participative service delivery methodologies. Capacity building of local administration in Chitral city should be arranged as part of the new solid waste management plan.

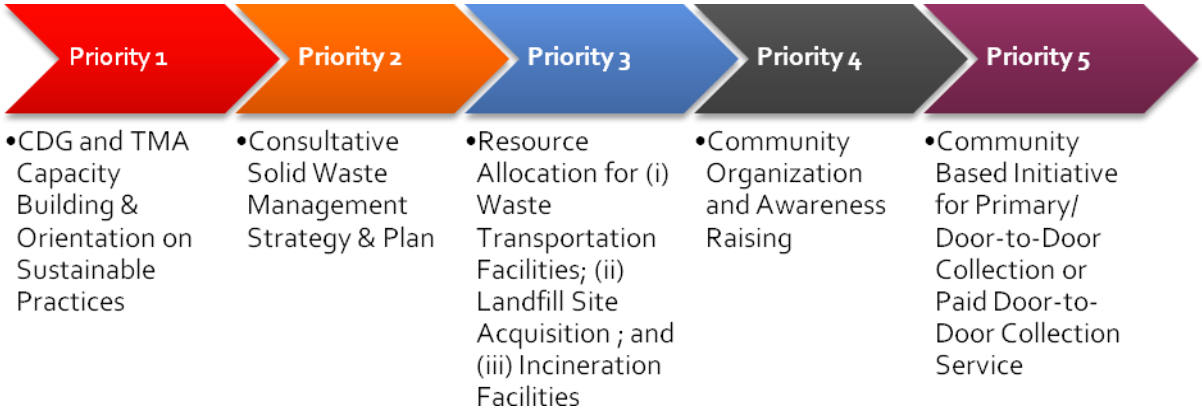


Figure 17 Prioritized and Urgent Needs

6.0 Way Forward - Proposed Action Plan

Keeping in view the key issue that emerged as a result of social and technical surveys an integrated SWM plan is proposed that will rapidly transform the SWM sector; its functions, operations, and implementing institutions. Under the plan, the SWM system will provide a reliable, sustainable community based municipal waste collection service to every waste generator in the city, achieve a recycling efficiency, ensure that all residual waste is transported and disposed-off in an environmentally safe and socially responsible manner, and in conjunction with other implementing stakeholders, make progress in initiating and improving the city's aesthetic and environment. The municipal SWM system will be managed and implemented by the Chitral town TMA.

6.1 Community Awareness/Mobilization Component

Data from HH survey and focus group discussions clearly showed a need for an immediate community awareness campaign to be lodged in Chitral. A large number of citizens are unaware of the drastic effects of throwing garbage into the river. Re-cycling and re-use of solid waste practices are at minimal. Components such as glass are either buried or thrown in regular waste. An alarming result of social survey was that people who are highly satisfied as well as un-satisfied with current SWM are in equal proportions. This clearly shows the need for community awareness.

Women are the main stakeholders in collection and disposal of waste from households. Experience of AHKRC in Chitral during social survey and focus group discussions indicated that Chitral women are keen to learn good solid waste management practices. They can significantly contribute to the improvement of current SWM practices in Chitral. In the forthcoming model of collection and transfer of waste in communities, community mobilization is an integral part for its success.

In addition, community based organizations should be trained in SWM practices. These organizations would; (i) provide periodic community awareness campaigns after the implementation of the SWM plan, raise awareness of environmental and SWM issues, (ii) provide public education and information campaigns on waste segregation and recycling, and (iii) solicit public support to eliminate the illicit dumping of wastes. Therefore, a well structured community awareness and mobilization would greatly impact the outcome of the integrated SWM plan for Chitral. Community mobilization plan may be based on following proposed models or a mix of both.

6.1.1 Model 1: Establishment and Functioning of Haryali Centers

SWM by Chitral's City District Government needs to be complemented by a community based primary collection, segregation, recycling, composting and disposal system. It calls for developing a viable household paid collection and neighborhood level sorting and recycling system that interfaces with Municipality's collection and disposal system. The primary collection managed and paid for by the community fits in well with the Municipality's solid waste collection. Under this arrangement a team of collectors supervised by resident committee would be paid Rs.25, 50, 100 per household and also makes an earning from recycling of inorganic wastes and composting of organic wastes. The operation would also pays for the rented premises. The Municipality tractor will finds it easy to collect from the Union Council level point. In the absence of an undeveloped market for compost, it may be used by households for kitchen gardening in the early stages. In the whole process methane emissions are reduced due to composting. The Union Council level sorting, recycling and composting center would be named Haryali center. Inorganic wastes, including plastics and metals, would be sorted, cleaned, compacted and stored before the sale to the scrap dealer. 3 Haryali center with 10 waste collectors in each Union Council and a core mobilization team for community (04-05 persons) will be needed for the entire area. Sustainability of Haryali center will depend on 2 factors; availability of scrap dealer on the spot to buy the recycling material from collectors, and market for compost. In a snap shot the proposed community mobilization will have following activities and steps:

- **Haryali Centers Establishment:** A "Haryali" unit can be established where the collected solid waste is dumped, segregated and made ready for composting process.1 Kanal land is enough for the process of 2000 households waste. Through the simple, non-mechanical technology, Haryali center can be built and operated at low costs.
- **Local Forums:** Forums on city level will be organized. In these Forums all the government institutions, NGOs, CBOs, politicians, activists, teachers, students and people from all walks of life will participate. Participants will share and highlight their solid waste management problems with a focus on Primary collection and will devise solutions.
- **Local Activists:** In the Forums local activist will be identified to introduce the model in different areas and Mohallas.
- **Trainings:** Selected activists will be sent to visit AHKMT's successful model in Rawalpindi. These activists will be trained on Solid waste management. AHKMT will enhance the capacity of the activists and train them on different aspects of SWM.

- **Lane Meetings:** Lane Meetings with the households of the targeted area (Street level) will be organized to motivate and train the community about solid waste disposal system and sensitize them about harmful effects caused by mishandling of the waste.
- **Service:** Collection of solid waste from door to door will start after the lane meetings
- **Segregation:** Segregation of organic and non-organic materials will take place in the process of compost making at the Haryali Center. Collectors will segregate the entire waste and separates the recycling material for sale, and green waste separation for making of Compost.
- **Composting:** Segregated green waste in a particular quantity will be treated in the specific sheds after the process of green matter segregation. Compost making process will take time of 08 weeks by natural process and can take 15 days time in case of using EM Technology.

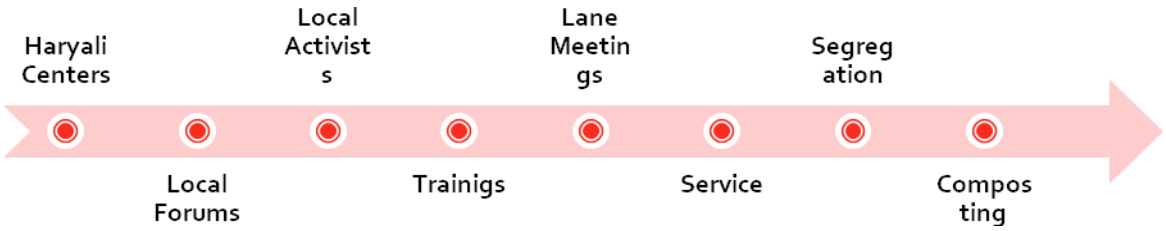


Figure 18 Basic Time Line for Community Mobilization Model 1

6.1.2 Model 2: Low Cost Community Based Solid Waste Management

Initial assessments of the situation transpire poor planning of local administration, lack of public infrastructure to manage such waste and absence of appropriate resources. Moreover there is less importance given by the TMA and CSOs, both having their own reasons. The socio-demographic profile of local communities is also playing a major role; where a large proportion of community is less educated originally belonging to rural areas and unaware of tools and techniques and benefits for managing their own environments. Generally people want a cleaner environment but don't have such a local arrangement which is within their affordability.

Given the local resources and socio-cultural as well as socio-economic profiles, a combination of community mobilization, public service delivery mechanisms, and partnership with private services can also be adopted. The model proposes a logical and well synergized concept to be developed from the core principles of sustainable community development i.e a low cost domestic solid waste management program; which can be conceived as following interventions in same order:

- **A community learning and education component** on Domestic Solid Waste Management i.e Train the Community Teachers, Who conduct sessions with their school Children once a week

throughout year, and Conduct 2 Orientation sessions with target community women (in each union council) and Conduct 1 Orientation session with targeted community men (in each UC). The learning program will aim at imparting learning on Domestic Waste Management, fate of Solid Waste, key environmental and health issues, need for solid waste management, and proper actions to be taken. Training will focus on selected teachers, who can train coworkers, all trained teachers then can train children, and all trained individuals orient general community. The children will practice safe environmental practices in schools and homes whereas the Teachers will act as local leaders and will participate in formation of community management committees, organize cleanliness days etc.

- **A Sweepers and Garbage Pickers orientation and training component** through local volunteers and key individuals. Aimed at training on grading and separation of domestic waste, economic benefits for them, social benefits, health hazards mitigation etc.
- **A Domestic Waste Collection Micro-financing component** (loan product-100 loans at least) on a customized social product i.e. Waste Picking Auto Rikshaw for individuals, onward individual assignment to localities/zones (10 Sweepers/UC & 250HHs/Sweeper) , household networking to these service providers, provision of service to households on a monthly fee basis, and waste disposal on TMA managed sites. One year monitoring through organizational volunteers, staff, and community management committees.
- **Creation of a locally managed endowment fund** from Sale of Waste and mico-loan repayments. Fund to be utilized on sweeping teams' welfare and health and onward financing for model expansion to more locations and sustainability in current targeted areas.

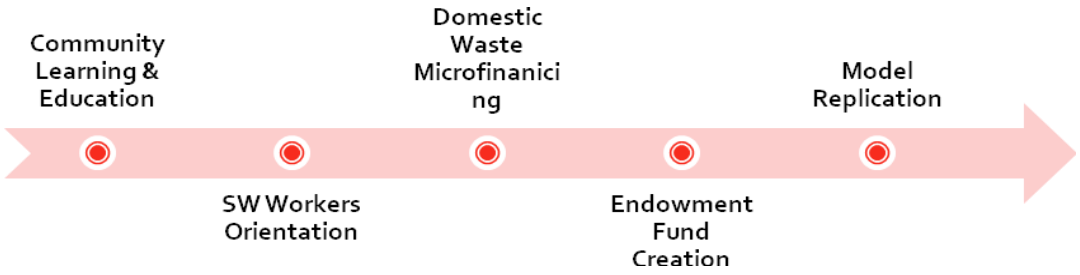


Figure 19 Basic Timeline for Community Mobilization Model 2

6.2 Improvement of Secondary Collection & Transportation

In the served areas i.e. bazaar and offices additional bins should be installed. It is proposed to procure 100 additional bins and install in consultation with Bazaar association and TMA. Existing tractor trolley with improved route analysis would be sufficient for bazaars and commercial areas. For the vast majority of un-served community areas a new model of collection and disposal is proposed. All 63 communities would be involved in collection and transportation of solid wastes.

Proposed collection and transportation model of communities is show in Figure 19. Waste bins would be placed at various locations after consultations with the community keeping in view their ease and social aspects. The bins would be emptied by community/paid employees and transferred to the transfer stations (basic transfer station with pre-fabricated top and built with local materials.) shown in the map. A single transfer station could serve 2-3 communities.

TMA staff would empty the transfer station bi-weekly or as per need by collection vehicles. For Chitral small auto-rickshaws with 400 kg capacity would be ideal considering its terrain and street pattern. These small vehicles would be cost-effective. Thick red dotted line in map shows secondary solid waste collection vehicles. Five such auto rickshaws would be needed for Chitral. In addition, two (2) small Holland tractors would also be needed to cater for hard to reach terrain.

DESIGN LIFE OF POPOSED COMPONENTS

Following design periods of different components of SWMS should be adopted :

SWM Machinery	10 years
Tractors/Trolleys	10 years
Wheel Barrows/Hand Cart	3 years
Civil works	25 years

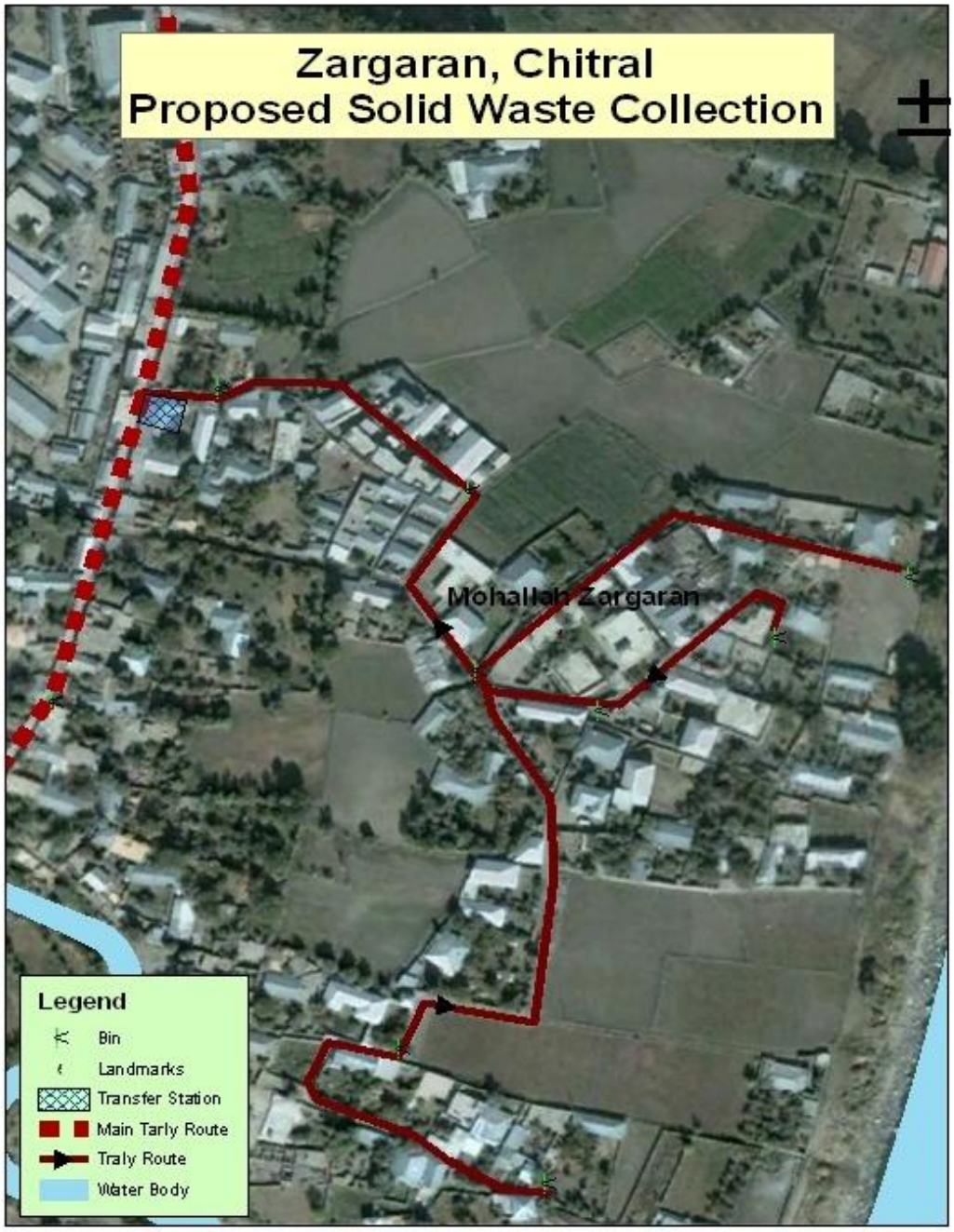


Figure 20 Proposed Solid Waste Collections (Zargarandeh)

6.3 Development of Final Disposal Component

Analysis and evaluation of alternative proposals is necessary in order to arrive at the best possible solution for final disposal. Different alternative technologies/methods for ultimate disposal of solid waste were considered. Besides, number of alternative sites have also been considered and evaluated for the proposed solid waste management system at Chitral City. Different alternative technologies and methods were studied for the ultimate disposal of solid waste generated from the Chitral including the "No Project" alternative. An analysis of these alternatives is presented in the following sub-sections:

- **No Project Option:** At present about 13 Tons/day of solid waste is generated from the City, out of which only 15-20% is being collected by TMA. This solid waste is expected to increase to 17.5 tons/day & 25 ton/day by the year 2021 & 2031 respectively. If the present solid waste collection and disposal system is not improved, the environmental and health situation in the city will be further degraded, worsening not only the aesthetic value of the city but also causing spread of diseases among the residents. Therefore the "No Project" conditions will result in further worsening of the present environmental conditions and increase health risks to residents of the city. From economic point of view, since the residents of the city will be more vulnerable to diseases, so they will have to spend a major portion of their earnings on getting medical treatment. Their earning will also be reduced due to loss of working hours because of frequent illnesses. The value of property will also decrease in the city due to poor aesthetic conditions as a result of haphazard open dumping of solid waste everywhere.
- **Incineration:** Incineration is the controlled burning process which provides heat and reduces the waste to minimum possible volume. Municipal refuse incinerator is used to reduce the huge quantities of waste to minimum possible (5-15%) along with utilizing their heat energy directly in central heating systems for producing electricity in Europe, America and Japan. Installation of incinerators is not recommended because of a few disadvantages (a) Very high capital, operation and maintenance cost, (b) Difficult to operate due to lack of skilled manpower, and (c) Risk of severe air pollution problem resulting from burning.
- **Composting:** Composting is a biological process for degradation of organic matter; into a sanitary, nuisance free and humus-like material. The compost can be used as a land conditioner, as a fuel or base material for more refined products such as fertilizer, wall board or building blocks. But the organic content of solid waste in Pakistan is on an average about 35% of which a maximum of 75% is compostable. That is why, while there are many small-scale pilot initiatives, there are no local examples of town-wide projects in composting. In-vessel composting for kitchen / catering derived organic wastes is the only possibility for Chitral solid waste management. However, there are several barriers at this time for composting, these include, (a) no market for compost in Chitral, (b) lack of

composting expertise, (c) low scale of operations, (d) cross contamination by glass and plastics and animal by-products, and (e) Bad odor and aesthetic problems.

- **Hospital Waste Disposal:** As discussed earlier in the report hospital waste is either burnt or disposed off in municipal waste, creating environmental hazards. High temperature incinerator is needed for the town to reduce hazardous effects of hospital waste. As hospital waste is not in volumes and quantity, a simple incinerator would be sufficient. Other feasible option for hospital waste disposal is self-clearing method; where hospital waste is treated to high temperature steam and then disposed off to regular landfill and buried.
- **Sanitary Land filling:** Sanitary land filling or the controlled tipping involves the disposal of the waste in the prepared trenches or the cells. The waste is daily compacted and then covered with soil. Final soil cover is then provided after it attains complete thickness. It is a biological process in which a number of micro-organisms generate different products. Vents are kept for the escape of gases. Methane and Carbon Dioxide are the major gases produced whereas Ammonia and Hydrogen Sulphide are emitted in small quantities. Major Reasons in favor of Sanitary Land filling are, (a) this is cost effective than incineration or composting if the land is available at economical haul distance and low rates, (b) highly skilled O&M staff is not required, (c) there is no significant impact on the health of adjoining population, (d) no environmental damage is generally caused, (e) fire hazard is reduced; and (f) reclamation of land is achieved.

Land is a scarce commodity in Chitral valley. There are few patches available that can be used as a landfill site. Discussions with stakeholders led to assessment of a couple of prospective sites. Following two candidate sites were visited during technical visit to Chitral. Both sites are feasible and have advantages and disadvantages.

6.3.1 Estimation of Final Disposal Component

As per District Census Report of year 1998, population growth rate of the Chitral Town during the period from 1981-1998 was 2.52% which is quiet similar to the national average. Population of Chitral Town for the year 1998 was 30,622 individuals whereas, present population is estimated as 42,568 individuals using growth rate of 2.52%. The population is projected to increase up to 70,712 individuals by year 2031. Per capita waste generation rate of 0.3 kg per capita per day is used for the design of the solid waste management system. This generation rate has been adopted by considering the present solid waste generation rate of the Town. It is estimated that the Per capita waste generation will increase by 1.5% every year, where and compound method can be used for future waste generation projections. The

waste generation increase has been proposed in accordance with city's population growth besides its social and economic development.

The densities of solid waste vary at different stages of solid waste management cycle. As presented in Chapter on Chitral's Solid Waste Analysis; the density of solid waste at final disposal site increases to 1200Kg/m^3 in Pakistan. The same densities are applied to waste generation compounding formula, which turns a minimum of 6.27 Acre of Land for required for Landfill site (See Exhibit 2).

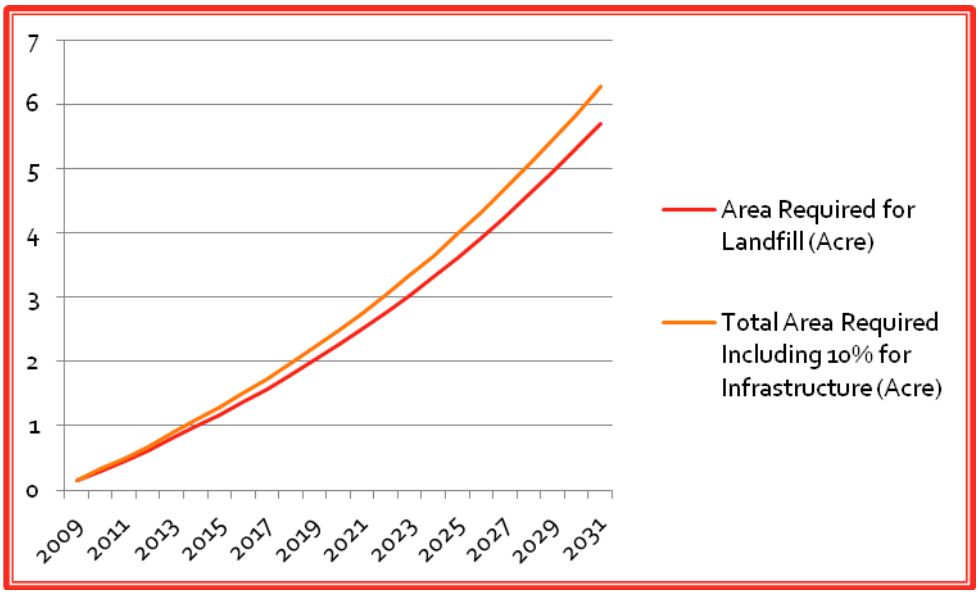


Figure 21 Yearly Comparison of Area Required for Landfill Site

6.3.2 Landfill Site Option 1

This prospective site lies north of Chitral town at a distance of 4 km from Chowi Bridge and lies in the Danin area. It has about **Eight Chukorum** area. Cost/market rate of land in this area is about Rs 2.0 million per **Chukorum**. A layout of the site is shown in the picture below (Figure 23 Proposed Landfill Site 1). The site has quiet many advantages and is generally meeting international selection standards::

- The site lies on the main road, therefore, there is no need to construct an access road;
- The Main road is also in excellent condition and is running condition all around area;
- There are no residential establishments or structures located on or near the site;
- The site does not affect any natural habitat or any historical, cultural/archeological site of Chitral;
- The site is situated away from any residential area and does not cause any adverse impact such as smell, dust or noise for local communities;
- The groundwater is not used by any adjacent population;
- The area of Land available is sufficient for 15-20 years needs.

The site has two major disadvantages:

- The site level is not high as compared to river bed;
- The soil of this land is sandy with lots of stones and would be difficult to excavate for site building.

Figure 22 Technical Team Visit for Landfill Site-1 with TMA Staff

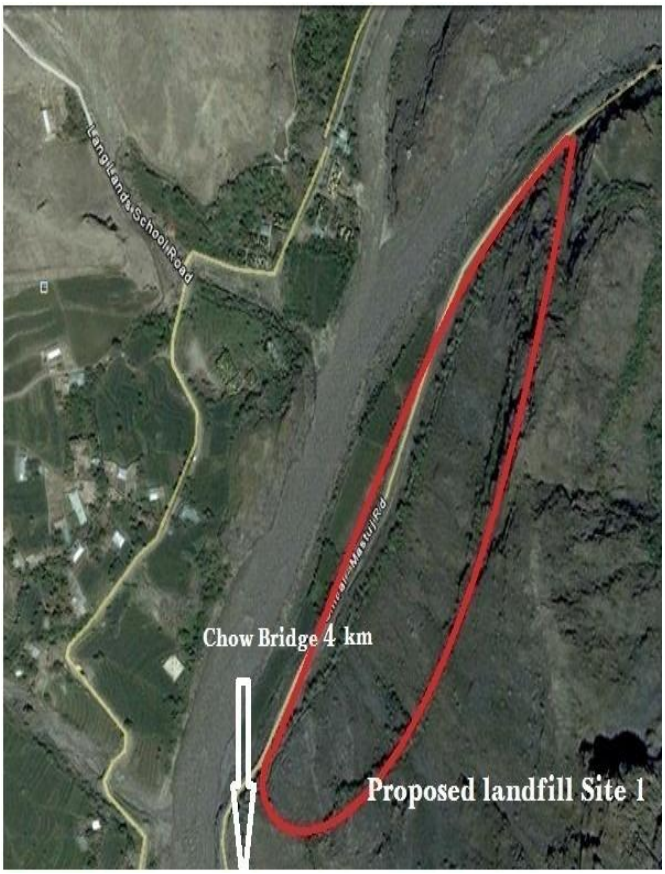


Figure 23 Proposed Landfill Site 1

6.3.3 Landfill Site Option 2

This prospective site lies south of Chitral town at a distance of 4 km from TMA office in Orghuchlasht area. A layout of the site is shown in the pictures below and in Figure 25 Proposed Landfill Site 2. Cost of land per **Chukorum** is around 1.5 million in this locality. Following are advantages of procuring this site:

- Electricity is available;
- There are no houses or any structures located on the or near site;
- It does not affect any natural habitat or any historical, cultural/archeological site in the area;
- It lies on flat and barren land;
- It is situated away from any residential area and does not create any adverse impacts such as smell, dust or noise for residents of the town;
- Groundwater is not used by any adjacent population;
- Land available is sufficient for 15-20 years needs.

Few disadvantages are as follows:

- Last 2km stretch of road is not paved, therefore it may be inaccessible during severe climate conditions;
- Its level is not high as compared to river bed;
- Soil is sandy with lots of stones and would be difficult to excavate.

Figure 24 Technical Team Visit for Landfill Site 2 with TMA Staff

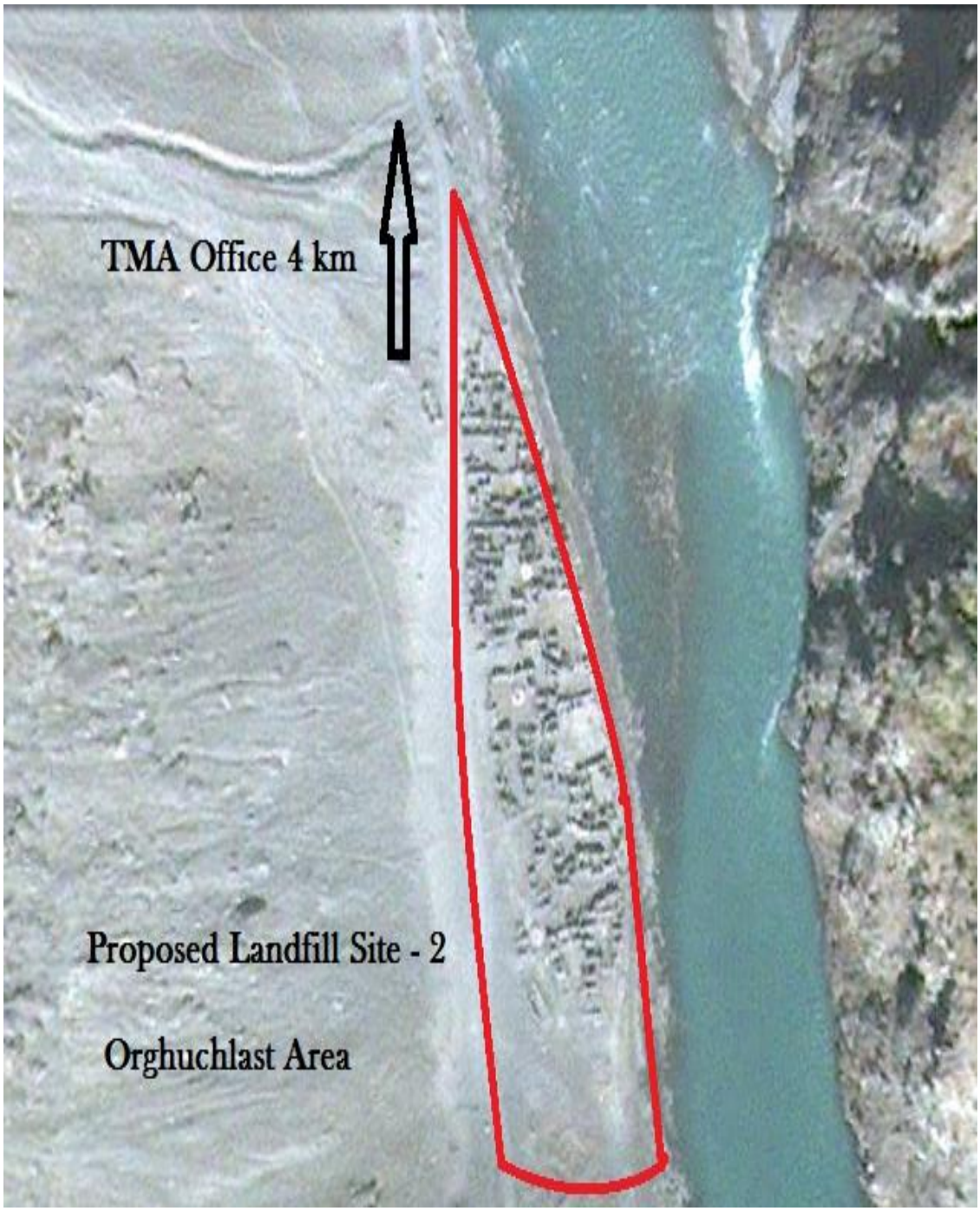


Figure 25 Proposed Landfill Site 2

6.4 Indicative Costs & Scheduling

Preliminary cost estimate of various solid waste management plans are given below. These preliminary costs are only indicative and more detailed feasibility would determine actual costs.

6.4.1 Indicative Costs of Proposed Solutions

Component	Description	Net Cost (Million Rs)	Total / Maximum Amount (Million Pak Rupees)	Appropriate Implementing Agency	Possible Financing Sources
Primary Collection: Community Awareness/ Mobilization	Model 1: Establishment & Functioning of Haryali Centers	2.0	2.3	NGO	Donors
	Model 2: Community Based Domestic Waste Management	2.3		NGO	Donors
Secondary Collection: Improvement of Collection & Transportation	Holland Tractors – 2 No.	1.25	4.0	TMA	Govt ADP/ Donor
	Transfer Stations – 25 No.	1.5		TMA	Govt ADP/ Donor
	Auto-Rickshaws – 4 No.	0.75		TMA	Govt ADP/ Donor
	Bins – 400 No.	0.5		TMA	Govt ADP/Donors
Development of Final Disposal	Procurement of land Fill Site (10 Chukorum)	1.6 per Chukorum	16.0	TMA	Govt ADP
	Development of land Fill Site	4.0	4.0	TMA	Govt ADP
	Hospital Incinerator (10-30 kg/hr capacity) or Autoclave	2.0	2.0	DG/ EDO (Health)	Govt ADP/Donors
SWM Trainings	TMA Staff Other related officials	1.0	1.0	DG/EPA	EPA-Govt
Contingencies	Price escalation, lead for procurement, other changes in demand etc.	1.0	1.0		
Total Preliminary Cost Estimate[5]		**30.3 Million**			

[5] *Preliminary cost estimate does not include design and site supervistion cost of the project.*

6.4.2 Indicative Timeline of Proposed Solutions

Component	Description	Total / Maximum Amount (Million Pak Rupees)	Indicative Time lines and Budgets[6] (Year)			
			Y1	Y2	Y3	Y4
Primary Collection: Community Awareness/ Mobilization	Model 1: Establishment & Functioning of Haryali Centers	2.3	1.15	1.15		
	Model 2: Community Based Domestic Waste Management					
Secondary Collection: Improvement of Collection & Transportation	Holland Tractors – 2 No.	4.0	1.25			
	Transfer Stations – 25 No.		1.5			
	Auto-Rickshaws – 4 No.		0.75			
	Bins – 400 No.		0.25		0.25	
Development of Final Disposal	Procurement of land Fill Site (10 Chukorum)	16.0		8.0	8.0	
	Development of land Fill Site	4.0		2.0	2.0	
	Hospital Incinerator (10-30 kg/hr capacity) or Autoclave	2.0	2.0			
SWM Trainings	TMA Staff Other related officials	1.0	1.0			
Contingencies	Price escalation, lead for procurement, other changes in demand etc.	1.0				1.0
Total Preliminary Cost Estimate		30.3	7.9	11.15	10.25	1.0

[6] Blue cells indicate project completion year whereas pink cells indicate when project must be initiated.

6.4.3 Existing Financing Windows through Vertical Programs

There are a host of existing flexible financing windows offering quick financing facility for different components of the proposed action plan. In the donor segments USAID manages a Small Grants and Ambassador Fund specifically offering financing for environmental protection proposals. This financing window is open for proposals to civil society organizations however the government entities can also enquire about eligibility. USAID is also implementing a Municipal Services Project in partnership with government of Khyber Pakhtunkhwa. Efforts can be made for financial allocations for Chitral through a vertical program. The government of Khyber Pakhtunkhwa is also implementing a World Bank supported trust fund which has specific component for capacity building initiatives. The Chitral DG can partner with provincial EPA and can submit a proposal for financing of DG and TMA capacity building. Moreover the TMA and DG can request Provincial P&DD and the Provincial FD for financial support from various funds specially the Chief Minister's Special Fund and PFC Award allocation.

Exhibits

Exhibit 1: Legal & Institutional Framework for Solid Waste Management in Pakistan

The legal rules and institutional framework[7] dealing with solid waste management in the country include:

- Pakistan Environmental Protection Act (PEPA) 1997.
- Section 11 of the Pakistan Environmental Protection Act prohibits discharge of waste in an amount or concentration that violates the National Environmental Quality Standards (NEQS).
- Hazardous Substances Rules of 1999.
- Guidelines for Hospital Waste Management since 1998 prepared by the Environmental Health Unit of the Ministry of Health, Government of Pakistan.
- Hospital Waste Management Rules 2005.
- Hazardous Substances Rules 2003.
- National Environment Quality Standards Rules
- Islamabad Capital Territory Bye Laws, 1968 by Capital Development Authority Islamabad.
- Section 132 of the Cantonment Act 1924 deals with Deposits and disposal of rubbish etc.
- There is also Prime Minister's committee on Climate Change which was established to ensure that Pakistan fulfills requirements of Clean Development Mechanism (CDM) under the Kyoto Protocol. This committee has a sub-divisional level technical committee on Waste Management.
- In 1994 Pakistan joined Basel Convention on the Control of Trans-boundary Movements of Hazardous Waste and Their Disposal. The Convention aims at enabling the member countries to initiate "environmentally-sound management" (ESM), the purpose of which is to protect human health and the environment by minimizing hazardous waste production.

The Pakistan Environmental Protection Act 1997 Section 12 directs that an Initial Environmental Examination (IEE), and wherever the project is likely to cause an adverse environmental effect, an environmental impact assessment be filed with the Environmental Protection Agency (EPA) for review and approval before the initiation of construction at site.

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[7] *The State of Pakistan's Economy ,Third Quarterly Report for FY09, State Bank of Pakistan.*

Exhibit 2: Landfill Site Standards

Landfill Site Selection Criteria

- Approach of the collection vehicles to the sites must be clear;
- Distance of the sites should not be too far from the City to avoid extra vehicular costs;
- The lands must be purchased away from any archaeological or historical site;
- The sites should never be located in an area, which is susceptible to floods or where problem of water logging or salinity is prominent;
- Similarly, the areas having water table close to surface should also be avoided; and
- Efforts must be made to select one landfill site, if feasible, instead of more than one site for easy maintenance.

Standards for Landfill Site Construction

- **Landfill Cover:** It is normal practice to provide soil cover after filling the waste up to a depth of 3 meters. As the depth of the landfill is not expected to exceed that depth, only final cover will be provided. It will consist of two layers one of clay with a thickness of 30 cm and the other of soil, also 30 cm thick as shown above in the cross section. When provided with a mild slope of 2-3%, it will help to avoid seepage of any surface runoff into the landfill and will support vegetation.
- **Drainage:** Proper drainage will be provided of each strip/working face. A collection sump with the provision of portable pump will be provided to take care of the surface runoff during the rainy season. Collected water will be pumped to the adjacent unfilled area of the landfill.
- **Leachate Control / Groundwater Protection:** The depth of water table in the landfill site ranges between 10 - 12 m. Total depths of sanitary landfill is 3 meter only and chances of groundwater pollution are rather limited, however tangible result can only be attained by conducting detailed soil investigation. Dry weather conditions prevailing over most parts of the year and good arrangement for drainage of surface runoff will further ensure this aspect. In this case production of Leachate will be minimal.
- **Gas Management:** Production of biogas is also an outcome of biological decomposition of organic matter under anaerobic conditions prevailing in the sanitary landfills. But this also requires moisture content. Due to dry weather prevailing over most parts of the year, moisture content in the landfill will not be sufficient for production of gas.
- **Rainy Season Arrangements:** During the rains the collection vehicles cannot reach the normal landfill area. There needs to be allocated some area near the paved access road.

Facilities at the Landfill Site

- Landfill site shall be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.
- The landfill site shall be well protected to protect entry of unauthorised persons and stray animals.
- Approach and other internal roads for free movement of vehicles and other machinery shall exist at the landfill site.
- The landfill site should have wastes inspection facility to monitor waste brought in for landfill and office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipments.
- Utilities such as drinking water (preferably bathing facilities for workers) and proper lighting arrangements for easy landfill operations when carried out in night hours shall be provided.
- Safety provisions including periodic health inspections of workers at landfill site shall be made.

Guidelines for Landfill Site Maintenance

- Land area and volume to provide the landfill capacity should be adequate to meet projected needs for at least twenty years, so that costly investments in access roads, drainage, fencing and weighing stations are justified.
- The land area should not be at locations where adequate buffer zones are not possible or in areas immediately

upwind of a residential area in the prevailing wind direction(s).
- Area characterized by steep gradients, where stability of slopes could be/are problematic.
- The seasonally high table level (i.e. 10 years high) of the ground water should be below the proposed base of any excavation or site preparation to enable landfill development. Soils above the groundwater's seasonable high table level are relatively impermeable (less than 10-6 cm/s permeability when undisturbed).
- No environmentally significant wetlands of important biodiversity or reproductive value, sensitive ecological and/or historical areas should be present within the potential area of the landfill development.
- None of the areas within the landfill boundaries should be part of the ten-year groundwater recharge area for existing or future water supply development.
- There should be no private or public irrigation, or livestock water supply wells exists down-gradient of the landfill boundaries because they will be at risk from contamination.
- Area should not be in close proximity to significant surface water bodies e.g. water courses or dams.
- No major power transmission mains or other infrastructure (e.g. sewer, water supply lines) should be crossing the landfill development area, unless the landfill operation would clearly cause no concern or rerouting is economically feasible.
- No residential development should be adjacent to the perimeter of the landfill site boundary. The waste disposal site should be away at least outside a radius of one thousand meters from a residential or commercial area and water sources.
- Landscaping and protective berms should be considered/included into the design to minimize visibility of operations from residential neighborhoods.
- Unstable areas are not recommended i.e. there should not be any significant seismic risk within the region of the landfill which could cause destruction of berms, drains or other civil works, or require unnecessarily costly protective measures.
- There should not be fault lines or significantly fractured geological structure that would allow unpredictable movement of gas or leachate within 500 meters of the perimeter of the proposed landfill development.
- Groundwater quality monitoring facilities should be provided during the site development phase. Consideration has to made for when there will be the need in the future to install a gas monitoring system near to buildings close to the site which may become at risk from gas migration once waste landfill filling has started.
- In areas falling under the jurisdiction of the concerned municipality, it should be the responsibility of concerned municipality to identify the landfill sites and hand over the sites to the concerned operator for operation and maintenance.
- Selection of landfill sites shall be based on examination of environmental issues. The concerned Provincial Environmental Protection Agency shall coordinate with the concerned operator for obtaining the necessary approval and clearances.
- The land fill sites shall be selected to make use of nearby wastes processing facility. Otherwise, wastes processing facility shall be planned as an integral part of the landfill site.
- Biomedical wastes should be disposed of in accordance with the Guidelines for Hospital Waste Management 2002, issued by the Environmental Health Unit, Ministry of Health, Government of Pakistan, as amended from time to time.
- A buffer zone with no development shall be maintained around landfill site and shall be the part of concerned municipality's land use plans.
- Landfill site shall be away from airports. Necessary approval of airport or airbase authorities like Civil Aviation Authorities of the Government of Pakistan prior to the setting up of the landfill site shall be obtained in cases where the site is to be located within 10 km of an airport boundary.

Exhibit 3: Waste Generation, Collection, and Disposal Projections

Calculation Criteria's

Chitral Town Population (1998): 30,622 individuals Growth Rate: 2.52%
Collection Efficiency 80%
Waste Generation: 0.3kg/capita/day Expected Increase 1.5% per year
Compacted density of Solid waste in Landfill 1.2 Tons/m^3

Table 6 Volume of Solid Waste Generated and Land Requirement for Sanitary Landfill

Volume of Solid Waste Generated and Land Requirement for Sanitary Landfill										
Year	Population	Daily Collection					Yearly Vol.	Vol. for Landfill	Area for Landfill	Total Area [8]
		Per Capita	Total Waste	Collection Efficiency	Total Wt.	Total Vol.				
		kg	Tons	%	Tons	m^3	m^3	m^3	Acre	Acre
2009	40265	0.300	12.08	80.0	9.66	8	2,939	2,939	0.15	0.16
2010	41280	0.305	12.57	80.4	10.11	8	3,074	6,013	0.30	0.33
2011	42320	0.309	13.08	80.8	10.57	9	3,215	9,228	0.46	0.50
2012	43386	0.314	13.61	81.2	11.05	9	3,362	12,589	0.62	0.68
2013	44480	0.318	14.16	81.6	11.56	10	3,515	16,105	0.80	0.88
2014	45601	0.323	14.74	82.0	12.08	10	3,676	19,780	0.98	1.08
2015	46750	0.328	15.34	82.4	12.64	11	3,844	23,624	1.17	1.28
2016	47928	0.333	15.96	82.8	13.21	11	4,019	27,643	1.37	1.50
2017	49136	0.338	16.61	83.2	13.82	12	4,202	31,845	1.57	1.73
2018	50374	0.343	17.28	83.6	14.45	12	4,394	36,239	1.79	1.97
2019	51643	0.348	17.98	84.0	15.10	13	4,594	40,833	2.02	2.22
2020	52945	0.353	18.71	84.4	15.79	13	4,803	45,636	2.26	2.48
2021	54279	0.359	19.47	84.8	16.51	14	5,022	50,658	2.50	2.75
2022	55647	0.364	20.26	85.2	17.26	14	5,250	55,908	2.76	3.04
2023	57049	0.370	21.08	85.6	18.05	15	5,489	61,397	3.03	3.34
2024	58487	0.375	21.94	86.0	18.87	16	5,738	67,135	3.32	3.65
2025	59961	0.381	22.83	86.4	19.72	16	5,999	73,134	3.61	3.98
2026	61472	0.386	23.75	86.8	20.62	17	6,271	79,405	3.92	4.32
2027	63021	0.392	24.72	87.2	21.55	18	6,556	85,961	4.25	4.67
2028	64609	0.398	25.72	87.6	22.53	19	6,853	92,814	4.59	5.05
2029	66237	0.404	26.76	88.0	23.55	20	7,164	99,977	4.94	5.44
2030	67906	0.410	27.85	88.4	24.62	21	7,488	107,466	5.31	5.84
2031	69617	0.416	28.98	88.8	25.73	21	7,827	115,293	5.70	6.27

[8] Total area required Including 10% for Infrastructure

Exhibit 4: Pilot Study Area – Zargharandeh Village

A field technical visit was made to village Zargharandeh near Fort to analyze existing solid waste management system and the proposals for its improvement. This visit was conducted after the social survey of the area. Technical visit complemented social survey and added direct observation aspects to the data.

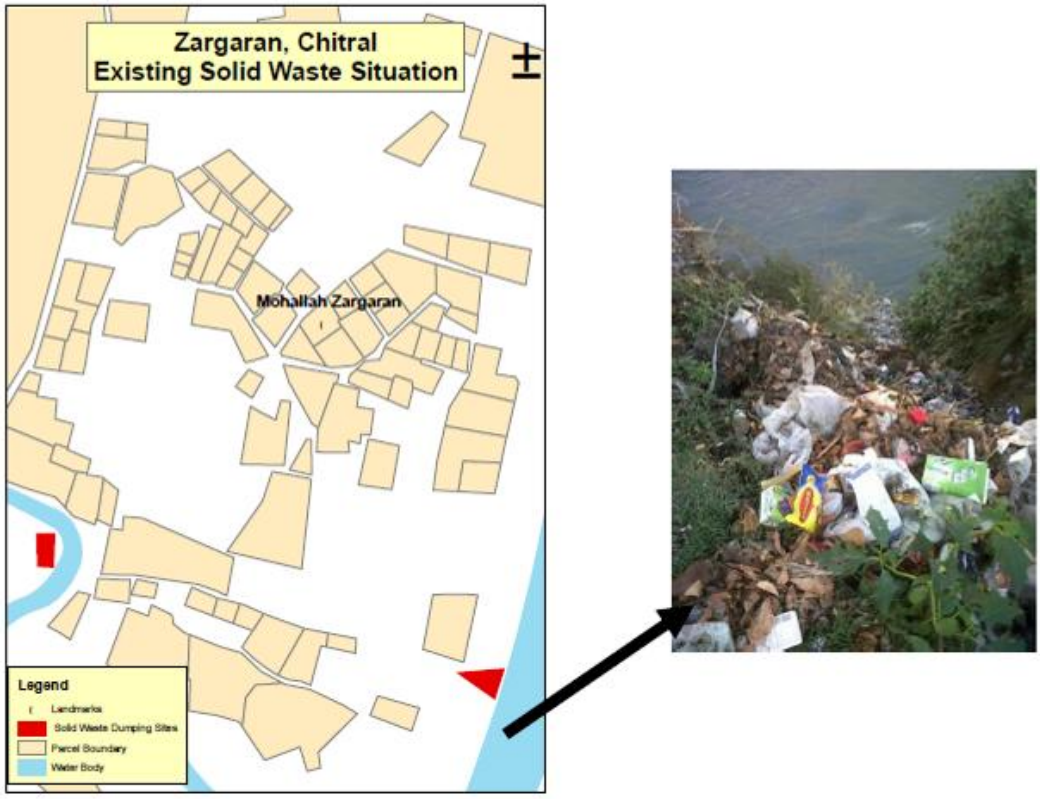

Figure 26 Map Showing Pilot Study Area (Zargharandeh)

According to local informants, the problem of waste collection exists at village, UC and also administrative level. There is no proper place for waste collection and disposal at village and UC level. There should be Youth Society at every village level and they must be trained and held responsible for waste collection. Normally waste is burnt or thrown it into open spaces. Government and other welfare organization's combined efforts can bring a positive change. The People are generally poor they can't afford the fee or charges for door-to-door collection services. If the community collect the waste in one specific place and TMA collect it on daily bases the problem can be minimized.

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Glossary of Terms

Bazaar (also known as market, collection of shops and commercial stores) is the center of commercial activity with all sorts of small and large shops.

Chukorum (a local **unit** measuring 11664 square feet) is a local land measurement unit in Chitral where 1 Chukorum equals 11,664 square feet.

Kanal is a traditional unit of land area. In Pakistan it is used in as an equal to 20 Marlas. Under British rule the Marla and Kanal were standardized so that the Kanal equals exactly 605 square yards or 1/8 acre; this is equivalent to about 505.857 square meters.

A **Nullah** or **Nulla** (http://en.wikipedia.org/wiki/Hindi Nallah in Punjabi) is an arm of the sea, stream, or watercourse, a steep narrow valley.

Refuse (also known as **rubbish**, trash, **garbage**, **junk**, and **litter**) is unwanted or useless materials. It is the final waste which is disposed-off / dumped after segregating usable items from ordinary waste.

Projected Population is a future estimate of population based on nearest available historical growth rate. The formula used for population projection is based on compound method which is **Pn = Po (1+r) n**

Where

Pn = Projected population for required year

Po= Population of base year, year of known population

r= Annual population growth rate

n = No. of years, counted from base year

Annexure

Annex 1: Chitral District Map

Annex 2: Persons Met and Consulted

Sher Qayum Khan
EDO Health
District Government Chitral

Dr. Nazeer Ahmad
MS
DHQ, Chitral

Mehr Sawat
Information Secretary
Bazaar Union, Chitral

Aman Ali Shah
Accountant/Manager
PTDC Hotel, Chitral

Rahmatullah
DCO
Chitral

Manzoor Ahmad
Admin Manager
Water & Sanitation Unit, Chitral

Kareemullah
TO Revenue
TMA, Chitral

Rahmani Gul Haji
Main Scrap Dealer
Chitral

Naseer Ullah
XEN Public Health
PHED, Chitral

Mumtaz Hussain
Manager
Terichmir View Hotel

Aijaz Ahmad
District Incharge,
Forest Department,
Chitral

Timber Forest Product
TMA Tractor Driver
TMA, Chitral

Zia-Ur-Rahman
Judicial Magistrate
District Chitral

Aftab Alam
Secretary
Denin, Lasht

Siddiq Rahman
Secretary
Chitral-I, Shoghoor-lotkoh

Jamshaid Ahmad
Secretary
Broze

M. Jaffar Shah
Secretary
Chitral-II

Ijaz Ahmad
Secretary
Ayun

Shakirullah
Secretary
Karim Abad

Shah Sikandar
Secretary
Yarkhon

Hidayatullah
Secretary
Arandu

Nanwar Shah
Secretary
Ashrat

Fasal-ud-din
Secretary
Shsihi Koh

Naeem-ud-din
Secretary
Koh Charun

M. Ali
Secretary
Drosh-I

Bahadur Ali
Secretary
Drosh-II

Nazir
Secretary
Terich

Bahadoor
Secretary
Mulkhow

Sher Faraz
Secretary
Laspur

A Ghafar
Secretary
Mastuj

Annex 3: Focus Group Discussion Participants

Sher Afgan
Mustajabandeh

Zeeshan Hussain
Mustajabandeh

Shamsher Khan
Ex UC-Nazim
Khorkashanda

M. Ajmal Khan
Hone

Adbul Sameeh
Hone

M Wali Shah
Orghoch

Burhan-ud-Din
Hone

Irfan Elahi
Balahisar

Akram-ud-din
ICDP Accountant

Rehman Ghafoor Baig
ICDP Social Organizer

Dr. Zabn Ar Rehman
Doctor
Singoor

Haji Salms Ar Rehman
Social Worker
Denin

M. Jan
Social Worker
Jang Bazaar

Haji Ghulam Hussain
Social Worker
Singoor

Riaz Ahmed
Superintendent Jail
Singoor

Ghulam Ishaq
Social Worker
Goldur

Shafiq
Secretary, Zilla Council
General
Singoor

Sher Nabi
Social Worker
Denin

Jaffar Shah
Secretary UC Chitral-II
Singoor

Karim Arshad
President (Dehi
Tanzeem)
Dolomuch

Sajjad Ahmed
Ex- Naib Nazim
Denin

Fazal Karim
Manager Admin, AKRSP
Denin

Amad-ud-din
Teacher
Denin

Zahir-ud-Din
Ex UC Councilor
Ragh Denin

Ali Nawaz
Public Servant
Denin Gol

Shakeel Ahmed
Secretary Sadabahar
Society
Bakar Abad

Kahirullah
President (Gallion
Society Denin)
Denin

Hidaytullah
Crush Machine Operator
Gajandeh Denin

Mudassar
Engineer
Shinjal Denin

M. Zahir
Police Service
Denin

Darwesh Khan
PTCL Employee
Mashangol

Ijaz A. Khan
Social Worker
Denin

Abdul Aziz
Student
Shadok

Shafeeullah
Wapda Employee
Shinjal Denin

Sardar Ibrahim
Teacher
Denin Galogh

Annex 4: Key Informants Interviewed

Abdul Majeed
Shopkeeper
Rehan Kot

Israr Wali
Government Servant
Rehan Kot

Jehan Zeb
Shopkeeper
Makhtoom Abad

Abdul Kareem
Government Servant
Makhtoom Abad

Umar Esa Khan
Govt Contractor
Shadok

Mujtaba Kamal
Lawyer
Shadok

Manzoor Ahmad
Lawyer
Zargarandeh

Riaz Ali Shah
Police Employee
Zargarandeh

Zabeeh Ullah
Private Employee
Jughoor

Abdul Rahman
Laborer
Jughoor

Dolat Ali
Daily Wager
Denin Gol

Abdul Wahid
Police Employee
Denin Gol

Asif
Student
Shalidan

Fawad ur Rahman
Student
Shalidan

Maqbool Ali
Government Servant
Jang Bazaar

M Afzal
Tailor
Moldeh Chitral

Naeem Ud Din
Student
Moldeh Chitral

Altaf Hussain
Private Job
Faizabad/Hone

Ijaz Ahmed
Private Job
Faizabad/Hone

Masroor
Laborer
Goldur Jughoor

M. Owais
Daily Wager
Goldur Jughoor

Annex 5: Data Collection Tools

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Interview Guide for Solid Waste Management

Community Key Informants

Instructions: *This guide is composed of initial interview questions. For getting more insights the Interviewers should include further questions. All answers should be recorded on back side of this sheet. Attach additional sheets if required.*

1. Interviewer's Name: _____
2. Locality Details: _____
3. Key Informant's Details (Name, Occupation, Gender etc): _____

Guiding Questions:

1. What are the problems in current solid waste management system at the levels of (i) household, (ii) community, (iii) Union Council or Administrative levels?
2. Who bears the responsibility of the current solid waste management issues and problems at the levels of (i) household, (ii) community, (iii) Union Council or Administrative levels?
3. How can the local situations be improved? What are your suggestions?
4. What problems and issues are faced with the sewerage system?
5. Does sewerage system affect safe drinking water? If yes, how can this situation be improved?
6. What suggestions do you have for selection of a Landfill Site?
7. What solutions do you think will be preferred the most by local populations i.e. (i) Lead by government, (ii) lead by government and CSOs, (iii) Jointly lead by government, CSOs, and citizens, (iv) Lead by Citizens themselves?
8. In your opinion, will citizens (local population) be willing to pay nominal fees for better Solid Waste Management facilities? If yes, how much this amount can be?
9. Is there any CSO (NGO,CBO,Donor etc) working to protect local environment in your area/locality? If yes which organizations (Name)?
10. If you know of any steps for local environment conservation and sustainability? Would you like to share details? Which organizations or people were involved?
11. In your opinion, what could have been reasons of success or failure of such initiatives at local levels?

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Focus Group Discussion Guide for Solid Waste Management

Community Representatives

Instructions: *This guide is composed of initial discussion questions. For getting more insights the FGD Coordinator(s) should include further questions. All answers should be recorded on back side of this sheet. Attach additional sheets if required. Also take help from matrix given on page 2 of this guide.*

1. FGD Coordinator' Name: _____
2. Locality Details: _____
3. Details of participants (Number, Names, Occupation, Gender etc). Write down this information on a separate sheet. Also provide details of all discussion questions and answers. For example Who said what ete?

Guiding Questions:

1. What are the problems in current solid waste management system at the levels of (i) household, (ii) community, (iii) Union Council or Administrative levels?
2. Who bears the responsibility of the current solid waste management issues and problems at the levels of (i) household, (ii) community, (iii) Union Council or Administrative levels?
3. How can the local situations be improved? What are your suggestions?
4. What problems and issues are faced with the sewerage system?
5. Does sewerage system affect safe drinking water? If yes, how can this situation be improved?
6. What suggestions do you have for selection of a Landfill Site?
7. What solutions do you think will be preferred the most by local populations i.e. (i) Lead by government, (ii) lead by government and CSOs, (iii) Jointly lead by government, CSOs, and citizens, (iv) Lead by Citizens themselves?
8. In your opinion, will citizens (local population) be willing to pay nominal fees for better Solid Waste Management facilities? If yes, how much this amount can be?
9. Is there any CSO (NGO,CBO,Donor etc) working to protect local environment in your area/locality? If yes which organizations (Name)?
10. If you know of any steps for local environment conservation and sustainability? Would you like to share details? Which organizations or people were involved?
11. In your opinion, what could have been reasons of success or failure of such initiatives at local levels?

Note: Take notes of answers to questions given on second page. A big sheet or chart can also be used for this purpose.

Stages of Solid Waste Collection and Disposal	Problem in your Opinion?	Improvements you would like to have?	Possible Improvement indicators
Basic Collection (HHs and Community Level)			
Secondary Collection (Administrative Level)			
Solid Waste recycling and re-use			
Final Disposal			

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Survey Form

Solid Waste Management

Semi-Structured interview from House Hold Representatives

Instructions: *Mark relevant answers. Attach additional sheets if required. Also take help from points given for personal observations*

Date: _____

Form Number	_____	**HH Number**	_____
Surveyor Name	_____	**Checked By & Entered By**	_____
House Hold Address: _____			
Mohallah/Locality: _____			
Name of HH Head: _____			
Respondent's Name: _____			
Total members of the House Hold:			

Age	Male	Female	Total
1-5 Years			
5-10 Years			
10-18Years			
More than 18 Years			
Total			

Generally what type of diseases occurs in this house?			
○ Dysantry ○ Gastro Intestinal ○ Diarrhea ○ Typhoid ○ Allergy		○ Malaria ○ Skin Diseases ○ Hepatitis ○ Any Other	
Do you have a Waste Bin in your house?		○ Yes	○ No
How Many Times do you empty the Bin?		○ Many Times in a Day ○ Once in a Day ○ Once in a Week	○ Twice in a Week ○ Some Times
Who goes out to empty the bin?		○ Men ○ House Lady/Women ○ Young Boys	○ Young Girls ○ Sweeper
If Sweeper than Is He Privately Hired or Government Hired? And how much he/she gets paid?	_____		
Do you segregate different types of Waste?		○ Yes	○ No
If yes. Do you sell some waste e.g. paper, plastic, glass etc?		○ Yes	○ No
If Yes…..how much money you raise on average in a month?	_____		
What happens to waste grass and fodder, if any?	_____		
How does following types of waste disposed off?		○ Kitchen Waste _____	○ Bones _____
		○ Glass _____	○ Newspaper/paper/books _____
		○ Plastic	○ Dry bread

		_____	_____
		○ Iron/Brass _____	○ Combed hair _____
Is there any kitchen garden in the house?		o Yes	o No
Does HHs grow vegetables, tomatoes etc in house?		o Yes	o No
Where do you dispose off the waste?		○ In street/Lane ○ Sweeper takes away	○ In an Empty Plot ○ Any other _____
What is the distance of local waste disposal site in terms of minutes?	_____		
If there is any waste heap, who takes it away and how often?	_____		
Do any one come and collect waste from your house?		o Yes	o No
If yes, is there any cost involved, how much on monthly basis?	_____		
Is there any community committee for dealing with Solid Waste issues and arrangements?		o Yes	o No
If Yes, what is the name of Committee	_____		
Have any of your family members taken any training related to Solid Waste Management?		o Yes	o No

If yes, have it resulted into any benefits?	_____	
Are you Satisfied with the current Solid Waste Management System?	○ Yes, Too Satisfied ○ To Some Extent, ○ Not at-all Satisfied	○ Not Satisfied to Some Extent ○ Don't Know
What are the reasons of your dis-satisfaction with current system?	_____	
Do you know where your locality's Waste finally disposed off?	_____	
Do you have any reservations for it?	_____	
Do you offer any suggestions for better solid waste management?	_____	
What would be an appropriate time of a day for a vehicle to come and collect waste from your locality?	_____	
What kind of vehicle can collect waste from your locality?	○ Small Cart ○ Cycle	○ Small Vehicle ○ Any Other ----------
What are the arrangements in your locality for dumping animal waste?	_____	
Is there any government representative in your locality (sweeper, committee, supervisor etc)? Do you know the name?	_____	
What kind of latrine do you have in your house? (Open drain, PIT, VIP, No latrine use fields etc)	_____	

If there is a latrine, is it connected with sewerage line?		o Yes	o No
Is there a sewerage line in the lane/street?		o Yes	o No
Further Observations:			
Still Water around Houses?		o Yes	o No
Waste dumped around houses?		o Yes	o No
Any waste bin/dumper available in the lane?		o Yes	o No
If yes, who has arranged it?		○ Government ○ NGOs etc	○ Any other
What is the condition of the Waste bin/dumper? Any heaps around it or not?	_____		
How often is this bin/dumper emptied?		○ Once in a week ○ Twice in a week	○ Some times
Is there any warehouse in the locality for collecting and storing re-usable waste items?		o Yes	o No
Do any government vehicle visit the locality, if yes how often in a week?	_____		
What is the system of drainage and sewerage?	_____		
Waste from houses is dumped into sewerage and drainage system?		o Yes	o No
Are their any drain holes (gutters)?		o Yes	o No

Are drain holes open or not covered?		o Yes	o No
Waste dumped into drain holes?		o Yes	o No
Special observations for houses near to rivers etc and sources of water?	_____		