FEBRUARY 2014
THE EUROPEAN BANK FOR RECONSTRUCTION AND DEVELOPMENT (EBRD)

Osh and Jalal-Abad Solid Waste Management – Environmental and Social Due Diligence

ENVIRONMENTAL AND SOCIAL ANALYSIS FOR OSH

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APPENDICES

1 Introduction

The City Administration of Osh (the City) with support of the Government of the Kyrgyz Republic has approached the European Bank for Reconstruction and Development (the EBRD, the Bank) with a request for financing of an investment project to improve solid waste management (SWM) in the City and the surrounding area.

The pre-feasibility study was conducted in late 2010, and the Feasibility Study for SWM project in Osh and a similar project in Jalal-Abad is under preparation starting from November 2012. The Bank has launched the environmental and social due diligence (ESDD) in parallel with the Feasibility Study.

The present report is an element of the set of five documents prepared according to the EBRD Environmental and Social Policy (2008). The report includes E&S Analysis of the proposed Project and description of proposed measures for mitigation of E&S impacts and enhancement of E&S benefits, as well as the proposed E&S monitoring program for the Project.

Other elements of the ESDD set are the E&S Management Review with overview of compliance with the EBRD Performance Requirements, the Environmental and Social Action Plan (ESAP), the Stakeholder Engagement Plan (SEP) and the Non-Technical Summary (NTS), prepared as separate documents.

Chapter 1 contains a brief description of the proposed Project with assessment of its area of influence and alternatives considered.

Chapter 2 of the present document include a description of relevant environmental and social aspects which serve as the baseline for impact assessment of the proposed investment Project.

1.1 General information about Osh

Osh city is located in the south-eastern part of the Fergana Valley at the foot of the Pamir-Alay mountain system. The terrain elevation in Osh city and suburbs is about 1000 m above mean sea level (see the map in Appendix 1). In 2000, Osh city celebrated the 3,000-year anniversary and is known as the oldest city in the Central Asia.

Osh is the second largest city of Kyrgyzstan and the largest city of the southern part of the country. Starting from 2003, Osh has the special administrative status as a self-governed city and not an administrative part of the Osh Province. The city surroundings belong to the Kara-Suu District of the Osh Province, which administrative centre is Kara-Suu town located 25 km north from Osh just at the border with Uzbekistan. The Kara-Suu District has the largest area among the districts of Kyrgyzstan. Like many other districts in Kyrgyzstan, the Kara-Suu District includes densely populated areas in the lowermost parts of the valleys and scarcely populated areas of higher-land pastures and mountains. Many rural settlements of the Kara-Suu District located close to Osh are involved in the on-going urban development and look like parts of the city.

A number of the Province-level institutions, the national ministries, agencies, international organisations, banks, commercial companies, etc. have their offices for the 3 Provinces (the Osh, the Jalal-Abad, and the Batken Provinces located in southern part of Kyrgyzstan out of the country's 7 Provinces) based in Osh. The city area is 18.5 thousand square kilometres. The data of latest census (2009) say that the city population is 228.1 thousand. The latest population estimate for the Osh agglomeration (the city and its densely populated suburbs) is approximately twice higher.

People of more than 40 ethnic groups live in Osh, most of them being Kyrgyz and Uzbek.

1.2 Brief description of the proposed Project

The proposed investment Project is supposed to improve in Osh and it suburbs the municipal solid waste management system including the following key components:

- collection of waste,
- transportation of waste,
- safe disposal of waste,
- billing and collection of payments for the waste management services provided to the households and other customers.

The Project is assumed to be implemented by Osh City Administration, who will receive a loan and a grant for the necessary investments in infrastructure and equipment for improved services of Osh-Tazalyk in Osh city and the suburbs. The

basic loan agreements are assumed implemented during the remaining of 2013, so that the contracts for implementation could be in place in 2014. The new waste collection system is assumed to start operation in 2015, and disposal of waste at new landfill will start in 2016.

1.2.1 Why improve waste management system in Osh city and its suburbs?

The current system for **waste collection** in Osh City and its surroundings involves the collection of solid waste from metal containers placed on the streets (collection point system), from the kerb-side where inhabitants have placed the waste at the collection day (kerb-side collection system) and from people bringing their waste directly to waste collection vehicles following the scheduled routes (signal collection system). The Osh city waste management company Osh-Tazalyk provides services within the whole Osh city area and selected adjacent residential areas, e.g. areas along extensions of the city streets.

Currently Osh-Tazalyk 582 un-lidded steel containers of 750 litres, 24 skips of 8 m^3 and 36 skips of 5 m^3 as well as smaller receptacles located in collection points. The total number of engineered collection points is approximately 250. The existing 750 litres containers are open steel containers, which mean that rodents and other animals have directly access to the waste, there is odour developing from the containers if the waste is stored too long time and there is no protection of the waste during rain and snowfall. The containers are without wheels, which mean that they cannot be manually moved and only be emptied by collection trucks equipped with a special lifting device, which make the system less flexible. The containers are emptied into the top of the compactor and it is difficult to avoid spillage of waste and liquids from waste during the loading. The driver needs to get out of the vehicle to operate the hydraulic arm and the emptying process is rather time consuming.

For **transportation** of waste accumulated at collection points Osh-Tazalyk has 34 vehicles including five side-loading waste trucks manufactured in 1987 and 2011. The trucks are of poor quality and require frequent repairs.

Due to insufficient number of waste containers, collection points and vehicles only about 80% of waste generated in Osh is collected. Some of the equipment is outdated and the daily operation of waste collection is a struggle to assemble equipment to keep the operation moving. Procurement of new containers and collection vehicles for replacement of existing equipment and increasing the collection capacity is urgently needed.

The modern 1.1 m^3 standard steel containers with lid and wheels can be moved manually and are more robust and durable than the existing containers and they are suitable for quick emptying by rear-loaded compaction vehicles. The containers have to be placed on firm ground (asphalt or concrete).

The proposed investment Project will assume procurement of rear loaded compaction trucks with capacity of 10 m^3 and 22m^3, but with similar operation,

maintenance and repair techniques. Their use could improve the waste collection services in Osh and suburbs; it will enhance the labour productivity and at the same time ease the working conditions of Osh-Tazalyk staff.

Disposal of the collected waste at present is carried out at the big municipal dumpsite located at the southern outskirt of the city. Opportunities for further development of the dumpsite are limited due to already started establishment of the new residential areas in the south-western part of Osh.

Minor dumpsites can be seen in many places in Osh and surroundings. Waste dumping "somewhere" is not a common, but occasional practice, while burning and burial of waste in back-yards is a common practice, particularly among residents of individual houses. Burning poses risk of spreading fire and nuisance from smoke. Burial of waste in pits is of limited use in densely populated areas of Osh, where the land plots are small.

Both the general public and the authorities can see that change of consumption habits and on-going urbanisation lead to increased generation of waste in residential areas and get interested in regular waste collection services. More and more people understand that improvement of waste collection services would require additional financing. In order to keep the residential areas and their vicinities clean and nice, the Osh City Administration and the KR Government have approached the European Bank for Reconstruction and Development (EBRD) requesting support for the improvement of waste management in Osh through procurement of modern waste containers, trucks and establishment of sanitary landfill for safe disposal of waste in accordance with the EU standards.

After a site selection study, the area in southern part of Shark Municipality has been selected as a suitable location for a future sanitary landfill. When the sanitary landfill is constructed, the existing dumpsite will be closed and covered with soil, so that the area looks like natural hill.

1.2.2 Reasons for including largest villages of Kyzyl-Kyshtak, Nariman, Shark and Toloikon

A number of large villages administratively belong to Kyzyl-Kyshtak, Nariman, Shark and Toloikon municipalities of the Kara-Suu District of the Osh Province, but are located close to the border of Osh City or exist as enclaves within the city territory and in their day-to-day life are well integrated in the city. If these villages are not serviced by the future waste collection system, a lot of their waste may anyhow end up on neighbouring streets of the serviced area. It would definitely make sense to provide waste collection services of the same level within the areas already functioning as one agglomeration, the Greater Osh.

It is envisaged that in of the four participating municipalities a number of villages located far from the Greater Osh, but accessible from main roads on the routes of waste collection vehicles, could also be serviced by the new system of waste management. The proposed service area for the future waste collection system is presented in Table 1.

Table 1: Population of the proposed Project area. (data provided by the concerned municipalities)

Municipality	Settlement	Population, 2013	Number of households, 2013	Household size (persons)
City of Osh	Osh	258,522	60,000	4.31
	Total, City of Osh	***258,522***	***60,000***	4.31
Kyzyl-Kyshtak	Kyzyl-Kyshtak	10,000	1,801	5.55
	Andijanskiy	4,700	708	6.64
	Jany-Turmush	3,000	500	6.00
	Total, Kyzyl-Kyshtak	***17,700***	***3,009***	***5.88***
Nariman	Nariman	5,534	1,350	4.10
	Nurdor	3,754	1,040	3.61
	Jany-Maala	3,323	530	6.27
	Jiydelik	4,857	860	5.65
	Pjim	2,575	488	5.28
	VLKSM	3,795	916	4.14
	Alim-Tepa	2,035	540	3.77
	Tadjik-Abad	2,230	460	4.85
	Kyzyl-Mekhnat	3,208	700	4.58
	Zarbdar	4,064	880	4.62
	Total, Nariman	***35,375***	***7,764***	***4.56***
Shark	Medrese	3,975	310	12.82
	Shark	18,465	3,321	5.56
	Tashtak	14,657	2,636	5.56
	Madaniya	3,801	684	5.56
	Top-Terek	625	112	5.56
	Padavan	3,275	589	5.56
	Total, Shark	***44,798***	***7,652***	***5.85***
Toloykon	Ozgur	1,814	334	5.43
	Tölöykön	3,617	588	6.15
	Uchar	5,411	903	5.99
	Dyikan-Kyshtak	9,228	1,733	5.32
	Kyrgyzstan	2,815	508	5.54
Surrounding Municipalities		**120,758**	**22,491**	**5.37**
Osh City and Surrounding Municipalities		**379,280**	**82,491**	**4.60**
Urban Population		**319,773**		
Rural Population		**59,507**		

1.2.3 Who will pay for the improvements?

EBRD is considering provision of a loan combined with a loan from the EIB and a grant from the EU for covering the costs of establishing the modern waste collection services for the Greater Osh with safe disposal of waste in one specially equipped place. The grant will cover one half, and the loans the other half of the actual investment needs (excluding the VAT). The loans are expected to be

provided for 15 years and repaid from revenue generated by the introduction of new tariffs, which are to be established for households and other users in service area of the new waste management system. Allocations from the national and/or Osh city budget will need to be provided for covering the VAT for investments. However, it is likely that all or part of investments under the Project will be exempted from VAT.

1.2.4 Future waste collection and transportation

In Osh city and the selected villages of adjacent 4 rural municipalities the new system will be based on further development of the existing system and include:

- Collection point system in some of areas with multi-storey buildings in Osh city;
- Signal collection system in some of the areas with multi-storey buildings in Osh city;
- Kerb-side collection system in areas with single family houses in Osh city;
- Combined collection point system and kerb- side collection system in the four municipalities adjacent to Osh city;
- Special system for separate collection of C&D waste and other bulky waste types (on an ad-hock basis according to the actual needs).

Based on discussions with Osh City Administration and Osh-Tazalyk the design of the systems is based on collection of 20% of the waste in Osh City by the collection point system, 50% by the kerb-side collection system and 30% by the signal system. Furthermore, it is assumed that 40% of the waste in the four surrounding municipalities is collected by the collection point/ container system and 60% by the kerb-side collection system.

A combination of 10 m3 and 22 m3 rear-loaded compaction vehicles are recommended for the waste collection and the majority of containers will be 1.1 m3 steel containers with lid and wheels.

For collection of bulky waste types two roll-off tipper trucks with changeable containers and crane to hoist bulky materials and garden waste and 32 containers of various sizes and types are recommended.

The precise number and placing of containers, the number and routes of vehicles, the waste collection schedule for various parts of the serviced area shall be determined and, when necessary, adjusted in the implementation phase of the Project.

1.2.5 Upgrading of Osh-Tazalyk premises

The existing administration building of Osh-Tazalyk serves the needs for the future, but the staff building and vehicle maintenance workshop are inadequate. An improvement of the sanitary conditions of the administration building is proposed alongside with construction of new staff building with toilet and shower facilities and of a well-equipped indoor workshop for vehicle maintenance. The territory of the premises will be fenced, paved and equipped with drainage system and outdoor lighting.

1.2.6 Sanitary landfill

Sanitary landfill is required for safe disposal of waste, i.e. burial of waste with minimal risks for the human health and the environment.

After exclusion of areas not suitable for establishment of landfill (see Appendix 2) and a thorough site identification study four promising sites have been considered in detail from the viewpoint of site selection criteria applied in the international practice. Each site has been given scores for the degree of meeting the specific criteria.

The following scores have been used for the different criteria:

1: Advantageous
0: Acceptable
-1: Disadvantageous

By direct use of these scores without different weighing of the criteria, the result of the evaluation is as described in Table 1.1.

Table 1.1 Evaluation of the four sites considered for the sanitary landfill of Osh

Criteria	**1: Near Osh dumpsite**	**2: Shark**	**3: Clay quarry**	**4: Almalyk**
Planning:				
Public ownership of the land	1	1	-1	0
Present land-use	1	0	0	1
Low value/demand land	0	1	0	1
Future plans for the area	-1	1	0	1
Potential for extension	0	1	0	1
Technical:				
Presence of clay deposits for liner	1	1	1	1
Presence of soil for construction and cover	1	1	1	1
Suitable access to the area	1	0	1	-1
Depth to groundwater table	1	1	1	1
Social + Cultural:				
Distance from residential areas	-1	1	0	1
Resettlement, economic displacement	0	1	0	1
Visual impact of operations	1	1	1	1

Criteria	1: Near Osh dumpsite	2: Shark	3: Clay quarry	4: Almalyk
Traffic nuisance	0	0	0	0
Cultural heritage	1	1	1	1
Environmental, Health and Safety:				
Groundwater interests	1	1	1	1
Sensitivity and impact on surface waters	-1	1	1	1
Habitat disturbance	1	0	1	1
Economic:				
Land acquisition	1	1	-1	-1
Transportation distance from major waste sources	1	1	1	-1
Construction costs	1	0	0	0
TOTAL SCORE	**10**	**15**	**8**	**12**

As it can be seen from Table 1.1, the criteria cover a wide range of various aspects. For some of them the uncertainty is rather high. However, in the evaluation of the four promising sites, the site in the Shark municipality clearly appears to be the best site for location of the new landfill.

Basing on the site selection study a site in Shark Municipality has been recommended for establishment of sanitary landfill, which will be designed, constructed and operated in line with the national regulatory requirements and the EU Landfill Directive.

The distance from the site to the centre of Osh is about 10 km. The distance to the nearest residential development area (the Atchi community of Osh city) exceeds 1 km, distance to the nearest stand-alone residential house is about 500 m. Map of the Project area showing the location of the site selected for landfill is included in Appendix 3.

The total area of the sanitary landfill is 29.8 ha including waste disposal area of 17 ha divided into three sections with steep (up to 1:2) slopes and the total volume of 1,780,000 m^3, which should be sufficient for disposal of waste during 19-20 years. The waste disposal cells will be constructed with an impermeable bottom structure consisting of a compacted clay soil covered with a layer of special high density polyethylene. This structure installed on bottom and slopes of each section will protect the groundwater and landfill surroundings from spreading of leachate (liquid present in waste due to rain, snowmelt water and decomposition of waste). Leachate generated in the landfill section will be collected by drainage system placed on the bottom liner. The collected leachate will be stored in and evaporated from a leachate pond with impermeable bottom. Spraying of leachate over the waste surface could speed up the evaporation.

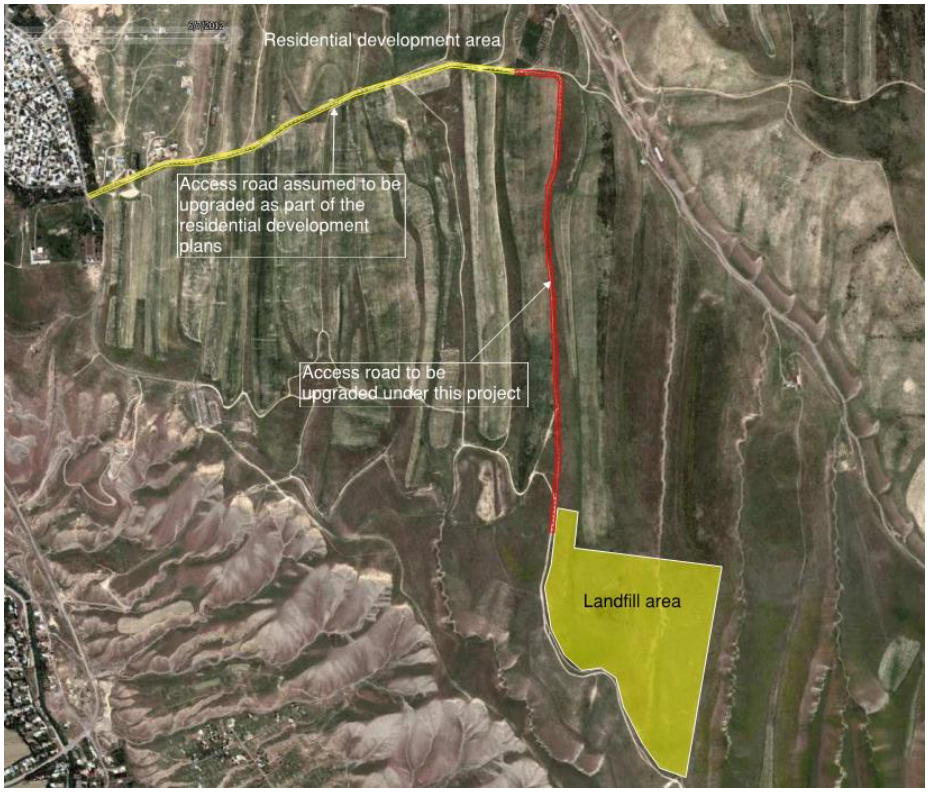


Figure 1.1 Proposed future landfill in Osh (Shark) and location of access roads

The landfill area will be fenced and include paved entrance and parking area, weighbridge, office and staff building, water supply and sanitation facilities with drinking water well, surface water collection system, garage and vehicle maintenance workshop, wheel wash facility (at exit), fire protection system, facilities for leachate collection, storage and evaporation, access road and internal roads, power supply, lighting and communication systems.

Landfill gas collection and flaring system as well as top cover for disposed waste will be established during the planning period when a landfill cell is filled up.

Technical description of the sanitary landfill is included in section 2.2.4 further below.

1.2.7 Will the waste be sorted at the landfill?

Currently there is no formal system for separation and collection of recyclables in the Project area. The market for the recyclables is poor. Private initiatives show no capacity to recover and sell any reasonable portion of recyclables.

All waste delivered by waste collection trucks to the new sanitary landfill will be weighed and registered at the landfill entrance. The trucks will then take the waste without any processing to a landfill section for disposal.

1.2.8 How will the waste be placed at the landfill?

Only one of the three disposal sections will be constructed and operated at a time. The waste unloaded from a truck into a disposal section will be rolled over by a heavy vehicle (compactor) rolling the waste into a layer. Each layer of waste will be systematically covered with a thin layer of soil (daily cover) preventing possible spreading of waste by wind, birds and animals. Thus during the landfill operation the waste will be open only at the tipping front of a disposal section currently being filled. The average height of waste body with daily cover constituting about 10% of the volume in each section of the landfill will be approximately 10 m including 1 m thick top cover layer with vegetation.

Once the whole landfill is filled and no longer used for waste disposal, there will be an aftercare period for least 30 years. Aftercare will include further collection of leachate, monitoring of landfill gas, monitoring of groundwater and surface runoff. In principle, the monitoring should continue until leachate and/or landfill gas no longer pose risks for the surrounding environment.

The landfill will be owned by Osh City and operated by the trained staff of municipal waste management company Osh-Tazalyk.

1.2.9 When will the existing dumpsite be closed?

The major dumpsite in Osh is located close to the main road towards Nookat town about 6 km south from the centre of Osh. After opening of the sanitary landfill, further dumping of waste at existing dumpsite shall be prohibited. The dumpsite closure and rehabilitation will require an effort to reduce the environmental and health impacts and to secure stability of the site. The proposed remediation activities include excavation of steep slopes, reallocation of waste, construction of a surface water ditch surrounding the dumpsite and covering of the waste body with minimum 0.9 m of soil and 0.1 m of fertile topsoil with vegetation.

Closure and rehabilitation of the dumpsite will be to the benefit of the surrounding communities suffering from consequences of poor operation of the dumpsite. Closure and remediation of the existing dumpsite will be the responsibility of the Osh City Administration and will not be financed from the loan and grant provided for the proposed Project.

1.3 Analysis of alternatives for the Project

A number of alternatives have been considered during the proposed Project preparation, as summarised in Table 1. The table presents a brief analysis of feasible alternatives of the Project (in terms of location, technology, design) carried out for comparison of potential environmental and social impacts.

Table 1.2 presents a spectrum of concepts typically discussed during feasibility studies and impact assessments related to development of municipal solid waste management systems.

Table 1.2 Other Alternative concepts considered during the Feasibility Study

No	Concept title	Details of the concept	Key challenges
1	No Project	No changes in the existing waste collection and disposal practice	High environmental and health impacts, visual impact, low comfort
2	Alternative location of the sanitary landfill	Location next to existing dumpsite of Osh city	Less than 500 m distance from existing and planned residential areas
		Location near abandoned Almalyk coal mine	Long distance (24 km) from Osh
		Location in clay quarry in southern part of Osh	Less than 500 m distance from existing and planned residential areas
3	Alternative design of landfill	Landfill of other type (e.g. without bottom liner)	Not meeting the EU standards
4	Alternative collection system	Separate collection of recyclables at sources (e.g. in plastic bags or containers of different colours)	High costs of collection, poor market for recyclables
		Separation of recyclables at central facility for sorting of mixed waste	Low quality of recyclables, poor market for recyclables
5	Alternative treatment and disposal technology	Composting, anaerobic digestion (AD), mechanical biological treatment (MBT)	High investment and operation costs, poor market for products
		Incineration (Waste-to-Energy)	High investment and operation costs, low energy prices in KR
6	Management of other types of waste, too	Recycling of construction and demolition waste	High investment costs, low prices for natural mineral materials
		Separate management of hazardous waste fraction of household waste	Separate collection and temporary storage will not make sense because a long-term disposal solution is not expected within realistic time (i.e. 5 years)
7	Alternative area serviced	Only Osh city serviced	Osh and adjacent villages generate the common waste flow
		Other number of villages/Municipalities	All densely populated areas with good access roads should be included, but transportation distances to landfill should be short

The alternatives may also include other combinations of facilities within the waste management centre and/or transfer station(s), other timing for construction and implementation of source separation schemes, combination of various schemes in specific areas, alternative financing mechanisms for full cost recovery and a variety of other alternatives.

Any additional elements of the waste management system (e.g. separate collection and interim storage of hazardous waste fractions of MSW, collection and recycling of construction and demolition waste, etc.) will require additional costs and thus higher tariffs for the new system. And the higher would be the increase of tariffs; the lower would be the chance for collecting the payments.

Based on the Feasibility Study the combination of 4 waste collection technologies (system with 1.1 m^3 containers at collection points, kerb-side system, signal system, system with roll-off tippers for bulky waste, garden waste, construction and demolition waste), direct transportation and landfilling of waste has been selected as the most feasible option for the Project.

In addition to proposing technical options, the Feasibility Study included consideration of alternative locations of the sanitary landfill. Several sites were studied from the viewpoint of the local and international criteria applied for the landfill site selection. A separate report on the landfill site selection was prepared during the Feasibility Study and disclosed in Russian language for stakeholders in Osh in March 2013.

1.4 Project's area of influence

According to the EBRD PR1 the environmental and social impacts and issues should be appraised in the context of the project's area of influence. This area of influence can be considered as an indication for the magnitude of the Project impacts. The area of influence may include, as appropriate, one or more of the components of the types distinguished by the EBRD, as specified in Table 1.3. The EBRD and its Client in case of Osh Solid Waste Management Project will need a common understanding of the area of influence of the proposed Project.

Table 1.3 Components of area of influence of the Project

No	Type of component according to the EBRD PR1	Components of area of influence for Osh Solid Waste Management Project
1	The assets and facilities directly owned or managed by the client that relate to the project activities to be financed (such as production plant, power transmission corridors, pipelines, canals, ports, access roads and construction camps).	Osh City Administration is responsible for the planning of solid waste management facilities. The Project will finance procurement of vehicles, bins and equipment for waste collection, which will be owned by the municipal management company. The sanitary landfill will be established on land owned by Shark municipality on steep slopes used as hay land and grassland. The Project will include upgrading of the existing

No	Type of component according to the EBRD PR1	Components of area of influence for Osh Solid Waste Management Project
		access road and relevant connections to infrastructure.
2	Supporting/enabling activities, assets and facilities owned or under the control of parties contracted for the operation of the clients business or for the completion of the project (such as contractors).	Assets and facilities of contractors involved in implementation of the Project; Assets/premises of the waste management company owned by Osh City
3	Associated facilities or businesses that are not funded by the EBRD as part of the project and may be separate legal entities yet whose viability and existence depend exclusively on the project and whose goods and services are essential for the successful operation of the project.	Area of site in Shark municipality recommended for establishment of sanitary landfill Areas of waste collection points in rural municipalities participating in the Project
4	Facilities, operations, and services owned or managed by the client, which are part of the security package committed to the EBRD as collateral.	The city dumpsite, which will be closed and rehabilitated after commissioning of the sanitary landfill The area of access road (within adjacent privately owned land) to the city dumpsite, which will be rehabilitated during closure and rehabilitation of the dumpsite
5	Areas and communities potentially impacted by: cumulative impacts from further planned development of the project or other sources of similar impacts in the geographical area, any existing project or condition, and other project-related developments that can realistically be expected at the time due diligence is undertaken.	Communities of urban and rural areas of Osh city and adjacent municipalities
6	Areas and communities potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that would occur without the project or independently of the project.	The areas and communities located to the west of Osh dumpsite, which will be subject for closure and rehabilitation after establishment of the sanitary landfill Additional areas and communities included in the service area of waste management system in the future

It can also be expected that the area of the Project's influence will include all other regions of the Kyrgyz Republic, because the Project will have a demonstration effect and will be part of the national plan of the waste management sector modernisation. The Project would be an example of improved planning of waste management replicable in other regions of the Central Asia.

Improvement of municipal waste management in Osh city agglomeration and prevention of waste dumping in catchments of the Ak-Buura River will have positive impact on downstream areas in Kyrgyzstan and Uzbekistan.

The proposed Project should be considered as a solid platform for further improvement of waste management in Osh and its surroundings allowing in the future to reduce, reuse and recycle the generated waste.

2 Phases of Proposed Project

2.1 Pre-construction phase

Pre-construction phase will include all the necessary preparations to introduction of improved municipal solid waste collection system in Osh city and its suburbs and to construction of the sanitary landfill.

Before the construction of proposed sanitary landfill can be started, the following activities should be carried out during the pre-construction phase of the Project:

- Signing of loan agreement between the EBRD and Osh City Administration;
- Establishment of PIU;
- Procurement of consultancy services for support to PIU and the waste management company (the Company);
- Completion of land transformation/transfer/allocation procedure for the landfill site;
- Procurement planning and tendering of contractor services for construction works and tendering of supply of waste collection equipment and waste transportation vehicles.
- Completion of Environmental and Social Impact Assessment (ESIA) procedure according to the national regulations[1] for establishment of landfill with public consultations according to the national legislation and regulations;
- Possible adjustment of design by Contractor(s) according to recommendations of the ESIA and updated national regulations, obtaining permits for connections to engineering infrastructure (water supply, power supply, telecommunication networks, roads), obtaining of approvals from the Environmental Expertise and from the State ("Construction") Expertise;
- Establishment of Project monitoring and reporting procedures.

[1] Environmental Impact Assessment (EIA) procedure in the Kyrgyzs Republic addresses the environmental and social aspects

2.2 Construction Phase

2.2.1 Establishment of new waste collection and transportation system

New waste collection and transportation system will be introduced in the Greater Osh. It will include the following elements convenient for residents of different areas:

- Collection point system in some of the areas with multi-storey buildings in Osh City;
- Kerb-side collection system in areas with single family houses in Osh City;
- Signal collection system in some of the areas with multi-storey buildings in Osh City;
- Combined collection point system and kerb- side collection system in the four surrounding municipalities;
- Special system for separate collection of C&D waste and other bulky waste types.

Based on discussions with Osh City and Osh-Tazalyk the design of the systems is based on collection of 20% of the waste in Osh City by the collection point system, 50% by the kerb-side collection system and 30% by the signal system. Furthermore, it is assumed that 40% of the waste in the four surrounding municipalities is collected by the collection point/ container system and 60% by the kerb-side collection system.

It would be advisable to plan a gradual introduction of the system, so that the types of containers, their placing within the municipalities, the waste collection and transportation schedule and routing could be adjusted based on the experience.

The estimated number of collection points and 1.1 m^3 containers required for improved waste collection services in 2016 to 2035 is presented in *Table 2.1*.

Table 2.1 Number of collection points and waste containers for the proposed Project area in Osh and surrounding municipalities.

	2015/16	2020	2025	2030	2035
Number of collection points					
Osh City	69	78	87	98	100
Municipalities (1 container per point)	875	1,068	1,226	1,407	1,442
Number of 1.1 m^3 containers*					
Osh City	217	244	273	304	312
Municipalities	919	1,122	1,288	1,447	1,503
Special containers for C&D waste and bulky waste	32	32	32	32	32

** Including 5% spare containers.*

Number of waste collection vehicles planned for operation of the improved waste management system in Osh and suburbs in 2015-2035 is presented in *Table 2.2*.

Table 2.2 Number of collection vehicles for the proposed Project area in Osh and surrounding municipalities

Collection vehicles	Compaction truck type	2015/16	2020	2025	2030	2035
Osh City						
Collection point system	10 m^3	1	1	2	2	2
	22 m^3	2	2	2	2	2
Kerb-side collection system	10 m^3	5	5	5	6	6
	22 m^3	7	7	8	8	8
Signal system	10 m^3	2	3	3	3	3
	22 m^3	5	5	6	6	6
Four municipalities						
Combined collection point and kerb-side collection system	10 m^3	2	3	3	3	3
	22 m^3	4	4	5	6	6
Total for collection of municipal waste	10 m^3	**10**	**11**	**12**	**13**	**13**
	22 m^3	**18**	**18**	**21**	**22**	**22**
C&D waste and bulky waste	Roll-off tipper	**2**	**2**	**2**	**2**	**2**

Rear-loaded compaction trucks are recommended due to the lesser strain on the container lifting device and greater reliability overall. The experience from Osh (and Jalal-Abad as well) is that cheaper waste collection trucks purchased without

proper technical specifications experience frequent breakdowns, are unreliable and generally poor investments.

2.2.2 Modernisation of the Company premises

The current administration building of Osh-Tazalyk is deemed sufficient in size for the future, but the adjacent workshop and staff buildings are generally inadequate and would need substantial upgrading. Generally, Osh-Tazalyk has a sizeable compound in the outskirts of the City and there is sufficient space to make the necessary improvements.

The upgraded domicile of Osh-Tazalyk is recommended to consist of:

- The existing administration building slightly upgraded with introduction of two toilets (for men and for women);
- A new staff building with dressing rooms with showers, toilets and steel lockers for clean and dirty clothes with capacity for up to 120 staff (for staff additions initially and during the planning period including male and female workers). Canteen and kitchen will remain in the existing building next to the gate;
- A new workshop for repair of trucks and storage room for spare parts. The workshop shall be a closed building for automatic gate for each of the vehicle bays.
- The outdoor are will be paved, it will have drainage and outdoor lighting.

Good and conventional construction materials and good workmanship shall be applied. Local origin construction materials shall be preferred.

2.2.3 Upgrading of billing and payment registration system

Electronic (non-cash) billing and payment registration system will be developed for Osh-Tazalyk providing additional opportunities for transparency of the Company operations, for improvement of revenue collection and interaction with customers.

2.2.4 Landfill construction

Once all necessary approvals have been obtained and a contractor has been hired for the construction of the landfill, construction works can commence. This is expected to happen in the second half of year 2014. Construction of the first section of the landfill and all the necessary buildings for normal operation of landfill should be completed in December of 2015, so that the landfill is operational from January 2016.

Upgrading of access road

From the road along the southern border of the Achy Residential Area to the east of Amir-Timur community (Territorial Council 9), the existing field road of 1.5 km

going south will be upgraded to become the access road to the landfill. No land acquisition is required for construction of access road. The road will be used during construction and operation of the landfill. The upgraded road is designed 7 m wide suitable for heavy traffic in two directions. The road will be provided with shoulders of 1.5 m and drain ditches along both sides of the road.

Fencing

Activities on the landfill site will be started from construction of a fence along the entire perimeter of the landfill area, for example a 2 meter high steel mesh fence with concrete posts or a fence made of prefabricated concrete plates. An 8 meter wide steel bar gate will be constructed at the main landfill entrance.

Trees and/or bushes will be planted along the entire landfill perimeter in order to limit the visual impact from the landfill to the surroundings.

Construction of internal roads

The internal roads will be constructed for receiving, tipping of waste, construction and filling of landfill cells, etc.

Establishment of reception area

A reception area will be established next to the entrance to the landfill in the lowermost part of the landfill site. The building for office, staff facilities, garage, workshop, an electronic weighbridge for incoming waste, a wheel-wash facility (at exit from the site) and parking areas for visitors.

Lightening poles will be installed for the paved sections of the reception area. Leachate collection and evaporation pond, sanitary facilities and on-site groundwater intake well will be established in the reception area. Example of reception area facilities is presented in Figure 2.1.

Figure 2.1 Reception area with weighbridge, buildings and leachate pond

Example of weighbridge facility is presented in Figure 2.2.

Figure 2.2 Electronic weighbridge for trucks delivering waste to the landfill

Construction of landfill cells

The total waste disposal area at the landfill is 170,000 m^2 (17 ha) and has a total disposal volume is 1,795,000 m^3. This capacity will last for at least a period of 19-20 years.

Technical description of proposed design for waste disposal cells of the sanitary landfill is provided in Table 2.3.

Table 2.3 Technical desctiption of waste disposal cells of the landfill

Installation	Design parameters
Geological barrier	The upper loess-like loam layer in Shark is very thick up to 20 m. The loess-like loam has a high content of clay and used for brick production. The loess-like loam is a loose deposit and needs to be pre-collapsed, waters and compacted before it can act as a low permeable geological barrier. The geological barrier of minimum 0.5 m thickness is proposed to be constructed either by use of in-situ loess-like loam by ripping, watering and heavy dynamic compaction or by an install barrier by mixing, watering and heavy dynamic compaction. The bottom areas of cells are proposed to be constructed by a ½ m of loam/clay barrier with a permeability of $k < 1x10^{-7}$ m/sec and at slopes a bentonite mat with $k < 1 \times 10^{-8}$ m/sec.

Installation	Design parameters
	Alternative to utilise the loess-like loam a bentonite enhanced soil barrier can be constructed.
Artificial liners	1.5 mm HDPE liner directly on the clay/loam barrier (clay/loam contains no stones). 4.0 mm Geotextile between HDPE liner and drainage gravel. To protect the HDPE liner the total thickness of liners shall be 1/10 of the max. grain size of the gravel layer which is defined as max 55 mm. The thickness of the geotextile shall be 4.0 mm at an overburden pressure of 200 kN/m² equal to the pressure from 20 m of waste.
Compared with EU standards	On slope the geological barrier do not comply with the EU-landfill standards as a thickness of minimum 0.5 m is not achieved. The slopes are as steep as 1:2 and as no permanently leachate pressure will stay on the liner the reduced thickness of the geological barrier should be acceptable. (Construction of a 0.5 m thick clay barrier on steep slopes are complicated, time consuming and with risk of failure/landslide.
Geometric shape of cells	Bottom slope min. 10.0 % for cell A, B and C. Slopes are in general in 1:2 or less steep and with a 5 m wide terrace/berm (platform) for each 10 m. Where the upper slope are only a little more than 10 m the terrace is excluded. Internal embankments (between cells and towards the access road) slope are in general 1:2 or 1:3. Each cell will be developed in several steps. First step up to first terrace and subsequence steps to final level Volume of cells are (step 1 + step 2+step 3): • Cell A (130,000 + 250,000+250,000) = 630,000 m^3 • Cell B: (135,000 + 450,000) = 585,000 m^3 • Cell C: (180,000 + 400,000) = 580,000 m^3 Total: 1,795,000 m^3

For many reasons, the entire waste disposal area shall not be constructed from the beginning. The main reasons are:

› Investments in waste disposal area should only be made when there is a need for additional capacity. Otherwise, the investment will not be cost-effective.

› The elements of a waste disposal cell (liner, leachate collection system etc.) are vulnerable and are likely to be damaged, if they are not covered by waste within approximately one year after construction.

- As little as possible of the waste disposal area should be kept open at the same time in order to reduce generation of leachate.

- To the extent possible, landfill cells should be filled up and closed before new cells are constructed and taken into operation. This will limit nuisances from the landfill (incl. odours, rodents, birds, escape of windborne waste etc.). Furthermore, the visual impact from the landfill to the surroundings will be limited this way.

The Project assumes that a total of 3 disposal cells (A, B and C) will be constructed within the lifetime of the landfill with only one cell being in use at a time. Only cell A will be constructed initially.

The schedule of construction completion (implementation) and operation for waste disposal cells of the landfill is presented in Table 2.4. The schedule corresponds to the medium level waste generation scenario.

Table 2.4 Schedule of construction and operation of waste disposal cells at the landfill

Cell	Implementation	Operation
Phase 1		
Cell A, first step	2015	2016-2017
Cell A, second step	2015	2017-2020
Succeeding phases		
Cell A, third step	2019	2020-2023
Cell B, firsts step	2022	2023-2024
Cell C, first step	2023	2024-2026
Cell C, second step	2025	2026-2031
Cell B, second step	2030	2031-2034
(Cell B+C, third step)	(2033)	(2034-2038)

The slopes in the cells will be steep with inclination up to 1:2, and the cells will be developed in 2-3 vertical steps, each having a height of approximately 10 m. The average height of the waste body filled at each step will be approximately 10 m.

The total volume of landfill is expected to be sufficient to its lifetime of 19-20 years assuming the waste average density of 1.0 t/m^3. Daily cover constitutes 10 % of the volume and a 1.0 m top cover layer is included in the life time estimate.

The landfill capacity can be easily extended by relocation of the high voltage line passing through the eastern part of the landfill area from its existing location to the top of the eastern ridge. This will make it possible to develop one more step for cell B and cell C. The additional possible volume is approximately 400,000 m³.

First, the land surface will be prepared with the correct shape and slope in order to ensure an even surface with a well-defined surface water runoff direction towards collection wells to be located at the deepest points.

The waste disposal cells are constructed with a liner system consisting of a geological barrier constructed by use of existing loess-like loam/ clay formation. The existing loess-like loam/ clay formation is dry and very loosely disposed. To achieve stable and low permeable geological barrier the loam/clay soil needs to be mixed with water to obtain the optimal moisture content and to be compacted with heavy dynamic compaction machinery. In particular the moisture content and thorough mixing of soil (for achieving a uniform distribution of the moisture content in the whole layer of local/clay soil) is important in order to obtain a correct result. The loam/clay soil typical for the adyr zone has high content of clay and is locally used for brick production. It should be possible to establish a geological barrier having thickness of at least 0.5 m with low permeability by use of the right equipment and methodology. The permeability obtained in the loam/clay layer is estimated less than $k = 1 \times 10^{-9}$ m/s and will result in an overall geological barrier with an equivalent protection as defined in the EU Directive of the landfill of waste ($t \geq 1$ m and permerabilty $k \leq 1 \times 10^{-9}$ m/s). Special attention should be focused on capacity of loes-like soil to settle/collapse when exposed to water, which is typical for the local conditions and is reflected in the national regulations for construction sector.

On top of the geological barrier a 1.5 mm HDPE liner is installed on bottom and slopes of waste disposal cell. A 0.5 m thick drainage layer for collection of leachate will be installed on the cell bottom with leachate collection drain pipes on a geotextile layer protecting the HDPE liner.

Photo in Figure 2.3 shows an example of clay layer construction and installation of HDPE liner for bottom of a landfill cell.

Figure 2.3 Construction of clay liner and installation of HDPE-liner

Installation of drainage layer, perforated pipes and chamber for collection of leachate on the bottom of waste disposal cell is shown in Figure 2.4.

Figure 2.4 Installation of drainage layer on top of the HDPE liner

Leachate collection drains will be connected to leachate wells at the lowest part of the waste disposal cell (see Figure 2.5). From here, leachate will be taken by gravity through pipes to the leachate collection pond.

Figure 2.5 *Construction of waste disposal cell, with bottom clay layer, HDPE liner on bottom and slopes, and a leachate collection well at the lowest point of a landfill cell*

Construction of other landfill elements

The waste disposal cells will be surrounded by embankments and by surface water ditches in order to keep the waste inside the disposal cell and to prevent surface water from the surroundings to enter the cell.

An access road will be constructed, passing the embankment and into the waste disposal cell in order to ensure access for trucks with waste and for landfill operation equipment, such as e.g. the waste compactor.

Internal service roads will be constructed along the perimeter of the waste disposal area. Lighting poles will be established at the gate, at the weighbridge, in front of the administration building, in front of the garage and workshop and along the internal road from the gate to the first landfill disposal cell.

Landfill gas collection and flaring system as well as top cover for disposed waste will be established during the planning period when a landfill cell is filled up.

2.2.5 Establishment of monitoring facilities

Groundwater monitoring wells will be established during construction of the landfill, onewell upstream and two downstream the landfill for the regular monitoring of the groundwater quality in the area adjacent to the landfill. Hereby, the integrity of the landfill liner and possible spills of leachate can be monitored and mitigation measures taken.

Also surface monitoring points will be established in connection to surface runoff ditches etc., enabling regular monitoring of the surface water quality.

2.2.6 Closure and remediation of Osh dumpsite

The dumpsite in Osh is located 6 km to the south of the City centre, next to the main road to Nookat. The terrain of the dumpsite is undulating and the average filling height of the dumpsite is estimated to be approximately 10 m.

The operation of the dumpsite is poor. The site has only limited fencing and no measures are taken to monitor and control incoming waste. A number of unofficial waste pickers work at the dumpsite sorting recyclables from the incoming waste, including in particular plastic bottles and glass bottles. However, the recyclables are to a large extent piled up at the dumpsite due to the currently poor market conditions for recyclables.

A large number of pigs from the adjacent pig farm are allowed to scavenge food waste at the tipping area.

Waste is tipped over a large area and frequently put on fire. There are no compactors at the site, but waste is sometimes pushed by means of an old bulldozer.

Although soil for covering is available, the entire operational area is uncovered and windborne litter is therefore common.

No environmental protection measures are applied at the site. Leachate is allowed to penetrate uncontrolled to the sub-soil and landfill gasses are emitted to the atmosphere.

From the data of the regional and local hydrogeological investigations it is known that there is no groundwater within the upper 70-100 m of geological formations of the adyr (hilly) areas. It is therefor assumed that no groundwater within the site isencountered within 70-100 m below the ground level. No surface water streams are observed in or near the dumpsite.

The waste slopes towards south are very steep and at the steepest parts up to 1:1 with a high risk for waste sliding.

The lower plateau with waste on its edge is very visible from the road between Osh and Nookat.

The organic waste in the household waste is assumed mainly under aerobic conditions and generation of landfill gasses is presumably low. The odour from the dumpsite is relatively strong at the site and noticeable outside the dumpsite area.

The practice of burning waste at the dumpsite can affect the ecology on areas adjacent to the dumpsite. The smoke could causes nuisance for the residents and the road traffic.

The following main activities are proposed for closure and remediation of the dumpsite:

- Excavate waste from the steep slopes and reload the waste on top of the site. The slopes shall be maximum 1:3;
- Relocate waste from some of the areas (e.g. north-west corner of the dumpsite) to minimise the final surface of the dumpsite for remediation;
- Establish a surface water ditch surrounding the dumpsite. It is assumed that the permeability of the soils are high and all collected surface water will penetrate into the ground;
- Upgrade the existing access road leading to the houses south-west of the dumpsite;
- Establish a ditch up-hill of the dumpsite to intercept all unpolluted water from entering the waste body;
- Regulate and compact the waste and cover it with minimum 0.9 m of soil and 0.1 m of topsoil;
- Seed the surface with grass. In particular at steep slopes a fast growing and robust grass type is required to prevent erosion grooves.

Closure and remediation of the dumpsite after construction of the sanitary landfill will be a responsibility of Osh City Administration. Clean-up activities and closure of minor dumpsites in the Project area will be important for implementation of the improved waste management system.

2.3 Operation and maintenance phase

When the landfill construction is completed, the landfill will be the only available facility for sound disposal of mixed municipal solid waste generated in Osh and adjacent municipalities within the Project area.

Measures for dumping prevention and enforcement of waste disposal at the sanitary landfill should be elaborated and implemented by the local authorities. It is important that all urban and rural municipalities join their efforts in this work.

Landfill gas emission from landfill activities cannot be avoided. Shortly after waste is disposed and compacted, the anaerobic digestion processes will result in methane emission through the waste at the tipping front or through other pathways. Collection of landfill gas will not be practical before a final top cover or a temporarily cover is in place. Flaring is in the initial phase of landfill operation the only option for handling and treatment of the collected landfill gas. Collection and flaring of landfill gas could be in place when the first cell is filled and covered which is estimated to be in 2016.

In 4-5 years after commence of the landfill utilisation of the landfill gas could be considered. Potential user of the landfill gas could be identified in the neighbourhood of landfill. The obvious option for utilisation of the landfill gas is production of electricity and maybe utilisation of the excess heat in a central heating system if installed in administration building or it may be realistic to utilise excess heat in greenhouses to be established at the nearby farmland (to the North of the landfill). It would be advisable to carry out a separate feasibility study for tailoring of the landfill gas utilisation system.

2.4 Closure of sanitary landfill

After the landfill has reached its planned capacity/height, a special engineered final cover system will be installed over the disposed waste. By that time a new waste disposal facility should be made available for the region. The options could include an extension of the landfill (e.g. by construction of additional cells) or construction of a landfill at a new site.

2.5 Aftercare of the sanitary landfill

Depending of the actual and potential development of landfill gas, a system for the longer term management of the landfill gas will be designed and installed. The generation of leachate and landfill gas may continue during more than 50 years after the closure depending of the percentage and composition of organic waste and the rate of wash out from the landfilled materials. Proper control and monitoring procedures for the aftercare period should be developed. The landfill operator/management will take the decision whether and when it is feasible to install the active gas collection and treatment system.

Pumping and registration station, flare and gas utilisation plant are not included in the currently proposed Project budget, because it will certainly not be relevant for the first three years and might not be relevant at all.

Installation of gas wells (initial parts), transport pipes and area designated for the flare etc. is included in the budget.

The landfill can be finally closed when the emission of landfill gas and leachate has reached a level where the environmental impact is insignificant and acceptable with regard to maintaining air and groundwater quality.

The aftercare includes regular monitoring of landfill gas and leachate emissions as well as regular inspections and maintenance of the top layer including the vegetation cover. Excavation and construction activities in the landfill area should be restricted.

3 Environmental and Social Baseline

3.1 Physical environment

Osh city is located at the border between the northern slope of the Alay mountain ridge (top elevations up to 6,000 m) and the Fergana Valley. Landscape conditions in piedmonts of mountain ridges facing the Fergana Valley are characterised by flat areas with fertile soil in the central part of the valley surrounded by a belt of elevated plateaus (adyrs) along the border between the valley bottom and the mountain ridges. The adyrs are built of conglomerates (thickness exceeding 100 m) and covered by loess and loess-like soil (thickness about 20-30 m). The landscape of adyr zone is characterised by relatively flat hilly plateaus separated by the river valleys and ravines of temporary surface water streams. Groundwater within adyrs is encountered only sporadically, mostly at depths exceeding 100 m and is saline. Groundwater of better quality and at lesser depths is encountered within alluvial deposits in valleys of rivers crossing the adyr zone. Rivers play key role in the economic development of the region. Rivers recharging in the mountains cross the zone of adyrs and discharge in the central part of the Fergana Valley where they are feeding the irrigation networks. Certain irrigation agriculture is also ongoing on the river banks within the peripheral (adyr) zone of the Valley. The adyrs in Osh and its vicinity are cut through by valleys of rivers and streams formed due to precipitation and melt water coming from south towards north. The territory of Osh city is crossed by the Ak-Abuura River valley and by 3 major fault lines with active seismic movements.

Climatic conditions in the Osh Province like in other regions of Kyrgyz Republic are closely associated with the terrain elevations. At elevations of 600 to 1100 m the climate zone is warm semi-arid. Winter is short and moderately warm (mean temperature of January is -4 - -3°C). Summer is dry and hot (mean temperature of July is 24 - 25°C). The maximum temperature is up to 40°C. Annual precipitation is about 200 mm with maximum in winter time. Vegetation period is 210 - 215 days.

Climate of Osh city and its suburbs is continental dry, with hot summer and mild winter. Mean annual temperature is +11.2°C, mean of July is +24.7°C, and mean of January is -2.5°C. During the last 10 years the highest temperatures (+43°C) were

observed in July and August of 2001 and 2002, the lowest temperatures (-14°C) were observed in December and January. First autumn frost comes in October. The spring frosts last until mid-March. Fogs occur only during cold months. Winds are mild, prevailing wind directions are from south-east and north-west. Annual mean wind speed is 1.7 m/sec. Strong winds are very seldom.

Annual precipitation is 310 mm, including 200 mm during warm months. The lowest precipitation rate (21 mm) was observed in July and September the highest (144 mm) was observed in May.

Rivers and streams in Osh Province are very important for irrigation systems in the city and particularly in areas with fertile soil north of Osh within the Kara-Suu District. Rivers and streams are also used for water supply of Osh city and many other residential areas.

3.1.1 Existing soil and groundwater contamination in the Project area

Dumping of waste, spills of oil products during operation, fuelling and maintenance of vehicles cause the contamination of soil in Osh and its surroundings. Household waste in rural suburbs of Osh is traditionally burned and/or buried in back-yard pits, in former quarries or dumped within some distance from residential area or just along the roads. Waste is often dumped in irrigation canals, valleys of streams and rivers and results in contamination of catchment areas and downstream areas. Washing of vehicles often result in percolation of wash water into soil or direct discharge of contaminated water in the surface water bodies. However, groundwater in Osh and its suburbs is rather well protected from the surface-based sources of contamination, since groundwater in the adyr zone is encountered at depths of about 100 m below terrain under thick layers of natural deposits having low permeability.

Burial sites of cattle infected by Siberian plague (Anthrax) registered in Kyrgyzstan as soil hot-spots could be inhabited by insects capable to spread the infection. The total number of identified soil hotspots in Osh Province is 247, in Jalal-Abad Province it is 345. According to the KR Ministry of Health, out of 1,119 hot spots of Siberian plague listed by the authorities 55% have not been identified afield.

3.1.2 Biological environment

Suburbs of Osh are located within sage-ephemeral-saltwort desert zone typical for adyrs following the borders between the Fergana Valley and the mountain ridges surrounding it.

Due to its location at the border of arid plains and high mountains accumulating a lot of precipitation from atmosphere (even though they are located at least 3 thousand kilometres from the nearest ocean) the territory of Kyrgyzstan is

characterised by unique biodiversity, which could be explained by a broad spectrum of landscape and climate conditions in zones with different altitudes. High mountains of the Pamir-Alay and the Western Tian-Shan systems are often called "the islands of biodiversity" in contrast to the flat areas of large valleys.

Occupying only 0.13 % of the world's terrestrial area the Kyrgyz Republic has over 2 % of world's flora species and 3 % of world's fauna species and is one of the world's 200 regions of high environmental priority. The number of species per area unit is the highest in the Central Asia.

Birds are characterised by the highest diversity among vertebrates. According to the National Environmental Statement of the Kyrgyz Republic for 2006-2011, the number of bird species in the country is 390 including 233 species nesting in Kyrgyzstan. According to BirdLife International, the total number of bird species in Kyrgyzstan is 329, including 12 globally threatened species and no country endemics. The list of globally threatened species is included in Table 3.1. The listed species are mainly associated with uninhabited mountaneous areas. None of the listed species is present on the Project site and in its vicinity.

Table 3.1 List of globally threatened bird species present in Kyrgyzstan

Species	Common Name	Conservations status (IUCN)
Columba eversmanni	Pale-backed Pigeon	VU - Vulnerable
Otis tarda	Great Bustard	VU- Vulnerable
Vanellus gregarius	Sociable Lapwing	CR – Critically Endangered
Neophron percnopterus	Egyptian Vulture	EN - Endangered
Falco cherrug	Saker Falcon	EN - Endangered
Oxyura leucocephala	White-headed Duck	EN - Endangered
Pelecanus crispus	Dalmatian Pelican	VU- Vulnerable
Clangula hyemalis	Long-tailed Duck	VU- Vulnerable
Aquila clanga	Greater Spotted Eagle	VU- Vulnerable
Aquila heliaca	Eastern Imperial Eagle	VU- Vulnerable
Haliaeetus leucoryphus	Pallas's Fish-eagle	VU- Vulnerable
Chlamydotis undulata	Houbara Bustard	VU- Vulnerable

About 48 thousand hectares in Kyrgyzstan is the total area of 11 internationally acknowledged Important Bird Areas (IBAs)[2]. Figure 3.1 shows location of IBAs in southern part of Kyrgyzstan and adjacent areas. According to the map, the IBA nearest to Osh is located at a distance of more than 200 km from city and in the Alay Valley separated from the Fergana Valley by the Alay Mountains. The nearest IBAs within the Fergana Valley are located on the territory of Uzbekistan about 300 km west of Osh.

Figure 3.1 Location of Important Bird Areas (marked green) in Southern Kyrgyzstan

Kyrgyzstan is party of 16 international environmental Conventions and Protocols[3]. The 4th National Report on Biodiversity Conservation was issued in 2008[4]; the 5th Report is under preparation. Detailed information of biodiversity status is provided in the National Environmental Statement of the Kyrgyz Republic for 2006-2011 issued by the KR State Agency for Environmental Protection and Forestry in 2012.

Rare and endangered species of flora and fauna of Osh Province (observed mainly in the undisturbed mountainous areas) are listed in

Table 3.2 List of rare and endangered species of flora and fauna present in Osh Province

English name	Russian name	Latin name
Zenaida's Tulip	Эремурус Зинаиды	*Eremurus zenaidae*
Knorring's Larkspur	Живокость Кнорринг	*Delphinium knorringianum*

[2] http://www.birdlife.org/datazone/country/kyrgyzstan/ibas

[3] http://www.nature.kg/lawbase/conventions/listconventions.xml

[4] http://www.cbd.int/doc/world/kg/kg-nr-04-en.doc

English name	Russian name	Latin name
Short-winged Bladder-senna	Пузырник короткокрылый	*Colutea brachyptera*
Wolly-fruited Kosopoljanskia	Козополянския пушистоплодная	*Kosopoljanskia hebecarpa*
Microcarpous Dorema	Дорема мелкоплодная	*Dorema microcarpum*
Tschitscherin's Root Borer	Усач Чичерина	*Prionus (Pogonartron) tschitscherini*
Kirghizobia Longicorn Beetle	Усач Киргизобия	*Kirgisobia bohnei*
Steppe, or Afghan, Tortoise	Среднеазиатская черепаха	*Agrionemys horsfieldi*
Desert monitor	Серый варан	*Varanus griseus ssp. caspius*
Zheltopusik (Armour Glass-lizard)	Желтопузик	*Pseudopus apodus*
Diadem, or Clifford's Rat, Snake	Пятнистый (Диадемовый) полоз	*Spalerosophis diadema ssp. schiraziana*
Lammergeier	Бородач	*Gypaetus barbatus*
Egyptian Vulture	Стервятник	*Neophron percnopterus*
Himalayan Griffon	Гималайский гриф	*Gyps himalayensis*
Eurasian Griffon	Белоголовый сип	*Gyps fulvus*
Cinereous Vulture	Черный гриф	*Aegypius monachus*
Eurasian Eagle-Owl	Филин	*Bubo bubo*
Bokhara Horseshoe Bat	Бухарский подковонос	*Rhinolophus (R.) bocharicus*
Lesser Horseshoe Bat	Малый подковонос	*Phinolophus hipposideros*
Asian Barbastelle (Asiatic Wide-eared Bat)	Азиатская широкоушка	*Barbastella leucomelas*
European Free-tailed Bat	Широкоухий складчатогуб	*Tadarida teniotis*
Beech Marten	Каменная куница (белодушка)	*Martes (Martes) foina*
Eurasian Lynx	Рысь	*Lynx lynx*
Snow Leopard	Снежный барс	*Uncia uncia*
Argali	Горный баран	*Ovis ammon*
Indian Crested Porcupine	Дикобраз индийский	Hystrix indica

A complete systematic illustrated check-list of the vertebrates present in Kyrgyzstan is available on www.wildlife.kg.

3.1.3 Protected areas

Protected nature areas play important role in biodiversity conservation and protection of ecosystems.

According to the KR Law "On Specially Protected Nature Areas" (of 3 May 2011, No 18), the protected areas with different purpose and rules of protection could be of the following categories:

- State natural reserves (for the strictest protection);
- State national parks;
- State game reserves (sanctuaries);
- State nature monuments;
- State botanical gardens, dendrological and zoological parks;
- Biosphere territories and/or reserves;
- Transboundary specially protected nature areas.

Out of 10 state reserves established in Kyrgyzstan one is located in the Osh Province - the Kulunatinskiy Reserve (27,780 ha) in the Karakuljinsky District near the Kulun Lake in the Alay Mountains at elevation of 2856 m south-east of Osh. Other protected areas located in the Osh Province are 2 State National Parks (Kyrgyz-Ata and Kara-Shoro), 15 game reserves (3 zoological, 2 forest, 3 botanical and 7 geological). Location of protected areas nearest to Osh is presented in Figure 3.2. The protected area nearest to Osh and suburbs is the Akbuurinskiy State Game Reserve (marked 12 on Figure 3.2) established in 1975 with area of 10 thousand hectares for conservation and recovery of the game species typical for steppe zone, e.g. hare, marmot, fox, etc. The game reserve is located at a distance of 17 km to the south (upstream of the Akbuura River) from the centre of Osh and from the site recommended for establishment of the sanitary landfill within the proposed Project.

Figure 3.2 Location of protected nature areas in the Osh Province

The Kyrgyz Republic Red List of endangered species of flora and fauna was published in 2007. The updated National Strategy of Biodiversity Conservation is under preparation. The Strategy will focus particular attention on establishment of additional protected nature areas. Development of protected areas is also reflected in the KR Government Program for Transition to Sustainable Development issued in 2013. According to the mentioned documents, establishment or extension of protected areas close to Osh city is not envisaged.

3.1.4 Current noise levels and air quality

Due to climate conditions with lack of winds the ambient air in the Greater Osh, like Bishkek, has a high risk of air contamination and a low self-cleaning potential. Even minor emissions of pollutants could result in considerable deterioration of air quality, particularly during winter time.

The air quality monitoring program in Kyrgyzstan was reduced in 1990. Only for the following 5 components are monitored during the recent years: NO_2, SO_2, NO, formaldehyde and ammonia. Assessment of air quality is based on comparison with the maximum permissible concentrations (MPC) for single time observed levels and MPCs for daily average concentrations of pollutants in air. The MPCs established by regulations of Kyrgyzhydromet are presented in Table 3.3, where the second column shows the permissible single time maximum concentration and the third column shows the daily average MPC.

Table 3.3 Maximum permissible concentrations of 5 pollutants in air, kg/m³

Pollutant	Maximum permissible concentration, microgram/m3	
	Single time maximun	Daily average
Main pollutants		
SO_2	500	50
NO_2	85	40
NO	400	60
Specific polluntants		
Ammonia	200	40
Formaldehyde	35	3

Source: Kyrgyzhydromet

Data on emissions of pollutants to air from stationary sources in regions of Kyrgyzstan are included in Table 3.4. Out of 36.3 thousand tons of pollutants emitted in 2011, emissions in Bishkek were estimated 17.0 thousand tons, and in Osh they were 1.3 thousand tons.

Table 3.4 Pollutant emissions to air from stationary sources in Kyrgyzstan, thousand tons

Region	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Batken Province	1.0	0.8	0.6	0.6	0.3	1.6
Jalal-Abad Province	2.2	2.2	2.1	97.9	2.5	2.4
Issyk-Kul Province	3.1	2.8	2.6	2.6	3.0	3.5
Naryn Province	0.04	0.04	0.04	0.04	0.04	0.03
Osh Province	0.3	0.16	0.15	0.12	0.09	0.99

Region	2006	2007	2008	2009	2010	2011
Talas Province	0.2	0.2	0.2	0.13	0.15	0.16
Chui Province	12.3	13.3	11.5	8.5	9.4	9.3
Bishkek city	16.4	17.8	21.9	25.6	14.4	17.0
Osh city	0.6	0.7	0.6	0.7	0.9	1.3
Kyrgyz Republic, total	36.1	37.9	39.7	118.2	30.7	36.3

Data on assessment of pollutant emissions from stationary sources per capita according to the KR State Committee of Statistics are included in Table 3.5.

Table 3.5 Pollutant emissions to air from stationary sources in regions of Kyrgyzstan, kg per capita

Region	2006	2007	2008	2009	2010	2011
Kyrgyz Republic	7.0	7.2	7.5	23.0	5.9	6.5
Batken Province	2.4	1.9	1.4	1.3	0.8	3.5
Jalal-Abad Province	2.3	2.2	2.1	84.7	2.6	2.3
Issyk-Kul Province	7.2	6.5	6.0	6.1	7.0	7.9
Naryn Province	0.1	0.1	0.1	0.2	0.1	0.1
Osh Province	0.2	0.2	0.1	0.1	0.1	0.9
Talas Province	0.9	0.9	0.9	0.4	0.7	0.7
Chui Province	16.3	15.9	15.1	10.7	11.7	11.3
Bishkek city	19.8	21.3	25.9	29.4	16.3	19.5
Osh city	2.4	2.7	2.4	3.1	3.9	5.0

Note: in 2009 in Jalal-Abad Province emissions of OJSC Kyrgyzneftegas were 79.4 thousand tons.
Source: KR National Statistics Committee

The assessment for Osh in 2011 was 5 kg per capita. For Bishkek it was 19.5 kg per capita. Concentrations of NO and SO_2 3 times higher than MPC were observed in Osh.

The transport is reportedly responsible for 69% of pollutant emissions to air in Osh. The number of vehicles in the city exceeds 13.5 thousand (about 10 % of them have diesel engines) with about 75 % of vehicles in private ownership.

Other sources of air pollution are the industries: Osh heat and power plant OshTETs, Asphalt and Concrete Plant JSC, Osh Ak-Tash JSC, Limatex Corporation, Oshkrasteks Ltd, Rosagrobusiness Ltd, Bektur XXI-Vek Ltd, ZhBI-20 CJSC, Bolot JSC, Oda-Yug Ltd, etc.

Noise disturbance for residents of Osh and suburbs during day hours is mainly related to road transport along the main roads. During night hours the noise nuisance could be caused by a lot of barking dogs, some of them are guarding the territories of enterprises and private houses, the others are stray dogs.

3.1.5 Emergency preparedness and response

Osh is located in the southern part of Kyrgyzstan, which highly vulnerable to a wide range of natural hazards such as floods, droughts, earthquakes, landslides, and mudslides. Construction projects in Kyrgyzstan should be elaborated and implemented in compliance with the available national regulations addressing the issues of emergency preparedness and response. The hazards in catchment areas of rivers originating on the territory of Southern Kyrgyzstan may have transboundary implications for the downstream areas located in Uzbekistan and Tajikistan. Outbreaks of infections are also among hazards posing risks for population and animal stock in Kyrgyzstan.

Management of preparedness and response for emergency situations in Osh and its suburbs is the responsibility of local authorities and the regional office of the KR Ministry of Emergency Situations. The impacts of natural disasters are particularly significant in cases when deposits of waste are eroded by surface water during floods upon heavy rains and rapid melting of snow and ice in the upstream areas. However, the impact of the Osh dumpsite is affecting the local communities even under normal precipitation conditions, because the surface water run-off from the dumpsite area enters the Aravan-Akbuurinsky Canal and poses risk of infection spreading in the area. Resolution of Osh City Administration issued on 21 January 2013 (regarding the performance of the City Department of Emergency Situations in 2012 and priority tasks for 2013) highlighted the urgent need for closure of the Osh dumpsite.

3.1.6 Description of site recommended for landfill

The site recommended for landfill was identified upon a thorough study with assessment and comparison of this site and three alternative sites. The materials are presented in the Site Selection Report prepared as a separate document during the Feasibility Study.

The recommended site is located within the upper part of the north-eastern slope of a hill ridge. The landscape conditions are typical for the zone of adyrs. Available schematic maps of the site are presented inFigure 3.3 and Figure 3.4.

Figure 3.3 Location of the site in southern part of Shark municipality

The site area has a triangular-like form with a south-western border along the road parallel to the top of ridge, the eastern border going south- north down the ridge slope and the northern border going in latitudinal direction. The ridge is a border between territory of Shark municipality and territories of Osh city west and of Toloikon municipality south-west of the considered site. The ridge is also a watershed divide between the watersheds of streams going towards south-west directly to the Ak-Bura River and the watersheds of temporaty streams going in the northern direction in spring time and having dry valleys the remaining time of a year.

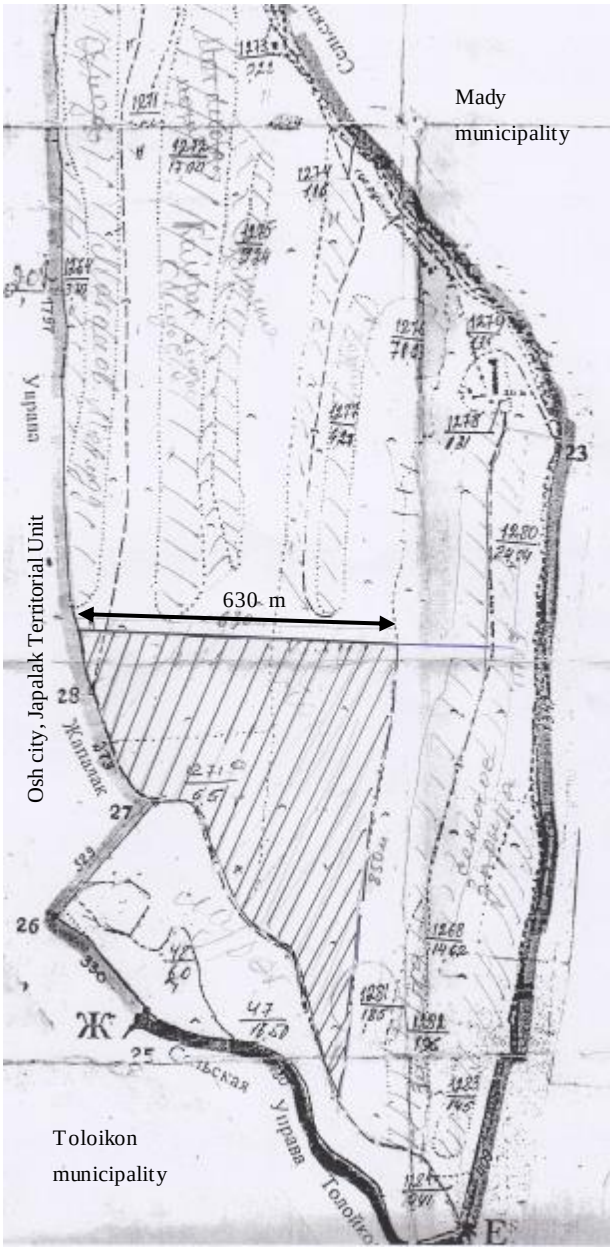


Figure 3.4 Southern part of Shark municipality borders and location of site considered for establishment of landfill

Transportation distance from the centre of Osh is about 10 km. The site location is rather convenient for transportation of waste from Kara-Suu town and other densely populated areas located north of Osh, particularly via the eastern road bypassing Osh.

An overview from the access road towards south over the site (in a depression on a slope with some remaining snow) recommended for establishment of landfill for Osh and suburbs is provided in Figure 3.5.

Figure 3.5 General view towards south over the site for landfill and road passing by the site

The site is located within the slope having almost negligible prospects to become an arable land. The site seems to have a potential for future extension of the landfill over the adjacent areas of similar type. The land used for agriculture and access roads to them, remaining concrete basements of some structures located west of the site are visible indications of habitat disturbed by economic activities.

Geology

The geological structure of the site is typical for adyrs and includes a cover layer of loess loam (thickness about 5-15 m depending on the terrain elevation) underlined by pebblestone (thickness exceeding 100 m).

Hydrogeology

No groundwater has been encountered within the investigated depth of 20 m in the lowest part of the site. Groundwater is reportedly encountered at the site like in the zone of adyrs in its surroundings within the depth of about 100 m.

Environmental and social concerns

The site is located within area which was earlier used as hay land, but in the latest land use plans of the Shark municipality is allocated for investment projects requiring large area sites (e.g. 15-30 ha). In this respect the considered site and its vicinity are definitely somewhat unique for the Greater Osh, where the general pattern of land ownership is a "mosaic" of smaller land plots.

No protected nature areas are located within 5 km radius from the site. Distance from nearest existing residential area (the Amir-Timur community, a part of Osh city) and the Achi residential area, which is under new construction (within the development program of Osh city by extending the city borders in the eastern

direction) exceeds 1.5 km. Three stand-alone houses have only roofs visible from the site, because the houses functioning as shepherd shelters are "hidden" in the landscape depressions. Photo on Figure 3.6 shows the nearest stand-alone house (only its roof is visible from the site) from a point along the access road to the site. The distance between the nearest houses and the site borders is more than 0.5 km. Thus the overall visual impact of the site operations would be low.

Figure 3.6 View of nearest stand-alone house from access road to the site

Construction requirements

Clayey soil (loam) is available for construction of landfill bottom. Loose soil is also available for meeting various construction requirements for other elements of landfill structure and the operation needs. Extra construction works would be required for upgrading of access road to the site – towards south from the southern border of the Achi residential area. The access road to the landfill is located outside the residential areas. The construction works for upgrading of access road to the landfill will have short-term impact on the communities. The impact will be caused by vehicles and machinery operated during the construction works.

A view from the site in northerd direction towards the areas of Amir-Timur community and Achi community of Osh city is provided in Figure 3.7.

Figure 3.7 View from the site towards the nearest residential areas

3.2 Socio-economic environment

3.2.1 National context

The Kyrgyz Republic's economy grew by an annual average of 3.9% during 2001–2012, despite its multiple challenges. Growth has been periodically undermined by political events, economic crises, and technical issues affecting gold production. Following the events of 2010, GDP contracted by 0.5 % in 2010. The economy in the country's South was especially hard hit by a closure of borders with Uzbekistan. Recovery began in 2011, with GDP growth of 6.0 %, but GDP fell by 0.9 % in 2012, when gold production declined. Gold production is expected to recover in 2013, and the Asian Development Bank (ADB) envisages the GDP growth of 7.5 % for the year. The government has growth targets of more than 7% for 2013 and 2014. The factors involved in the uneven growth pattern show clearly that political stability and economic diversification are needed to make the country's growth sustainable.

Services, particularly transport and communications, have grown rapidly. The service sector's share in GDP increased from 31.5 % in 2001 to 46.6 % in 2012. The share of agriculture declined from 34.5 % to 17.5 % during the same period, while the share of industry remained roughly constant. On the demand side, growth was driven by the consumption financed by remittances from labour migrants working abroad, which have increased rapidly since 2000 and was equivalent to 27.3 % of GDP in 2012. In 2012, two-thirds of investment was directed to Bishkek City and the Chui and the Issyk-Kul Provinces and concentrated in the transport, communications and mining sectors.

Gold makes up 46 % of exports, and the Kumtor Gold Company alone accounts for more than 10 % of GDP.

The country's GDP per capita ($1,144) in 2012 was the second lowest in the Commonwealth of Independent States.

In April 2010, major protests across the country forced the president to leave. The political unrest was followed by ethnic violence in June in which, hundreds of people died and a great deal of property was damaged. Although stability has returned, the reconciliation process has been slow and especially painful in Osh.

Persistent poverty and economic disparities contributed to the past popular unrest and remain the government's greatest challenges. The poverty rate declined rapidly from 56.4 % in 2001 to 31.7 % in 2008, but a harsh winter in 2008 and the effects of the global economic crisis in 2009 stalled progress. The global crisis particularly affected remittances, which are an essential source of financial support for many households. The poverty rate rose to 33.7 % due to the impact of the protests in 2010 and to 36.8% in 2011. Bishkek City, the Chui oblast that surrounds it, and Issyk-Kul oblast have substantially lower poverty rates than the rest of the country. Poverty rates often differ little between rural and urban areas within oblasts (provinces). Education level is a significant determinant of poverty.

Official unemployment was about 8.5 % in 2011, with an estimated 20 % of the labour force working abroad, mostly in the Russian Federation or Kazakhstan. Off-farm work is increasingly important—only 46% of the overall rural population (including workers absent abroad) worked in agriculture. The country's labour productivity is among the lowest in Central Asia, although it has been increasing gradually since 1995. Labour migration has contributed to reducing rural poverty.

The Kyrgyz Republic needs economic growth to reduce poverty. Political instability, weak rule of law, and corruption are the most serious constraints to growth. Other constraints to the country's economic growth are (i) a shortage of skilled labour due to the low quality of education and training, (ii) the high cost of finance, and (iii) an unreliable electricity supply. The problems of skill shortages and the high cost of finance are especially acute in remote oblasts.

Improving access to affordable finance not only in the better-off regions of Bishkek City and the surrounding oblasts but also in the country's remote oblasts will help distribute economic opportunities more evenly across the regions.

In January 2013, the President of the Kyrgyz Republic approved the National Sustainable Development Strategy (NSDS) for 2013–2017, which was developed by the National Council for Sustainable Development of the Kyrgyz Republic. The strategy aims to achieve successful, stable democracy, along with stable growth in GDP and household incomes. Persistent poverty and regional disparities are recognized as key challenges. The strategy addresses the causes of instability directly by making the rule of law, national unity, and the integration of all ethnicities its main goals.

According to findings of the **Life in Transition survey** results for Kyrgyzstan published by the EBRD in 2011 less than half of respondents in Kyrgyzstan say that the crisis has not affected them at all. Around 45 per cent of households say that reduced remittances and wages have been the dominant consequences. This may reflect the fact that the economic downturn in Russia, which hosts many Kyrgyz migrant workers, exacerbated the impact on households in the Kyrgyz Republic. The vast majority of households have cut down their consumption of staple and luxury goods in the past two years.

Although one-third of respondents prefer democracy and a market economy, around 25 per cent would rather live, under some circumstances, in an authoritarian system and planned economy. Only 60 per cent believe that elections are necessary to choose political leaders – among the lowest support for elections in the transition region. Just about 20% of respondents say that they would prefer a country with more political liberties and lower economic growth to a country with higher growth and fewer liberties.

Respondents are sceptical about the existence of basic democratic institutions. A majority of respondents do not think that their country has free and fair elections or law and order. However, few are apathetic about the style of government and most believe that its form will affect them: one-fifth believe that citizens should be more active in questioning the actions of the authorities.

Trust in governmental institutions has collapsed since 2006. The Kyrgyz Republic now ranks in the bottom 10 of transition countries for trust in the presidency and government. This may be a consequence of violent riots in the capital, which brought down the government in April 2010 and were followed by ethnic unrest in the south of the country. On the other hand, over 95 per cent of respondents have complete trust in the family, although two-thirds say that they would not trust people who they meet for the first time.

3.2.2 Power relationships and governance issues in Osh

Osh City Kenesh is the legislative power body. Osh City Administration is the executive power body. According to website of Osh City Administration (www.oshcity.kg), the Kenesh and City Administration do not have enough power for comprehensive and efficient governance on the city level. The City Administration in fact is coordinating the work of several utilities. Other spheres of governance are covered by establishments of the national ministries, committees, agencies and services. These establishments are not actively involved in cooperation with Osh City Administration.

Additional challenges for the governance in Osh are caused by rather complicated and not clear pattern of administrative and territorial set-up. Many of the city territories are located as enclaves within the Karasu District of the Osh Province. At the same time some of residential areas of adjacent rural municipalities are located as enclaves surrounded by territories of Osh city. The borders between Osh city and adjacent rural municipalities are not defined clearly. This results in

complications for the city budget and during elections of the national and local power bodies.

The city's administrative structure includes 11 territorial councils and 1 (Japalak) territorial board of villages including 10 villages. The community/neighbourhood based self-government organisations are 86 Quarter Committees.

3.2.3 Demography and social composition

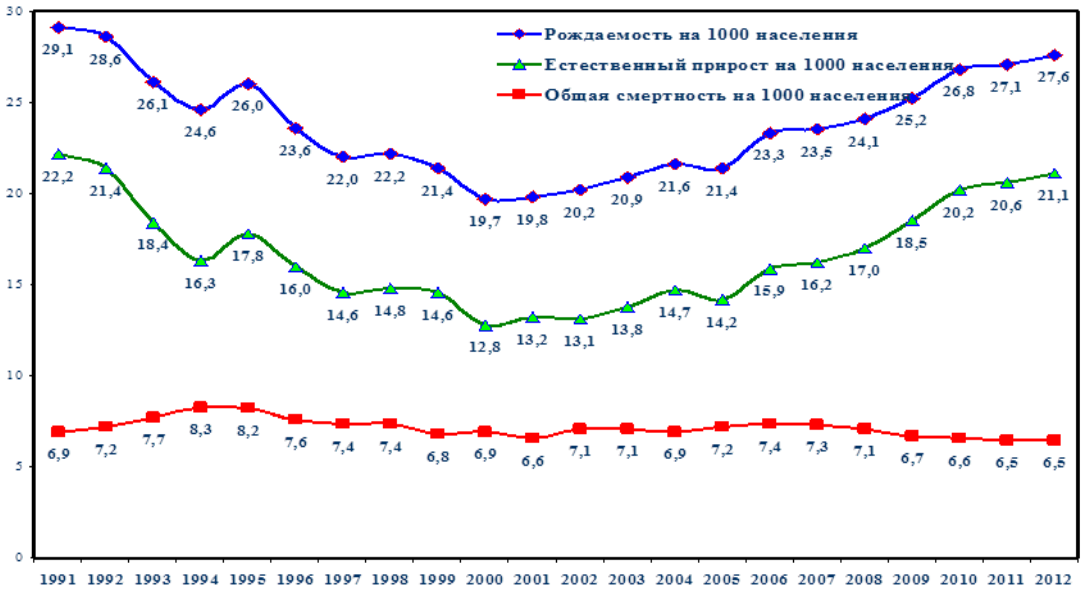
National context

By 1 April 2013 population of the Kyrgyz Republic was 5.6878 million, which is 1.9 % higher than a year ago. The population growth shows rather stable trend (1.4% in 2012) resulting from birth rate exceeding the death rate even with the negative balance of international migration.

Population of Kyrgyzstan is rather young. In the beginning of 2013 the number of children and teenagers corresponded to 36.5% of population, the percentage of active working age was 60.8, and the number of residents older than working age corresponded to 6.6% of population.

Growth of birth rate is observed starting from 2001. The natural increase of population in 2012 was 21.1 per 1,000 persons. Mothers of about 65% of children born in 2012 were 20-29 years old and were born during the baby-boom of mid-1980-ies. Data for demography of the Kyrgyz Republic for 1991 to 2012 are presented in Figure 3.8.

Figure 3.8 Data on demography of the Kyrgyz Republic



Source: Draft of the KR Strategy for Health Sector Development until 2020[5]

Blue line on the Figure shows the birth rate for 1,000 of residents, the red line shows the death rate, and the green line indicates the natural increase of population.

Osh region

According to the official statistics the number of permanent residents of Osh in 2011 was 255.8 thousand (with 1133.2 thousand women and 122.6 thousand men) including 25.4 thousand residents of villages within the city territory (23.5 thousand of them being Kyrgyz and 1.6 thousand being Uzbek).

The number of households in Osh is estimated 57,392 with average size of 4.5 people. According to the latest census (2009) the average household size in Osh is 3.3 in urban areas and 5.8 in rural areas. About 56% of households in Kyrgyzstan consist of one generation of parents with or without children. The remaining 34% are households with two and more generations of parents. The number of single-person households is estimated 9% (mostly of pensioners); the number of households including non-relatives is about 2%. In 2009, about 34% of singe-person households were of people with age 60 and older, majority of them being women.

Many people in Osh, including local residents and internal migrants, live in singe-storey buildings constructed close to each other and not compliant with regulations in the sphere of urban development, hygiene and fire safety. Yong people from Osh and suburbs during recent years tend to become labour migrants in Russia and Kazakhstan, but people from rural areas come to Osh as internal labour migrants.

[5] http://www.med.kg/Articles/ViewSection.aspx?m=28&sm=28438&ArticleID=438

The phenomenon of labour migrants shows dramatic consequences for the traditional family relations in Kyrgyzstan. Many young families most of the time stay without one of the parents (typically fathers travel for jobs). Labour migrants concentrated in Bishkek, Osh and other cities cause certain social tensions, particularly when their anti-social behaviour affects the local communities or they get involved in crimes.

3.2.4 Conflict and social tension in Osh

Certain conflicts and social tension in the Osh agglomeration are considered as having ethnic background. The authorities, local community based organisations, NGOs, international organisations implement the conflict prevention and resolution programs and public advocacy campaigns for tolerance and interethnic dialogue. The local economy and social environment were dramatically affected during the inter-ethnic conflict of 2010. The governmental program of the city rehabilitation and development investment projects is under implementation in Osh. The authorities are reporting on the progress in construction of residential buildings, roads, water supply facilities. NGOs play active role in mitigation of conflicts and tensions, e.g. Interbilim NGO keeps active dialogue with the Osh City Administration and the stakeholders of the investment projects and has experience of the project monitoring.

Donors and international organisations, including UNDP, did not anticipate that violent conflict of the scale experienced in April and June 2010 could occur in Kyrgyzstan. In response to the events the international organisations put more emphasis on conflict prevention and peace building interventions and strengthened the conflict-sensitivity of their programmes to contribute to stability and peace. UNDP's subsequent peace building and conflict prevention activities helped ease tensions through support to local peace councils and cross-border working groups addressing causes of cross-border conflicts and promoting cooperation. In 2010 UNDP supported dialogue between civil society, law enforcement agencies and the Central Electoral Commission, in order to prevent violence during the elections, and to provide conflict-sensitive capacity development support to the State Directorate for Reconstruction and Development of Osh and Jalal-Abad Cities.

Advocacy Centre NGO in Osh is contributing to prevention of social tensions related to internal migrants. According to the NGO leader Mr Zhenish Toroev, the internal migrants typically come to Osh from peripheral rural/mountainous areas, which after collapse of collective farms provide no job opportunities. Internal migrants coming to Bishkek and Osh are typically those who could not go for jobs in Russia or Kazakhstan. According to official statistics, the number of internal migrants in Osh in 2012 was 260 thousand. They typically live in private or corporate dormitories of 50-70 rooms with 3-7 people per room. Some of them have been living in the dormitories since 1991, but still has no formal registration as Osh residents. Without registration they cannot get a land plot and have limited access to social services (place for kids in kindergarten, school, access to medical services, pensions, subsidies, etc.). The internal migrants often have low qualifications and low salaries.

A study carried by Advocacy Centre shows that the majority of criminal cases dealt with by police in Osh and taken to court were committed by internal migrants. About 60-70% of crimes were committed by unemployed persons due to their desperate situations. Dormitories and flats occupied by internal migrants in Osh sometimes become centres of prostitution.

The head of police office in Osh in information provided via the mass media agency Aki-Press reported without providing the specific data that within the overall number of of various crimes committed in Osh (according to the information source, the overall number has not been growing) the number of crimes committed by women has been growing during the recent years. The Osh police experts see the reason for this in general weakening of family status, changes in social status of young women, early marriages and divorces, conflicts in families between young women and too demanding relatives of their husbands.

3.2.5 Waste pickers in Osh

About 30 people (10-15 women of age 30-40, 3-5 children of age 8-10, about 5 men of age 15-20 and about 5-10 men of age 30-40) are involved in waste picking activities at Osh dumpsite. Most of them are of the Lyuli ethnic minority. The Lyuli are often known in the Central Asia as being poor and migrating from place to place without permanent jobs. They are sometimes considered as an excluded and marginalised group. Their lifestyle is somewhat similar to the lifestyle of the Roma minority in Europe. In Lyuli families women are traditionally supposed to earn money (e.g. by beggary and fortune-telling), while men take care of kids and housekeeping. Many of the waste pickers have no passports or other personal documents, required for being considered eligible for formal employment with Osh-Tazalyk, but the Lyuli are typically not even interested in seeking formal , because this would conflict with their traditions. However, some of the Luyli having passports are employed and successfully working in Osh-Tazalyk as loading workers in crews of waste collection trucks. At the same time a number of lyuli communities located in Osh and its surroundings are also known as well functioning similarly to communities of other ethnic groups.

Waste pickers apparently supply specific fractions of waste to some recycling chains. Families of the waste pickers have other sources of income, as they typically cannot just rely on sales of materials they extract from waste. The waste pickers accumulate on the dumpsite territory rather big quantities of separated recyclables, before they are picked up by "the clients". Experience and skills of waste pickers could be valuable for possible support of private recycling initiatives. Livelihoods of waste pickers depend on access to waste. Informal waste pickers present at the dumpsite in Osh have free access to waste disposed earlier, but are particularly interested in access to new waste arriving at the dumpsite. Closure and rehabilitation of the dumpsite will limit the access to waste and thus affect the livelihoods of informal waste pickers. The interests and skill of waste pickers should be addressed during planning of the improved waste management system including establishment of the sanitary landfill.

3.2.6 Land ownership and tenure in Osh

According to the assessment made by the Taxation Service of Osh City in 2013, the city territory after 2004 was enlarged with about 3.67 thousand hectares transferred from the adjacent rural municipalities. However, the land taxes are still paid to the rural municipalities and not to the city.

Land ownership and housing demand is a hot issue in Osh and its surroundings. Many of parcels of land have been provided to families of Osh residents, but due to conflicting provisions of resolutions issued by the governmental bodies, the construction of family houses during several years was not authorised on the provided parcels. .

According to the mass media agency AKI-Osh, in May 2013 about 400-500 participants of a meeting held in the centre of Osh underlined the need for formal registration of their rights for land plots allocated in Ken-Sai and Achi residential areas, which are currently under establishment. Reportedly, more than 80 thousand people applied for allocation of land plots in 2011, but the formal protocol on approval of the land plot allocations has not been signed. About 5 thousand people took part in unauthorised take-over of plots in the mentioned areas.

More than 60 thousand families have applied for allocation of a land plot for construction of their own houses. Most of the applicants came from various districts of the Osh Province and have worked for more than 5 years in Osh living in rented flats and dormitories without formal registration. About 9 thousand of people who have got the land plots and started the construction had to stop because of the missing governmental decision and the engineering infrastructure (water, gas, power supply) development plans for the areas.

Some people still awaiting the allocation of land plots are those who came to Osh during the Soviet Uniton time, when young people from rural areas were mobilised by the authorities to get education in professional colledges and became the workers at large state-owned industrial enterprises based in Osh (the cotton factory, the silk factory, the pump plant, etc.). For many years these workers lived in dormitories and awaited the corporate allocations of flats in Osh. After collapse of the Soviet Union the privatisation resulted in redundancies, closure of enterprises, so the workers got no salaries and now places to live. Some of them in 2010 just took-over the plots they could see available.

The government decided to allocate 31,200 plots (3,747 ha) of the Aravan District territory, the Kara-Suu District territory and the territory of Osh city for establishment of the Kensai/Kattasai residential area (1,643 ha) close to the south-western border of Osh and the Achi residential area (1,343 ha) close to the eastern border of Osh. The areas are former arable land transferred for construction of individual houses.

3.2.7 Present and proposed land use for Osh landfill

Transfer of agricultural lands and establishment of new residential areas were addressed during elaboration of the future MSW management system in Osh and

its suburbs. The present and future land use aspects were studied with particular attention during selection of site for establishment of the sanitary landfill for the Greater Osh, as described in the Site Selection Report prepared earlier in 2013 within the Feasibility Study funded by the EBRD.

Starting from 1985 the share of degraded agricultural lands in Kyrgyzstan has been considerably increasing. About 80% of agricultural lands are considered affected by the degradation, but the status is not monitored since 1990. The average productivity of pastures is about 40% of the normal level, and for the pastures closes to residential areas the productivity level is estimated 10-20%. According to the specialists, the present grazing methods and available breeds of cattle cause further degradation of pastures, particularly on steep slopes of hills and mountains, where the protection of vegetation is important for control of soil erosion. Degradation of vegetation typically results in changed diversity of plant species. Indicators for degradation of pastures have been observed on the slopes of adyrs in eastern suburbs of Osh, i.e. within the site in southern part of Shark Municipality recommended for establishment of sanitary landfill for Osh and suburbs.

The areas adjacent to the site selected for landfill were some years ago disturbed during construction of facilities for a major irrigation canal. The construction works were stopped without subsequent rehabilitation of the excavated areas and removal of the in-situ cast concrete structures. A high-voltage power transmission line poles are installed along the eastern border of the site.

The site recommended for establishment of the sanitary landfill within the proposed Project is owned by the Shark municipality and is located in area with steep slopes not particularly suitable for agriculture or urban development. However, the site is still registered as hay land and for establishment of landfill should pass the procedure of land transformation (change of land use category) applicable in Kyrgyzstan. Shark Municipality and other municipalities in the Kara-Suu district have recent experience of agriculture land transformation for the needs of Osh city development, e.g. for the Achi residential area (including more than 400 ha of former agricultural lands) located about 1.5 km north from the site recommended for establishment of the landfill. The transformation procedure for hay land and pastures is reportedly much easier than for arable and irrigated lands, but can anyhow take more than a year, because the final decision should be made at the national level. Options for future ownership of the landfill site include ownership by Shark Municipality or ownership by Osh city.

3.2.8 Economic activities

National context

The private sector in Kyrgyzstan accounts for 75% of GDP and dominates most sectors. A very large number of small economic entities—mainly farmers, individual entrepreneurs, and small enterprises operating in the informal/grey sector—dominate the economy. Few large firms with strong growth prospects

exist. State ownership is concentrated in infrastructure, utilities, and social services. Infrastructure markets are characterized by limited competition and include monopolistic structures dominated by state-owned enterprises. In addition to its policy and regulatory roles, the government is generally responsible for public infrastructure, directly or through state-owned enterprises.

Osh region

The economy of Osh includes 37 major enterprises with profiles in textile and clothing industry, food industry, construction activities and production of construction materials. The agricultural sector includes about 2 thousand of farms typically specialising in animal husbandry (production of milk and meat), vegetable gardening and plant growing. The main crops are wheat, barley, corn, potatoes, vegetables, melons. Commercial companies of Osh are active in wholesales on the local and external markets. Numerous shops and markets operate all over the city and have long opening hours. The traditional bazar is located in the city centre. Many residents of rural areas are commuting to Osh on a daily basis for business reasons.

Transport system of Osh includes road and railway infrastructure, as well as an airport with regular domestic and international connections.

Informal (grey) sector of economy (in Kyrgyzstan it is estimated 39% of GDP) is characterised by poor enforcement of taxation and lack of financial transparency, which provides unfair competition and wrong incentives for economic development. It affects the quality of official statistics, which provides a poor background for political and economic decisions. It also underpins the corruption and lowers the country's attractiveness for international investors.

Considerable part of active population in Osh is employed in trade sector, which is typically organised following the local family and tribal principles and has a major part of grey turnover with rather low contribution to the city budget. Activities of informal sector in Osh city provide opportunities for livelihoods of many families, but are not transparent and accessible for the taxation system. To improve transparency of financial operations the city authorities facilitate for development of non-cash payment systems, first of all for the services of the city utilities. More and more private and corporate customers of utility services prefer electronic payments (for services of utilities including waste collection services), e.g. via terminals in supermarkets, via webpages and via mobile phones.

Generation of municipal solid waste in the formal and informal sectors of economy should be taken into consideration during preparation and implementation of the Project. Rules and revenue collection systems should be clearly established for the customers other than households.

3.2.9 Distribution of income, goods, services

National context

According to the National Statistics Committee, the average monthly salary in Kyrgyzstan by the 1 October of 2012 was 10,473 KGS. The data for Osh city and the Osh Province are included in Table 3.6.

Table 3.6 Average monthly salaries (data by 1 October)

	Average salary, KGS/month			
	Employees of budgetary sectors		Employees of other sectors	
	2011	2012	2011	2012
Kyrgyz Republic	6,393	8,878	11,170	13,302
Osh Province	4,663	7,243	6,960	9,721
Osh	5,898	8,329	9,822	11,430

The annual average value of the minimal living wage in Kyrgyzstan was calculated to be KGS 3,502.65 (2010), an increase of 7.3% compared to 2009. In 2010, prices and tariffs for consumer goods and services have increased almost 19.2% compared to 2009 and over 5 years the overall consumer prices and tariffs have increased almost 1.7 times. Over the past five years, changes in inflation were ambiguous. In 2006, the average inflation rate for consumer goods and services was 5.1% and in 2007 and 2008 it increased to 20%. In 2009, prices and tariffs remained unchanged compared to 2008, but in 2010 once again consumer prices and tariffs rose with 19.2%. Over the last five years, the share on pensioners made up on average 10% of the overall population of Kyrgyzstan with 3.9 employed persons per one pensioner.

The living wage (poverty level) in Kyrgyzstan by 1 October of 2012 was 4,298.95 KGS. Cost of food items was estimated 65% of the minimum living wage, cost of non-food goods was 16%, cost of services was 17% and taxes were estimated at the level of 2%. Data for living wages of different categories of population in Kyrgyzstan in 2012 are included in Table 3.7.

Table 3.7 Living wage in Kyrgyzstan in 2012, KGS

Average	**4,298.95**
Population of active age	4,810.41
Men	4,928.11
Women	4,752.32
Pensioners	3,824.16
Children	3,651.10
age 0 to 7	3,243.66
age 7 to 14	3,799.28
age 14 to 17	4,112.83

The political tensions in Kyrgyzstan and the global economic crisis resulted in the overall lower living standards. The poverty rate increased from 31.7% in 2008 to 36.8% in 2011. The highest poverty rates are in the Talas Province (50.2%), in Naryn Province (49.9%) and in Jalal-Abad Province (45.3%).

Over the past five years, the nominal cash income of the population in Kyrgyzstan has increased 2.2 times. The nominal per capita cash income in 2012 was 2,494

KGS per month, an increase of 7.9% compared to the previous year. The cash income of urban population is 10% higher than that of rural population. However, the cash income significantly differs from region to region, with Osh and Jalal-Abad Provinces being at the same level of approximately 2,300 KGS, whereas population in Bishkek City has a cash income of 3,024 KGS. The lowest cash income 2,099 KGS is recorded in Talas Province. Over the last five years, the per capita cash income increase was the highest in Jalal-Abad Province (3.3 times).

Should be separate sub heading here.

Osh region

According to the assessment of Osh City Board of the KR Ministry for Youth, Labour and Employment in August of 2013 the number of unemployed persons registered as looking for jobs was 5,970 including about 2.6 thousand women. About 2.4 thousand of the registered persons (1.9% of economically active population) had the official status of unemployed, 42.5% of them were women. The city authorities are using opportunities for involvement of unemployed people in paid social works, e.g. related to development of infrastructure.

People in Osh complain about poor information about the status of their payments for waste collection services. Many people are not sure that their cash payments at a waste collection truck or to via a person from a street committee are actually registered in the accounting system of the waste collection company. More and more people in Osh prefer the non-cash payments and access to clear information of the customer payment balance for waste management in the same way as they get for other services.

Increase of tariffs for waste management should be addressed taking into consideration the local affordability constraints and the existing system of social allowances (see Section 3.2.13).

Effective methods should be used for improvement of the revenue collection rate for the waste management services.

Transparency of billing and payments is essential for the revenue collection system. A modern non-cash billing and payment registration system is a convenient tool to ensure the transparency.

3.2.10 Education

National context

A shortage of skilled or qualified workers is a major constraint on economic growth in Kyrgyzstan. This is mainly caused by deterioration in the quality of general and vocational education, the failure of the education system to offer training that meets the market's needs, and migration. An individual's levels of education and skills are important determinants of employability and wages. Data show that graduates of vocational schools and tertiary education are more likely to be employed than high school graduates. Yet, 50% of the country's high school

graduates do not go on to higher education or vocational schools, and the prevalent youth unemployment that is considered a simmering cause of social unrest.

Osh region

Like in other regions of Kyrgyzstan, better education and skills training are high priorities for development of human resources in Osh. However, the city faces tough constraints in the sphere of education.

According to the Head of Osh City Department for Education, there is a shortage of preschool education institutions in Osh. The number of kindergartens before 1990ies was 71, but most of them have been closed, the buildings rented out. By August of 2013 only 31 kindergartens were functioning, many of them with groups twice larger than according to the regulatory guidelines. About 7 thousand kids in Osh have no access to preschool education institutions. The City Administration is daily approached by more than 10 parents looking for preschool education opportunities for their children. Rural suburbs of Osh face similar shortage of kindergartens.

About 4,500 children started the first year in schools in Osh in September 2013. The number of schools is 56 with about 45,000 pupils and 2,500 teachers. More than 180 positions of school teachers were vacant in Osh by the beginning of new school year in September 2013. There are not so many young teachers, so the schools make efforts for attracting the future graduates of universities and for professional support to the young teachers. The local authorities in Osh cover the costs of utility services provided to the teachers.

According to the Head of Education Department of Osh, the analytical data of last years show that the number of schoolchildren is decreasing (from 51,000 in 2008-2009) due to migration and a trend of leaving schools after the 9th year for getting a professional education or job. About 25-30% of children with incomplete education (9 years) go for jobs in the services sector. Workers professions are not popular with the youth in Osh.

Among students of 5 universities located in Osh the most popular professions seem to be lawyers, economists, doctors. Many of the new graduates cannot get jobs in the relevant sphere.

Preparation and implementation of the proposed Project should consider involvement of children and youth in the public information and awareness raising activities via the education institutions.

No institutions for education and training of SWM specialists are available in Osh. Staff training programs with support of consultants will be required for the Project implementation.

3.2.11 Population health profile

National context

According to the KR Ministry of Health data of August 2013, about 35-45% of all infection diseases in Kyrgyzstan are caused by helminthis infections. From 24 to 45 thousand cases of helminthosis are registered annually. The main causes of helminthosis are discharge of wastewater without proper treatment, spreading of infection with food products, poor hygiene in kindergartens and schools, insufficient sanitary and veterinary services. About 40 thousand cases of enteric infections are registered in Kyrgyzstan every year. More than 80% of the infected are children of ages below 14.

According to the Programme of the Health Sector of the Kyrgyz Republic Adaptation to Climate Change for 2011-2015, every year more than 17,000 people, i.e. about 50 people per day die in the Kyrgyz Republic from heart-relating diseases. A big number of people who died of heart diseases are persons of "working age", leading socially active life, who are employed in different areas (production, business, science, culture, etc.). Although the majority of cardiovascular deaths are in the older age groups, in 2006 compared with 1990, mortality from cardiovascular disease in young people (aged 30-39 years) increased by 18,3% and among persons in the age bracket of 40-49 years old - by 15,6%.

For the primary causes of disability of the adult population of the Kyrgyz Republic, cardio-vascular diseases constitute 17.4%, which significantly exceeds similar indicators for other diseases, which are under 10%.

Cardiovascular diseases are the prevailing causes of death in Kyrgyzstan (51.3% of persons died in 2012) for elderly people and for people of the active working age.

The second group of death causes are traumas, intoxication and other external factors (9.6% of persons died in 2012). Among people died after accidents 80.5 % were people of active working age with 4 times more men than women. The third group of death causes (9.2% of persons died in 2012) including various types of cancer, and 7% of persons died in 2012 because of respiratory system diseases. Infections and parasitic diseases caused 2.6% of deaths, 62% of them due to tuberculosis. Life expectancy for men is almost 8 years lower than for women.

Outbreaks of infection diseases occur in Kyrgyzstan every year. During the last 5 years for every 100 thousand of population the number of cases was 3.3 to 3.8 for enteric febed, 0.8 to 1.7 for paratyphoids, 4.2 to 13.4 for salmonellosis, 294.7 to 487.9 for various enteric infections, 0.16 to 0.4 (i.e. 15 to 23 cases total) of Siberian plague. The risks with regard to Siberian plague are still high, since 55% of hotspots registered by the authorities in Kyrgyzstan as places with infected soil have not been identified and marked in the landscape. The total number of Siberian plague soil hotspots registered in Kyrgyzstan in 1,119. The numbers of hotspots in various regions of Kyrgyzstan are presented in Figure 3.9.

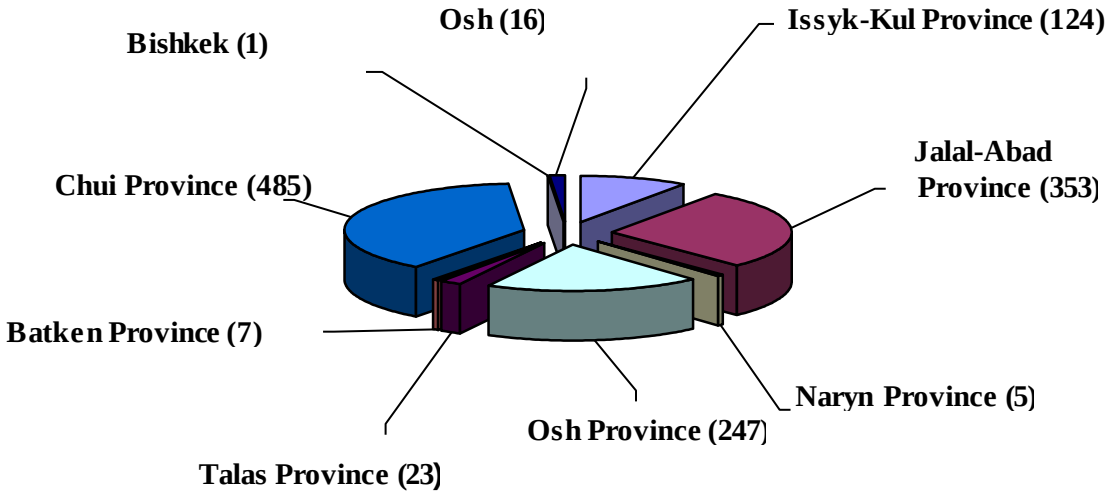


Figure 3.9 Number of soil hot spots of Siberian plague (Anthrax) registered in Kyrgyzstan

Available data on cases of the Siberian plague registered in 2005-2009 are presented in Table 3.8

Table 3.8 Cases of Siberian plague in Kyrgyzstan and selected regions

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Osh Province	-	-	8	13	20	17	5	6	6	-
Jalal-Abad Province	2	4	-	1	6	19	12	6	26	10
Osh city	-	-	-	-	-	2	-	4	2	1
Kyrgyzstan	**2**	**4**	**8**	**20**	**31**	**41**	**17**	**23**	**47**	**11**

Outbreaks of infections result from discharge of untreated wastewater into surface water bodies used for household needs, damage of water supply networks, and pollution of surface water intakes during disasters (earthquakes, floods, mudflows). The population is also affected by newly appearing vira (influenza, acute respiratory viral infections). According to the Ministry of Health, only 87.8 % of the Kyrgyzstan population (in rural areas only 71.7%) have access to potable water pipelines. During the last 5 years 2.2 to 2.5 % of investigated samples were not compliant with chemical standards for potable water quality and 10-13% of investigated samples were not compliant with microbiological standards for potable water quality.

In line with the Millennium Development Goals, the key priorities of the KR National Health Protection Reform for 2012-2016 are related to cardiovascular diseases, protection of other and child health, tuberculosis and HIV-infection. The

KR Government has established the National Emergency Commission for Control of Epidemics and Epizooties[6].

Osh region

According to the Head of the Osh Plague Combat Department of the KR Ministry of Health[7] about 200 hot spots of plague are registered in the Alay District of Osh Province. They are inspected and monitored during annual missions of the Department teams. The mission completed from 10 June to 20 July 2013 included assessment and disinfection of the hotspots, vaccination of hunters and shepherds. Resources available from the Ministry are not sufficient for similar treatment of all the registered hot spots of diseases.

Sanitary and Epidemiology Service of Osh informed that in January-July 2013 the number of cases of acute enteric infections was 121% higher than during the same months of 2012, and the number of ARVI during the 7 months increased 115%. The number of viral hepatitis cases is also increasing. Sales of food products in poor sanitary conditions are considered the key cause of infections spread.

According to information disclosed in August 2013 by Ministry of Health, 7 cases of enteric fever (in Nooken District and in Mailuu-Suu town in Jalal-Abad Province) and 13 cases of paratyphoid (2 in Osh city and 6 in Jalal-Abad Province) have been registered in the southern regions of Kyrgyzstan in 2013. Hot weather and poor hygiene caused the cases.

Waste fires occurring in Osh at waste collection points (typically, when too much waste is accumulated outside containers or just in heaps in the streets) and dumpsites pose risks for community health and safety. Spills of waste and leachate in residential areas during waste collection and transportation cause odour nuisance, pose health risks, e.g. as a consequence of falls. With the limited capacity currently available in Osh-Tazalyk the Company makes considerable efforts for collection schedule meeting the waste generation rate and for minimising the disturbance to people and vehicles passing by the loading workers during waste collection and clean-up operations.

In areas serviced according to kerb-side collection system, waste left (in bags, buckets, boxes) outside the gates on the day of collection pose environmental and health risks and nuisance for general public. Spreading of waste by stray dogs and unauthorised access to waste may occur before the waste is collected. The odour of waste and dust from waste (particularly from waste containing ash in winter time) manually loaded in trucks by emptying of the bags/buckets/boxes pose nuisance and health risks for general public and for the Company workers.

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[6] Республиканская чрезвычайная противоэпидемическая и противоэпизоотическая комиссия при Правительстве КР

[7] Ошское противочумное отделение при Министерстве здравоохранения КР

Implementation of the proposed Project should lower the negative impacts of waste on the human health and contribute to improvement of hygienic habits of the population, which is important in the region with high risks of spreading infections.

3.2.12 Gender issues

National context

Official statistics in Kyrgyzstan contains detailed gender-segregated data for many aspects. The country has a very progressive framework of national legislation and the strategic documents focused on achieving the gender equality.

The Kyrgyz Republic scores high on international gender equity indices for education but consistently low on the economic and political empowerment of women. Since independence, declining employment opportunities have limited the economic activities of women. Women are active in the informal sector, but their average earnings in the formal labour market in 2010 were only 63.6% of men's. The labour force participation rate for women is 52.3%, compared with 76.6% for men. Women are overrepresented in public education and health sector jobs, which pay relatively low salaries but provide other benefits and often demand shorter working hours. Women are also underrepresented in managerial positions.

Men and women often have different priorities and concerns about the way in which the services in various sectors are provided. This is sometimes due to the different allocation between men and women of responsibilities for household tasks as well as cultural values. Women in Kyrgyzstan use public transport more than men; women stress the importance of street lighting as they tend to feel threatened when visibility is scarce; women and girls play a key role in waste management and the use of domestic water for cooking and washing, while men and boys are in charge of watering the garden and taking care of the cattle.

Many municipal organisations and companies have very few women at decision making levels while they are over-represented for certain tasks such as administration and human resources. The employers tend to focus on inputs (the number of hours worked) rather than outputs (the quality or speed at which tasks are competed) and therefore decision-making positions are closely associated with a higher number of hours worked and the ability to work extra hours flexibly, which in many cases represent an obstacle for women to progress in these organisations given their household and child care responsibilities. The unemployment rate for women in Kyrgyzstan (9.9 % in 2011) is higher than for men (7.7% in 2011).

Gender inequality and psychological pressure at a family level is to considerable degree associated with forced and early marriages in combination with the tradition of young couples staying with the husband's family.

Early maternity is a known phenomenon in Kyrgyzstan. Out of 139,344 births registered in 2011 about 1.2% of births were given by teenagers. About 30% of babies in Kyrgyzstan are born by not married mothers. Since the early marriages

are typically not registered, in case of divorce the young mothers cannot raise formal claims for financial support from the child's father.

Osh region

According to the Gender Resource Centre located in Osh about 77% of early marriages are not registered, but could be approved by Muslim priests, even in cases when a teenage girl becomes the second wife, which is illegal.

According to the local experts, early marriages are more typical for rural areas (14.4% of marriages) than for urban areas (9.7% of marriages). While teenage maternity without marriage attracts the public attention, the teenage maternity upon marriage is not considered a problem. However, the social consequences of early marriages and maternity are well known in Kyrgyzstan, because they pose risks for mother and child health, put barriers for access to childcare subsidies, for education and personal development of women.

Cleaning of yards and streets by women during morning hours is rather often observed in residential areas with single-family houses in Osh and suburbs. On the other hand, there are almost no female drivers in Osh and suburbs. Women are typically underrepresented at public meetings and in the local authorities. Women are very active in NGOs and community-level organisations. Women councils are established as community-based organisations and at the level of municipalities. Experience shows that by specifically inviting representatives of the women councils to the Project stakeholder meetings the percentage of female participants could be considerably increased.

3.2.13 Vulnerable groups

Waste management services are essential for all categories of population.

National context

According to the KR Strategy of Social Development for 2012-2014, Kyrgyzstan was the first country in the CIS, which in 1995-1998 optimised the system of social protection. The following 6 instruments are used for social protection of the vulnerable groups:

1 Monthly social allowance for low-income families with children;

2 Monthly social allowance for persons incapable for work;

3 Pensions for persons incapable for work;

4 Monetary compensations instead of utility tariff discounts;

5 Social services for vulnerable groups;

6 Social insurance for working persons.

The first instrument (235 KGS in 2010) is used for compensation of the gaps between the minimum living wage and the income level of poorest families having children. The second instrument (1503 KGS in 2010) is used for persons incapable for work, but not receiving pensions. About 8% of the country population receive payments according to the listed instruments.

Starting from 2010, the monetary compensations are paid to about 45,000 persons of 25 categories.

About 404.5 thousand children (18.4 % of all children in the Kyrgyz Republic) are recipients of the social allowances. About 362 thousand children (16% of all children) are recipients of monthly allowances for low-income families. The allowances were increased several times, but in 2012 were still equal to only 16% of the minimum living wage for a child.

During the last 5 years the KR Government made considerable efforts for increasing the pensions. By the beginning of 2013 the average pension was 4,270 KGS, which is 3 time higher than in 2008. The average pension is now estimated 110% of minimum living wage. In 2008 it was 45.7%.

Osh region

About 1.5 thousand children in Osh live in 656 families with low income and receiving the monthly allowances.

According to the data of Osh Department of the KR Social Fund, more than 20.5 thousand residents of Osh are pensioners. The average pension in 2013 was 4,377 KGS; the pensions were paid in time.

The Luily people having no identity documents (passports, birth certificates) are not eligible for allowances. The Lyuli form a majority among about 1.5 thousand people living in Kyrgyzstan as stateless, most of them live in suburbs of Osh. Even though the Lyuli children without documents go to school in Zhany-Kyshtak and other villages near Osh, the stateless people are vulnerable. About 30 informal waste pickers at Osh dumpsite are the Luily with no identity documents. Families of waste pickers seem to have other sources of income (some Lyuli women work on the city bazar, earn money by beggary and fortune-telling, some of the Luyli are craftsmen, some of the Lyuli families have houses and land plots in suburbs of Osh, as they cannot rely only on sales of recyclables under the present poor market conditions for them in Osh. About 10 of the Lyuli men having identity documents are employed with Osh-Tazalyk as waste loading workers.

3.2.14 Cultural heritage in Osh

Osh is famous for the cultural heritage site located on the picturesque four-headed Sulaiman-Too Mountain in the city centre. In 2009, the Sulaiman-Too became the

first site in Kyrgyzstan included in the UNESCO list[8]. The site with archaeological finds tracing a residential area established for more than 3000 years ago is visited by many tourists. Caves, historical buildings, site-seeing routes for visitors, a museum and kiosks are located on the mountain slopes. Improvement of waste collection services on the site would make it more attractive for visitors.

As one of the largest cities on the silk way mentioned in historical documents dating back to the 10th century, Osh has a number of historical heritage buildings (mosques Sheyit Debe, Acha-Bazar, Sadyk-Baya, Shehid-Deba, Mukhammad Yusuf Baijoji-Ogly, a mausoleum of 11th century, ruins of the Ak-Buura fortress), as well as a number of museums, monuments, a philharmonic hall and two theatres. Improvement of waste collection services in Osh should be planned and implemented taking into due consideration the cultural heritage sites.

The site recommended for establishment of sanitary landfill is located about 10 km from the cultural heritage sites of Osh.

3.2.15 Cultural specificities

Osh region

Islamic and tribal traditions are rather popular in Kyrgyzstan. They play significant role in family relations, but also in cultural life of Osh and suburbs.

Local authorities appreciate support from the Islamic leaders in addressing the social challenges and prevention of conflicts. For example, in September 2013 the Mayor of Osh at a meeting in the City Administration expressed his position regarding the wearing of traditional clothes by the local girls during school hours: "Let the girls wear hijab (head cover) and follow good religious lifestyle instead of going in short skirts to nightclubs and drinking alcohol".

A network of beautiful mosques is established and well visited by men in Osh and its suburbs. The local Islamic leaders plan to establish a mosque for women in Osh.

National context

Kyrgyzstan with population below 6 million has the largest number of religious education centres among the countries of Central Asia. In addition to 75 Islamic education centres (65 of them are medrese) the country has 16 Christian education centres, including 8 university-level centres and 8 Christian schools. Most of the Islamic education centres (4 Islamic university-type centres, 35 medrese and 1 Orthodox school) are located in the southern part of Kyrgyzstan, while the neighbouring Uzbekistan has only 57 medrese for population of 60 million.

[8] (http://whc.unesco.org/en/list/1230), http://www.v-z.kg/about-kyrgyzstan/attractions/sulaiman-too.html)

Some medrese in Kyrgyzstan are financed from abroad (e.g. from Pakistan, Egypt, Saudi Arabia, Turkey) and have rather different teaching systems, different and sometimes even conflicting interpretations of Islam and Islamic traditions. The need for reducing the number of religious education centres and for streamlining the religious education is discussed in the country.

3.2.16 Aspirations and attitudes to the Project in Osh

For assessment of aspirations and attitudes relevant for preparation of the proposed Project the Consultant in cooperation with Osh-Tazalyk in December 2012 – July 2013 carried out a number of interviews and meetings with present and potential customers of waste collection services in Osh and its suburbs. An overview of the meetings and interviews is presented in the Stakeholder Engagement Plan, prepared as a separate document. The Plan also includes activities recommended for the next stages of the Project preparation and implementation.

The sections below provide brief information on the findings of consultations with the public in parallel with the Feasibility Study for the earliest possible assessment of aspirations and attitudes relevant to various aspects of the municipal solid waste management system in Osh.

Observations and interviews during waste collection operations

On Saturday 15.12.2012, the Consultant carried out interviews with representatives of 15 households of private houses located at Street 1 in Ak-Tilek community ("micro-district") in Osh. The interviews were carried out during collection of waste by a truck of Osh-Tazalyk according to the signal system. Out of 19 persons delivering waste from households to the collection truck only 2 were men (pensioners), and the rest were women (younger than 35 and older than 60 years) and children (6 to 14 years).

The key findings of interviews were as follows:

- In most families women take care of removal of waste and its delivery for collection
- Men are mostly prepared to discuss the waste collection tariffs and the need for increasing the tariffs
- Women are more concerned about the methods and adequate frequency for waste collection and are well informed for discussing the need for regular waste collection services, the system and time schedule convenient for waste collection
- None of the interviewed persons took part in decision-making regarding the tariffs, time and methods of waste collection in their community
- Many of the interviewed persons had practical recommendations for the waste collection company

› Almost 30% of the interviewed persons said they were ready to pay more for waste collection in order to get improved services.

Experience of local NGOs

The Consultant studied experience of the local NGOs in the sphere of waste management.

In cooperation with Osh City Administration and the Environmental Department of Osh Province with financial support from OSCE the **NGO TsIMIR** in 2007-2009 took part in pilot projects with installation of new containers in various communities and mobilisation of the public for more careful attention to sanitary conditions on the city. The NGO provided training for the activists of the local quarter/street committees. The pilot project activities included experiments for separate collection of various fractions of waste (see Figure 3.10).

Figure 3.10 Separate collection of recyclables during pilot project in Osh (2007-2009)

Residents of pilot areas mobilised to participate in the separate collection were rather disappointed seeing that all the fractions were anyhow collected by the same truck and taken to the dumpsite. The separate collection initiative was not considered as a success, even though the stakeholder engagement was broad and active. More successful was the project component related to installation of computers and software in the office of Spetsavtobaza (former name of the municipal waste management company) for electronic registration of customers instead of registration with handwriting on paper.

NGO Smail.kg in cooperation with NGOs Mumtaz-Centre, Ukuk Legal Centre and MSDSPKG Public Foundation (the initiative of Aga Khan) in 2012 took part

in a project supported by the UK Government with establishment of an information centre in Osh for the public monitoring of municipal waste collection services. The project facilitated for development of cooperation between the waste collection company, the territorial councils and other community-based organisations and general public for improvement of waste collection and prevention of littering in the city.

Figure 3.11 Public monitoring of waste collection services in Osh is discussed during a project with participation of NGO Smail.kg

The project participants have found out that the households were not satisfied with services provided by Spetsavtobaza. A lot of small spontaneous waste dumps from time to time appeared on the territories of communities involved in the project. However, the NGO has also found out that many of the households did not paid for waste collection and did not follow the waste collection rules. The project participants informed the public about activities of the waste collection company and assisted a number of commercial units (shops, café) in the proper arrangements for regular collection of waste.

Teams of volunteers (mainly students) mobilised during the project identified spontaneous waste dumps in Osh and immediately informed the waste management company about them for the waste could be collected as soon as possible.

Feedback to questionnaires

Presenting the proposed Project to stakeholders during a number of meetings in Osh the Consultant asked the meeting participants to provide their personal feedback by filling in the questionnaires about the existing waste management system and about the proposed Project. The questionnaires offered several options of answers for most of the questions. The responses received from members of the City Council (meeting on 04.07.2012) and from the leaders of the Territorial Councils (meeting on 09.07.2012) are presented in Appendix 3 about the existing

system and in Appendix 4 about the proposed Project. The response after the two meetings was received from 99 persons, including 37 women and 62 men. The majority of participants were men of age 35-64. About two thirds of the respondents live in single-family houses, more than 10 years in Osh.

Attitude to existing waste management system in Osh

According to 52% of respondents, mainly women take out the waste generated in their households. In households of 30% of respondents men do this. Only 3 persons responded that both men and women take out the waste generated in their households.

Roles of women and men are different for different methods of waste handling. Delivery to a waste collection truck, digging-in in the yard and transportation to dumpsite are typical for participation of men. In case of placing waste in a street container the respondents stated equal involvement of men and women (Table 3.9).

Table 3.9 Summary of answers to question about waste handling methods typical in households of the respondents

Where goes waste from your household?	Number of respondents		
	Men	Women	Total
We take it to container	22	22	44
We take it to waste collection truck	31	5	36
We burn it or dig in	28	7	35
We take it by car to dumpsite	5	1	6
It is collected from kerb-side	1	2	3

Most of the respondents (men and women) state that waste collection services improved during the last year, but men appear to be more critical in their evaluation of waste collection services: among those who mean that the quality of waste collection services did not change or deteriorated the majority are men (see Table 3.10).

Table 3.10 Summary of answers regarding the quality of waste collection services

Has waste collection improved during the last year?	Number of respondents		
	Men	Women	Total
Yes, improved	32	26	58
Did not change	18	4	22
Difficult to answer	6	5	11
Got worse	5	1	6
No answer	1	1	2

Response from men and women regarding the need for changes in waste collection system servicing their streets was rather similar (see Table 3.11). Most of male and female respondents consider the present level of payments for waste collection services sufficient.

Table 3.11 Answers to question about need to change the waste management system in Osh

Should waste collection in your street be changed?	Number of respondents		
	Men	Women	Total
Yes	46	35	81
No	8	1	9
Difficult to answer	7	1	8
No answer	1	0	1

According to 65 respondents out of 99, payments for waste collection services are typically made by women. Only 3 persons answered that both men and women out of their households make the payments (see Table 3.12).

Table 3.12 Answers to question about payments for waste collection services

Who of your household members typically makes payments for waste collection services provided to the household?	Number of respondents		
	Men	Women	Total
Woman	61	4	65
Man	8	21	29
Woman and man	2	1	3
No answer	2	0	2

Response to questionnaires allows concluding that men discuss the waste management issues in various groups, but women mostly discus the waste management issues with neighbours, at meetings and in family. Every sixth women informed than she has not discussed the waste management issues at all.

Have you discussed waste collection issues?	Number of respondents		
	Men	Women	Total
In family	28	7	35
At a meeting	22	10	12
With neighbours	18	11	32
With colleagues at work	10	4	29
With friends	11	1	14
All 5 options	1	0	1
Not at all	0	6	6
No answer	1	0	1

Attitude regarding the proposed Project

Vast majority of respondents (74 out of 99) stated that they understood the Project proposed by the Consultant. However, every third participant (the same level among men and women) responded that financing of the Project was not clear.

Both men and women see the landfill construction, purchase of new equipment and improvement of payment system as the most important elements of the Project. (see Table 3.13) The respondents were offered to mark more than on option. There is some difference in attitude to the service area of the Project. Only 1 woman (and 11 men) marked this element as important.

Table 3.13 Answers to question about the most important elements of the Project

What do you see as the most important in the Project?	Number of respondents		
	Men	Women	Total
New equipment	32	19	51
Landfill construction	30	19	49
Payment system	10	5	15
All elements	7	7	14
Dumpsite closure	7	5	12
Service area of the Project	11	1	12
Difficult to answer	5	8	13
No answer	5	1	6

Almost all women and half of all men among the respondents stated their readiness to pay higher tariffs for improved (more regular and convenient) waste collection services. The other half of men stated they were not ready to pay higher tariffs or were not sure about this (Table 3.14).

Table 3.14 Attitude of respondents to higher payments for waste collection services

Are you ready to pay more for improved services?	Number of respondents		
	Men	Women	Total
Yes	31	32	63
No	16	4	20
I do not know	11	1	12
No answer	4	0	4

Majority of the respondents (men and women) are ready to pay for waste collection services in advance for the next month. Only some respondents are ready to pay in advance for the next quarter or year. Some gender-related difference could be seen with regard to the preferred tariff setting approach. The respondents were offered to select more than one option. Most of women prefer to set the waste collection tariff per capita. Men prefer this option as well as the option of setting the tariff per household (see Table 3.15).

Table 3.15 Response regarding approach to setting of waste collection tariffs

What would be the best approach to tariff setting?	Number of respondents		
	Men	Women	Total
Per person	24	19	43
Per household	20	6	26
Per volume unit	9	8	17
Per adult	5	4	9
Per weight unit	2	1	3
No answer	4	0	4

According to the received feedback, men and women are equally interested in discussing the revised rules for waste collection services.

Attitudes to closure of Osh dumpsite

At present, the Japalak community of 11 villages (part of Osh city) includes Japalak village and settlement of DEU-21[9] and SMU[10] workers, which are the residential areas nearest[11] to the existing dumpsite. The community includes 4,600 households with population of about 27,000. Labour migration is a serious challenge for the community. According to the Head of Japalak municipality, practically every family in the community has a member, who is a labour migrant. The number of migrants is about 5,000; most of them are young men working on construction sites in Russia, Kazakhstan and Bishkek.

The community has 2 kindergartens, 10 schools, 1 polyclinic, 11 paramedic-midwife stations, 1 social and culture club, 1 youth organisation, 1 women organisation, 1 association of water users. Only men were present at a meeting held on 17 December 2012 for discussion of approach to closure and rehabilitation of the dumpsite. The meeting participants are concerned about polluted runoff coming after snow melting and rain from the dumpsite to the irrigation canals, used by the community residents. According to the meeting participants, pollution from the dumpsite is also affecting the main body of the Aravan-Akbuura canal. The situation is rather critical, because due to the poor condition of the local water supply system, the residents use the canal water. In some of the villages the canal water is distributed by the water supply system, even though the local health authorities state that the canal water is not suitable for water supply. Pollution of the surface water results in high morbidity observed in Japapak community. According to the local pharmacy staff, the customers often suffer from dysentery, acute enteric infections, hepatitis A. In 1998, more than 1,000 residents of Japalak community got infected during an outbreak of typhoid fever epidemic. The health authorities concluded that the outbreak was caused by pollution of water supply

[9] Road maintenance company name
[10] Construction company name
[11] The eastern border of the newly developed Kattasai/Kensai residential area in the future could become the nearest to the dumpsite territory

system by wastewater. However, the local residents are sure that the dumpsite was the source of infection.

The community is concerned about the dumpsite operation. The dumpsite is not fenced. The cattle and children can easily enter the dumpsite. The residents can see that pigs from a farm located next to the dumpsite find their food at the dumpsite. Additional concerns are the waste pickers working on the dumpsite. The local residents consider them posing security risks, because there are no local residents picking waste at the dumpsite, and the waste pickers look like suspicious poor dirty and aggressive strangers.

The Japalak community is not serviced by the municipal waste management company. The villagers burn their waste and/or burry waste in back-yard pits. According to the Head of Kere-Too village, the attempt to arrange for waste collection services revealed that the offered tariffs for waste collection by a truck (2,000-3,000 KGS per a truckload collection or more than 10,000 KGS a month) were too high for the village residents.

The following conclusions were made upon consultations regarding closure and remediation of Osh dumpsite:

- People in nearby communities are concerned about poor operation conditions of the dumpsite and are sure that the dumpsite poses risk for their health;
- No dumpsite impact monitoring and assessment data are available;
- The local communities are ready to participate in public actions for closure and remediation of the dumpsite.

3.2.17 Community health, safety and security

Present waste management operations in Osh and its suburbs pose risks for community health, safety and security.

Due to limited resources of Osh-Tazalyk, the only waste management company in the city and suburbs, not all generated municipal solid waste, but only about 80% of waste is collected in Osh. Osh-Tazalyk provides waste collection services in parts of adjacent rural settlements located as part of the city. Operation of partially worn out containers without lids, poor conditions of waste collection points, delays in waste collection, burning and dumping of not collected waste pose health and safety risks.

Area of the Company's premises and area of the city dumpsite are not fenced and thus are accessible for external parties, which pose health, safety and security risks. Spreading of waste and polluted run-off from the dumpsite with open waste surface poses risks for health, safety and security of adjacent residential areas.

3.2.18 Occupational Health and Safety (OHS)

The system of OHS management in Kyrgyzstan is rather weak, mainly due to lack of resources available. The effectiveness of health checks is low. The capacity for identification of occupational diseases and OHS non-compliances at workplaces is poor.

According to the Kyrgyz Republic Strategy of Health Protection Development towards 2020, working conditions of more than 30,000 persons in Kyrgyzstan are below the OHS standards, including 11,000 persons working in environment with heavily polluted air and 9,000 persons working in environment with high noise. At 13% of investigated workplaces the content of dust in air was above the permissible level, at 10% of workplaces the concentrations of other pollutants in air were above the permissible levels. Data of the health checks show that about 2% of the KR workers (and 9% of workers in Issyk-Kul Province) have occupational diseases.

Like in many other companies in Kyrgyzstan, the OHS management system in Osh-Tazalyk is fragmental. The Company has no written policy, procedures or guidelines regarding OHS management. General awareness of the Company staff in the sphere of OHS and the Labour Code of the Kyrgyz Republic is low. Major OHS risks are related to absence of general rules defining the types of waste acceptable for collection by the Company employees.

No overall heath examinations of staff are carried out, but the drivers pass yearly examinations at a polyclinic. No medical staff or room is available. The Company management informed about practically no days of sick leaves of workers.

Hygienic conditions of the amenity facilities are very poor. A primitive outdoor toilet (latrine) is located outside the Company's partially fenced site. Female employees of the Company are particularly concerned about the matter.

Main OHS risks for workers of the Company are associated with heavy lifts, night shift work, traffic conditions, welding fumes, dust and odour nuisance coming from of waste, fuel, lubricants. OHS risks for the office workers are related to sitting work position and to impact of computer monitors. The work of controllers is associated with emotional pressure and certain risk related to working with cash. The Company recommends the controllers not to work alone and to follow with the waste collection vehicles.

The set of training programs in the Company is limited. OHS training program for drivers includes an induction, initial instruction at workplace followed by 3-10 days of training with experienced driver.

The Company's capacity in identification and provision of convenient PPE, cleaning and repairs of PPE is limited. Enforcement of PPE use and training in application of PPE are not adequate. The workers' clothes often look dirty and worn out, typically not as provided by the Company. This could be explained by a high turnover of the staff and limited budget for provision of PPE.

The staff amenity facilities within the Company premises are not clean, not comfortable and require modernisation.

Improvement of OHS management in Osh-Tazalyk is seen as integral element of the general improvement of municipal solid waste management system in Osh city and suburbs.

4 Environmental and Social Analysis of the Proposed Project

The E&S Analysis presented in this chapter was carried out according to the ToR for identification and assessment of the potential environmental and social (community) impacts associated with the proposed Project as well as for proposing a set of measures to mitigate such impacts. A series of meetings with stakeholders was carried out for identification of the potentially affected physical and social environment.

4.1 Methodology of impact assessment

The baseline description (Chapter 2 of the present document) provides information on receptors potentially affected by the Project activities. The potential impacts should be described and the needed mitigation measures should be proposed for including them in the Project. The impact management strategy and effectiveness of mitigation measures is typically discussed in terms of residual impacts.

Key attention in the Analysis is focused on construction and operation of the sanitary landfill. Certain impacts will be associated with other activities envisaged during the Project implementation (procurement of equipment, upgrading of the Company premises, establishment of new collection system, introduction of electronic system for customer billing and payment registration, etc.). It is expected that the impacts of these activities will be mainly positive and predictable. They could be in detail addressed during the ESIA procedure including public consultation according to the national legislation of the Kyrgyz Republic during the pre-construction phase of the Project (see Section 2.1 above). Measures for enhancement of the environmental and social benefits of the proposed Project could be also elaborated within the national ESIA procedure during the pre-construction phase.

At the stage of the EBRD funded Feasibility Study and the ESDD the stakeholder consultation meetings were held in Osh to addess the environmental and social impacts during selection of site for establishment of the sanitary landfill, during selection of communities to be included in the Project area, during presentation of

the Feasibility Study findings and the proposed investment Project. The already completed and planned further stakeholder consultation activities are described in the Stakeholder Engagement Plan prepared as a separate document.

4.1.1 Receptors

Biophysical resources sensitive to impacts of the proposed Project include soil, landscape, air, surface water and groundwater, urban and natural habitats, protected nature areas and species of flora and fauna, ambient noise, and areas of cultural heritage.

Social receptors sensitive to impacts of the proposed Project include residents of Osh and adjacent rural municipalities and persons visiting the area regularly and often (working in the area) or for a short time (tourists). Employees of contractors involved in construction of the landfill and the staff of the landfill management unit of Osh-Tazalyk should also be considered among sensitive receptors.

4.1.2 Significance of impacts

The identified potential impacts of the proposed Project include positive and negative impacts of higher or lower significance. Impact significance aspects considered during assessment of the impacts can be listed as follows:

- Magnitude of impact - the level or intensity of changes caused by the project activities with regard to baseline conditions. An impact of high magnitude would mean major changes for large amount of biophysical resources and/or people.
- Area of impact - the area where the changes occur.
- Duration of recovery - estimated time required for returning to pre-impact conditions after the impact is stopped.

From the viewpoint of significance the impacts can be of negligible, minor, moderate or major level. Definitions for these levels are presented in Table 4.1 below:

Table 4.1 Impact significance levels

Level	**Impact on biophysical resources**	**Impact on socio-economic conditions**
Negligible	Almost no changes in the environment, the effects can be recovered within a few days	Almost no changes in socio-economic conditions or commercial activities, the effects can be recovered within a few days
Minor	Isolated change in local biophysical conditions within a limited area (radius of 100 m or so) , the recovery takes a few months, no	Isolated change in local socio-economic conditions and/or commercial activities lasting for a few days to a few months with no

Level	Impact on biophysical resources	Impact on socio-economic conditions
	residual effects observed	residual effects
Moderate	Observable change in biophysical environment lasting from a few months to a few years before recovery. Considerable affected area is within a radius of 0.5 km or a lesser impact over a larger area.	Considerable change in socio-economic conditions and/or commercial activities of up to 10% of persons present in the Greater Osh or lesser change for 50% of persons
Major	Changes in biophysical conditions observable within a radius beyond 0,5 km or a considerable change in a smaller area not recoverable within a few years	Considerable changes in socio-economic conditions and/or commercial activities of more than 50% of persons present in the Greater Osh or noticeable changes for persons outside the Greater Osh

4.1.3 Residual impacts after mitigation

Effectiveness of mitigation measures proposed for potential negative environmental and social impacts at various stages of the proposed Project (pre-construction, landfill construction, operation, closure and aftercare) should be verified to see, whether they would result in considerable reduction of the negative impacts. Effective mitigation measures in most cases can make the residual impacts low or practically negligible.

5 Impacts and Mitigation Measures during Pre-construction Activities

In general pre-construction activities are those that are necessary for fixing locations of project components, completing engineering documents and collecting environmental data. They provide essential information for determining project feasibility and developing project description used during environmental studies.

Pre-construction activities for the Osh Solid Waste Management Project (the Project) include:

- Feasibility Study
- Environmental and Social Due Diligence
- Signing of loan agreement between EBRD and Osh City Administration (the loan agreement package includes ESAP as an annex)
- Establishment of PIU
- Completion of Environmental and Social Impact Assessment (ESIA) with public consultations according to the national legislation and regulations and meeting the EBRD requirements;
- Arrangements for transformation of land use category and (if required) change of land ownership status in accordance with the national regulations and the EBRD Performance Requirement 5.
- Possible adjustment of design according to recommendations of the ESIA;
- Obtaining of permits (technical conditions) for connection to engineering infrastructure networks (water supply, power supply, telecommunications), planning of back-up arrangements in case of disruptions and emergency situations;
- Obtaining of approvals from the Environmental Expertise Authority and from the State ("Construction") Expertise Authority;
- Procurement planning, tendering and contracting for construction works and for supply of waste collection equipment and waste transportation vehicles.

- Planning and preparation of mitigation measures for waste pickers in accordance with the national regulations and the EBRD Performance Requirement 5.

The impacts which may appear during construction and operation stages of the proposed Project (e.g. traffic safety, soil erosion, air and water pollution, impacts on habitats, nuisance for communities, work with hazardous substances, identification of borrow sites for landfill development, etc.) shall be taken into consideration during design stage to ensure adequate mitigation of environmental and social adverse impacts.

It is expected that the proposed Project will not require any physical displacement. However, the ESIA during the pre-construction activities should reveal the issues related to possible economic displacement that can be full, partial, permanent, or temporary and be caused by restrictions imposed during the Project activities (e.g. the landfill construction and operation, the dumpsite closure and remediation) and resulting in loss of access to physical assets or natural resources irrespective of mechanism used for introduction of such restrictions. The Compensation and Livelihood Restoration Framework is prepared at the stage of the Feasibility Study and will be expanded to the Compensation and Livelihood Restoration Plan at the stage of working design for the Project components.

The measures for mitigation of the impacts identified at this stage shall be integrated into the design documentation and contractual clauses for contractor(s) to ensure their proper implementation.

The main issues to be considered at this stage of the landfill establishment project include the following:

- Optimal waste collection and disposal scheme, adequate capacity of landfill for the planned period, site suitable for landfill location, waste transportation scheme and access to the landfill.

- Identify existing borrow sites (quarries) that could be used for the landfill development, to the extent possible eliminate the need for opening the new borrow sites;

- On steep slopes and along river banks erosion protection with gabions, gravel or vegetation shall be included in design, if relevant;

- Storm-water facilities shall be included in the design taking into account the risk for pollution of surface and groundwater resources;

- Best management practices applied for similar projects shall be studied to ensure that the most relevant and adequate mitigation measures and practices are considered;

- All relevant permits shall be obtained prior to commencement of construction activities, including positive resolution issued by the Environmental Expertise Authority.

- During preparation of the bidding documents for procurement of contractor for construction works careful consideration should be given to reflecting the EBRD Performance Requirements.

- Procurement of consultancy services should be arranged for adequate supervision of construction works.

- Project monitoring program should be agreed with the EBRD, the local authorities and possibly other parties (e.g. NGOs).

The main issues to be considered at the pre-construction stage would include the following:

- stakeholder engagement program focused on involvement of all urban and rural municipalities in implementation of the new municipal solid waste management system in Osh and suburbs;

- consultations for step-by-step increase of waste tariffs for households and other clients, for establishment of waste registration system and waste tipping fee by the beginning of 2016, when all elements of the new waste management system are to be operational;

- planning for smooth introduction of the new system elements with regard to technical and social aspects;

- preparations for coordination of activities planned in Osh and adjacent municipalities, exchange of experience (lessons learned);

- planning and allocation of funds for closure of existing dumpsites;

- elaboration of joint enforcement measures for prevention of waste dumping;

- planning of public awareness-raising campaign for prevention of waste dumping;

- training of the staff;

- elaboration of reporting format for the EBRD and the local stakeholders.

Many of the above listed activities will be continued during later phases of the Project. The following chapters describe the environmental and social impacts of Project activities during landfill construction, its operation, closure and aftercare. The summary matrix including potential impacts, magnitude of impacts, mitigation measures, and magnitude of residual impacts after implementing mitigation measures is included after description of the impacts.

6 Environmental Impacts and Mitigation Measures during Construction

The proposed Project includes the improved waste collection, transportation and disposal operations based on the establishment/construction of the sanitary landfill for Osh and its densely populated suburbs (the Greater Osh). Impacts related to this phase of the Project scheduled for about 2 years will mostly have a relatively short duration.

The following impacts will not likely be significant:

- Loss of natural habitats, native species, introduction of alien species;
- Forest, fishery and mineral resources, handling of surplus soil;
- Surface run-off and coastal structures;
- Cultural heritage;
- Indigenous peoples (there are no indigenous peoples in Kyrgyzstan);
- Thermal pollution and electromagnetic radiation;
- Transboundary impacts.

Environmental impacts and mitigation measures relevant for the construction phase of the Project are in detail discussed in the following sections.

6.1 Change in drainage pattern

No major changes in drainage pattern will be caused during procurement of new waste collection containers and waste collection vehicles during establishment of new waste management system in the Greater Osh. Measures for management of surface runoff should be included into design for upgrading/establishment of the waste collection points, upgrading of the Company premises, preparations for closure of dumpsite with clean-up of areas adjacent to the dumpsite.

Changes in the local drainage pattern during establishment of the landfill will be related to construction of surface runoff management system and leachate management system. The runoff collection system for the landfill is designed with

the objective to keep clean surface runoff separate from the contaminated runoff and leachate.

During construction phase the water will be mostly used during soil moving works for dust control and for compacting a layer of clayey material (an element of the bottom liner) to achieve its lower permeability; when clearing vegetation and grading; for unpaved road traffic; for making concrete for foundations; and for consumptive use by the construction crew. Water will likely be trucked in from off-site by means of special vehicles. The quantity of water used for construction activities will be relatively small and will not cause any changes to existing drainage pattern. Establishment of a borehole for intake of groundwater is proposed as an element of the water supply system for the landfill. Sanitary protective zone will be established for protection of the groundwater intake.

Construction activities for the proposed development can have minor impact on hydrology and water quality of the area, as the construction waste will not be leached into groundwater or any surface water body. The area designated as acceptable for location of the landfill facilities is located with a section of a steep slope of adyr hill range. The surface runoff generated on the slope section during snow melting and rains is drained without recharging a surface water body, but is accumulated and then evaporated in lower parts (minor depressions) of the flat area located downstream to the north of the slope foot. It is unlikely that runoff from the area can eventually reach a temporary brook in a major ravine separated from the area by two rows of low adyrs.

Grading associated with earthworks could cause runoff to be directed away from a landfill site. In addition, rain falling directly on the landfill area will flow under gravity to site gullies and may discharge into depressions and potentially affect the soil quality in the downstream areas. Overall, the impacts on surface water resources are related to the project footprint (e.g., land disturbance, erosion, changes in runoff patterns, and hydrological alterations, etc.).

Site-specific drainage control is required to ensure that surface water runoff is properly managed. In particular, the following mitigation measures are recommended:

- Minimize the planned amount of land to be disturbed as much as possible. Use existing access roads and quarries, if possible;
- Locate access roads to minimize stream crossings;
- Construct drainage ditches where necessary, use appropriate structures at culvert outlets to prevent erosion;
- Clean and maintain drainage ditches and culverts regularly;
- Use special construction techniques in areas of steep slopes, erodible soils and stream crossings;

- Do not alter or restrict existing drainage systems, especially in sensitive areas such as erodible soils or steep slopes;

- Dispose of excess excavation materials in approved areas to control erosion and minimize runoff.

Taking into account the fact the proposed landfill site is located in the area with thick cover of clayey deposits and depth to groundwater exceeding 70 m it is not likely that surface runoff can penetrate into groundwater.

6.2 Flooding potential

No permanent natural water bodies are located nearby the site proposed for establishment of the sanitary landfill. The proposed site is located in a zone elevated above an arid plain with major residential and agricultural areas. The impact from flooding is likely to be low. Due to establishment of drainage ditches/culverts the snowmelt and rainfall water will be drained from the proposed landfill area and discharged into natural drainage flows.

6.3 Landscape impacts of excavation and construction

The Project activities related to establishment of the sanitary landfill will be carried out within the area affected by earlier soil works for construction of a canal and high-voltage power line, by cattle grazing and traffic of vehicles along mud roads. Numerous pits and swashes, concrete basements and trenches remaining from earlier construction activities are currently observed in the landscape. The proposed Project activities will include upgrading of the access road, which will assume a certain scope of landscape engineering including leveling of the area and establishment of side ditches, which will provide more regular landscape features. Construction of landfill will be carried out in phases allowing establishing facilities with the limited area of excavation and construction activities at a time. The design of landfill is prepared based on minimum scope of soil works changing the existing landscape.

6.4 Pollution of surface water and groundwater

Pollution of water resources during construction phase usually happens as a result of improper storage of construction materials, construction waste and excavated materials, as well as spillage of fuel, oil and other substances during construction works.

To prevent pollution of surface water and groundwater resources the following mitigation measures shall be implemented during construction works:

- To reduce the likelihood of contamination due to spillage of oil from construction equipment and wastewater from construction camps, the sites for these areas shall be carefully designated and proper technical condition of machinery and equipment shall be ensured. In addition, sand or fine gravel

should be spread on the ground in the locations designated for parking and servicing of construction machinery. In case of spillage the polluted layer should be removed and replaced with new layer of sand or fine gravel;

- Sections located very close to drainage ditches/culverts shall not be used for construction material storage and temporary accumulation of waste;
- Provide for covered zones of preliminary accumulation of construction materials and wastes in order to minimize formation of leachate as a result of rainfall;
- All vehicles must be regularly checked and their normal operational technical conditions shall be ensured. In case any leakage of oil or other liquid is observed, the vehicle must be moved to a paved impermeable area and be immediately fixed;
- Water samples shall be tested for oil products, in case the leakage is observed.

The proper supervision should ensure that the landfil is constructed according to design based on the Feasibility Study, so that risk of soil and groundwater contamination is very limited. This is due to the following reasons:

- Limited precipitation and high evaporation in the local arid climate conditions (i.e. limited leachate generation and its intensive evaporation);

- Large slope of bottom liner resulting in a limited area where a potential leak of leachate can occur, before the leachate enters the leachate collection pipeline;

- Accumulation of leachate evaporation pond having impermeable synthetic bottom liner, which can be inspected regularily;

- The landfill design in accordance with the EU directive.

- A protective zone for groundwater intake established and maintained with due care in order to prevent contamination of water abstracted from the well. Groundwater monitoring wells installed, the monitoring program started.

6.5 Air pollution

Air pollution occurs during construction works and includes release of dust from digging-loading works, earthworks, establishment of earth access roads, operation of heavy machinery and construction equipment, emission of harmful substances from combustion of diesel used by transportation means and machinery during the construction works, emissions from welding, concrete-mixing, asphalt-placing activities, as well as dust caused by improper storage of friable construction materials and non-timely disposal of friable construction waste. Dust and the bitumen smoke arising from construction activities may have negative impact on the ambient air quality. However, there are no receptors within 500 m of the landfill boundaries and hence the potential for nuisance impacts is limited. It

should be noted that these impacts will occur during the construction works, but will only be short-term and affect different people at different times. No major air pollution is expected as long as proper construction and equipment functioning practices are applied.

To prevent or minimize the potential impacts on air, the following mitigation measures are recommended:

- Sprinkling of water on unpaved, non-vegetated surfaces to minimize airborne fugitive dust and during earthmoving activities, prior to clearing, and before excavating, backfilling, compacting, or grading;
- Post and enforce speed limits for vehicles to reduce airborne fugitive dust from vehicular traffic;
- Allow site access only to authorized vehicles;
- Keep soil moist while loading into dump trucks;
- Keep soil loads below the freeboard of the truck;
- Tighten gate seals on dump trucks;
- Trucks loaded with loose construction materials (such as gravel, sand, soil, etc.) shall be covered to minimize dust emissions during transportation;
- When feasible, shut down idling vehicles and equipment;
- Train workers to handle construction materials and debris during construction to reduce fugitive emissions;
- Where possible stockpiling of friable material should be avoided and in-time delivery should be practiced;
- Conduct dust-depressing measures aimed at prevention of air pollution through watering of access roads, construction site, construction camps;
- Develop a traffic management plan to ensure smooth traffic flow and safety both for workers and the passing traffic;
- All vehicles must be regularly checked and equipped with effective exhaust mufflers according to the requirements of relevant national legislation.

6.6 Wastewater generation and disposal

During landfill construction stage the water will be used at construction camp for drinking, cooking, washing and bathing purposes, as well as at construction sites for construction activities (i.e., watering of the construction sites, washing the wheels, etc.). The facilities for daily accommodation of the workers shall be equipped with systems for water supply and sewerage collection. The wastewater

from construction camp will be collected in a septic tank with 20m^3 capacity, which is made of impermeable material (the minimum volume of septic tank is specified in the locally applicable regulations). The tank will be regularly emptied by a special vehicle, which will transport wastewater to a centralized wastewater collector in accordance with prior agreement with the local authorities.

Improper operation of the sewerage system and wastewater collection tank may have minor negative impact on the site as a result of pollution of surface runoff accumulated in seasonal pools. At the construction site, in order to minimize negative impacts from wastewater generation and discharge, the following measures are recommended for application:

- Avoid potential spills; washing of vehicles and equipment on the site to shall be restricted;
- Chemicals and other liquid and solid dangerous materials must be managed properly;
- Wastewater from the accommodation facilities shall be collected and adequately removed from the site.

6.7 Hazard vulnerability

Overall, the term "natural hazard" refers to all atmospheric, hydrological, geological (including seismic), and wildfire phenomena that, because of their location, severity, and frequency, have the potential to affect humans, their structures, or their activities adversely. The natural hazards relevant for the landfill site include drought, earthquake, flood and wildfire. The site is located in southern part of Kyrgyzstan, where the risk of earthquakes is rather high, so all the landfill facilities should be constructed with respect to this fact. Drought and extreme precipitation (rain, snow) might affect the waste and soil humidity and runoff conditions during soil works.

Mitigation of disasters usually entails reducing the vulnerability of the elements at risk, modifying the hazard-proneness of the site. Mitigation measures to address such impacts usually include specific safety or vulnerability reduction measures incorporated in the design documents developed for construction of landfill facilities or building of protective devices (if relevant). To properly deal with hazards and ensure timely implementation of mitigation measures it is recommended that a Disaster Management Plan be developed for the landfill jointly with relevant authorities. The Disaster Management Plan should include measures addressing the following issues:

- Natural hazard prediction;
- Emergency preparedness;
- Disaster rescue and relief;
- Post-disaster rehabilitation and reconstruction;
- Educational and training activities.

To reduce hazard vulnerability at the landfill site the following measures are recommended:

- Construction of cut-off drains;
- Establishment of buffer zone around landfill;
- Ensure preservation of safety rules by workers, while dealing with hazardous and toxic materials;
- Compliance with rules on storage and handling of construction materials, fuel, oil products, chemical substances, etc.;
- Regular inspection of landfill facilities to ensure their proper operation;
- Train workers on how to act in emergency situations;
- Establish reliable communication between landfill site and respective local authorities, first-aid service, rescue service, police office, fire office, operators of electricity, gas and water supply utilities to ensure adequate response in case of emergency.

The landfill is located in a seismic activity region (9 points according to SNiP KR 20-02:2009). However, sufficient engineering measures for soil collapsing elimination and watering of subsoils are implemented by a geological barrier and impermeable liners as well as surface water and melt water derivation around the landfill. Since the bottom liner is composed of natural and synthetic materials having certain strain and elasticity. The flexible drainage layer and elastic synthetic materials will be used for leachate collection system. It is estimated that there is only a minor risk for failure in the integrity of the liner in case of earthquake.

6.8 Noise

The primary source of noise during construction will be heavy equipment (e.g., bulldozers, graders, backhoes, excavators, dump trucks, etc.) and vehicular traffic. The magnitude of construction noise impacts depend upon the construction activity. Noise levels generated by construction equipment, duration of the activity is considered to be limited due to significant distance (more than 1 km) from noise-sensitive receptors of Amir-Timur and Achi residential areas, and location of the landfill site in adyr zone in a depression on a slope with soft soil and vegetation. Raised noise levels at the construction site are inevitable, but they are temporary and might generate short time impact. Use of machinery and equipment during construction and operation of landfill will be planned to ensure that the estimated noise levels will not exceed the levels acceptable for the key receptors (residents of Osh and suburbs). The allowable noise levels are regulated by the Sanitary Norms applicable locally. Due to complicated landscape conditions the estimates cannot be based on calculations or modelling, but should be verified by instrumental measurements of noise levels at the receptors.

The following mitigation measures are recommended to reduce noise impacts:

- Limit noisy activities to the least noise-sensitive times of day (weekdays only between 7 a.m. and 10 p.m.);
- All machinery and equipment should have sound-control devices no less effective than those provided on the original machinery/equipment. Motorized equipment should be adequately muffled and maintained;
- Whenever feasible, schedule different noisy activities (e.g. earthmoving, truck unloading, etc.) to occur at the same time, since additional sources of noise generally do not add a significant amount of noise. That is, less-frequent noisy activities would be less annoying than frequent less-noisy activities;
- To the extent feasible, route heavy-truck traffic away from residences and other sensitive receptors;
- Workers in the vicinity of sources of high noise shall wear necessary protection gear;
- Barriers (e.g. fences) or purpose-built acoustic screens should be used to reduce the noise reaching worker's camp, where practicable;
- Avoid use of percussive and impact tools wherever possible;
- Machinery in intermittent use should be shut down or throttled down to a minimum when not in use.

6.9 Odour

Earthworks and civil works are not among the activities considered likely to produce odour emissions. It is considered unlikely that activities associated with the construction phase would result in the generation of odours other than odours from vehicles and construction machinery. It is therefore considered that the odour impact during landfill construction phase would be minor.

6.10 Spillage of hazardous or medical waste

During construction of the landfill no spillage of hazardous or medical waste is expected. Relevant measures will be implemented during operation and maintenance of construction machinery and vehicles for preventing spills of fuel, waste oil and chemicals. These measures will include:

- Keeping vehicles and equipment in good working order to prevent oil and fuel leaks;
- Training of workers to promptly clean up any fuel or oil spill;
- Availability of portable spill containment and clean-up equipment in all vehicles.

6.11 Biodiversity

The impacts from landfill construction to biodiversity would be proportional to the amount of disturbance and habitat fragmentation. It should be noted that the site is not a critical habitat of any plant or animal species and there are no protected natural resources nearby the landfill site. The likelihood and significance of impacts on biodiversity are low.

Site fencing will be developed during the landfill construction to prevent site access by cattle and wildlife species.

6.12 Sustainable natural resources management

Taking into account location of the landfill site in the area of former clay quarry and absence of natural water bodies nearby, the impact on biota and water resources should be considered negligible. The construction activities are planned within the areas of existing access road, existing dumpsite and former quarry. The locally available construction materials will be used wherever applicable. Requirements for sustainability of supply chain for the materials (e.g. delivery of sand and gravel from authorised borrow sites, origin of materials not from areas of high ecological value, monitoring of origin) will be included in the contracts and checked during the construction supervision.

6.13 Greenhouse gas emissions

During construction phase, no landfill gas will be generated, and hence no significant emissions of greenhouse gases are expected. However, there could be limited emissions of greenhouse gases by construction machinery and equipment, transportation vehicles, welding works, etc.

The following measures will ensure minimization of contribution of construction activities in generation of greenhouse gases:

- Develop a traffic management plan to ensure smooth traffic flow;
- Regularly check technical condition of vehicles and machinery, and ensure that all the vehicles are equipped with effective exhaust mufflers;
- Turn off the construction machinery and equipment that is not in use.

6.14 Climate change and adaptation

The construction works will be mainly carried out during summer months. Probability of extremely hot temperatures should be considered during planning of the works. On the other hand, probability of severe winter frosts and heavy snow should be addressed during planning of equipment and construction site maintenance.

6.15 Assessment of environmental impacts during construction

Summary of identified environmental impacts related to the proposed landfill construction activities and measures recommended for mitigating the potential negative impacts is presented in Table 6.1.

Table 6.1 Assessment of environmental impacts during construction of landfill

Impacts	**Assessment**	**Mitigation measures required**
Change in drainage pattern	Negligible	-
Flooding potential	Negligible	-
Landscape impact of excavation and construction (landfill and access road)	Minor positive	-
Contamination of soil, surface water and groundwater	Minor negative	Installation of bottom liner in landfill cells and leachate pond, surface runoff management, at construction sites, spill control, at construction sites
Air pollution (dust and emissions from machinery, dust during soil works)	Moderate negative	Maintenance of equipment, sprinkling of soil, covers during soil transportation, low on-site vehicle speed
Noise from construction machinery and vehicles	Moderate negative	Construction during day hours, use of silencers, low on-site vehicle speed, PPE for workers
Odour	Minor negative	Maintenance of vehicles and machinery
Biodiversity	Negligible	-
Management of natural resources (land, water)	Negligible	Use local materials where applicable
Greenhouse gas emissions	Minor negative	Use efficient machinery and work schedule
Climate change and adaptation	Negligible	-

7 Social Impacts and Mitigation Measures during Construction

Construction of the landfill and upgrading of access road to the site are planned on a public land. The site was in advance allocated as potentially fit for storage of waste and is located at a distance of about 500 m from the nearest residential buildings. Construction of the landfill on this area will not require any permanent or temporary acquisition of land. The landfill construction and upgrading of access road can be carried out with no disruptions in any public services.

Key adverse social impacts of landfill construction usually include the increased traffic, noise, aesthetic degradation, and property devaluation nearby landfill area. Impacts of these types will not be critical for the proposed Project, because the site selected for landfill is located on the territory of a former quarry far from residential areas and next to the existing major dumpsite.

It is expected that contractors of the infrastructure of sanitary landfill will bring their qualified staff but will also recruit local daily labourers for construction activities. Therefore the assessment is that construction of the sanitary landfill will have a positive impact on local employment.

Social impacts and mitigation measures relevant for the construction phase of the Project are in detail discussed in the following sections of this chapter.

7.1 Socio-economic and cultural impacts

Increase of waste collection tariffs in the Greater Osh required for proposed improvement of the waste collection services and establishment of the sanitary landfill will be the key socio-economic economic impact of the proposed Project. All households in the project region will be affected by increase of tariffs. The tariffs will be also increased for other users of the waste management system (institutions, shops, hotels, restaurants, etc.). To mitigate the major negative impact of a major increase of tariff in one go it is proposed to start increasing the tariffs step-by-step already during the landfill construction and establishment of the new waste collection system and to ensure that the compensation for the tariff increase is provided from the city budget to the population groups with the lowest income Increase of tariffs can bring essential improvements of waste management services only if collection rate of the tariffs is high. Otherwise, the households will not be encouraged to pay more for the services. Thus the waste tariff increase will have a direct socio-economic and an indirect cultural impact.

Socio-economic impact of the Project will also be associated with potential loss of access to waste and means of livelihood for about 30 informal waste pickers after closure and remediation of Osh dumpsite. Measures to be considered for livelihood restoration of the informal waste pickers within the Project will include training of waste pickers and providing them job opportunities within the solid waste management system. A framework document including the livelihood restoration measures has been prepared within the Feasibility Study. The document will be further developed to become a specific plan tailored for restoration and improvement of livelihood for waste pickers.

Direct socio-economic impacts will include creation of new jobs for construction workers and the associated income generated by the landfill construction. It is expected that the contractor will hire local drivers for transportation of construction materials. This employment opportunity will be available for about 2 years. Indirect impacts will occur as a result of the new economic development, and will include new jobs at businesses that support the expanded workforce or provide project materials. Meantime, taking into account that the landfill is constructed for the whole Greater Osh, the employment impacts on the local economy are likely to be negligible. The majority of the new employment associated with the landfill will be of temporary nature.

Land use impacts are also considered to be negligible, since the landfill and access road to it are located on the publicly owned land and no land acquisition is necessary to ensure land availability for landfill development. No impact is predicted upon the residential areas of nearby communities, as those are located at a sufficient distance from the landfill site. However, the impacts related to restricted access for residents of adjacent areas to the landfill site during its construction and operation will need to be established prior to construction works.

Direct impacts to cultural resources could occur from construction activities, and indirect impacts might be caused by soil erosion and increased accessibility to landfill site location. Given that the proposed landfill is located in the area of abandoned clay quarry, where clay extraction has been carried out for a period of time, the impacts to cultural resources are very unlikely. However, the following mitigation measures are proposed to prevent cultural resource impacts, if any occur:

- Use existing roads to the maximum extent feasible to avoid additional surface disturbance;
- Periodically monitor cultural resources in the vicinity of the landfill site (if any);
- An unexpected discovery of cultural resources during construction phase shall result in an immediate stoppage of civil works in the landfill site. The relevant information should be provided to the State Agency for Protection of Historical and Cultural Monuments of the Ministry of Culture, which after due consideration of the findings will recommend whether the works can be continued or the design must be revised;

› Educate workers and the public on the consequences of chance finds and unauthorized collection of cultural findings.

7.2 Labour and Working Conditions

According to the Labour Code of the Kyrgyz Republic the employers should follow the principles of non-discrimination and equal opportunities during recruitment and remuneration of the employees. The following measures are recommended to ensure that the principles are followed:

› Develop and implement procedures for recruitment and career development in a manner consistent with the principles of fair treatment, non-discrimination and equal opportunities (for men and women, for members of different ethnic groups, etc).

› Establish and maintain the grievance mechanism for the employees, ensuring that it is accessible to all employees allowing them to submit their formal or informal grievances and issues of concern and to have them properly registered, followed up and addressed.

The employers - as part of construction process - need to assess potential risks to ensure the safety and health of workers (depending on the size of the construction company, such assessment can either be performed by company's specialists or hired experts), as well as inform workers on safety practices and develop action plans to be followed in case of emergency. The construction company can establish a special committee dealing with worker's health and safety issues. The construction company shall ensure appropriate working conditions, so as the workers can implement their working duties. In particular, the construction company shall ensure:

› Proper working condition of vehicles, machinery, mechanisms, equipment and other devices;

› Timely provision of appropriate technical documentation;

› High quality and timely provision of materials and tools to be used by workers;

› Reliable and uninterrupted supply of electricity, gas and other sources of energy;

› Safe working conditions for employee's health (preservation of safety norms and rules, proper lighting, heating, ventilation, level of noise lower that the minimum norms accepted, dust, vibration, and other factors that may negatively impact the health of employee);

- Presence of emergency exits that are permanently accessible, free of physical obstacles. All workers should be made well aware of location of emergency exits;
- Availability of fire extinguishers in all the vehicles and construction sites;
- Availability of first-aid kit in all the vehicles and construction sites. All the workers shall be trained in delivering first aid and should be informed about the location of first-aid kit;
- Close monitoring of workers' physical condition; strictly prohibit the use of alcohol, psychotropic drugs and narcotics during the works.

Employers are responsible for comprehensive promoting healthy work environment, for encouraging the workers encourage workers to take responsibility for their own health, safety and wellness, for creating environments that make the healthy choice the easy choice, for providing information and resources to assist the workers to make health choices and to maintain good health, to make work a healthy life experience.

In case the waste pickers get involved in arrangements for collection and sales of recyclables, their working conditions will be improved.

7.3 Occupational health and safety issues

Potential impacts to workers and public health and safety from landfill construction would be similar to those expected for any construction project associated with earthmoving, use of heavy machinery and equipment, transportation of construction materials, and installation of industrial facilities. Most accidents at excavation and construction sites result from overexertion, falls, or being struck by equipment. Construction-related illnesses could also result from exposure to chemical substances from spills. In addition, health and safety issues include working in potential weather extremes and possible contact with natural hazards, such as uneven terrain and dangerous plants, animals, or insects. All personnel involved in excavation and construction would utilize appropriate safety equipment and would be properly trained in required occupational health and safety practices.

Measures to be carried out in order to mitigate occupational health and safety impacts include:

- Conduct a safety assessment to describe potential safety issues (site access, construction, work practices, security, transportation of heavy equipment, traffic management, emergency procedures, and fire control and management) and measures to mitigate them;

- Develop and implement a health and safety program for workers and the public, addressing all of the safety issues identified in the assessment and all applicable safety standards;
- Identify all applicable occupational safety standards and establish safe work practices;
- Ensure adequate provision of PPE, training on its use, timely cleaning and replacement of PPE;
- Closely monitor application of appropriate occupational health and safety practices at the construction sites, in particular while working with electrical equipment, welding equipment, heavy and lifting mechanisms, etc.;
- Consult with local planning authorities regarding traffic and traffic hazards. Address specific issues in a traffic management plan;
- Develop a fire management strategy to minimize the potential for a human-caused fire and establish fire safety evacuation procedures;
- Train workers in the early detection of fires;
- Fence and closely monitor the landfill construction site to prevent public access;
- Use appropriate procedures for storage and transportation of explosive materials, including appropriate signage indicating their location;
- Institute proper training protocols for employees working with dangerous materials.

7.4 Visual impacts, including view from the main road

Assessment of visual impacts, including view from the main road is largely based on professional judgment. During the construction phase, works will be confined to the proposed landfill site. The construction area will include installation of 2m high surrounding fence, establishment of paved access road, arrangement of offices and auxiliary facilities, and preparation of the first three cells for waste reception (for mixed household and commercial waste).

Visual impact during the construction period will result from the traffic and on-site operation of machinery. Taking into account that the Report on Landfill Site Selection mentions about low visibility of the site located within the abandoned quarry remaining after excavation of clay material, the visual impact generated by the project will be negligible. The fence will not be visible from any substantial distance. Visual impacts of the landfill facilities can be reduced by painting the buildings in a colour that merges with the surrounding natural background.

Soil excavated during construction of landfill cells will usually form 2-3 m high temporary earth bunds along the perimeter of the cell. The surrounding landscape for the most part of the year is of yellow-brown colour, the mounds will have only a marginal impact on the general view in terms of shape and colour.

The degree of change to the existing landscape during the construction stage will be low. Impact on visual receptors, as well as the duration and extent of the change in the landscape quality and value, taking into account that the landscape is currently of low sensitivity and can tolerate the change, will also be low.

The following mitigation measures are recommended for during construction phase:

- Design, construct, and paint conspicuous structures to blend with the character of the surrounding environment;
- Minimize the number of structures and co-locate facility components to the extent possible;
- Bury any power cables or lines on the site in a manner that minimizes additional surface disturbance, such as within areas that are already disturbed (e.g., access road shoulders);
- Use non-reflective paints and coatings to reduce reflection and glare. Avoid uncoated galvanized metallic surfaces;
- Use existing roads and disturbed areas to the maximum extent feasible to avoid additional surface disturbance;
- Lighting for facilities should not exceed the minimum required for safety and security.

7.5 Population movements

No resettlement, temporary or permanent acquisition of land, property and other assets is required for landfill construction.

The likelihood of population growth following the in-migration of the construction workers associated with landfill development and associated facilities in communities is very limited, taking into account the scale of the employment opportunities offered as a part of the project. Though a minor natural growth is observed, it is extremely unlikely that the trends will be impacted as a result of landfill development. In addition there is labour migration, particularly seasonal movements, from rural areas to urban ones and CIS countries, mostly Russia.

7.6 Economic impacts

The major economic impact during construction phase will be creation of employment opportunities for local population, as well as increase in production of materials to be used during construction process. Though these opportunities

(including 10-15 drivers and 10-15 unskilled workers) will be of temporary nature, they may still provide some possibilities for the local population to find work in the region, thus indirectly leading to reduction in seasonal workforce migration. Meantime, it should be also adopted that due to the scale and nature of the construction works, overall economic impact on the regional economy will be negligible, even in the communities located nearby the landfill site (e.g. nearby located Amir-Timur and Achi). The positive effect on employment, however slight, can be increased through procurement of local goods and services including contract services.

Traffic volumes on the roadways used to access the landfill will increase during the construction periods, in order to transport construction materials and workers. Increased traffic volume may cause air pollution (dust and emissions) and noise; however, these effects will be temporary and manageable with proper planning.

The impact on farming land is likely to be minimal, with assumption that the construction works are implemented with all the precautions and rules duly kept, in particular those regarding control of noise, dust, soil and water resources. But if there are disruptions and income is lost, this needs to be compensated.

Construction of the landfill is not expected to generate any significant additional demands on utility services (water, electricity, etc.). These services are required for the on-site facilities and workers.

Overall, the adverse impacts mentioned in this section can be sufficiently mitigated though the measures described above in this report.

7.7 Community Health, Safety and Security

During construction process the community health, safety and security may be impacted from dust and noise caused by vehicles and machinery movement to the construction site and transportation of construction materials. It is envisaged that during the landfill construction the daily traffic on access road to the site will include 15-20 trucks and 10-20 smaller vehicles. The largest sole delivery will be 20,000 m3 of drainage gravel transported by 2,000 trucks, which will stay for 50% of all incoming trucks to the site over 1 year (250 working days) Taking into account that landfill site is located in a sufficient distance from residential areas no increase in incidence of communicable diseases, deterioration in health or access to healthcare facilities is expected to occur during construction activities. It is expected that the trucks will come via the bypass road in the eastern part of Osh, will pass the residential area Amir-Timur, follow the road forming the southern border of Achi residential area (under development) of Osh city and then turn south to the landfill access road.

To prevent any potential negative impact on community health, safety and security the following measures are proposed:

- Provide information about landfill development project to the mayors of beneficiary communities;

- Install appropriate warning signs at the entrance of construction site in a visible place;
- Fence construction site to prohibit entrance of unauthorized people;
- Use covered/closed trucks for transportation of construction materials to avoid nuisance from dust;
- Limit speed of trucks, construction machinery passing through communities (particularly the eastern part of Osh, including Amir-Timur area and newly developed Achi area) to minimize nuisance from noise and vibration;
- Terminate the works at the established time (e.g. work in daylight time) and avoid increase of noise and number of peak hours.

7.8 Education

During landfill construction process it is not expected that access to educational facilities will be impacted. Taking into account that landfill site is located in a sufficient distance from residential areas it is not likely that project would lead to severance from education facilities. Meantime, education facilities may benefit from the project by having access to the information regarding landfill establishment and providing special thematic training to pupils.

7.9 Social Tension

Commencement of the project related to establishment of municipal solid waste landfill for the Greater Osh may lead to creation of tensions within and between communities; particularly due to limited number of job opportunities available during construction phase of the project. Another issue that may cause some social tension among beneficiary communities is the mechanism to be employed after completion of construction works to ensure proper operation of the landfill site, such as waste collection mechanism (the route of movement of truck that collects waste, frequency of waste removal from communities, etc.,) and fee collection principles (who collect money, what is money used for, who will be involved in landfill operation, why there is a need to engage a private operator, etc.).

The management of the sanitary landfill will strongly influence the socio-economic impacts that the landfill will have on the neighbouring communities. If the management is sensitive towards the concerns of the community, and develops timely solutions for the anticipated concerns of the communities, than minimal negative impacts are expected. The social monitoring system and grievance mechanism will be established during implementation of the proposed Project for identification and addressing the social tension issues.

7.10 Gender

Though construction of landfill in the Greater Osh would not have direct impact on men and women's social and economic roles, however, appropriate activities

should be undertaken to ensure that both men and women are provided with equal opportunities to benefit from landfill development and to ensure they are not disproportionately adversely affected by any project activities and duly consulted before and during introduction of changes in the waste collection system.

Measures to ensure that gender issues are properly addressed include:

- Education and awareness campaigns organized and conducted at schools, culture clubs, libraries, and community gatherings to enhance men and women awareness and knowledge of solid waste collection and disposal process;
- Facilitate the participation of women to provide their opinion and input on organization of waste collection services; design of containers, collection times and frequency, collection of recyclables, safety, security, etc.
- Ensure that requirements of labour code and safety rules are duly applied during construction activities;
- Ensure that landfill facilities include separate toilets and changing rooms for men and women;
- Organize meetings on health hazards of solid waste and on occupational health risks with men and women in local communities.
- Development of a plan to introduce measures that will provide equal employment and remuneration opportunities in the work places for men and women.

7.11 Impacts on vulnerable groups

It is anticipated that the landfill construction could benefit low-income and other vulnerable groups of population by creating job opportunities and stimulating local economic growth via Project revenues and increased tourism. Issue of potential concern relevant for implementation of construction works at the landfill and access road, during upgrading of waste collection points is the loss of income of waste pickers. However, waste pickers in the Greater Osh typically have other sources of income in addition to participation in informal recycling. Opportunities for participation of waste pickers in collection of recyclable fractions in special containers installed in Osh and suburbs and business contacts with the recyclers will be considered by Osh City Administration and the waste management company in cooperation with the PIU.

7.12 Assessment of social impacts during construction

Identified social impacts of the Project and measures required for mitigating the potential negative impacts during the landfill construction are briefly summarised in Table 7.1 below.

Table 7.1 Summary if social impacts and mitigation measures during construction of landfill

Impacts	**Assessment**	**Mitigation measures required**
Increase of tariffs	Major negative	Gradual increase of tariffs, enhancement of public awareness and revenue collection rate
Loss of income for waste pickers	Moderate negative in the Project scale, but critical for about 30 waste pickers	Involvement in arrangements for collection and sales of recyclables
Labour and working conditions	Negligible positive	-
Occupational health and safety	Minor negative	OHS management plan
Visual impacts	Minor positive	-
Population movements	Negligible	-
Economic displacement (users of land adjacent to landfill, waste pickers)	Minor negative	Information, avoidance, compensation
Community health, safety and security	Moderate negative	Traffic safety measures, fencing during excavation and construction activities
Education	Negligible	-
Social conflict	Moderate negative	Establishment of landfill management unit and transparent procedure for regulation of landfill gate fee
Gender	Minor positive	-
Disturbance during introduction of new waste collection system, construction of new collection points	Minor negative	Information, gradual introduction of changes, grievance mechanism

8 Environmental Impacts and Mitigation Measures during Operation and Maintenance

Environmental impacts and mitigation measures relevant for the operation phase of the Project are in detail discussed in the following sections of this chapter. Their summary is provided after the description.

8.1 Change in drainage pattern

During operation phase the water will be mostly used for washing the wheels of vehicles, sprinkling the earth access roads, as well as in the administration facilities. Operation of the landfill will have minor impact on hydrology and water quality of the area, as the wastewater will be discharged into natural environment only after appropriate treatment. In case the normal operational conditions of the landfill are kept, no impact on surface runoff of areas adjacent to the site is expected. Surface runoff within the site will be managed with installation of facilities for collection of clean runoff separated from collection system for contaminated runoff and leachate. Clean surface runoff and leachate will be collected in separate ponds established on the landfill site, within the lowermost, northern part of the closed drainage area of the former clay quarry.

The following mitigation measures are recommended to ensure adequate drainage control during landfill operation phase:

- Clean and maintain drainage ditches and culverts regularly to ensure proper removal of runoff;
- Do not alter or restrict existing drainage systems, especially in sensitive areas, such as erodible soils or steep slopes;
- Regularly monitor groundwater table through monitoring wells established at the site.

8.2 Flooding potential

Taking into account that there is no natural water bodies located nearby the proposed site, it is considered that there is likely to be a low impact to the soil from flooding. A seasonal brook flowing in the northern direction is located in a 10 m deep ravine going north at a distance exceeding 1 km from the eastern border of the

landfill site. The ravine's catchment area is separated from the site by 2 rows of low adyrs located to the east from the site.

To ensure that landfill area is properly drained even in case of heavy rainfall, the landfill operator should develop a Storm Water Management Plan ensuring that runoff from landfill area would not be allowed to migrate away from the site or into surface water bodies, and implement it when necessary.

8.3 Landscape impacts of excavation and construction

Operation of the landfill assumes tipping of waste and covering it with soil. It is recommended to use locally available soil for covering the waste and to carry out this activity without making any deep excavations on the landfill site and close to it. The filling height of 11 m is comparable with the depth of the clay quarry height of natural hills located close to the landfill site. As a result of waste disposal and its covering with soil during the landfill development the existing clay quarry will be somewhat filled up. Thus the impact of excavation and construction works during landfill operation on the landscape will be minor positive.

8.4 Pollution of surface water and groundwater

During the operation phase pollution of water resources at landfills may be caused by uncontrolled discharge of runoff or leachate, leakage from the clogged drainage systems, runoff from the raised landfill areas. It may also occur as a result of improper maintenance of machinery and equipment operated at a landfill site, due to spillage of fuel, oil and other substances. Meantime, proper operation of drainage system, leachate collection and treatment facilities, re-use of "clean" soils as capping soils to reduce surface water runoff from the waste, as well as stabilization of stockpiled soil by re-vegetation will minimize the potential adverse influences, and will allow to keep the physical, biological and chemical impacts to the water resources at a very low level.

Rain falling directly on active waste disposal areas within the landfill excavation may lead to an increase in leachate generation. This will be mitigated through leachate management and using temporary capping throughout operation. Areas of completed landfill will be progressively permanently capped.

Rain falling directly on non-active areas within the landfill excavation will not be considered as leachate, and will be collected, stored and tested for surface water quality before discharge to the environment, via gullies or ditches.

Rain falling directly on non-excavated areas of the site will not be considered as leachate, and will flow under gravity to site gullies and ditches before discharge to the environment.

Establishment of the proposed landfill far from natural water bodies will minimize the inflow of surface water that may be polluted by the leachate.

Carefull operation of the landfil and maintenance of leachate collection system should ensure that risk of soil and groundwater contamination is very limited. This is due to the following reasons:

› Limited precipitation and high evaporation in the local arid climate conditions (i.e. limited leachate generation and its intensive evaporation);

› Large slope of bottom liner resulting in a limited area where a potential leak of leachate can occur, before the leachate enters the leachate collection pipeline;

› Accumulation of leachate evaporation pond having impermeable synthetic bottom liner, which can be inspected regularily;

› The landfill design and operation (with the manuals available) in accordance with the EU directive "On the Landfill of Waste".

Groundwater intake well installed for the on-site water supply system and its protective zone will be maintained with due care in order to avoid contamination of groundwater. Groundwater monitoring program will be carried out.

According to the regional hydrogeological data the depth to groundwater within the site and its vicinity is about 100 m. The layers having low permeability prevent infiltration of local precipitation, which is very limited due to the arid climate, and protect the groundwater from contamination originating from sources located on the land surface.

To prevent pollution of surface water and groundwater resources the following mitigation measures are proposed for implementation during operation and decommission phases:

- Regularly inspect and clean drainage ditches/ culverts;
- Regularly inspect leachate collection and treatment facilities, wheel wash system, water supply and sewerage network at administrative building to ensure proper operational technical conditions;
- To reduce the likelihood of oil spillage from machinery and equipment, and contamination with wastewater from administrative facilities, proper technical condition of machinery and equipment shall be ensured. In addition, sand or fine gravel should be spread on the ground in the locations designated for parking, and servicing machinery. In case of spillage, the polluted layer must be removed and replaced with new layer of sand or fine gravel;
- All vehicles must be regularly checked and their normal operational technical conditions shall be ensured. In case any leakage of oil or other liquid is observed, the vehicle must be moved to a paved impermeable area and be immediately fixed;

› Groundwater and surface water quality shall be monitored at regular intervals during operation and decommission phases.

8.5 Air pollution

Air pollution occurring during operation phase of the new waste collection system and the sanitary landfill includes release of dust during waste and soil transportation and loading, levelling, unloading works, emissions from engines of vehicles and machinery. At present the traffic of waste collection trucks to Osh dumpsite is at the level of 30 trucks a day. Upon replacement of existing trucks by compaction trucks of higher capacity the estimated daily number of collection trucks of the municipal waste management company (the Company) delivering waste to the landfill will be 20 in 2016 and will reach 33 by 2035 (Table 8.1). Occasionally, a roll-off tipper will deliver bulky waste collected by the Company.

Table 8.1 Daily number of the Company trucks delivering waste to the existing dumpsite and the future landfill of Osh

		2013	2016	2025	2035
Existing system (transportation to the dumpsite):		**30**			
Future system (transportation to the sanitary landfill):	Collection point system		4	5	7
	Kerb side collection		10	13	17
	Signal collection		6	7	9
	Total:		**20**	**25**	**33**

It could also be expected that certain amounts of waste could be delivered to the future landfill by private and corporate cars in addition to the Company trucks. Upgrading and maintenance of access road to the landfill is important for mitigating the impact from vehicles delivering waste to the landfill.

Taking into account that there are no residential areas within 1 km and no stand-alone residential buildings within 500 m of the landfill boundaries, the potential for nuisance impacts from dust and subsequent air pollution is considered to be low. The landfill will be operated in line with the good international practice and measures for prevention of impacts on land and biota around the landfill will be implemented. A fence and a belt of trees and bushes will be established around the site as a barrier on the way of waste spreading by wind. Waste accumulated in the green belt will be regularly collected and taken to the landfill. During the windy hours the landfill operations could be stopped. Waste tipping can be carried out in a mobile tent.

Waste from landfill can be also spread by birds and animals. The fence should limit/prevent access to the site for animals. Bird control measures should be implemented (e.g. by using bird scaring kites, sound signals, trained birds of prey).

Potential sources of air pollution that can occur during the operations within the landfill site include impacts on air quality arising from operation of a diesel

generator, impacts on air quality arising from emissions of landfill gas and the potential combustion of landfill gas. Air pollution can occur in case of fires.

Coverage of the delivered waste at the landfill site will considerably reduce impacts on air.

To prevent or minimize the potential impacts the following mitigation measures are recommended:

- Post and enforce speed limits to reduce airborne fugitive dust from vehicles;
- Allow site access only to authorized vehicles;
- Keep soil moist while covering of waste;
- Keep waste collection and transportation trucks closed/covered when travelling on public roads;
- Maintain containers and trucks for preventing spills of leachate during waste collection and transportation
- Water unpaved roads to prevent spreading of dust;
- Regularly check technical conditions of all vehicles operated at the landfill site. These vehicles should be equipped with effective exhaust mufflers according to the requirements of relevant national and international legislation;
- Arrange daily coverage to control spreading of waste by wind, birds, animals;
- Restrict access to the landfill, train the staff to ensure prevention of waste fires;
- Monitor landfill gas emissions and arrange for their collection and utilisation, when relevant.

8.6 Wastewater generation and disposal

During landfill operation the water will be used at the administrative facilities for drinking, cooking, washing and bathing purposes, as well as for washing the wheels of vehicles. The facilities for daily accommodation of landfill employees shall be equipped with systems for water supply and sewerage collection. The wastewater from administration, control and staff (including sanitary) facilities will be collected in the wastewater collection tank for further treatment. Wastewater originated from washing the wheels of vehicles and through drainage system will be discharged into the surface water collection and treatment system that includes sand trap and oil separator, and will treated prior to its discharge into natural environment. Another option would be to use the wastewater for watering the waste. The appropriate facilities (drainage layer, leachate collection pipelines, leachage accumulation and evaporation pond with impermeable synthetic bottom

liner) will be used to ensure collection, storage, treatment and discharge of the leachate. Improper operation of the drainage system, leachate collection and treatment (evaporation) facilities as well as wastewater collection tank can have medium-scale negative impact and cause pollution of soil and seasonal water pools on the territory of the former clay quarry which is a closed drainage area.

At the landfill site, in order to minimize negative impacts from wastewater generation and discharge, the following measures are recommended for implementation:

- Regularly inspect and ensure proper maintenance of wastewater collection tank, wheel washing system, leachate collection and treatment facilities;
- Regularly inspect and maintain the surface water collection and treatment system that includes sand trap and oil separator. Ensure regular cleaning of drainage ditches/ culverts;
- Avoid potential spills through application of appropriate occupational rules; washing of vehicles and equipment on the site to be restricted;
- Chemicals as well as other liquid and solid dangerous materials must be stored and managed properly;
- Wastewater from the accommodation facilities shall be collected and adequately removed from the site.

8.7 Hazard vulnerability

The natural hazards relevant for the landfill site include: drought, earthquake, flood and fire.

To reduce hazard vulnerability at the landfill site during operation the following measures are recommended:

- Prepare Emergency Preparedness and Response Plan, inform the workers on its provisions;
- Regularly inspect of cut-off drains and maintain the sanitary protective zone (radius 500 m from waste disposal areas according to MUD Guideline of 2010) around the landfill;
- Ensure compliance with rules on storage and handling of construction materials, fuel, oil products, chemical substances, etc.;
- Regularly inspect landfill facilities and infrastructure to ensure their proper operation and updating of as-built documentation;
- Provide periodic training to workers on how to act in emergency situations;

- Maintain reliable communication between landfill site and respective local authorities, first-aid service, rescue service, police office, fire office, operators of electricity, gas and water supply utilities to ensure adequate response in case of emergency.

The landfill is located in a seismic activity region (9 points according to SNiP KR 20-02:2009). However, sufficient engineering measures for soil collapsing elimination and watering of subsoils are implemented by a geological barrier and impermeable liners as well as surface water and melt water derivation around the landfill. Since the bottom liner is composed of natural and synthetic materials having certain strain and elasticity. The flexible drainage layer and elastic synthetic materials will be used for leachate collection system. It is estimated that there is only a minor risk for failure in the integrity of the liner in case of earthquake.

8.8 Noise

The primary source of noise during operation would be machinery working at site (e.g., bulldozers, dump trucks, etc.) and vehicular traffic. The magnitude of noise impacts during operation is considered to be limited due to location of the site at a significant distance from residential areas and due to the landscape features with bars and depressions playing the role of noise barriers between the landfill site and the residential areas.

Noise impacts at the operation phase could be minimized though application of the following mitigation measures:

- Limit noisy activities to the least noise-sensitive times of day (weekdays only between 7 a.m. and 10 p.m.);
- All equipment should have sound-control devices no less effective than those provided on the original equipment. Motorized equipment should be adequately muffled and maintained;
- Insulate the administrative buildings at the landfill site;
- Install sound control devices (baffles, silencers) to limit noise levels of facility equipment;
- Landfill employees in the vicinity of sources of high noise shall wear necessary protection gear;
- Barriers (e.g. fences, etc.) or purpose-built acoustic screens should be used to reduce the noise reaching administrative building, where practicable;
- Avoid use of percussive and impact tools wherever possible;
- Machinery in intermittent use should be shut down or throttled down to a minimum when not in use;

› Personal protective equipment should be provided to employees for hearing protection, the sign boards and training procedure should be in place.

8.9 Odour

Operation of the sanitary landfill will allow to close the existing dumpsites and thus to stop odour nuisance from them for residents and visitors of the adjacent areas.

There are two main sources of odour during operation of the landfill: odour from the degradation of the organic waste and odour from the leachate pond. The key mitigation of odour nuisance will be achieved due to location of the landfill site to the south-south-west from residential areas, while the prevailing wind direction has south-western - north-eastern orientation.

The mitigation of odour can be achieved by the followings:

› Minimize duration of waste exposure at the landfill without cover, particularly during days with high temperatures;

› Unload, spread and compact the waste in the smallest area possible;

› Avoid parking full waste vehicles on site overnight;

› Directly recycle leachate from sumps and drains to leachate pond;

› Closely monitor and maintain the gas collection systems and flares;

› Regularly inspect and maintain top cover of landfill cells to ensure its integrity and development of vegetation cover;

› Washout vehicles and their substructure to reduce on road vehicle odour;

› Use waste collection vehicles with containers for leachate; regularly empty the containers at dedicated leachate collection points.

› Plan waste collection services for shortest possible storage of waste at collection points.

8.10 Spillage of hazardous or medical waste

During operation the landfill a dedicated area will be used for temporary storage of hazardous collected as a fraction of municipal waste. Negative impacts may appear if this waste fraction were not properly handled and were released to the environment as a result of accidental spills.

A set of mitigation measures to be applied to prevent spillage of hazardous or medical waste and minimize negative impacts in case of accidental spill include the following:

- Prepare a comprehensive list of all hazardous materials that can be used, stored, transported, and kept in a facility for temporary storage of hazardous waste during landfill operation;
- Develop a hazardous materials/medical waste management plan addressing storage, use, transportation, and disposal (interim and final) for each item in the list. The plan should identify specific details regarding emergency response;
- Develop a waste management plan identifying anticipated solid and liquid waste streams, and addressing inspection and waste minimization procedures, storage locations, and waste-specific management and disposal requirements;
- Develop a spill prevention and response plan for addressing storage locations of hazardous and medical wastes, spill prevention measures, training requirements, waste-specific spill response actions, spill response kits, and notifications to authorities;
- Train employees to promptly contain, report, and/or clean up any oil, hazardous material and/or medical waste spill;
- Provide portable spill containment and clean-up equipment in all vehicles;
- Develop a storm water management plan to ensure compliance with regulations and to prevent off-site migration of contaminated storm water or increased soil erosion;
- Containerize and periodically remove the hazardous waste for recycling or for disposal at appropriate off-site permitted disposal facilities;
- Document accidental releases as to cause, corrective actions taken, and resulting environmental or health and safety impacts.

8.11 Biodiversity

Operation of landfill on the territory of the former clay quarry will not cause any significant negative impact on the wildlife. The site will be fenced and get a green belt of trees and bushes typical for the region. The green belt will prevent spreading of waste by wind and will be attractive for a variety of small birds. Proper coverage of waste during operation of the sanitary landfill should result in reduced number of crows on the site. At present, the numerous and noisy flocks of crows are constantly present on Osh dumpsite. Closure of dumpsite and regular covering of waste at the landfill will ensure vermin and rodent control. Generally speaking, the impact of landfill on biodiversity will be negligible.

8.12 Sustainable natural resources management

Issues related to management of natural resources during the landfill operation include optimisation of waste covering with soil (to avoid using too much soil and

taking the landfill capacity), management of water resources on the site (for keeping the clean runoff separate and available for use within the area), optimisation of vehicle routes, other energy saving measures. One of the measures for minimisation of soil use will be application of inert waste (e.g. construction waste) as cover material.

8.13 Greenhouse gas emissions

The landfill will generate landfill gas during the whole active lifetime, as well as during a long period after the landfilling has been completed. The whole period of landfill gas generation from the site depends on the waste type and anaerobic activity in the landfill. Experience from other landfills indicates that the period may be as long as 70 years. Installation of gas collection system will be carried out during the landfilling. Flaring/utilisation of landfill gas will be implemented after closure of the landfill. Assessment of GHG emissions and Emissions Reduction Units for the existing dumpsite which will be closed after establishment of the sanitary landfill for Osh is difficult, because there is no information regarding age, composition, annual amounts and status of waste (e.g. how much of the waste was burned). Based on the Feasibility Study, no active emission reduction activities were recommended at the existing dumpsite.

It is proposed to close the existing dumpsite by a soil cover with a topsoil layer with grass. A top cover layer with a humus layer will reduce methane emission as microorganism will, under favourable conditions, oxidise methane into CO_2 and water. After closure of the dumpsite it is assumed that the total CO_{2eq} emissions can be reduced. The emission reduction potential is, however, difficult to assess as much of the landfill gas will penetrate through fissures, cracks etc. in the top cover, and most likely there will also be areas in the topsoil where humus is not present.

8.14 Climate change and adaptation

Operation of landfill will be carried out according to procedures developed for the climate conditions during its design. However, the landfill design and development based on the best international practice allow to mitigate the impacts of extreme temperatures (e.g. lengthy too hot or too cold periods) or precipitation pattern (e.g. heavy rain, thick snow, drought), so that they are negligible for areas adjacent to the landfill. The landfill operation procedures will be updated, if necessary, according to the climate change trends. A trend to desertification of climate in Kyrgyzstan can lead to higher evapotranspiration of leachate generated at the landfill.

8.15 Summary of environmental impact assessment during operation phase

Environmental impacts of the Project and measures required for mitigating the potential negative impacts during operation of the sanitary landfill and new waste management system for Osh and suburbs are briefly summarised in Table 8.2.

Table 8.2 Summary of environmental impacts and mitigation measures during operation of landfill and new waste management system

Impacts	**Assessment**	**Mitigation measures required**
Change in drainage pattern	Negligible	-
Flooding potential	Negligible	-
Landscape impact of excavation and construction	Minor positive	-
Contamination of soil, surface water and groundwater	Moderate negative	Filling of waste in cells with installed bottom liner, surface runoff management, spill control, leachate management
Air pollution (dust and emissions from machinery, dust during soil works, spreading of waste by wind and birds)	Moderate negative	Maintenance of equipment, sprinkling of soil, covers during waste and soil transportation, management of green belt, littering control, fire control
Noise from machinery and vehicles	Minor negative	Operation during day hours, use of silencers, low on-site vehicle speed, PPE for workers
Odour	Minor negative	Maintenance of vehicles and machinery, systematic covering of waste, maintenance of buffer zone
Biodiversity	Negligible	-
Management of mineral resources (soil, grus)	Moderate negative	Use local materials where applicable
Greenhouse gas emissions	Moderate negative	Install and operate landfill gas collection
Climate change and adaptation	Negligible	-

9 Social Impacts and Mitigation Measures during Operation

Social impacts and mitigation measures relevant for the operation phase of the Project are described in the following sections of this chapter. The summary is provided after the description.

9.1 Socio-economic impacts

Major socio-economic impact during introduction and operation of the new waste collection system including the sanitary landfill will be related to increase of tariffs for households and other customers. As it discussed during comparison of applicable alternatives, the degree of tariff increase will depend on macroeconomic conditions, but mainly on the selected option of the waste management system and the revenue collection rate. The social impacts will be related to affordability of the future tariffs. Affordability threshold recommended for waste tariffs based on the international practice is 1% of the average income per capita.

Mitigation of social impacts can be achieved by the following measures:

- Development, implementation and adjustment of tariff setting strategy for households and other customers (shops, organisations, hotels, unorganised tourists, etc.),
- Monitoring of incomes on annual basis and introducing the improvements making sure that the tariffs do not exceed affordability threshold approximately estimated as 1% of average income per capita (management of the tariffs will be the responsibility of municipal authorities, who will regulate the tariffs for population and other users of the waste management system),
- Introduction and maintenance of transparent system of waste registration,
- Improvement of billing and collection system,
- Raising of public awareness for improved collection of recyclable fractions,
- Involvement of up to 30 waste pickers in collection of recyclables and arrangements for their marketing.

Direct socio-economic impacts during landfill operation stage include establishment of new jobs for workers involved in waste collection, transportation

and disposal at the landfill site, as well as for those involved in landfill operation activities. Indirect impacts will involve new jobs at businesses that support the expanded workforce or provide project materials, and associated income. Meantime, taking into account that the landfill is constructed (probably by an international contractor with recruitment of qualified local workforce) for Osh and suburbs, the employment impacts on local economy will be positive, but most likely negligible.

Key adverse social impacts of landfill construction usually include the increased traffic, noise, unpleasant odours and property devaluation of land close to the landfill. Therefore the assessment is that the investment in the sanitary landfill will have a positive impact on local employment.

Introduction of organized waste collection will contribute to overall sustainable socio-economic development at local and regional level. The potential social impacts during the landfill operation stage are assessed as positive and considered to be a significant step forward towards sustainable development.

Land use impacts are considered to be minor, as the landfill is located within the community owned land, which can be transferred to other use with adequate compensatory arrangements.

9.2 Impact on cultural heritage

Impacts on cultural resources are also considered to be negligible, as the excavations have been made in the area of former clay quarry before the project, thus probability of finding or impacting cultural resources at the operation stage is almost non-existent. However, the following mitigation measures applicable for construction phase remain valid for operation stage as well, in order to prevent cultural resource impacts:

- Use existing roads to the maximum extent feasible to avoid additional surface disturbance;
- Periodically monitor cultural resources in the vicinity of the landfill site (if any);
- An unexpected discovery of cultural resources during any phase of the project shall result in an immediate stoppage of civil works in the landfill site. The relevant information should be provided to the KR Inspectorate for Protection of Historical Cultural Monuments (establishment of the KR Ministry of Culture, Information and Tourism), which after due consideration of the findings will recommend whether the works can be continued or the design must be revised;
- Educate workers and the public on the consequences of chance finds and unauthorized collection of chance findings.

9.3 Occupational health and safety issues

Possible impacts to health and safety during landfill operation stage can include accidental injury or death to workers. Health impacts could result from exposures to chemicals and products used and produced in landfill facilities, air emissions, and noise. Potential fires and explosions will cause safety hazards. Gasoline or diesel might also be stored on site. In addition, health and safety issues include working in potential weather extremes and possible contact with natural hazards, such as uneven terrain and dangerous plants, animals, or insects.

Occupational health and safety (OHS) issues will be addressed within the overall environmental, social, health and safety mangement system of the company operating the landfill. All personnel involved in operation of the landfill would utilize appropriate safety equipment and would be properly trained in required occupational health and safety practices.

Measures recommended for mitigation of potential adverse impacts include the following:

- Carry out and keep updated OHS risk assessment of work places; identify and minimise, so far as practicable, the causes of potential hazards to workers; develop and update safety instructions for each workplace;
- Closely monitor application of appropriate occupational health and safety practices at the landfill site, in particular while working with electrical equipment, welding equipment, heavy and lifting mechanisms, etc.
- Consult with local planning authorities regarding traffic and traffic hazards. Address specific issues in a traffic management plan;
- Identify all applicable occupational safety standards and establish safe work practices;
- Fence and monitor the landfill site to prevent public access;
- Use appropriate procedures for storage and transportation of explosive materials, including appropriate signage indicating their location;
- Train landfill personnel on appropriate actions to be taken in case of fire, wastewater leakage, etc.;
- Provide appropriate personal protective equipment (uniform, mask, gloves, glasses, boots, etc.) to landfill employees;
- Install fire resistance measures, ensure availability of appropriate tools;
- Ensure availability of first aid kit with appropriate medicaments in all vehicles and buildings at the landfill site.

› Provide comfortable and clean amenity facilities for workers (men and women) with access to potable water according to national sanitary and hygienic regulations.

9.4 Visual impacts, including view from the main road

It is expected that landfill will be operate during 10-12 hours/day in a 7 days/week. Waste received at the landfill will be placed in cells, covered with a daily soil cover and compacted by tracking plant over the placed waste. It is estimated that the minimum disposal volume at the landfill should be at least 1,200,000 m^3 to enable sanitary landfill operation for 20 years.

Every batch of waste disposed in the site will be covered with dredged soil of at least 200mm thickness on a daily basis, which means that the colour of the operational cell and the perimeter/surrounding soil bunds will merge with the background (where yellowish-brown colours prevail). The size of the waste mounds at both landfill sites will increase gradually. The expected average height of the landfill is approximately 11m.

As was mentioned above, the surrounding area is generally undeveloped and of limited agricultural interest. It is anticipated that the area surrounding the landfill site will not be used for recreation or purposes other than agricultural. The only industrial developments in the local area is the on-going excavation of clay for the needs of the cement plant, which is located at some distance from the proposed site and will unlikely be affected by any "deterioration" of landscape and visual amenity. Thus, it can be concluded that the visual impacts during the operation of the proposed landfill will be low.

The following mitigation measures are recommended to ensure minimum impacts during operation phase:

› Maintain the site during operation of the facility. Inoperative or damaged equipment and poor housekeeping, in general, creates a poor image of the activity in the eyes of the public;

› Avoid uncoated galvanized metallic surfaces;

› Use existing roads and disturbed areas to the maximum extent feasible to avoid additional surface disturbance;

› Lighting for facilities should not exceed the minimum required for safety and security.

After completion of the operational life of the landfill, all remaining soil mounds will be graded to merge with the surrounding landscape. Therefore a low residual visual impact is likely, as the mounds will gently merge into the surrounding

environment and the office and other facilities will have been removed. Landscaping of the site following closure will replicate as closely as practically possible, the natural features of the surrounding landscape.

9.5 Labour and Working Conditions

According to the Labour Code of the Kyrgyz Republic, employers - as a part of landfill operation process - need to assess potential risks in order to ensure the safety and health of employees (depending on the size of the landfill operator, such assessment can either be performed by its specialists or hired experts), as well as inform landfill employees on safety practices, and develop action plans to be followed in case of emergency. The operator can establish a special committee dealing with worker's health and safety issues. The landfill operator shall ensure appropriate working conditions, so as the employees can duly implement their working duties. In particular, the construction company shall ensure:

- Proper working condition of mechanisms, equipment and other devices;
- High quality and timely provision of materials and tools to be used by employees;
- Reliable and uninterrupted supply of electricity, gas and other sources of energy to ensure proper operation of landfill facilities;
- Safe working conditions for employee's health (preservation of safety norms and rules, proper lighting, heating, ventilation, level of noise lower that the minimum norms accepted, vibration, and other factors that may negatively impact the health of employee);
- Presence of emergency exits that are permanently accessible, free of physical obstacles. All workers should be well aware of location of emergency exits;
- Availability of fire extinguishers in all the vehicles and landfill facilities;
- Availability of first-aid kit in all the vehicles and landfill facilities. All the employees shall be periodically trained in delivering first aid, and should be informed about the location of first-aid kit;
- Monitoring of employee's physical condition, strictly prohibit use of alcohol, psychotropic drugs and narcotics in work sites.

9.6 Population movements

No resettlement, temporary or permanent acquisition of land, property and other assets is required for landfill construction.

The likelihood of population growth following the in-migration of the operation workers associated with landfill development and associated facilities in communities is very limited, taking into account the scale of the employment opportunities offered as a part of the project.

9.7 Economic impacts

The sanitary landfill will be operated bythe following staff of Landfill Division of Osh-Tazalyk:

Managing Director/Financial administrator: 1
Foreman: 1
Control office: 2 weighbridge and waste control operators;
Vehicle operators: 3
Guard at gate: 1 (3 persons working in shifts)
Unskilled worker: 3

Operation of the sanitary landfill will closure and remediation of Osh dumpsite. Closure of the dumpsite is expected to leave about 30 informal waste pickers (including several children of school age) without access to waste as the source of their income and will require implementation and preparation of Livelihood Restoration Plan tailored according to the circumstances of the waste pickers. Framework document (Compensation and Livelihood Restoration Framework) outlining the Project approach to livelihood restoration of informal waste pickers is prepared as separate document at the stage of Feasibility Study. Proposed livelihood restoration measures include job opportunities provided to waste pickers. It is expected that about 25 of them could be trained and get jobs within the solid waste management sector in Osh and suburbs.

The overall impact of landfill operation on the regional economy and employment situation is negligible. On the other hand population of Osh and suburbs will significantly benefit from establishment of organized waste removal, transportation and disposal process. Indirect positive impact on business opportunities will be related to catering services (e.g. for employees of the landfill company, drivers of waste collection vehicles), but also assignments for consulting companies (e.g. for monitoring of leachate wells, runoff, groundwater, preparation of reports according to environmental monitoring programme approved by the environmental authorities and the EBRD),

Traffic volumes on the roadways used to access the landfill will increase during the operation period, in order to transport waste to the site. The overall rating of such impacts is minor.

The impact on farming land is likely to be minimal, as the landfilling should have no impact on the ability to farm nearby lands, providing the facility operates within normal conditions, in particular with respect to control of vermin, dust, litter, and management of surface water and groundwater.

During operation the landfill is not expected to generate any additional demands on utility services (water, electricity, etc.). These services are required for the on-site facilities and employees.

9.8 Community Health, Safety and Security

The Project proposed for improvement of waste management system in Osh and suburbs will have a major positive impact on the health and safety of population. Closure of dumpsites, clean-up of waste from access roads to the dumpsites and prevention of dumping after establishment of modern waste collection system with the sanitary landfill will improve the environment in residential areas and will lead to better waste management habits of population.

During the landfill operation the community health, safety and security may be impacted from dust and noise caused by trucks transporting waste from communities to landfill. Health risks at landfill are usually associated with exposure to vermin, contact with leachate and emissions of smoke in case of fires.

Taking into account that landfill site is located at a sufficient distance from residential areas, no increase in incidence of communicable diseases, deterioration in health or access to healthcare facilities is expected to occur during landfill operation. Meantime, in should be noted that timely removal of waste from communities and proper operation of landfill would reduce odour impacts, health risks and infectious diseases, which may appear as a result of waste accumulation and its improper disposal in the communities.

To prevent any potential negative impact on community health, safety and security the following measures are proposed for the landfill operation phase:

- Provide information about waste removal schedule to the communities, ensure that appropriate information leaflets are posted in places of community gatherings (e.g. major office, shops, post office, cultural club, library, medical station, etc.), so as the population is aware of the new waste collection procedures;
- Install appropriate warning signs at the entrance of landfill and at collection points in communities;
- Fence landfill site to prohibit entrance of unauthorized people;
- Use covered/closed trucks for transportation of waste, use vehicles with leachate collection containers to prevent spills;
- Increase frequency of waste collection at hot season of the year;
- Plan waste collection routes and limit speed of waste collection trucks passing through the communities to minimize nuisance from noise and vibration and to ensure traffic safety;
- Obtain feedback from communities and use grievance mechanism for evaluation and adjustment of waste collection and landfill operation;
- Maintain sanitary protective (buffer) zone of the landfill.

9.9 Education

During landfill operation it is not expected that access to educational facilities will be impacted. Since landfill site is located at a sufficient distance from residential areas, it seems unlikely that Project would impact operation of education facilities. The potential minor impacts may include noise and dust nuisance from the trucks that transport the waste. Meantime, education facilities may benefit from the project by organizing practical lessons and visit operating landfill as a part of regular school course on ecology/environment to ensure better understanding of waste disposal practices and provide special thematic training to pupils.

9.10 Social tensions

Introduction of organized waste collection and disposal services requires a change of attitude of the population, services and enterprises that at early stages of the process may cause some social tensions. Population, services and enterprises have to acknowledge that it is their responsibility to care for sustainable and environment friendly development. This responsibility starts with the timely collection of the costs for waste collection and disposal from all stakeholders. The beneficiaries of the municipal waste management system also have to pay at a level that allows the landfill operator to recover the cost of providing a modern, well-regulated and efficient service. In some cases, municipalities, especially rural ones, underestimate landfill operation cost. In some cases representatives of vulnerable groups cannot afford payment for waste collection, which may also lead to creation of social tensions within community.

Uncontrolled scavenging is often perceived as a potential negative impact. There could be fear that the waste-pickers will move to the communities located nearby landfill area. Another issue is that child labour in any stage of waste collection and landfilling process must be strictly prohibited and prevented to the extent possible. Children have been observed as involved in waste picking at Osh dumpsite during preparation of the present document.

Overall, addressing the major social concerns depends in large part on raising public awareness of the issues and changing behaviour in waste collection and disposal. The behaviour and capacities of the public sector in managing, supervising and monitoring landfilling project activities also needs to be enhanced.

9.11 Gender

Gender issues will be addressed during operation of the improved waste management system. Establishment of sufficient number of adequately equipped and placed waste collection points, improved schedule of waste collection, clean-up of waste spread near collection points in the streets will be appreciated by the communities in Osh and suburbs, but particularly by women, who are typically caring of taking the garbage out of homes and also spend more time at home and in the areas close to homes, when they take care of children, kitchen gardens and local shopping.

Special attention will be focused on street illumination conditions to ensure better safety of waste collection operations, if they are carried out during dark hours.

Equal opportunities will be provided for employment and remuneration of men and women with the waste management company. By involving the NGOs and/or consulting companies in opinion surveys the PIU, waste management company and/or the Project municipalities make sure that men and women are consulted during evaluation of the quality of services and assessment of the improvements achieved and still required. Relevant experience is available with the local NGOs. The Project would benefit from obtaining from (mostly female) housekeeping personnel of hotels, hospitals, shops, catering companies their feedback on waste collection services. Men will be consulted with regard to collection of recyclables, technical aspects of waste loading operations at waste collection points and access to them with minimum disturbance for road traffic and parked vehicles. These and other efforts for receiving a feedback from various groups of population with attention to the interests of men and women are recommended to prevent negative attitude to the Project and to enhance its positive social impacts, so that men and women could benefit from improvement of waste management system in Osh and suburbs during the Project implementation.

9.12 Impacts on vulnerable groups

Key vulnerable groups during operation of the sanitary landfill and new waste collection system will include households with low income and persons affected by economic displacement due to temporary or permanent restriction of access to productive assets. The assets to be considered include the land plots near the landfill site (resource for the land owners) and the municipal solid waste (as resource for waste pickers).

Owners of land near the landfill site could be affected by pollution (e.g. littering) from the landfill. The land areas adjacent to the landfill site were partially used (for agriculture and picnics) during preparation of the Feasibility Study and the ESDD. A map of land plots titled in the vicinity of the site recommended for establishment of landfill with names of their owners is available with Shark Municipality Administration. The land ownership issue will need attention of Osh City Administration for the local negative impact could be avoided, mitigated or compensated. The Project grievance mechanism will address the issue. On the other hand, it is expected that proposed upgrading and maintenance of access road to the site will have positive local impact on the conditions of the adjacent land plots.

Attention to the informal waste pickers/recyclers is important, as changes in this area (e.g. closure of dumpsite, restricted access to waste in containers and at the sanitary landfill) can have significant consequences on the livelihoods of vulnerable people.

The impacts on vulnerable groups during operation phase of the Project will be addressed line with the EBRD Performance Requirements 1 and 5 in the Environmental and Social Action Plan (ESAP) of the Project. Approach elaborated

during construction of the landfill and establishment of the new waste management system could be further developed during the stage of operation with further elaboration of Livelihood Restoration Framework agreed with the vulnerable groups.

9.13 Summary of social impacts during operation phase of the Project

Summary of identified social impacts of the Project and measures required for mitigating the potential negative impacts during operation of the sanitary landfill and new waste management system for Osh and suburbs are briefly summarised in Table 9.1. The landfill operation is planned for about 20 years and thus will have long-term social impacts.

Table 9.1 Summary of social impacts and mitigation measures during operation phase of the Project

Impacts	**Assessment**	**Mitigation measures required**
Increase of tariffs, higher collection rate of fees	Moderate negative	Increase of public awareness, transparency of tariff setting for households and other customers
Labour and working conditions, occupational health and safety	Minor positive	-
Visual impacts	Minor positive	-
Population movements	Negligible	-
Economic displacement (users of land adjacent to landfill, waste pickers)	Minor negative	Information, avoidance, compensation
Community health, safety and security	Major positive	-
Education	Negligible	-
Social conflict	Minor negative	Operation of landfill management unit and transparent procedure for regulation of use fees and landfill gate fee
Gender	Minor positive	-

10 Environmental Impacts and Mitigation Measures during Final Closure and Aftercare of the Landfill

This chapter and the next one are related to the Project phase, when the first sanitary landfill is filled up to its maximum capacity and should be closed, and a new facility for disposal of municipal solid waste should be made available for the Osh city and suburbs. It is assumed that the improved waste collection and transportation system will continue its operation. Certain impacts could be related to decommissioning of containers and waste collection trucks, landfill operation machinery, but they would be the same as during the operation and maintenance phase of the improved waste management system with landfill. That is why the specific environmental impacts and mitigation measures for this phase of the Project should be considered mainly with regard to closure and aftercare of the sanitary landfill.

Many of impacts related to final closure of landfill are expected to be similar to impacts of landfill construction and operation phases. The impacts and issues should be addressed for this phase in a way similar to construction and operation phases. A Landfill Closure and Aftercare Manual should be developed prior to the landfill construction starts and updated during the operation and the cell-by-cell development of the landfill. The Manual should include the mitigation measures to be implemented at the landfill site during and after the landfill closure, i.e. during and after establishment of the final cover.

The final cover is suggested constructed with a simple system consisting of:

- 0.2 m top soil
- 0.8 m sub soil
- 0.15 m gas drainage layer

An impermeable synthetic topliner is not recommended due to low precipitation, high potential evaporation and steep slopes on final cover (mainly 1:3) which result in high surface water run-off and little leachate generation.

Impacts of aftercare will be mostly related to leachate and landfill gas. They are also discussed in the chapter addressing the residual impacts and risks.

Some of the impacts and mitigation measures at the stage of landfill closure and aftercare are briefly described in the following sections of this chapter. The summary assessment of impacts is presented after the description.

10.1 Landscape

During landfill closure and aftercare it is recommended to:

- Remove all unnecessary aboveground structures and facilities from the landfill area;
- Re-establish the terrain and drainage pattern similar to natural conditions of the adjacent areas;
- Restore the vegetation cover, composition, and diversity commensurate with the ecological setting;
- Review reclamation efforts and weed control periodically until the site is determined to have been successfully reclaimed;
- Stabilize all areas of disturbed land using weed-free native shrubs, grasses, and forbs;
- Use plant species characteristic for the landscape in the course of restoration of the vegetation cover on reclaimed areas;
- Restrict construction activities on the landfill site after closure.

10.1.1 Pollution of surface water and groundwater

During landfill closure and aftercare it is recommended to:

- Regularly inspect and clean drainage ditches/ culverts;
- Regularly inspect leachate collection and treatment facilities to ensure proper operational technical conditions;
- All vehicles must be regularly checked and their normal operational technical conditions shall be ensured. In case any leakage of oil or other liquid is observed, the vehicle must be moved to a paved impermeable area and be immediately fixed;
- Surface runoff should be managed for directing clean runoff away from sources of possible contamination;
- Groundwater and surface water quality shall be monitored at regular intervals during operation and decommission phases.

10.2 Assessment of environmental impacts for the Project phase of landfill closure and aftercare

The environmental impacts of the Project and measures required for mitigation of potential negative impacts during the landfill closure will be rather similar to impacts during operation of the landfill. The impacts for closure and aftercare phase of the proposed Project are briefly summarised in Table 10.1.

Table 10.1 Environmental impacts and mitigation measures during landfill closure and aftercare

Impacts	**Assessment**	**Mitigation measures required**
Change in drainage pattern	Negligible	-
Flooding potential	Negligible	-
Landscape impact of excavation and construction	Negligible	-
Contamination of soil, surface water and groundwater	Minor negative	Surface runoff management, leachate management, top cover maintenance, sending hazardous waste from temporary storage facility to final disposal
Air pollution (dust and emissions from machinery, dust during soil works, spreading of waste by wind and birds)	Minor negative	Maintenance of equipment, sprinkling of soil, covers during waste and soil transportation, management of green belt, littering control, fire control
Noise from machinery and vehicles	Negligible	
Odour	Minor negative	Maintenance of vehicles and machinery, systematic covering of waste, maintenance of buffer zone
Biodiversity	Negligible	-
Management of mineral resources (soil, grus)	Moderate negative	Use local materials where applicable
Greenhouse gas emissions	Moderate negative	Install and operate landfill gas collection
Climate change and adaptation	Negligible	-

11 Social Impacts and Mitigation Measures during Closure and Aftercare

This chapter, like the previous one, is related to the Project phase, when the first sanitary landfill is filled up to its maximum capacity and should be closed, and a new facility for disposal of municipal solid waste should be made available for Osh and suburbs. Some of the social impacts and mitigation measures relevant for the landfill closure and aftercare phase of the Project are in described in the following sections of this chapter. The summary of their assessment is included after the description.

11.1 Labour and Working Conditions

It is expected that the waste management company (the Company) and contractor(s) involved in closure and aftercare activities comply with the EBRDs PR2. The Company should develop and implement the adequate retrenchment policy, which might include re-training of the staff and offering alternative employment opportunities, e.g. with a unit operating a new landfill for Osh and suburbs or for some other region.

11.2 Population movements

No temporary or permanent acquisition of land, of property or of economic assets is envisaged during closure and aftercare. No migration into or out of area is envisaged after closure of the landfill.

11.3 Economic impacts

The economic impacts and mitigation measures will be identified and determined prior to closure of the landfill and necessary mitigation measures will be included in the Landfill Closure and Aftercare Manual. These impacts could be related to the following spheres:

- Impact on economic assets including land, access road;
- Reduction of direct and indirect employment.

11.4 Community Health, Safety and Security

The ESIA may need to identify how the Project could influence the health of the affected communities. There are a number of effects that need to be considered:

- Environmental conditions created by Project which may lead to deterioration in health.
- The impact of the Project on access to health care facilities.
- Security of the site for prevention of access to facilities posing risks (e.g. leachate pond).
- Signage and information for preventing damage and excavation of landfill top cover.

The potential social impacts associated with the landfill closure and aftercare are expected to be less significant than during construction and operation of the landfill, but a set of measures should be taken to mitigate the potential negative impacts.

11.5 Education

The supplementary environmental and social studies to be completed prior to the start of construction works can address the impact of the Project on access to education facilities. There could also be identified opportunities for the education facilities to benefit from the Project.

11.6 Social Conflict

At the present stage it is difficult to foresee social conflicts relevant for the Project. The conflicts could be caused by changes in interests of the Project stakeholders and changes in relations between them. These and other issues will need to be considered further during Project implementation.

11.7 Gender

As discussed above, due to the different roles of men and women in waste collection and with respect to waste picking, the impacts of the Project will also be different. These will need to be monitored during implementation to see if any measures are required.

11.8 Impacts on vulnerable groups

The impacts and mitigation measures will be assessed as part of the supplementary environmental and social studies to be completed prior to the start of construction works.

11.9 Assessment of social impacts during the phase of landfill closure and aftercare

It is assumed that by the time of the proposed landfill closure and aftercare a new option for waste disposal (e.g. a new landfill) will be available for the region. Social impacts of the Project and mitigation measures required during the landfill closure and aftercare phase of the proposed Project are briefly summarised in Table 11.1.

Table 11.1 Social impacts and mitigation measures during landfill closure and aftercare

Impacts	**Assessment**	**Mitigation measures required**
Increase of tariffs	Major negative	Availability of affordable new waste disposal option
Labour and working conditions, occupational health and safety	Negligible	-
Visual impacts	Minor positive	-
Population movements	Negligible	-
Economic displacement	Negligible	-
Community health, safety and security	Major positive	-
Education	Negligible	-
Social conflict	Negligible	-
Gender	Negligible	-

12 Management of Residual Impacts and Risks

The residual impacts and risks of a project are typically considered in terms of the potential for accidents and incidents (such as oil spills, explosions, contaminant release, dam failure, etc.).The nature of key residual impacts should be described and their significance assessed in the ESIA.

12.1 Residual environmental impacts and risks

Management of residual environmental impacts and risks should be the subject of contingency planning. The Project will include development of emergency preparedness and response plan for the landfill management unit. It will also include requirement for emergency preparedness and response planning in tender documents and in the contracts.

The Emergency Preparedness and Response Plans should be coordinated with the local authorities and establishments of the Ministry of Emergency Situations.

Closed landfills with the proper cover and aftercare measures typically do not pose major environmental risks. There is even an internationally known practice of urban development projects implemented on top of former landfills. However, the following risks are to be addressed in the Project:

- fire (even though this risk is lower than during operation of the landfill),
- disruptions of power supply, water supply, telecommunication lines (the back-up arrangements should be included in the Project design),
- escape of landfill gas (and its possible impact on indoor climate),
- spills of leachate (due to malfunctioning of leachate management system),
- erosion or damage of the landfill cover.

For the specific conditions of southern part of Kyrgyzstan it is important that the buildings and installations of the landfill are constructed taking into consideration the high level of seismic activity and the climate change trends.

12.2 Residual social impacts and risks

Social risks are very context-specific and could be related to the following factors:

- Economic changes such as inflationary trends;
- Political changes which may make it difficult to implement particular mitigation measures;
- Unforeseen events such as natural disasters;
- Conflicts between municipalities participating in the Project, collapse of cooperation.
- Lack of skilled people to implement mitigation measures;
- Weakness of enforcement measures (e.g. for prevention of waste dumping, for collection of revenues);
- Insufficient capacity for supervision and monitoring.

More detailed information about residual social impacts and risks will become available once the supplementary environmental and social studies are completed.

13 Project Benefits and Opportunities for their Enhancement

The Project is expected to provide major environmental and social benefits for Osh and suburbs as a result of introduced sound collection and disposal of municipal solid waste, prevention of waste dumping and its burning.

The following specific benefits could be achieved during the Project implementation:

- Improved quality of collection and transportation of waste in Osh and suburbs;
- Increased service area of waste collection system in Osh and densely populated suburbs of Osh;
- Improved sanitary conditions and visual image of residential areas and their surroundings;
- Sound disposal of waste;
- Improved working conditions of waste management operators;
- Addressing of gender aspects in the Project;
- Improved environmental awareness, education, public participation
- Improved attractiveness of the region for tourists;
- Local business development and capacity building;
- Improved governance and transparency.

It is expected that the environmental and social benefits of the Project will have a long-lasting effect for Osh and suburbs, but will also have a demonstration effect for Kyrgyzstan and other countries. The environmental and social benefits could be enhanced within implementation of the Environmental and Social Action Plan in cooperation with the local stakeholders. Opportunities for enhancement of environmental and social benefits of the Project, as well as the information on the actions in progress and the already completed actions should be presented in the Stakeholder Engagement Plan, which should be systematically updated during the Project.

13.1 Enhancement of environmental benefits

13.1.1 Remediation and Clean-up of contaminated sites

Availability of sanitary landfill will provide background for remediation and clean-up of sites in Osh and suburbs currently occupied by dumpsites.

13.1.2 Habitat enhancement

The Project will contribute to protection of natural habitats and improvement of modified habitats.

To avoid impacts on natural habitats, it is proposed to establish the landfill within the modified habitat area of hay land/grassland affected by roads, high-voltage line and earlier construction of a canal.

Habitat enhancement will be ensured by lowering risks of further spreading of dumpsites in natural and modified habitats. This will require enforcement of safe disposal of waste at the sanitary landfill.

13.1.3 Energy and Resource Efficiency

The Project includes procurement of modern vehicles and machinery of waste collection, transportation and disposal at the sanitary landfill. Tender specifications for procurement of all equipment, vehicles and machinery will include requirements regarding energy efficiency.

Resource efficiency of the Project will be achieved in case of gradual purchase of equipment and gradual development of the landfill.

Gradual purchase of equipment and its installation will allow avoiding the purchase of equipment, e.g. containers, not fitting the local physical conditions, waste collection practice and habits.

Gradual development of the landfill will assume construction of the cells according to the filling progress and demand. It is also propose that installation of the landfill gas collection system should be considered at later stage of the landfill development, e.g. after closure of its first cell.

For efficient use of vehicles and machinery the Company will operated a set of equipment sufficient for daily operations at a current stage of the landfill development. For example, equipment for picking up the leachate from the leachate pond and spreading it over the body of accumulated waste could be purchased later or rented (e.g. from a wastewater collection company).

One more aspect of resource efficiency will be collection of recyclable waste fractions, as well as the use of locally available construction materials, wherever applicable.

The Project will assume clean-up of areas contaminated with waste along the roads and in minor dumpsites.

Considerable benefit of the Project could be expected in case the recycling schemes are implemented for a few waste fractions at early stage of the system operation and further developed by covering additional fractions at later stage of the Project.

13.1.4 Cleaner Technology

The Project implementation will ensure introduction of the cleaner technologies for waste collection, transportation and disposal. Enhancement of the Project's benefit could be achieved by a set of arrangements with recyclers of selected waste fractions. At a later stage of the Project it would be advisable to consider opportunities for collection of landfill gas and utilisation of its flaring energy, e.g. for district heating, hot water supply or heating of greenhouses.

13.1.5 Institutional Strengthening

The Project will result in establishment of the first Project Implementation Unit for operation of waste management system with sanitary landfill in the southern part of Kyrgyzstan. Institutional strengthening will be enhanced for providing services in Osh and adjacent rural municipalities. Institutional strengthening of the system could be enhanced by the PIU's support to Osh City Administration and to authorities of the rural municipalities in establishment of an efficient institutional setup for cooperation.

13.1.6 Capacity Building

The Project benefits related to building of the local waste management, community mobilisation and environmental management capacity could be enhanced by involving the staff of municipal waste management companies in the training sessions and workshops.

Enhancement of the Project benefit for the local capacity building could be supported by including the requirements for training of the local staff into the tender documents and contracts for the equipment and machinery suppliers.

13.2 Enhancement of social benefits

Whilst social impact assessments are generally concerned with mitigation of negative impacts, they also present an opportunity for impacted people to take advantage of and benefit positively from the Project. Areas of the Project benefit may include:

- temporary and permanent jobs within the Project
- opportunities for local firms to sub-contract services
- opportunities for local firms to supply goods

- in cases where relocation is required there may be opportunities to improve the housing condition of people relocated.
- Project may be able to link up with local schools and other educational centres to create opportunities for learning.

Like many other projects financed by the EBRD and other international organisations, the Osh Solid Waste Project will have its particular opportunities for facilitating the local development. These opportunities should be considered in dialogue with the local authorities and during the public consultation.

In exploring the strategy for development opportunities, particular attention should be given to vulnerable categories within the area of impact. Unless very specific measures are taken, they are likely to be excluded from development gains. It is important to remember that particularly with this group of people, participatory or community demand driven approach to campaigning will not necessarily ensure that they are included in the benefits. Moreover, special measures may be required to enable certain categories to take part in activities, for example employment of disabled people may require the setting of special facilities.

Communities participating in the Project will consider involving the elderly and disabled people in communicating the advantages of the new waste collection system in urban and rural communities. The elderly people should be consulted, before the closure of chutes is implemented in each specific residential block. The Project would advise the municipal waste management companies to make sure that the elderly and disabled persons receive adequate support for collection of their waste. The PIU and the Company could arrange workshop(s) to discuss the lessons learned and to promote the best practice.

Gender analysis

Gender aspects of social benefits and opportunities for their enhancement should be identified and addressed during the Project. Questions that need to be discussed could be as follows:

- What are men and women's social and economic roles in municipalities involved in the Project?
- Will the project impact adversely on men and women's social and economic roles.
- What institutional arrangements have been made for consulting with women?
- Are there equal opportunities for both men and women to benefit from the Project?
- Are there barriers to women's participation and how can they be overcome without creating tensions within the community?

Public monitoring

Elderly and disabled people, who spent most of their time at home, could be involved in selecting the optimal location of waste collection points and in monitoring the performance and status of the waste collection points. Elderly

people are typically rather attentive to cases of vandalism, incompliance with established rules, spreading of waste, disruptions in services, etc. Elderly people are used to conveying messages to local authorities on phone and during meetings. This experience can be used for a public monitoring system, which can facilitate for improvement of waste collection services in Osh and suburbs. At the same time many elderly people are very much interested in improvements and are opened for expressing their opinions in telephone or in-person interviews. This kind of social feed-back and public monitoring services could be remunerated (payment, presents, promotional items with logo, etc.) by the municipal waste management company or authorities.

Public monitoring and community mobilisation could be an efficient measure for prevention of unauthorised dumping of waste in recreational zones in Osh and surroundings. This measure should be combined with other measures, e.g. with introduction of a fee for cars entering the most visited tourist sites. Experience from various countries shows that even a very low "symbolic" fee will facilitate for more precise assessment of the number of visitors and quantities of their waste during the year and at the same time can cover some of the costs related to collection and disposal of waste generated by the unorganised tourists.

Enhancement of Project benefits for building of the local capacity for waste management could be achieved by training sessions and workshops arranged by the Project for staff of waste management company. One of the key issues during then training sessions would be the local capacity building for environmental management in line with the EBRD Performance Requirements.

14 Environmental and Social Monitoring

Monitoring of the Project performance should focus on key indicators agreed with the EBRD and the Kyrgyz Republic State Agency of Environmental Protection and Forestry for assessment of the social and environmental impacts. Indicators should be aligned to elements of the existing pre-project baseline and be specific, measurable, achievable, relevant and conducted following an appropriate time schedule.

In order to verify the effectiveness of mitigation measures and the compliance of the Project with the national regulations and the EBRD Performance Requirements, the Project implementation will include establishment and implementation of the following three major monitoring programs:

- Contractor/Supplier Compliance Monitoring Program (CCMP)
- Environmental Monitoring Program (EMP) for the landfill
- Social Monitoring Program (SMP) focused on the Project impact on the communities

The programs will provide information on the actual impacts and could also serve as tools for identification of unforeseen and not addressed impacts.

The CCMP will be carried out as part of contractor supervision during construction works.

14.1.1 Environmental monitoring program (EMP) for the landfill

The EMP will include baseline monitoring activities which will be started during construction of the landfill and monitoring activities during operation, closure and aftercare of the landfill.

Objectives of monitoring

Environmental monitoring program will be an integral part of the Landfill Operation Manual. The objectives of the monitoring are as follows:

- collection of information on the situation before landfill establishment and before landfill closure;
- assertion of the effect of environmental measures as provided in the design;
- evaluation of processes within the waste mass;
- assertion of compliance with the permit provisions.

The monitoring program will include field measurements, laboratory analyses and preparation of reports. Some of the field measurements could be carried out by the landfill company staff; however, most of the monitoring activities should be assigned to competent contractors.

Maximum allowable/permitted concentrations (limit values)

These are parameter values indicating significant environmental pollution and the need for corrective actions aimed at evaluation and prevention in case of exceeded limit values. These values must be specified in the permit for landfill operation and assessed by a landfill operator. The limit values are established by the national regulatory authorities typically with reference to the national or international (EU) standards. They are case specific for each landfill and should be identified based on the results of baseline monitoring and verified during the monitoring of landfill compliance with the permit. The exceeded values of main parameters demanding implementation of corrective action program must be indicated in the environmental permit for landfill establishment and operation or approved by the national regulatory authorities.

Scope of EMP

Monitoring is required during the whole lifetime of a landfill. The monitoring program typically includes pre-operational, operational and post-operational phases. The monitoring program will be launched before the landfill operation. The monitoring results will be regularly evaluated, so that the monitoring program can be adjusted and a corrective action implemented, if required.

A scope of monitoring program for landfills typically includes the following environmental aspects that may be influenced during landfill operation:

- Waste acceptance
- surface water;
- groundwater;
- leachate;
- landfill gas;
- meteorological data;
- odour;
- noise;
- dust;
- flora and fauna;
- landfill stability and settlement of disposed waste.

For the sanitary landfill in Osh the key aspects of monitoring will include monitoring of surface water, leachate, landfill gas and groundwater.

Waste Acceptance Monitoring

A topographic survey of the waste disposal area will be carried out prior to commencement of the waste deliveries to the landfill and then on an annual basis for monitoring of amount and settlement of waste deposited.

During the landfill operation the Company will carry out a routine monitoring of waste received at the landfill and prepare monthly and annual reports including, inter alia, the following information on the Company operations:

- Types and amounts of waste (in tonnes) delivered and disposed of at the site
- Estimated volume of waste disposed off (based on topographic survey)
- Estimated remaining disposal volume at available disposal units (cells)
- Mileage and/or number of operating hours for trucks and other movable equipment belonging to the Company.
- Fuel consumption
- Staff employed at the plant during the year
- Costs

The results should be analysed, evaluated and recommendations made to management for improving performance. The remaining capacity of the landfill and its life span should also be evaluated.

Surface water monitoring

The landfill site is located in the closed basin on the bottom of the former clay quarry. Surface water entering the landfill site from adjacent territory (e.g. during snow melting or heavy rains) and from precipitation on the landfill territory will be collected in ditches, and thus prevented from contact with waste, and accumulated in a surface water collection pond established in the lowest elevation area in the northern part of the landfill site. The monitoring will be carried out for assessment of amount and quality of surface runoff from the landfill area. It is expected that no discharge will occur from the landfill area to any surface water bodies located off-site, because the surface water accumulated in the pond will evaporate during summer months, as it happened before construction of the landfill.

The quality of water in the pond will deteriorate, if the surface runoff management system on the landfill site is not efficient. Water samples from the pond will be collected on a quarterly basis and analysed for presence of components typical for leachate (see Table 14.2 further below).

If the social survey performed during the supplementary environmental and social studies to be carried out prior to construction of the landfill reveals that access to water accumulated in the surface water pond within the site area is important for cattle owned by residents of areas adjacent to the landfill site, possible alternative solutions will be assessed and agreed with the cattle owners.

Leachate monitoring

Aerobic and anaerobic biological decomposition processes of organic matter, resulting in the production of soluble organic and non-organic components and water, will take place on the landfill. Leachate is the most frequent source of

environmental pollution causing serious consequences. The objectives of the leachate monitoring program are the following:

- checking conformity of the leachate handling system to the design criteria;
- obtaining information on biodegradation processes in the waste;
- timely review of the parameters for the underground and surface water analyses based on the information about leachate composition changes.

The concentration of organic matter in the produced leachate may reach several tens of grams per litre. The intensity and duration of the process, concentrations of various substances in the leachate, the amount of the leachate depend on the origin of the organic waste, the compression level, thickness of the waste layer, humidity, temperature, aeration conditions, etc.

At the landfill in Osh the leachate will be re-circulated, i.e. flow from waste cells via leachate collection system into the leachate pond (established for leachate accumulation and evaporation), and then will be spread over the surface of waste cells (e.g. in a way similar to irrigation), where from it can be evaporated.

Level of leachate for assessment of leachate volume will be measured in the leachate pond and in the leachate collection system of cells. Samples of leachate will be taken from leachate pond. Frequency for leachate monitoring activities is specified in Table 14.1.

Table 14.1 Frequency of leachate monitoring

Parameters	**Operation phase**	**Closure and aftercare phase**
Leachate level	Every week	Every month
Leachate volume (amount)	Every month	Every 6 months
Leachate composition	Every 3 months	Every 6 months

Leachate composition depends on landfill age, waste composition, intensity of waste biodegradation processes, amount of precipitation in the waste, and temperature. The leachate analyses could be selected considering the impact from each of the above factors. Standard leachate analyses include parameters listed in Table 14.2. The analyses will be made by an accredited laboratory.

Table 14.2 Leachate monitoring parameters

pH	Total dissolved solids TDS
Temperature	Lead Pb
Ammonia nitrogen NH_4-N	Magnesium Mg
Biochemical oxygen demand	Manganese Mn
Chemical oxygen demand	Nickel Ni
Conductivity EL	Potassium K
Calcium Ca	Natrium Na
Cadmium Cd	Sulphates SO_4
Chrome Cr	Zinc Zn
Chlorides Cl	Total alkalinity ($CaCO_3$)
Copper Cu	Total organic carbon C org tot
Mercury Hg	Total nitrogen oxides NO tot
Iron Fe	Total petroleum hydrocarbons TPH

Evaluation of leachate monitoring, groundwater monitoring and surface water monitoring data will be carried out to verify that the leachate is adequately re-circulated within the landfill and is not polluting the surface water and groundwater.

Monitoring of landfill gas

Landfill gas composition will be monitored at the top of the gas collection wells. The landfill gas typically contains methane and hydrogen which can form flammable mixtures with air. The critical flammable concentration limits are known as Lower Explosive Limits (LEL). The measurements of methane and hydrogen concentrations in landfill gas will be carried on a quarterly basis by means of standard gas monitoring equipment. When concentration of the flammable gases in the landfill gas reaches 5% of LEL, the measurements will be carried out more frequently. The monitoring results will be used for assessment of the waste decomposition process and for assessment of possible utilisation options. Quarterly measurements of air quality in various points within the landfill may be used for assessment of the landfill cover and the landfill gas collection system. Air quality measurements within the sanitary protective zone will be carried out for identification of any landfill gas leakage zones.

The results of leachate and gas analyses will be displayed in a graphic form (concentration versus time), the resulting trends analysed and where necessary remedial actions implemented.

Groundwater monitoring

At the site selected for landfill no groundwater has been encountered during the Feasibility Study, but according to data of regional hydrogeological investigations, the groundwater could be reached at depth about 100 m below the terrain. Due to presence of thick layers having low permeability, the groundwater is well protected from contamination sources based on the land surface. Groundwater intake (one abstraction well) will be established for the on-site water supply system. Groundwater will be monitored for checking the efficiency of implemented protection measures and identification of possible leachate intrusion and groundwater contamination. In order to select correct sampling points and receive the results of analyses reflecting on the situation, the hydrogeological site conditions should be very well known. Groundwater level will be measured and groundwater samples will be taken 4 times a year in the abstraction well and monitoring wells installed within the landfill site perimeter. Only three monitoring wells will be installed during construction of the landfill. Groundwater levels in them will be measured once a month during construction of the landfill, so that the groundwater flow direction an seasonal fluctuations could be determined and during the first year of the landfill operation the additional monitoring wells could be installed: one downstream the landfill (for monitoring of groundwater passing the landfill) and one upstream and far from the landfill, e.g. at the border of sanitary protective zone (as a reference point for monitoring of groundwater definitely not affected by the landfill). Since groundwater monitoring wells are significantly different in design from drinking water wells, the wells should be installed by a certified well driller with experience in the construction of groundwater monitoring wells.

Groundwater samples will be analysed for determining the baseline/background concentrations of various components before operation of the landfill. During the following years the analyses will be carried out for identification of changes in groundwater quality due to contaminants potentially originating from leaks of leachate. The results of the analyses will be displayed in graphic form (concentration versus time), and compared with the baseline concentrations and/or national/international standards for drinking water.

Table 14.3 provides a list of parameters recommended for baseline monitoring and for compliance monitoring.

Table 14.3 Parameters for groundwater analyses

Monitoring parameter	Baseline monitoring	Compliance monitoring
PH	•	•
Conductivity EL	•	•
Total dissolved solids TDS	•	•
Temperature	•	•

Monitoring parameter	Baseline monitoring	Compliance monitoring
Ammonium nitrogen NH_4-N	•	•
Oxygen O_2	•	•
Residue after evaporation (180°)	•	•
Calcium Ca	•	•
Cadmium Cd	•	•
Chrome Cr	•	•
Chlorides Cl	•	•
Copper Cu	•	•
Cyanides CN, tot	•	•
Iron Fe	•	•
Lead Pb	•	•
Magnum Mg	•	•
Manganese Mn	•	•
Nickel Ni	•	•
Zink Zn	•	•
Potassium K	•	•
Natrium Na	•	•
Mercury Hg	•	•
Sulphates SO_4	•	•
Tot alkalinity ($CaCO_3$)	•	•
Tot organic carbon C org tot	•	•
Total amount of nitrogen oxides NO tot	•	•
Total petroleum hydrocarbons TPH	•	•

Monitoring parameter	Baseline monitoring	Compliance monitoring
Arsenic As	•	
Barium Ba	•	
Boron B	•	
Fluorides F	•	
Phenols	•	
Phosphorus P	•	
Antimony Se	•	
Silver Ag	•	

An evaluation monitoring exercise should be started when the results of the compatibility monitoring show the parameter values exceeding the ambient level. The purposes of the evaluation monitoring are the following:

- identification of pollution emission source;
- identification of pollution origin, amount and flow;
- environmental risk and human health hazard assessment;
- evaluation of pollution elimination or reduction measure;
- collection of required information for the implementation of corrective project.

Evaluation monitoring program may require an increased number of borings, increased sampling frequency and additional pollution dissemination analyses. A number of software modules for contamination transport modelling are used to identify contamination spreading direction and conditions.

The output of the evaluation monitoring exercise should be the clearly defined corrective measures aimed at reduced pollution emission and environmental impact.

Air quality

Air quality monitoring for assessment of dust, emissions from waste and odour nuisance will be carried out on a quarterly basis at the border of sanitary protective zone established for the landfill. An accredited contractor will be hired by the Company.

Meteorological data

Registration of meteorological data will be an obligatory part of a landfill monitoring program. Precipitation, temperature, evaporation and humidity are

important factors having effect on the total amount and composition of the leachate produced. The data will be used for the estimation of the water balance, required for operation of leachate collection and recirculation systems. Exact water balance may be estimated based on the meteorological data from the landfill site. Applicable meteorological data may be received from measurements on the site and from the nearest meteorological station (Osh).

Parameters and their registration frequency required for water balance estimations and evaluation of leachate generation are included in Table 14.4.

Table 14.4 Frequency of meteorological registrations for monitoring

Parameter	Operation	Closure and aftercare
Amount of precipitation	Daily	Every month
Temperature min/max	Daily	Average monthly
Wind speed and direction	Daily	Not required
Evaporation	Daily	Every month
Air humidity	Daily	Average monthly

Flora and fauna

It is important for the landfill operation to have no significant effect on the ecosystems. Thus regular observations of the flora and fauna around the landfill should be performed and any changes or stress traces of the ecosystem should be registered. Landfills attract birds and small rodents and provide favourable conditions for the development of some vermin, worms, and flies. The information provided by the monitoring will be used for the selection of means to prevent the appearance of unwanted fauna, e.g. for bird control measures.

Landfill stability and subsidence

Stability monitoring will be carried out to assess the integrity of the landfill structure. The sliding of landfill disposal slopes may produce certain human health hazard, thus regular landfill slope monitoring should be carried out. Slope stability should be evaluated once per year by a qualified inspector.

The waste volume settles primarily due to the increasing waste density, when some biological materials degrade and the space is filled by others, while the relative waste weight is increasing. The settling rate is difficult to predict, since it depends on a number of factors, specific to each particular landfill, such as humidity, composition, density. The settling process may also start due to the damages of the bottom or top insulation, leachate collection, gas collection or drainage systems. Regular monitoring during the operational and post-operational periods should facilitate the identification of required changes in the operational procedures aimed at reducing the risk of uneven settling. The evaluation of settling should be made by a qualified inspector at least once a year.

Documents

Annual reports will be issued with a full monitoring program description, implementation report and summary of monitoring results. These reports will be kept on the landfill premises and will be accessible for the EBRD, for the controlling institutions and for the public.

Review of the program

Landfill operator performs periodical check-ups to ensure the compatibility of the program with the monitoring objectives and, if required, update the program. The check-ups are important for program quality, efficiency and continuous appropriateness. The interval between check-ups should not be more than 12 months.

Duration of monitoring

Landfill constructed on the proposed site near Osh will receive waste for about 20 years. After the final cover is established the landfill aftercare might be carried out for more than 50 years.

There are no national criteria for landfill aftercare and monitoring duration. Article 13(d) of the European Landfill Directive (CEC,1999) states: '… for as long as the competent authority considers that a landfill is likely to cause a hazard to the environment…, the operator of the site shall be responsible for monitoring and analysing landfill gas and leachate … and groundwater regime in the vicinity of the site …'. Accordingly, aftercare cannot be ended, or in other words landfill aftercare completion cannot be agreed upon, until the competent authority can be convinced that the landfill is no longer causing a hazard.

In many countries the authorities accept that landfills can be released from aftercare if they do not endanger the well-being of society and in particular do not endanger the groundwater protection. The criteria for the competent authority to assess this situation are to a large extent related to degradation of organic matter and stability of the landfill.

The period for aftercare will be decided during the preparation of the Landfill Closure and Aftercare Plan considering the emission limit values and the assessment of the compliance of an entire landfill with these limit values.

14.1.2 Social monitoring program (SMP)

Social monitoring program of the Project will be carried out in the Greater Osh. It will be particularly important during the first years of the Project, i.e. during construction of landfill and the first years of its operation with roll-out of the improved waste collection system. The SMP will include the following key elements:

- Monitoring of tariffs for waste management services as a percentage of household income with special attention to affordability of tariffs for the poorest and most vulnerable groups;

- Monitoring of waste fee collection procedures/practice and collection rate;
- Monitoring of grievances and comments received from the public and response to them disaggregated by gender;
- Monitoring of grievances and comments received from the workers and response to them disaggregated by gender;
- Social surveys for evaluation of new waste collection system (with assessment breakdown according to various communities, population groups, men and women) and response to them;
- Monitoring of livelihood restoration for waste pickers and job opportunities or informal recyclers;
- Monitoring and evaluation of public outreach activities related to implementation of the new waste management system in Osh city and suburbs;
- Review of social disaggregated by gender benefits from the Project, including the gender audits and coordination with other development initiatives.

Project performance in line with the Environmental and Social Policy and Performance Requirements of the EBRD will be presented in regular (typically annual) reports submitted by the Project Implementation Unit to the EBRD. The reports will contain information on progress in implementation of the ESAP.

15 Preparation and Implementation of Environmental and Social Action Plan

According to the Environmental and Social Policy of the EBRD, an Environmental and Social Action Plan (ESAP) is developed for and should be implemented during the Project. The ESAP includes the programmes and systems to address, in an integrated and comprehensive fashion, environmental and social impacts, issues and opportunities should be established with clearly stated outcomes or targets, timeframes, responsibilities and resources required.

The ESAP is based on adaptive management and include appropriate monitoring activities to ensure that:

- mitigation measures are effective,
- unforeseen negative impacts or trends are detected and addressed,
- expected project benefits or opportunities are achieved.

The ESAP prepared for the Project should also include a provision for:

- capacity building such as training of project staff and/or third parties (if appropriate),
- contingency and emergency response plans and measures (including adequate resources).

Appendix 1 Map of Osh and surroundings

Appendix 2 Map showing areas not suitable for landfill in Osh and surroundings

Appendix 3 Map of Osh Project area

Appendix 4 Response to questionnaires about existing municipal waste management system in Osh

Appendix 5 Response to questionnaires about the proposed Project