THE MINISTRY OF ECONOMIC DEVELOPMENT OF THE REPUBLIC OF AZERBAIJAN

CLOSURE AND REHABILITATION OF GARADAGH AND SURAKHANI LANDFILLS

ENVIRONMENTAL and SOCIAL IMPACT ASSESSMENT

FINAL DRAFT REPORT

March 2012

ABBREVIATIONS AND ACRONYMS

AG	Azerbaijan Government
ARP	"Ecological Rehabilitation of Absheron" Project
SOCAR	State Oil Company of Azerbaijan Republic
CSSWM	Common System for Solid Waste Management
SWM	Solid Waste Management
SWMC	Solid Waste Management Company
WB	World Bank
AIE	Assessment of Impact on Environment
ESIA	Environment and Social Impact Assessment
EPSM	Environment and Plan of Social Management
ASIE	Assessment of Social Impact on Environment
SEP	Complex Plan of Activities for the Improvement of the Ecological Situation in Azerbaijan Republic in 2006-2010 Short – State Ecological Programme
TECG	Thermal Effect Creating Gases
EE	Ecological Expertise
LFG	Landfill Gases
MED	Ministry of Economic Development
EP	Executive Power
MENR	Ministry of Ecology and Natural Resources
NGO	Non-Government Organisation
OI	Operational Instructions
SIA	Social Impact Assessment
UEIP	Urgent Ecological Investment Project
DHPU	Department of Housing and Public Utilities
DHPS	Department of Housing and Public Services
FS and CD	Feasibility Study and Conceptual Design

LIST OF CONTENT

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

1.1. INFORMATION ABOUT THE PROJECT AND THE PROJECT TARGETS

The **"Integrated Solid Waste Management" project (ISWMP)** executed according to the Credit Agreement signed on May 20, 2009 between the Government of Azerbaijan represented by the Ministry of Economic Development and the World Bank under the "Ecological Rehabilitation of Absheron Programme" is implemented.

The main purpose of the "Ecological Rehabilitation of Absheron Programme" is to eliminate the environmental risks on the Absheron Peninsula being the main industrial potential of Azerbaijan and home for human resources, to clean the soil that is very important for the rapid economic and demographic development. The following are the main development:

- *Economic growth:* Though during the Soviet time the exploitation of oil springs was one of the high priorities, the pursued economic policy was a reason for the majority of the population to live in poverty in spite of the fact that Azerbaijan was rich in oil. After gaining the independence, the country took a step towards the strong economic development stage that became a basis for the improvement of the living condition.

- *Rapid urbanisation and increasing need for the land:* During the last several years a lot of the country's population moved to the Absheron Peninsula and Baku and Sumgayit, main two cities of the Peninsula in order to find a job and new possibilities for them and their family members. The rapid increase of the population and revival of industry created a strong need for the land. Baku is surrounded by the old oil fields and other contaminated areas; Baku has disorderly expanded and spread all over the peninsula in the literal sense of the word and the population's chance to use the principle infrastructure is very little because of those contaminated areas. Unauthorised housing complexes in the areas exposed to heavy contamination create serious hazard for the public health through expanding. At the same time, if those lands which are in the vicinity of the rapidly expanded residential areas are cleaned-up they will again possess high potential for the development.

- *Unauthorised land management:* There is no complex strategy for the regional planning, development and capital investments regarding the Greater Baku area. The latest prepared General Plan dates to the middle of 1970's. This Plan covers now only a small part of the urbanized areas and excludes the new housing areas established during the last 15 years. There is very little information about the property rights and/or use which are on the land on the Absheron Peninsula and the majority of this information is old. It is necessary to have a system-based approach prioritizing lands to be cleaned-up for the land cleaning up and landscape rehabilitation. Expenditure for any area rehabilitation directly depends on its future use assignment. Besides, the value of any area is defined by its future use assignment and the economic effectiveness of the cleaning-up.

- *Continuous worsening of the environmental condition*: As a result of 150 years of oil production the Absheron Peninsula has been exposed to heavy contamination. The total area contaminated by oil as a result of oil fields operation is approximately 30.000 ha and out of it 15.000 ha area has been very heavily contaminated and this became a source of trouble for the environment. The Caspian Sea also could not get rid of the negative impact created by the improper oil field operations, as a big quantity of contaminated

water flowed into the sea and was a reason for the generation of radioactive wastes (from natural radionuclides). As a result of the rapid urbanization and week management potential, sewerage and solid waste management has significantly fallen into decay. In general, inadequacy of the solid waste management practice demonstrates its impact continuously.

- *Critical condition of solid waste management*: Week solid waste management is a very striking ecological issue. As Balakhany all-city refuse receptacle being the main waste landfill of the Greater Baku was managed ignoring the environmental requirements for a long time, it created the ecological tension for the Boyuk Shor Lake adjacent to the landfill and the neibouring areas including some residential areas of Baku (mainly smoke from the fires in the landfill and odour). A lot of landfills appeared aside the city centre and this is widely spread in the newly established residential zones and in the areas where the communal services are inadequate. The Balakhany landfill as well as other informal landfills create serious health hazards for the population. The rapid increase of the Absheron population makes the solid waste problem more serious.

In the **ISWMP** framework, the following activities are planned: preparation of the strategy in solid waste management area, closure of plenty of unauthorised landfills available on the Absheron Peninsula, the rehabilitation/closure of the planned (Balakhany, Surakhany, Garadagh) waste landfills, establishment of the infrastructure (including equipment) required for the implementation of solid waste management, institutional strengthening.

In this report, ESIA results for the ***Garadagh and Surakhany landfills closure*** project activities implemented in the framework of the ISWMP are given.

Surakhany landfill is located east of Baku City about 3 km south of Surakhany village. The total area is approximately 14 ha of which a small part has been active for disposal of waste. The landfill was established in 1994. The site is not operational at present.

Garadagh landfill is located south-west of Baku City and northeast of Lokbatan village, in close proximity to the City bypass road. The total area is approximately 25 ha of which approximately 3 ha has been active for disposal of waste. The site was developed in 1994 and was operated by the Department of Housing and Communal Services (DHCS) of the City of Baku. The landfill it is estimated that it has received approximately 750,000 m^3 wastes, until it was officially closed. The waste is mostly covered.

The characteristics of the damp sites are summarised in the following Table.

Landfill	Year of Establishment	General area, (ha)	Used area, (ha)	Year of Closure
Surakhany	1994	14.0	0.93	2008
Garadag	1994	25.0	3.0	Operation

Table 1.1. Characteristics of Surakhany and Garadagh landfills

The location of the Surakhany and Garadagh landfills is presented in the following photos.

1.2. APPLICATION OF ESIA PROCEDURES FOR THE ISWMP

ESIA is an important planning tool for integrating environmental consideration and public involvement into development projects including solid waste management. The application of ESIA at an early stage of ISWM Projects makes the project environmentally sound, socially acceptable and technically feasible.

An application of ESIA facilitates to safeguard agreed environmental standard, provide cost effective measures to be adopted and involve various communities and stakeholders at the various stages of ESIA implementation. ESIA also provides balanced, credible and reliable information for decision making, right at planning stage.

The application of ESIA is of utmost importance for the solid waste management project as the solid waste problem is in ever-growing trend due to the rapid growth of urbanization, consumerism and industrialization. Improper management of municipal solid waste causes mainly the degradation of environmental quality, loss of aesthetic beauty and public health hazards in the municipalities concerned.

Figure 1.1. Garadag landfill

Figure 1.2. Surakhany landfill

The inadequate management, and the project implemented without ESIA can affect the viability of waste treatment and disposal options such as operation of composting, incineration and sanitary landfilling. ESIA helps towards converting wastes into useful resources in terms of recycled products, valuable energy sources, safe disposal of hazardous wastes and reclamation of problematic old landfill sites into promising recreational areas.

For the activities implemented in the framework of this project (Components B and C), a package of documents including 'Environment and Social Impact Assessment (ESIA)" and "Environmental and Social Management Plan (ESMP)", in accordance with the WB's requirements and the Azerbaijani Legislation will be produced:

1. Preparation of ESIA and ESMP documents for the closure of Balakhany landfill/construction of ditches for burial new wastes.
2. Preparation of ESIA and ESMP documents for the complete closure of Garadagh and Surakhany landfills, their use after rehabilitation or their construction again as transfer stations depending on the SWM conceptual project assessment results.
3. Preparation of ESIA and ESMP documents for the closure of unauthorised landfills in the Greater Baku and neighbouring areas.

1.3. PURPOSE OF THE PROJECT

The purpose of the presented "ESIA Report on the "Project description and design for closure and remediation of Garadagh and Surakhany Landfills" is to help making the project presented for the World Bank financing reliable and sustainable from the ecological point of view and ensure conformity of the project requirements to the requirements of the Azerbaijani Legislation.

Based on the WB's policy on the Environmental Assessment (OP/BP 4.01) ISWM Project is classified as the Category B project. The ecological analysis has to be carried out, conformity of the procedures and instructions to the Azerbaijani legislation and the Bank's policy has to be ensured in accordance with the requirements of the WB and current Azerbaijani legislation

(WB's OP/BG/GP 4.01 document) for the Category B projects.

Investments proposed in the framework of the project make application of OP/BP 4.12 Compulsory Replacement and OP 17.50 Explanation Policy necessary. For this reason, these policies will be considered as basic when preparing the above-mentioned documents. At the same time, the WB will study the possibility of application of other safety policies in this project.

The potential impacts of the project on the natural environment and social situation has been defined in the report. Social researches were carried out, social surveys were conducted.

As one part of the project preparation, the assessment of the project's environmental and social impact was conducted, the preventive measures and mitigation procedures (including corresponding monitoring) in order to avoid, minimize and eliminate the project's possible negative impacts was identified.

The Environmental and Social Management Plan (ESMP) and Environmental Monitoring Plan (EMP) are included in the ESIA report in order to implement work aimed to mitigate the potential negative impacts. Besides, the public consultations were initiated to discuss the project and recommended ESMP.

Waste management in accordance with international standards, in particular the activities on the rehabilitation/closure of open-air landfills in line with environmental regulations have been employed in recent years in post-Soviet republics. In this respect communities and environmentalists need to be better enlightened on such project and environmental assessment activities. Having regard to this, the presented ESIA, compared to other ESIA documents developed for similar project activities, will provide more detailed information on project solutions, project impacts and mitigation of such impacts. We believe that this will help not only the environmentalists but broader communities as well in assessing the social and environmental aspects of projects being developed across the Greater Baku region.

1.4. THE PROJECT STRUCTURE

The ESIA volume and content was designed to conform to the WB's Operation policy and Procedures (WB OP/BP 4.01). This project was defined as Category B project by following the Bank's criteria and because of the potential environmental effects for categorizing the projects based on the potential environmental impacts.

The following sections are included in the ESIA report:

1. Introduction
2. Project description;
3. Political, legal and administrative structure;
4. Basic information;
5. Environmental impact;
6. Analysis of the alternatives;
7. Environmental and Social Management Plan;
8. Public consultations;

Sections 1 and 2 where the project introduction and description are given is followed by Section 3 where a summary of the political, legal and administrative structures are presented.

Information about the current environmental situation in the project area is given in Section 4. Joint project impact analysis and description of the environmental impact are presented in Section 5. This Section assesses the construction and operation potential impacts on the local environment. The researches cover the following: geology and soil, surface and underground water, air and climate, noise, ecology, social and cultural heritage. In order to be informed about the negative environmental impacts determined in the previous Sections and to mitigate these impacts the measures are summarized in Annex 3 and Section 7, ESMP and control plan.

2. PROJECT BACKGROUND AND OBJECTIVES

2.1. MAİN GOALS OF THE PROJECT

The closure of Balakhany Landfill/construction of ditches for burial new wastes project will be implemented under the *Integrated Solid Waste Management* (ISWM) Project. The objective of the ISWM project is to support the reform of the Greater Baku solid waste collection and disposal operations into an effective and sustainable system.

The overall goal of this service assignment is to support improvement of the waste management system and reduce the adverse environmental impacts of solid waste in the Greater Baku Region by carrying out the design for rehabilitation and/or closure of the waste disposal facilities in the Greater Baku Area.

The second assignment of the project is also aimed at the rehabilitation of the Garadagh and Surakhani solid household waste sites. According to the component C (closure and management of other waste landfills) of ISHWM project it was stressed that the following alternative solutions for the development of Garadagh and Surakhany waste landfills are planned to be assessed:

- The site will be closed as per the project
- Capital inputs into environment, health and safety oriented rehabilitation works with an intent to continue activities entitled "new sanitary landfill"
- Waste transportation points (in post-rehabilitation stage)

In consideration of the above mentioned, activities required within the scope of service assignment (surveys, rehabilitation actions plan) will be identified and implemented in accordance with the designed purpose of use of each site each site.

Specifically rehabilitation works and site protection include the following tasks:

- Waste Relief Formulation Works – final cover
    - Rearrangement of waste mass inside the rehabilitation area
    - Waste excavations and embankment fills
    - Waste mass compaction
    - Leachate and biogas management
    - Installation of final capping
- Site protection
    - Construction of flood protection and rain water drainage infrastructures
    - Construction of utilities
    - Environmental monitoring programs

Site rehabilitation shall be performed in compliance with the EU and the Azerbaijani Legislation on Waste Landfilling.

2.2. EXISTING SURAKHANY AND GARADAGH LANDFILLS

2.2.1. GARADAGH LANDFILL

The landscape on the site and on its surroundings is composed of small-size water lakes formed by hills surrounding the site, and turns to the bed of rain water streams after heavy downpours. The hillsides formed by soil and are therefore affected by rain and wind erosions. .

Nearby the landfill, in the north-west directions are a) uncontrolled dump landfills filled with ever-burning mixed wastes, and b) operational soil extraction areas.

The soil on the site has relatively low conductivity rate (to the extent of 10^{-5}~10^{-7}m/s) and consists of fine grains, which is quite favourable for use in building industry (in terms of easy excavation by machineries) .

There are two power lines extended over 35-45 meters in width running across the site from its south-east extremes up to north-west boundaries. Also there are two dead oil wells each having round-shaped safety zone 100 meter in diameter – one located on the north of the site and the other – outside its the south-east boundary

2.2.2. SURAKHANY LANDFILL

The uncontrolled Surakhany landfill was formed in the cavity 12 meter deep from the surface of surrounding landscape where former and now dead sand and gravel quarries used to operate. The walls of the quarry have solid structure due to natural formation of conglomerate compounds on it.

Along the perimeter of the quarry and primarily along its west side where the maximum depth occurs, wastes have been piled in an uncontrolled manner at the crest of the quarry and they extend inside the quarry, forming ‘’cones’’ of wastes of limited stability.

Throughout the years of the site operation, the disposal of waste took place in an uncontrolled manner without having the necessary infrastructure or any protection measures for the environment and human health.

However, removal of wastes to the landfill has continued over the last two months and has been left burning without any control.

The morphological relief at the site is completely uneven with small and large humps and ditches.

Along the north and partly along the west borders of the Surakhani waste disposal site, crosses a gas pipeline of 0.75m diameter wich has a protection zone 100m wide (50m on each side of its axis). At the southern end of the site crosses a small diameter water pipeline.

The subsoil in the area of quarries has rich structure consisting of clay rocks, sand, gravels and slightly compact conglomerates. The subsoil conductivity is supposed to be quite high (10^{-3} ~10^{-5} per second) in areas primarily composed of larger size soil compounds.

2.3. PROPERTIES OF WASTES DUMPED ON TO GARADAGH AND SURAKHANY WASTE LANFILLS

2.3.1. GARADAGH LANDFILL

The total area of Garadagh landfill is 25 ha. According to estimates only 3% of the area of the landfill is covered by waste dumps. Wastes transported to the landfill every month from the nearby Garadagh settlement amount to 5500 m^3 ("Environmental Management Structure" BMVİ February, 2008). In addition, according to the initial feasibility reports (Jacobs gibb, 2006) the Garadagh landfill was once piled with 77,400 m^3 of waste in 2004. The total volume of wastes accumulated in the area amounts 75, 0000 m^3. This figure constitutes approximately 2.7 % of all wastes dumped onto authorized landfills (except waste treatment facilities in Sumgait town) in service areas across the Absheron peninsula

According to SC calculations (report on the inventory of illegal waste sites in the region of Baku city. 2010) it was estimated that the waste storage capacity of the landfill before its official closure had amounted to circa 337.500 m^3.

As per the results of surveys carried out by feasibly study and CD consultant on the site (March 2011) the area of waste piles on the surface of the site is 6.2 ha (61,782.97 m^2). According to geotechnical surveys carried out across the site (September, 2011), the depth of waste piles in the areas covered by the surveys varied from 0.00 to 3.9 meter. The total volume of such wastes, as estimated through geotechnical surveys by FS and CD consultant, stood at around 78,000 tons (130,000 m^3). In terms of qualitative properties the wastes dumped onto the site mainly consist of solid household wastes and nonhazardous substances (such as rock fragments, rubbles and etc.). Although, it was unfeasible to find out the full structure of wastes through surveys since such wastes were covered with soil, the presence of industrial wastes on the site was identified.

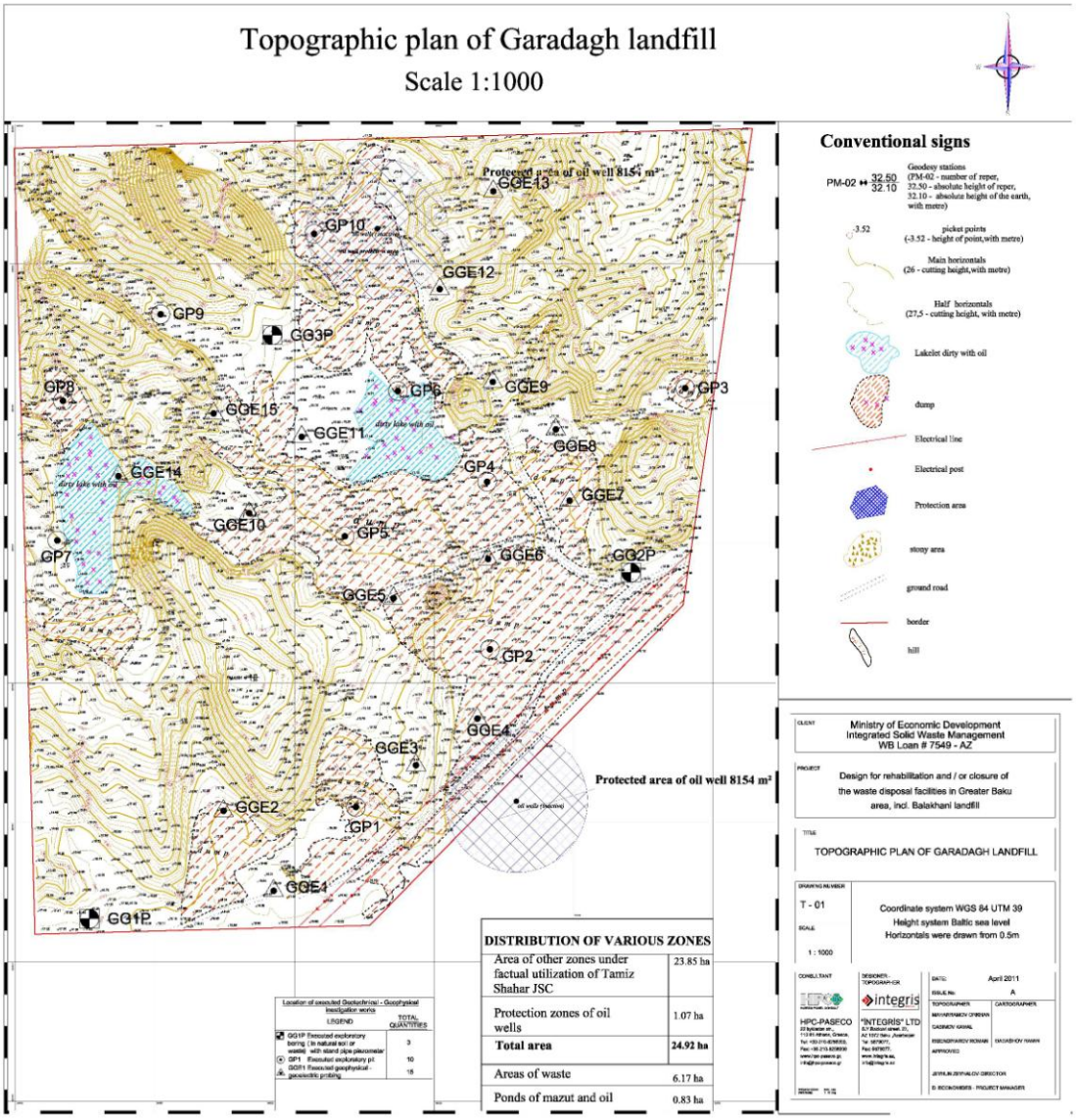


Figure 2.1. Topographic plan of Garadagh landfill

2.3.2. SURAKHANY LANDFILL

The total area of the Surakhani waste disposal site is approximately 14 ha and it has been in operation from 1994 up to 2008.

Until its closing the Surakhani disposal site received wastes from the Surakhani region amounting around 3,000 m^3 per month (Environmental Management Framework', February 2008). Based on this estimation, the total amount of waste deposited at the initial cell of the site which operated from 1994 until 2002 is approximately 290,000 m^3.

Based on the geotechnical – geophysical investigation conducted on site by the FS and CD Consultant on August – September 2011, it was concluded that the largest percent of waste deposits is located at the west side of the site which is also the lower elevation area of the site.

Based on the topographic survey conducted on site by the Consultant (March 2011) the area of the visible surface waste deposits (scattered waste or waste piles) is 4.2ha.

For the calculation of the volume of the waste deposits was used the specialized software, suitable for this purpose, AutoDESK Land Desktop, combining data from the topographic and geotechnical-geophysical surveys.

It has to be noted that the disposed waste in the landfill undergo physical, chemical and biological processes which in combination with the waste mass compaction from the overlying weight result in the waste having less unit weight. Therefore, the unit weight of existing waste in the study area is considered equal to 0.60 tn/m^3

On average on the rest west part of the site waste deposits depths range from 0.90m to 2.70m below ground surface. The volume of waste existing onsite is approximately 410 min ton (410,000m^3).

Regarding the quality of deposited wastes onsite, these consist mainly of municipal solid waste and inert materials (debris, demolition waste etc). However overall composition of the disposed waste cannot be fully specified by onsite surveying since the majority of these wastes is covered with soil, and the geotechnical investigations were implemented in specific locations.

Yet, it was found out that industrial wastes in large quantities did exist on the site.

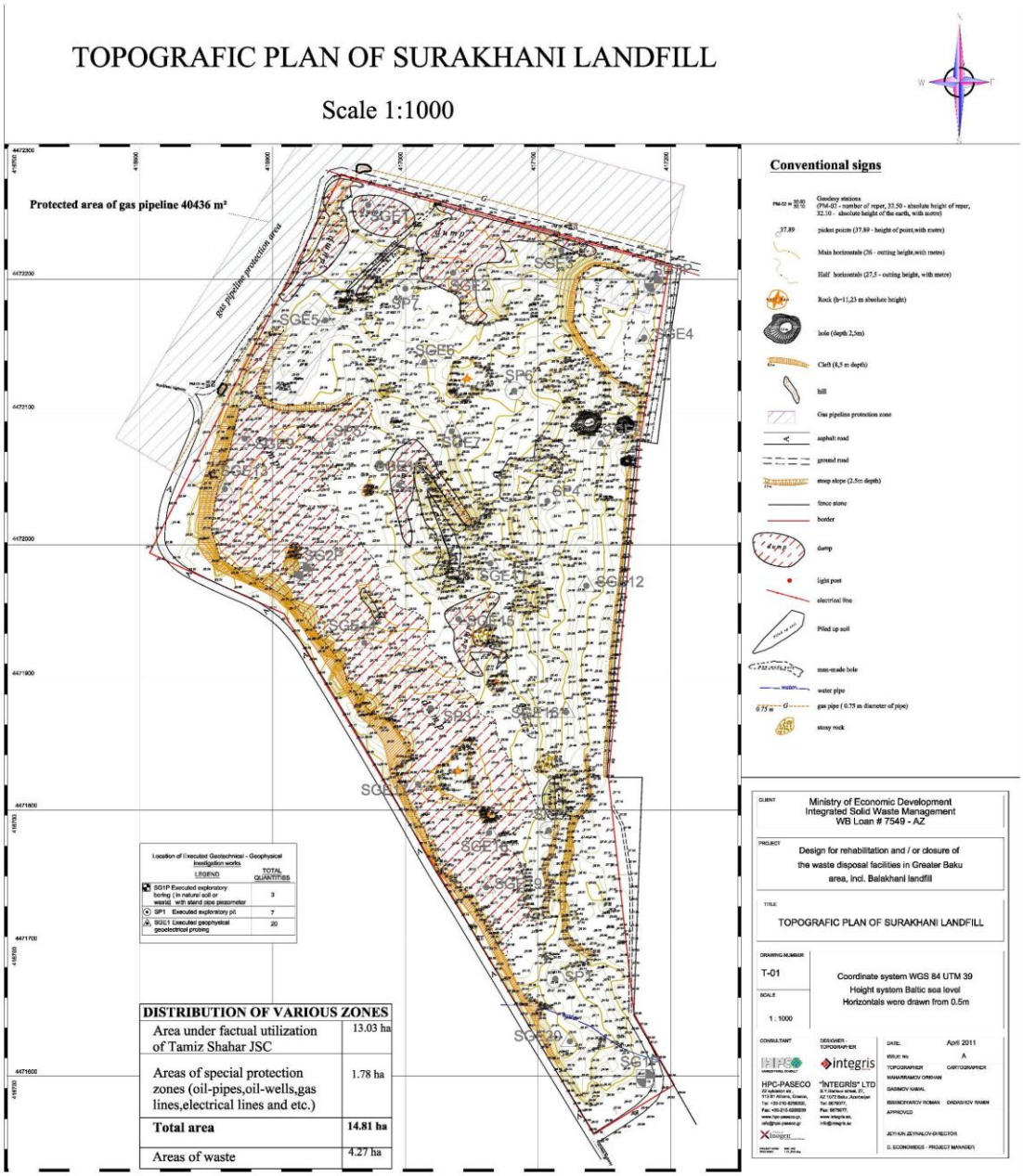


Figure 2.2. Topographic plan of Surakhani landfill

2.4. ASSESSMENT OF ALTERNATİVE REAHBILITATION ACTIVITIES PLAN. SELSCTION OF ADVANTAGEOUS PROJECT SOLUTION

2.4.1. SURAKHANY LANDFILL

The following alternative activities plan has been reviewed during FS and CD surveys:

1. **Zero activity plan**
   In case the zero activity plan is selected, no rehabilitation works for the Surakhani landfill will commence. The site will then remain in its current appearance.

2. **Rehabilitation of the site for it to be used as sanitary landfill (Activity plan A)**
   The subject of the activity plan A on the rehabilitation of the Surakhani landfill suggests the expansion of the site in vertical direction and its use, after closure, for sanitary landfill purposes in accordance with EU nonhazardous waste landfill regulations (Council Resolution 1999/31/AB/25.04.1999).

3. **Rehabilitation of the site for it to be used as recreation zone (Activity plan B)**
   According to the activity plan B on the rehabilitation of the Surakhani landfill it is proposed to close the site pursuant to EU nonhazardous waste landfill regulations (Council Resolution 1999/31/AB/25.04.1999) and allocate the area for recreational facilities (such as parks)

4. **The rehabilitation of the site with the purpose of allocating it for waste neutralization facilities (activity plan C)**
   The subject of the activity plan C on the rehabilitation of the Surakhani landfill suggests collection of wastes on the south extremes of the landfill and their orderly relocation; covering all collected wastes and allocation of cleaned areas for Recycling Materials Landfill (RML) and Waste Delivery Points (WDP in accordance with EU nonhazardous waste landfill regulations (Council Resolution 1999/31/AB/25.04.1999).
   .

For obtaining the most favorable solution in regard to rehabilitation activities not only feasibility factors, but also social and environmental elements of the project have been taken into consideration in comparative assessment of alternative activity plans on the basis of several criteria. In order to achieve more accurate assessment results the criteria have further been split into separate groups where each group and criterion had its own measurement identity.

The breakdown of criteria into groups is as follows:

- Compliance with the legislation (regulations for environment and land allocations)
- Social (social discord, employment opportunities and so on)
- Technical (sustainability – reliability– simplicity)
- Environmental (environments with natural and artificial origins)
- Economic

Based on above analysis related to the alternative activities on the rehabilitation of the Surakhani landfill the following conclusions can be made:

Activity plan A is regarded as least beneficial for the rehabilitation of the area concerned. Considering the small size of the Surakhani landfill (14ha) and location of nearby human

settlements designating the area for a new waste landfill would seem unviable. This may require huge capital costs for the landfill to be operational only for a short period of time. Given the importance of social discord a new landfill would not be considered as long-term capital investment.

Although Activity plan B is not a risk potential for human health and environment, it does not however create conditions for the removal of wastes from the site to Balakhani waste landfill.

The activity plan C was identified as of less value than plan B and consequently – plan A. The area to be used for collection and relocation of wastes for the purpose of setting up parks and other recreational facilities is much smaller than the area envisaged by plan B (half as big). Consequently, the amount of required building materials to be utilized for the area rehabilitation purposes and working hours would turn out to be very little. Given the fact that waste treatment and relocation works would have a little additional cost implications, activity plan C is still considered more cost-beneficial than activity plans A and B. *In this sense activity plan C seems more feasible from an economic point of view .*

Thus, in view of increasing size of waste disposals in the region of Baku city (rapid growth of population, total urbanization plans etc.), insufficient quantity of waste landfills and limited area of the Balakhani waste landfill a research has been commenced into the possibilities for the use of rehabilitated Surakhani landfill for additional purposes, namely setting up new waste treatment facilities such as Recycling Materials Landfill (RML) and Waste Delivery Points (WDP) (activity plan C). Setting up aforesaid waste treatment facilities would provide economic benefits to SC either through resale of recycled materials (RML) or through reduction of both the amount of waste deliveries for final neutralization/relocation purposes and travel routes of such waste handling facilities (WDP). *Consequently, the most reasonable choice would be the installation of Material Recycling facilities.*

2.4.1.1. REHABILITATION OF THE SURAKHANYY LANDFILL WITH AN AIM OF USING THE SITE AS WASTE TREATMENT AREA. GENERAL PLAN

The rehabilitation works of the existing waste disposal site in Surakhani will be performed in a specific sequence, aiming to the fast and proper environmental site restoration.

The rehabilitation activities will take place within the borders of Surakhani waste disposal site having an area of approximately 14 ha.

In the proposed design all existing wastes across the property, will be accumulated in one area (indicated as ABCDEFA in the Figure 2.3.) that will be surrounded by an embankment made from onsite rather impermeable soils, and will be covered by an impermeable cover system. The embankment will be founded on natural soils, after removal of any waste that may exist in its foundation area. In this way, and considering also that on site runoff will be controlled by the proposed hydraulic works, all deposited waste will be ‘’encapsulated’’, and eventually leachate production will be diminished, eliminating thus the danger to public health and the environment.

After the rehabilitation is completed the free of waste area at the north side of the site near the gas pipeline and the ground road, indicated by GHIJKLG in General Layout Drawings of Annex B, could be used for the development of waste management facility such as a sorting plant or a transfer station. The said area is around 20,100m^2 (2.0 ha).

The rehabilitation activities will take place in two phases with the following timeline:

(A) Rehabilitation Works

a. The uneven terrain inside the ABCDEFA area with the small and large humps and ditches, will be cut down and backfilled respectively in order to create a smooth surface. All excess materials from the cuts will be stock piled inside the Surakhani site limits and will be used for construction of the perimeter embankment, periodic and final covers, fire protection etc.
b. Compaction by a heavy vibratory roller will be applied across the entire ABCDEFA area, aiming to the systematic compaction of the uncontrolled deposits, in order to minimize future settlements (total and differential).
   In order to avoid large differential settlements, it is necessary that the site will be uniformly graded at its base and sides according to accompanying drawings (Annex B), prior to waste re-deposition.
c. Construction all around the ABCDEFA area, of a perimeter embankment 4.0m wide at its crest, with height varying from 1 to 5m at its outer side and from 2.5 to 11.5m at its inner side. The embankment will have outer and inner side slope at 1v:2h. The embankment will be founded on native soil, after removal of any waste from its foundation area and scarification of the foundation area. This embankment will be used for the anchoring of the final closure cover.
d. It is noted, that the height of this embankment will be such that the constructed embankment will be morphologically a smooth continuation of the deposited wastes, in a manner that will promote runoff, on the ABCDEFA area (after the placement of the final closure cover) outside the embankment.
e. Excavate and remove all, on site, wastes that have been deposited outside the area ABCDEFA, and redeposit them in a controlled manner inside the area ABCDEFA.
f. Installation of six (6) vertical biogas venting wells in parallel with the placing of waste inside area ABCDEFA. Considering that the wastes have been deposited long time ago, the majority of generated biogas has been diminished by now, and therefore the gas management system is proposed to be used primarily for safety against possible explosion. The wells will consist of gravel or equivalent porous medium such as scrap tire (tire derived aggragete) and will vent biogas to the atmosphere through biofilters.
g. Final and precise grading of the deposited and compacted waste, in order to accept the final closure cover system. The precise grading aims to create a shape of the closed site that will promote effectively all runoff on the ABCDEFA area towards its perimeter drainage ditch. In the final grading, the upper plateau of the waste mount will have an inclination of around 3-5% towards the west- northwest, and the sides will slope at 1v:3h.
h. Placement of the final cover system including the vegetative soil on top of the properly shaped waste mount and plantation with native species.
i. Construction of a perimeter access road approximately 5-6m wide and a drainage ditch all around and outside the embankment. Offsite runoffs will be diverted by the perimetric drainage ditch, around the landfill area towards to the northwest border of the new waste area (point B). Thereafter the runoffs will be diverted through an underground pipe to a natural receptor (seasonal lakes) to the north – northwest of the site.
j. The areas outside ABCDEFA from which wastes will be removed, they will be backfilled with clean soil and will be properly graded to promote runoff towards a natural receptor.
k. The free of waste area at the north side of the site (2.0 ha), that is not used for waste deposition, will be properly graded, and drained to the designed drainage infrastructure and will be used in the future to develop a Materials Recovery Facility (MRF) or a Waste Transfer Station (WTS).

l. In parallel to the rehabilitation works the implementation of the environmental monitoring program will begin in order to collect data on the existing conditions of the environment.
m. After the site's closure, in order to manage properly on site run offs, they will be collected at a low elevation area in the NW side of the rehabilitated site (point B), that will be free of waste and thereafter towards a natural receptor to the north – northwest of the site after crossing the existing ground road.

Finally, a fence, an entrance gate, irrigation water supply and basic fire protection infrastructure will be constructed, in terms of the rehabilitation works. These works are absolutely necessary for the avoidance of accidents and the protection of the site.

(B) Return of the rehabilitated site for other uses

Upon completion of the rehabilitation works the following continue to operate and apply:

- Leachate collection system (leachate recirculation in waste volume and periodic removal)
- Biogas (biogas passive venting and odour removal through biofilter)
- The environmental monitoring program (e.g. air, groundwater quality)
- Settlements monitoring program.
- Vegetation maintenance

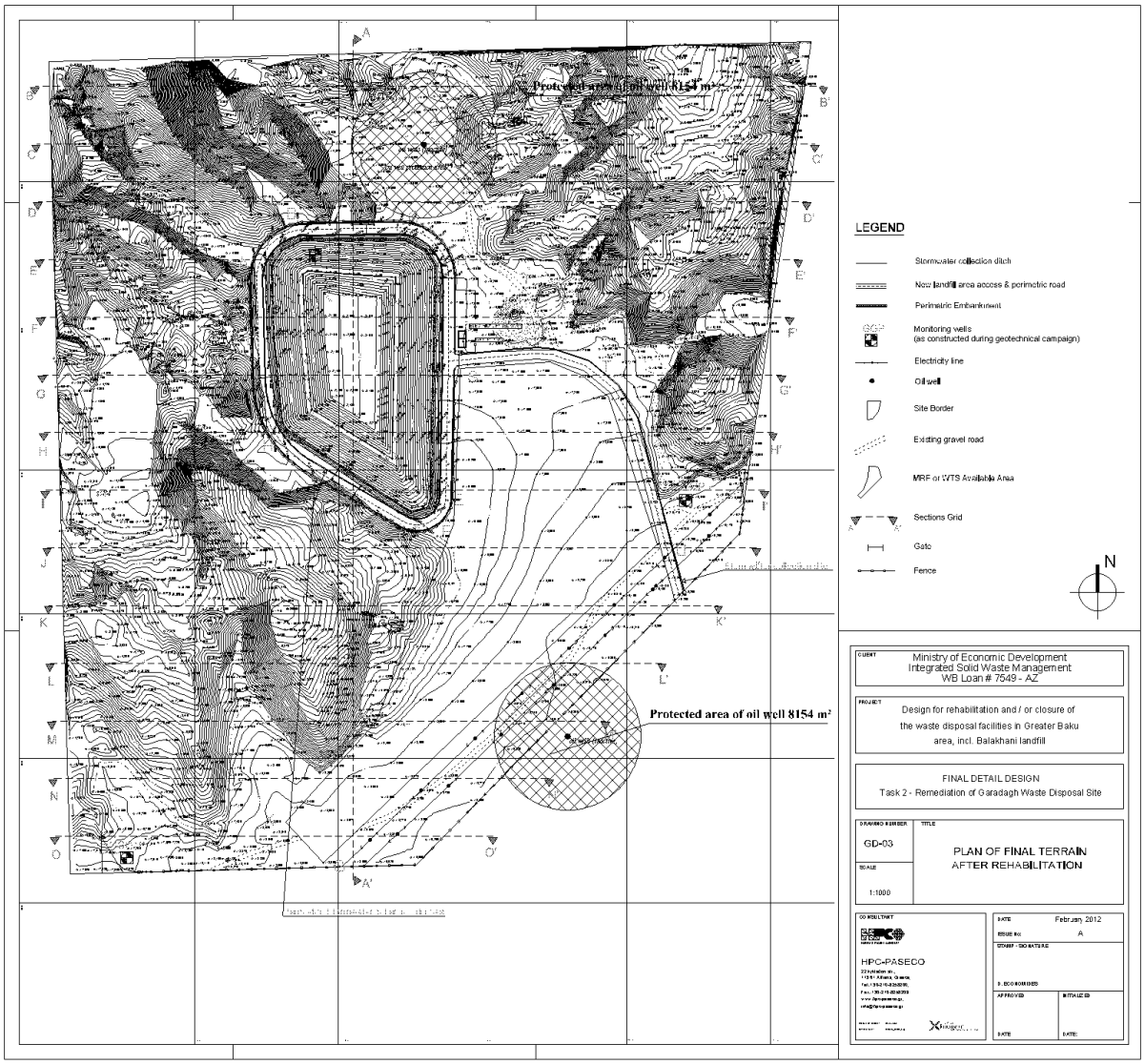


Figure 2.3. Plan of final terrain after rehabilitation (Garadagh landfill)

2.4.2. GARADAGH LANDFILL

The following alternative activities plan has been reviewed during FS and CD surveys:

1. Zero activity plan

In case the zero activity plan is selected, no rehabilitation works for the Surakhani landfill will commence. The site will then remain in its current appearance.

2. Rehabilitation of the site for it to be used as sanitary landfill (Activity plan A)

The subject of the activity plan A on the rehabilitation of the Surakhani landfill suggests the expansion of the site in vertical direction and its use, after closure, for sanitary landfill purposes in accordance with EU nonhazardous waste landfill regulations (Council Resolution 1999/31/AB/25.04.1999).

3. Rehabilitation of the site for it to be used as recreation zone (Activity plan B)

According to the activity plan B on the rehabilitation of the Surakhani landfill it is proposed to close the site pursuant to EU nonhazardous waste landfill regulations (Council Resolution 1999/31/AB/25.04.1999) and allocate the area for recreational facilities (such as parks)

4. The rehabilitation of the site with the purpose of allocating it for waste neutralization facilities (activity plan C)

The subject of the activity plan C on the rehabilitation of the Surakhani landfill suggests collection of wastes on the south extremes of the landfill and their orderly relocation; covering all collected wastes and allocation of cleaned areas for Recycling Materials Landfill (RML) and Waste Delivery Points (WDP in accordance with EU nonhazardous waste landfill regulations (Council Resolution 1999/31/AB/25.04.1999).

.

For obtaining the most favorable solution in regard to rehabilitation activities not only feasibility factors, but also social and environmental elements of the project have been taken into consideration in comparative assessment of alternative activity plans on the basis of several criteria. In order to achieve more accurate assessment results the criteria have further been split into separate groups where each group and criterion had its own measurement identity

The breakdown of criteria into groups is as follows:

- Compliance with the legislation (regulations for environment and land allocations)
- Social (social discord, employment opportunities and so on)
- Technical (sustainability – reliability– simplicity)
- Environmental (environments with natural and artificial origins)
- Economic

Based on above analysis related to the alternative activities on the rehabilitation of the Garadagh landfill the following conclusions can be made:

Activity plans A and C are the most appropriate for the area in question.

Although activity plan B doesn't bear risk for human health and environment, nor does it contribute to waste management initiatives in most problematic areas (wastes transportd to Balakhani).

Thus, having regard to an increase of the amount of waste disposals in the Baku city region (rapid growth of population, total urbanization plans etc.), lack of controlled waste disposal sites and limited space of the Balakahni landfill for disposal of wastes as well as a long distance between the Garadagh and Balakhani landfills and morphological structure of the soil across the Garadagh site, using this landfill for the allocation of waste treatment facilities on it would fit to purpose.

RML and WDP still remain as a requirement for the waste landfill (sanitary landfill) that exists on the area. As there is no landfill as such in the territory of Garadagh district, wastes would need to be transported over a far distance for disposal purposes.

The activity plan C was identified as of less value than plan B and consequently – plan A. The area to be used for collection and relocation of wastes for the purpose of setting up recreational facilities is much smaller than the area envisaged by plan B (half as big). Consequently, the amount of required building materials to be utilized for the area rehabilitation purposes and working hours would turn out to be very little. Given the fact that waste treatment and relocation works would have additional cost implications and such costs would be quite little, activity plan C is still considered more cost-beneficial than activity plans A and B. In this regard, **the activity plan C** would be more viable from economic standpoint.

In conclusion, the project scenario C has been selected as the most advantageous solution. Accordingly, the project proposals have been evaluated as per **the activity plan C** determined in the ESIA document as an advantageous alternative project.

2.4.2.1. REHABILITATION OF THE GARADAGH LANDFILL WITH AN AIM OF USING THE SITE AS WASTE TREATMENT AREA. GENERAL PLAN

In compliance with the Action Plan C for the reconstruction of the territory of Garadag, in accordance with the EU rules on safe landfills (Conference decisions 1999/31/AB/25.04.1999), all wastes from the territory will be collected and placed in the same area.

The rehabilitation activities will take place within the borders of Garadakh landfill having an area of approximately 25 ha.

In the proposed design all existing wastes across the property, will be accumulated in one area (indicated as ABCDEFGHI in the Figure 2.4.) that will be surrounded by an embankment made from onsite rather impermeable soils, and will be covered by an impermeable cover system. The embankment will be founded on natural soils, after removal of any waste that may exist in its foundation area. In this way, and considering also that on site runoff will be controlled by the proposed hydraulic works, all deposited waste will be ''encapsulated'', and eventually leachate production will be diminished, eliminating thus the danger to public health and the environment.

After the rehabilitation is completed the free of waste area at the north side of the site near the gas pipeline and the ground road, indicated by STUGXWNS in the Figure ___ - ; could be used for the development of waste management facility such as a sorting plant or a transfer station. The said area is around 33,000m^2 (3.3 ha).

The rehabilitation activities will take place in two phases with the following timeline:

(A) Rehabilitation Works

a. Excavate and remove all, on site, oil residues and oil mixed soils, and dispose them appropriately outside the site, following EC regulations.
b. The portions of the existing low hills that fall inside the ABCDEFGHI area, will be cut down to the level of the low elevation areas inside the ABCDEFGHI area (say approximate elevation -16.00m). All said portions of the existing hills are expected to consist of soil (not rocks) and thus all cuts will be done using mechanical means (no blasting). All materials from the cuts will be stock piled inside the Garadagh site limits. These materials will be used for construction of the perimeter embankment, daily and final covers, fire protection etc.
c. Compaction by a heavy vibratory roller will be applied across the entire ABCDEFGHI area, aiming to the systematic compaction of the uncontrolled deposits, in order to minimize future settlements (total and differential).
d. Construction all around the ABCDEFGHI area, of a perimeter embankment 4.0m wide at its crest, with height varying from 1 to 5m at its outer side and from 2.5 to 11.5m at its inner side. The embankment will have outer and inner side slope at 1v:2h. The embankment will be founded on native soil, after removal of any waste from its foundation area and scarification of the foundation area. This embankment will be used for the anchoring of the final closure cover.
e. Excavate and remove all, on site, wastes that have been deposited outside the area ABCDEFGHI, and redeposit them in a controlled manner inside the area ABCDEFGHI.
f. Installation of 3 vertical biogas venting wells in parallel with the placing of waste inside area ABCDEFGHI. Considering that the wastes have been deposited long time ago, the majority of generated biogas has been diminished by now, and therefore the gas management system is proposed to be used primarily for safety against possible explosion. The wells will consist of gravel or plastic media and will vent biogas to the atmosphere through bio-filters.
g. Final and precise grading of the deposited and compacted waste, in order to accept the final closure cover system. The precise grading aims to create a shape of the closed site that will promote effectively all runoff on the ABCDEFGHI area towards its perimeter drainage ditch. In the final grading, the upper plateau of the waste mount will have an inclination of around 3-5% towards the west- northwest, and the sides will slope at 1v:3h.
h. Placement of the final vegetative soil cover system.
i. Construction of a perimeter access road approximately 6 m wide and a drainage ditch all around and outside the embankment. Offsite runoffs will be diverted by the perimetric drainage ditch, around the landfill area towards to the northwest border of the new waste area. Thereafter the runoffs will be diverted through an underground pipe to a natural receptor to the south-east of the site.
j. The areas outside ABCDEFGHI from which wastes will be removed, they will be backfilled with clean soil and will be properly graded to promote runoff towards a natural receptor.
k. The free of waste area at the north side of the site (3.3 ha), that is not used for waste deposition, will be properly graded, and drained to the designed drainage infrastructure and will be used in the future to develop a Materials Recovery Facility or a Waste Transfer Station.
l. In parallel to the rehabilitation works the implementation of the environmental monitoring program will begin in order to collect data on the existing conditions of the environment.
m. After the site's closure, in order to manage properly on site run offs, they will be collected at a low elevation area in the TŞ side of the rehabilitated site (point B), that will be free of waste and thereafter towards a natural receptor to the north – northwest of the site after crossing the existing ground road.

Finally, a fence, an entrance gate and fire protection infrastructure will be constructed, in terms of the rehabilitation works. These works are absolutely necessary for the avoidance of accidents and the protection of the site.

(B) Return of the rehabilitated site for other uses

Upon completion of the rehabilitation works the following continue to operate and apply:

- Leachate collection system (leachate recirculation in waste volume and periodic removal)
- Biogas (biogas passive venting and odour removal through biofilter)
- The environmental monitoring program (e.g. air, groundwater quality)
- Settlements monitoring program.
- Vegetation maintenance

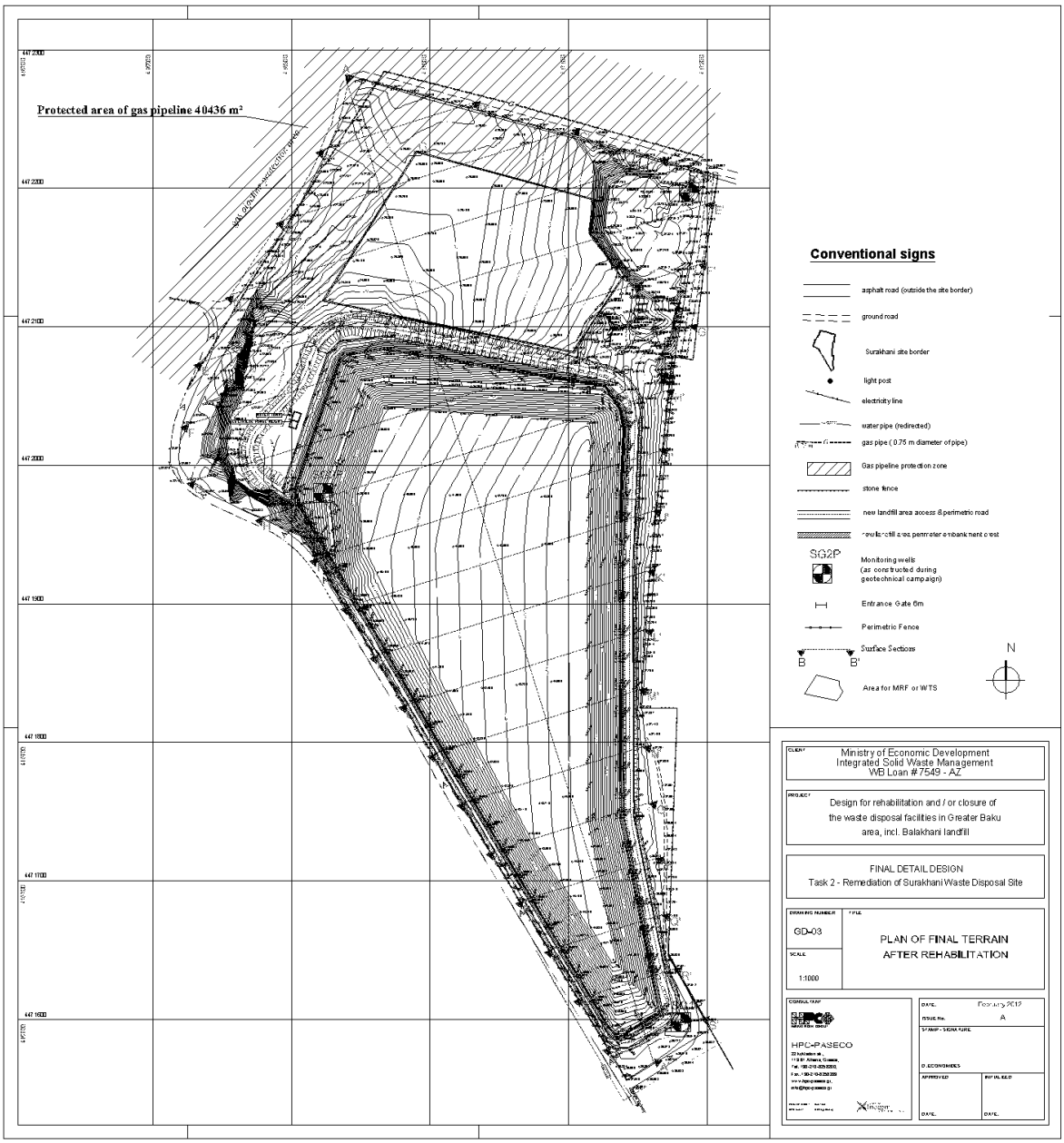


Figure 2.4. Plan of final terrain after rehabilitation (Surakhani landfill)

2.5. STAGES OF THE CLOSURE/REHABILITATION PLANS OF SURAKHANY AND GARADAGH LANDFILLS

Similar rehabilitation scenario has been selected for Garadagh and Surakhany landfills. The main technical solutions of this scenario are very similar for both landfills. Only some technical solutions are different. This difference will not have significant impact on the results of the ecological assessment of the both project solution. According to the TOR identified for the Advisor, the ecological assessment is carried out by the Ecological Advisor only for the closure/rehabilitation of the landfills.

2.5.1. SURAKHANY LANDFILL

2.5.1.1. WASTER FORMATION

According to the proposed design of Surakhany landfill all existing wastes across the property, will be accumulated in one area that will be surrounded by an embankment made from onsite rather impermeable soils, and will be covered by an impermeable cover system. The embankment will be founded on natural soils, after removal of any waste that may exist in its foundation area. In this way, and considering also that on site runoff will be controlled by the proposed hydraulic works, all deposited waste will be ‘’encapsulated’’, and eventually leachate production will be diminished, eliminating thus the danger to public health and the environment.

2.5.1.2. PERIMETRIC EMBANKMENT

All perimeter embankment will have relatively mild side slopes inclined at 1v:2h, its crest will be 4m wide, and its height varies at the outer side from 1m to 5m and at the inner side from 2.5 to 11.5m in order to facilitate to the proper bottom basin sloped formation. The embankment can be constructed using local clayey soils.

The embankment will be founded on native soil, after removal of any waste from its foundation area and scarification of the foundation area, in order to create an impermeable barrier that will not allow offsite runoffs to enter the site, eliminating thus leachate production in the long run.

2.5.1.3. TOP (FINAL) COVER

Once the front of the landfill reaches the top surface of the final waste relief and is covered with the temporary soil cover material, will be properly graded and then the final impermeable cover of the landfill is placed.

The final relief of the landfill will be similar to the waste relief, having side slopes at 1v:3h and the upper plateau will have an inclination of around 3- 5% towards the southeast (see Figure 2.5).

The laying and compaction works will be carried out using bulldozers. The works of laying and compaction of waste will take place gradually and simultaneously with the deposition of waste, meaning that the rehabilitation will take place in parallel with the filling of the new waste area.

The final surface will be smooth in order to achieve the highest possible stormwater drainage downstream and the minimal infiltration of stormwater inside the waste area that will lead in higher production of leachate.

The final cover (top cover) will be placed on top of the intermediate soil cover, and will be consisted of the following elements starting from its bottom to its top.

a. **Intermediate soil cover (leveling layer):** Will be placed over the final waste surface to create a uniform and smooth surface on which to construct and create the other layers of the final cover of the waste mount. The thickness of the compacted soil layer will be around 30cm.
b. **Geotextile for the protection of the geomembrane.** To protect the geomembrane from the coarse grains of the intermediate soil cover, a 300gr/m^2 geotextile will be used (if necessary, depending on the maximum grain size in the available material of the intermediate soil cover).
c. **HDPE geomembrane liner (sealing layer)**. The HDPE geomembrane liner with thickness t=1.5mm will be placed on top of the protection geotextile. To increase the frictional resistance to sliding, the HDPE geomembrane will be textured on both sides.
d. **Drainage layer.** The drainage layer will be placed on top of the HDPE geomembrane (textured on both sides) and serves the purpose of draining water from the top soil cover assuring thus its stability. Given the scarcity of proper natural materials (gravel, etc) in the area the drainage layer, will be an HDPE geonet with nonwoven geotextile heat bonded on its top and bottom phases.
e. **Vegetative Top soil.** Top soil will have thickness t=0.5m and will be placed on top of the drainage layer. The quality of the top soil will be such that it can maintain local vegetative species .

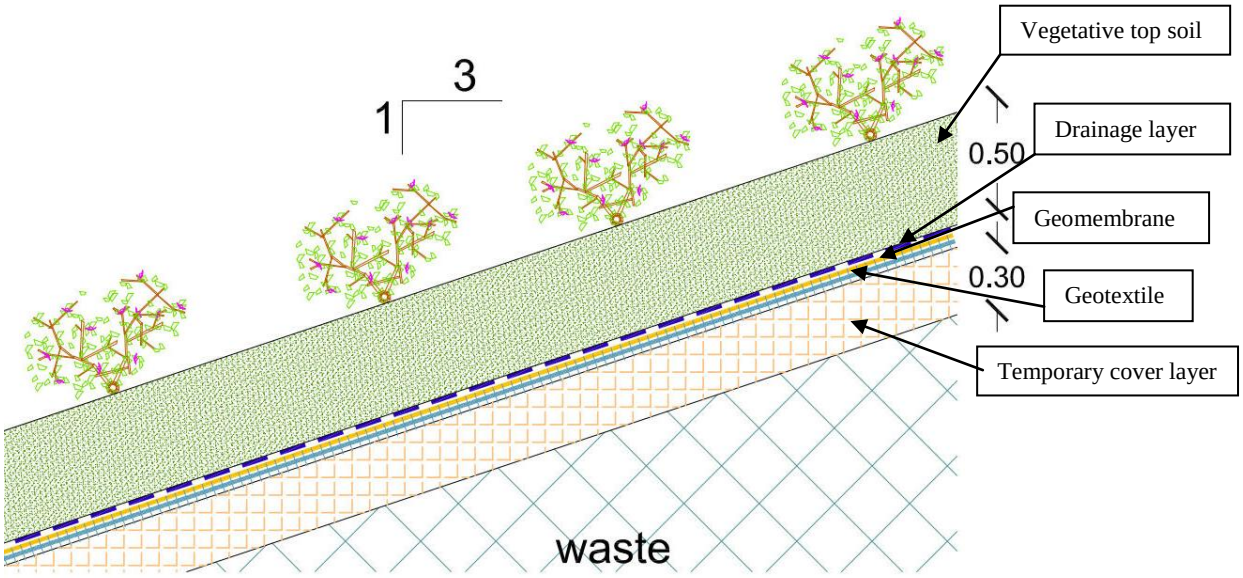


Figure 2.5. Waste relief final cover

The total width of the proposed final cover of the waste relief will be maximum 1.50m. The proposed structure of the final cover of waste provides adequate sealing against rainwater.

Moreover, special care is taken for the removal of stormwater from the drainage layer of the cover, by placing PVC pipes (DN 100) every 20m within the embankment that will transfer water from the anchoring trench of the drainage layer to the perimetric stormwater drainage ditch.

Upon completion of the rehabilitation, the restored uncontrolled waste disposal site will be characterized by a maximum elevation of +44.60 to the east side of the top plateau of the new waste area and minimum elevations of +21.00 at the base of the perimeter embankment at the northwest side.

2.5.1.4. LEACHATE MANAGEMENT

For the collection of leachate a trench will be excavated around the landfill in the downstream side. This trench will be 1m wide and filled with gravel. A perforated pipe will run in the bottom of it. The leachate then is collected in the trench by means of the natural slope of the ground below the deposited waste. Then, it is collected, through the pipe, to the lowest points of this trench, where two wells are being constructed in each of the two lowest points. One more well will be constructed in the middle of the longer trench in order to collect the leachate from the farthest end of it . In these wells a flexible pipe and a pump is put for the collection of the leachate.

The final capping which will be implemented at the site under study is practically impermeable and therefore the infiltration through the waste mass will be diminished. So very small quantities of water is expected to reach the waste body and consequently the produced leachate is expected to be reduced until little or no leachate will be produced, after the rehabilitation works and the closure of the site. Nevertheless, a calculation has been made for the determination of the maximum expected leachate quantity taking the worst case assumptions for the calculation.

For the calculation of the quantity of the leachate that will be produced in the site, the Hydrologic Evaluation of Landfill Performance (HELP) computer program was used.

The Hydrologic Evaluation of Landfill Performance (HELP) computer program is a quasi-two-dimensional hydrologic model of water movement across, into, through and out of landfills. The model accepts weather, soil and design data and uses solution techniques that account for the effects of surface storage, snowmelt, runoff, infiltration, evapotranspiration, vegetative growth, soil moisture storage, lateral subsurface drainage, leachate recirculation, unsaturated vertical drainage, and leakage through soil, geomembrane or composite liners.

The basic conclusion from the calculations is that without even the top membrane the leachate quantity collected from the bottom layer (layer 6 in the calculations) is never exceeding 0.22m3/day.

Since the quantity of the leachate produced is very small, the leachate produced will be collected in the three manholes in the collection ditch. The manholes will be emptied whenever it fills up and the leachate collected will be recirculated in the waste mass.

The pipe which will be used for the recirculation of the leachate will start from the pump in the manhole and will end in a special “socket” on top of the landfill in order to be able to pass

through the final capping and disperse into the waste with the help of a hole filled with gravel. The pipe will be flexible in order to be able to be moved in the various different sockets.

2.5.1.5. BIOGAS MANAGEMENT

Based on the onsite surveys it can be concluded that the biodegradation process of waste is in advanced phase. This is also supported by the biogas level measurements that were taken by the Consultant on the 6th October 2011 in various locations inside Surakhany waste disposal site. Biogas levels were found extremely low and in most locations zero. The measurements were taken using the device *Riken Keiki Personal Gas Monitor model GX-2009* which is a gas monitor designed to provide continuous exposure monitoring of combustible gas, Oxygen (O_2), toxic gas (CO, H_2S etc.) in hazardous environments. The quantity of produced biogas on site has also been estimated using computational methods to validate the field measurements and vice versa.

Based on the calculations the maximum production rate of biogas is 1,180 m^3/year for the first year that the rehabilitation works will be operational, corresponding to 708 m^3/year of recovered biogas. This quantity is not sufficient **t**o sustain biogas flaring.

A minimum flow of biogas at flaring torches is around 100 m^3/hr. The estimated production of biogas from the existing landfill is lower (80.8m^3/hr for 2012).

Based on these calculations, it appears that the residual biogas production does not justify the financial investment in active biogas recovery system for flaring or even more for energy recovery.

Therefore it is proposed to create passive escape routes of biogas at the surface of the site, which is common practice for relatively small landfills. The goal of passive venting is to facilitate escape of biogas from specific points in order to minimize or completely prevent uncontrolled lateral escape of biogas.

In the case of passive venting the site will be degassed in a controlled manner; however the nuisance of odors will remain. This is incompatible with the prospect of future use of the site as a recreation area. For this reason the outgoing biogas will be deodorized by passing through bio-filter after its exit from the waste mass and before being released to the air.

2.5.1.6. FLOOD PROTECTION WORKS

The flood protection works in a site will consist of the following:

- Circumferential ditches which are lined with armed concrete (15 cm thick). These ditches stretch around the landfill and prevent storm water from entering in it, as well as collect the storm-water from the surface of the final cap.
- In the places where the ditches discharge the water towards the final receptor, the natural soil will be covered with riprap (consisting of gravel with weight 5-20 kg) in order to protect the soil near the embankments from erosion, as well as lead the storm-water safely away from them.
- In case that large level areas have to be drained a system of grated wells, manholes, pipes and grated trenches is constructed for the collection of storm-water.

2.5.1.7. LANDSCAPE DESIGN

According to the design for the rehabilitation of Surakhany landfill, all scattered deposited wastes will be accumulated and properly disposed in one area at the south end of the site. The accumulated waste will be covered according to internationally established practices for non-hazardous landfills in order to protect the environment and human health. The remaining free of waste area of the site will be properly prepared for future construction of a waste management facility such as a Materials Recovery Facility (MRF) or a Waste Transfer Station (WTS).

Subsequently, the proposed re-vegetation methodology proposed herein, concerns only the south end of the site (designated by ABCDEFA in Foto) where the deposited waste will be covered. The remaining free of waste area will not be planted in order for infrastructure to be developed in the future.

2.5.2. GARSDAGH LANDFILL

2.5.2.1. WASTER FORMATION

According to the proposed design of Garadakh landfill all existing wastes across the property, will be accumulated in one area that will be surrounded by an embankment made from onsite rather impermeable soils, and will be covered by an impermeable cover system. The embankment will be founded on natural soils, after removal of any waste that may exist in its foundation area. In this way, and considering also that on site runoff will be controlled by the proposed hydraulic works, all deposited waste will be ‘’encapsulated’’, and eventually leachate production will be diminished, eliminating thus the danger to public health and the environment.

2.5.2.2. PERIMETRIC EMBANKMENT

All perimeter embankment will have relatively mild side slopes inclined at 1v:2h, its crest will be 4m wide, and its height varies at the outer side from 1m to 5m and at the inner side from 2.5 to 11.5m in order to facilitate to the proper bottom basin sloped formation. The embankment can be constructed using local clayey soils.

The embankment will be founded on native soil, after removal of any waste from its foundation area and scarification of the foundation area, in order to create an impermeable barrier that will not allow offsite runoffs to enter the site, eliminating thus leachate production in the long run.

2.5.2.3. TOP (FINAL) COVER

The final covering work in Garadagh landfill will be carried out analogous to the same as in Surakhany landfill (See section 2.5.1.3.).

2.5.2.4. LEACHATE MANAGEMENT

Leachate generation and management is similar to the plan prepared for Surakhany landfill.(See 2.5.1.4).

For the calculation of the quantity of the leachate that will be produced in the site, the Hydrologic Evaluation of Landfill Performance computer program was used. The basic conclusion from the calculations is that without even the top membrane the leachate quantity collected from the bottom layer is never exceeding 5 m^3/year.

Since the quantity of the leachate produced is very small, the leachate produced will be collected in the three manholes in the collection ditch. The manholes will be emptied whenever it fills up and the leachate collected will be re-circulated in the waste mass.

2.5.2.5. BIOGAS MANAGEMENT

The quantity of biogas generated in the landfill was measured by means of the same measuring and relevant computer programme as in Surakhany landfill. The estimated production of biogas from the existing landfill is lower. The quantity of produced biogas on polygon has also been estimated using computational methods to validate the field measurements and vice versa.

Based on the calculations the maximum production rate of biogas is 169 m^3/year for the first year that the rehabilitation works will be operational, corresponding to 281 m^3/yr of recovered biogas. This quantity is not sufficient **t**o sustain biogas flaring.

A minimum flow of biogas at flaring torches is around 100 m^3/hr. The estimated production of biogas from the existing landfill is lower (32 m^3/hr for 2012).

The management of biogas will be the same as in Surakhamy landfill.

2.5.2.6. FLOOD PROTECTION WORKS

Will be the same as Surakhany landfill (See 2.5.1.6).

2.5.2.7. LANDSCAPE DESIGN

Will be the same as Surakhany site (See 2.5.1.7).

2.6. ENVIRONMENTAL MONITORING

The overall monitoring system of the landfill will consist of the following parts:

- Groundwater monitoring system
- Surface water monitoring system
- Air quality monitoring system

- Settlements monitoring system.

All data collected from the monitoring systems must be kept in appropriately organized records, reviewed and analyzed regularly, in order to take promptly appropriate remedial measures.

For the long term environmental monitoring for potential leaks of landfill leachate and biogas, three (3) monitoring/sampling wells have been installed at the perimeter of the site

According to the initial assumption, three monitoring/sample wells will be required and each of them will be drilled in the depth of maximum 30 m or 8 m lower than ground water layer. Properly carved plastic pipe (PVC, etc.) of 50 mm diameter of filter group and safety cover will be placed in each well. The heights and samples of ground water will be taken from these wells in the established period for the chemical analyses. Soil samples for the chemical analyses will also be taken during the excavation works.

Unlike the wells described above, measuring of biogas is carried out by means of gas detectors at the site around the landfill.

Direct or indirect information about the environmental hazards is necessary in order to build a monitoring system for the control over ground water contamination. Control over the ground water quality will be carried through inspection from the nearest irrigation and water supply wells located in the lower and upper direction of the site.

In order to measure settlements, the so-called "settlement plates" are installed on the waste surface (in the areas where final waste height has been reached).

These plates include a steel plate (square 1m x 1m x 4 mm thickness) where a steel pipe (2'' diameter) is welded. The base of the settlement plates is installed 0.5 m underneath the final surface of the final cover, secured in its position by a layer of concrete (thickness 20 cm).

The iron pipe is used to measure height reduction. The elevation of the pipes is measured and compared with the elevation of stable points.

3. THE LEGAL AND INSTITUTIONAL FRAMEWORK

3.1. APLICATION OF WB'S SAFETY POLICY FOR THE PROJECT

Certain impact on the environment during the project implementation is expected. (Section 5). It is possible to forestall or mitigate the project's negative impacts through application of preventive measures and mitigation procedures. (Section 7).

The WB's Safety Policy makes necessary the application of the Environmental Assessment (OP 4.01, BP 4.01) for this project. The main directives describing the WB's policy in the environmental assessment (EA) area are Operation Policy (OP[1]) and WB Procedure (BP[2]) 4.01 on the EA. EA is one of ten policies regarding the WB's safety measures and the projects that want to get the Bank's financial support have to conform to this policy requirements. Such basic policies' purpose for the projects financed by the Bank is to identify, minimize and mitigate the potential unsatisfactory ecological and social impacts. Ten protection policies of the Bank shown in Table 3.1 and Annex 1 identify the requirements put forward for crediting the projects by the WB.

Based on the WB's policy on the Environmental Assessment (OP/BP 4.01) "ISWM" project is classified as the Category B project. Investments proposed in the framework of the project make application of OP/BP 4.12 Compulsory Replacement and OP 17.50 Explanation Policy necessary.

During the EA, the possibility of application of the WB's safety policy rules in EIA process was examined. The EA results regarding the application of these policies in EIA process are following:

- ***Environmental Assessment (OP 4.01, BP 4.01)***

The project will have certain ecological and social impacts. This fact makes the application of the WB's Environmental Assessment (OP[1] 4.01, BP[2] 4.01) policy in the proposed project necessary.

Environmental Policies	**OP/BP/GP 4.01**- Environmental assessment
	OP/BP 4.04 –Natural settlement environment
	OP 4.09- Pest Management
	OP/BP 4.36 - Forests
	OP/BP 4.37- Safety of Dams
Social Policies	**OD 4.20,** - Indigenous Peoples
	OP/BP 4.12- Involuntary Resettlement
	OP 11.03 – Protection of Cultural and Physical Heritage
Legal Policies	**OP/BP/GP 7.50** – Projects on International Waterways
	OP/BP/GP 7.60 – Projects in Disputed Areas

[1] Operation Policies (OP) – The WB's Operational Policies are short, focused statements that follow from the WB's Articles of Agreement, the general conditions, and policies approved by the Board. OPs establish the parameters for the conduct of operations.

[2] Bank Procedures (BP) – Bank personnel's explanation how to implement the policies established by OP's. They also explain the procedure and documentation providing the succession and quality of banking.

Additional Ecological Provision Tools	Information book on prevention and reduction of contamination
	Information book on Ecological assessment
	WB's public participation book
	Information disclosure book
	Involuntary Resettlement electronic guidance

Table 3.1. WB's Environmental and Social Safety Policies

The Environmental Assessment Policy (OP-4.01) is activated as the implementation of works related to building sanitary landfills or closing waste dumps, as well as the operation of proper disposal sites may generate significant environmental and social impacts that need to be avoided, mitigated and/or compensated with adequate environmental management tools. The main environmental impacts related to solid waste final treatment and disposal can be summarized as: (i) health and environmental impacts of solid waste facilities, including transfer, composting and landfill facilities; (ii) potential impact on soil and water quality; (iii) emissions of gases, and bad odors from waste collection and transportation vehicles; and (iv) landscape alteration.

To meet the Bank's OP-4.01 policy, and considering that the subprojects will be yet unknown by Board approval, an Environmental Management Framework has been developed specifying detailed procedures for screening, evaluation, preparation and implementation of subprojects from an environmental perspective. The ESMF builds on the national environmental framework, aiming at complying with the Bank environmental and social safeguard policies.

- ***Involuntary Resettlement (OP/BP 4.12)***

This policy will be applied for the B Component of the project. (Balakhany Landfill Rehabilitation and Management). So, based on the initial researches conducted in the project framework a number of internally displaced families live in the area of Balakhny landfill. Besides, the implementation of this project means the reconstruction of the landfill. Fencing of the territory will create difficulties for about 200-300 people who collected waste here and used it as income source as their entry to the area will be limited. Consequently, the MED prepared a Framework document on the resettlement plan in order to solve in principle a problem of potential resettlement of the population settled in Balakhany and rehabilitation of waste collectors' income source. At present, work is carried out for the project implementation.

The Involuntary Resettlement Policy (OP-4.12) is activated because as open dumps (Closure and management of other landfills project) are closed those families whose income came from recycling activities in the dumping areas become affected. The new national regulations prohibit recycling activities and workers in the dumping areas of new landfills. It was therefore agreed that an Involuntary Resettlement Policy Framework would be developed as an instrument to enable the pertinent entities to address these problems in accordance with the Bank's directives.

- ***Public consultations and disclosure (OP 17.50)***

The Environmental Management Framework report[3], prepared by the MED presenting a guidance tool to ensure that the proposed sub-projects financing the rehabilitation of three existing landfills and the closing or rehabilitation of several informal landfills in Baku area

[3] Integrated Solid Waste Management System for the Absheron Peninsula Project. Environmental Impact Assessment (framework document .Currie & Brown Int. Ltd. 2008

comply with the existing environmental regulations and standards in Azerbaijan as well as with the WB's Safeguards Policies, was publicly disclosed on February 22, 2008 on the MED website. Several other project relevant safeguard documents were disclosed and discussed during a public meeting held on February 20 including the draft EIA for the Balakhany landfill rehabilitation works and the project and the project RPF. Minutes of the meeting and comments received from the public are incorporated in the final draft EIA and disclosed further in country and at the WB Infoshop.

Public discussions of ESIA and EIA documents will be initiated in accordance with the WB procedures and Azerbaijani Legislation.

- ***Protection of the Cultural Heritage (OPN 11.03, being revised as OP 4.11)***

Application of this policy will have a warning character. According to the conclusion of the project implementators carrying out the area assessment there are no cultural heritage examples, archeological monuments exactly in the area where the project work is planned.

Nonetheless, as site selection will only take place under implementation, it has been decided to trigger the Physical and Cultural Resources Policy (OP-11.03) and address mitigation measures by integrating 'chance finds' procedures into the ESMF. Therefore the policy is precautionary activated as during the development of civil works and operation of the landfills there can be accidental chance finds that might require special treatment to avoid their damage or loss and to complete the necessary documentation. The EMP shall include management measures and procedures in case these findings take place.

- ***Other safety policies***

As the project activities will be carried out in the area where the landfill is located, there is no need for the direct application of the WB's other safety policies based on the description of the current environmental status of the project site (Section 4) and the results of the environmental assessment. Mitigation and elimination of impacts that are probable in that safety policy will be taken into account in the EMP prepared in accordance with the environmental category of the project.

3.2. EUROPIAN REGULATION ON WASTE MANAGEMENT AND ESIA

3.2.1 EU WASTE MANAGEMENT LEGISLATION

Relations between the EU and Azerbaijan on environmental protection are primarily based on the EU-Azerbaijan Agreement on Partnership and Cooperation (APC) and European Neighbourhood Policy (ENP).

The EU-Azerbaijan Agreement on Partnership and Cooperation signed between the European Communities and its Member States and Azerbaijan (signed in Luxembourg on the 22nd of April 1996) is valid since the 29th of June 1999 demonstrating the high level of cooperation.

In conformity with Clause 43 of the agreement: "RA shall demonstrate efforts in order to provide regular coordination of its legislation with the legislation of the EU.

According to Article 50 of this Agreement, Azerbaijan will "promote the use of Community technical regulations and the application of European standards and conformity assessment procedures" in the country. Azerbaijan is also obliged to improve the national regulations based on the European standards.

By involving the South Caucasian countries in the European Neighbourhood Policy the European Commission's recommendation were approved on 17-18 June 2004 in the Brussel Summit held with the participation of the EU State and Government leaders. In 2006, "EU – Azerbaijan Action Plan" was signed in the framework of the European Neighbourhood Policy. The following issues were recommended for Azerbaijan in this document:

- Integration into the EU and international legislation and management experiences in the field of standards, technical regulations and alignment assessment;
- Improvement of procedures and enterprises for the assessment factors having impact on the environment including conclusion and application of corresponding laws;
- Provision of planning for the preparation of structural legislation and basic procedures, of the environmental protection of main environmental sectors, especially air quality, water quality, waste management described in the National Environment Plan;
- Continuation of the alignment process for the European standards.
- Conforming Azerbaijan's legislation and standards on environmental protection to EU legislation and standards;
- Strengthening the management potential of environmental protection through a complex permit system;
- Improving environmental impact assessment procedures and structures; and
- Working out environmental protection plan (waste and water resources management, air pollution etc.).

The single-most important EU regulation relevant to this project is the Council Directive 1999/31/EC on the landfill of waste, where the environmental standards for landfilling within the EU member states are defined. The Directive includes both technical standards required for individual landfills of different classes and demands on the member states regarding reducing amounts of waste to be disposed at landfills and time schedules for implementing the directive.

Below we present a series of other EU directives and documents concerning solid waste and landfilling, forming the legal base for the project:

- Directive 75 442/EEC on waste as amended by the framework Directive on waste (91/156 EEC) as further amended by Decision 2000/532/EC of 3 May 2000 and further amended by Commission Decisions 2001/1 18/EC, 2001/1 19/EC and 2001/573/EC amending list of wastes;
- Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste. Amended by: Regulation (EC) No 1882/2003 of the European Parliament and of the Council of 29 September 2003, Regulation (EC) No 1137/2008 of the European Parliament and of the Council of 22 October 2008
- Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.
- Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste. Amended by: Regulation (EC) No 1137/2008 of the European Parliament and of the Council of 22 October 2008. Corrected by: Corrigendum, OJ L 145, 31.5.2001, p. 52 (2000/76/EC)
- Council Directive of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture (86/278/EEC). Amended by:

Council Directive 91/692/EEC of 23 December 1991 standardizing and rationalizing reports on the implementation of certain Directives relating to the environment

- Directive 91/689/EEC of 12 December 1991 on hazardous waste as amended by Decision 2000 532 EC of 3 May 2000 and further amended by Commission Decisions 2001/1 18/EC, 200 1/1 19/EC and 2001/573/EC amending list of wastes
- Directive 2005/20/EC of the European Parliament and of the Council of 9 March 2005 amending Directive 94/62/EC on packaging and packaging waste
- Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste;
- Directive 1 994 67/EC, Hazardous waste incineration;
- Directive 89/369/EEC on Municipal incinerators.

3.2.2. EC REGULATIONS RELATED TO EIA AND ENVIRONMENTAL PERMITTING

Council Directive of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment 85/337/EEC.

Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment

3.3. OVERALL RELEVANT AZERBAIJAN LEGISLATION

The most relevant Azerbaijan environmental sector and health safety related regulations applicable to the proposed Project are the following:

The *Law on Environment Protection* (1999) establishes the main environmental protection principles, and the rights and obligations of the State, public associations and citizens regarding environmental protection. It also establishes the principles and requirements for the preparation of the State Ecological Expertise (SEE) which is the official EIA procedure in Azerbaijan.

The Law states the basics of SEE in Azerbaijan as a process of "identification of the environment's correspondence with the quality norms and ecological requirements aimed at revelation, prevention, and prediction of possible negative impacts of economic activities on the environment and related consequences" (Article 50). Such definition presents a technocratic approach to environmental issues, whereby the legislation provides the economic activities with certain limits for using natural resources rather than mechanisms to achieve minimal environmental impacts through preventive and mitigation measures. The other key document forming the legal basis for EIA is the *Handbook on the Process of Environmental Impact Assessment in Azerbaijan* (1996) on which more detailed information are presented in the following sub-chapter.

The *Environmental Safety Law* (1999) indicates that land users are responsible for rehabilitation of damaged soil and other natural resources for their subsequent use.
Specifically, the law prohibits import of radioactive wastes, processed re-usable nuclear fuel, other radioactive substances and nuclear materials.

The *Law on Radiological Safety of Population* (1997) calls for ensuring radiation safety in industrial entities during operation. The Law also establishes main principles of government

policy on meeting radiation safety requirements, as well as environmental norms providing safety of employees and population in areas affected by use of radioactive sources. The Law provides for compensation which can be claimed by population for damage to their health, property and life during accidents.

The *Law on Sanitary and Epidemiological Safety* (1992) establishes rights and obligation of citizens and national monitoring institutions in provision of sanitary and epidemiological safety; basic principles of establishing sanitary-hygienic norms and standards; sanitary and epidemiological requirements for industrial entities, to be met at design, construction and operation stage, and for other economic activities. According to Article 39 of this Law, and Criminal Code of Azerbaijan Republic, violating sanitaryhygienic norms and rules causes criminal responsibility.

The *Law on Protection of Atmospheric Air* (2001) establishes norms for mitigating physical and chemical impacts to atmosphere, as well as provides for legal basis for state registration of negative impacts on atmosphere, for control over air protection, solving disputes emerging due to pollution of atmosphere.

The *Land Code* (1999) sets mandatory requirements for remediation of all soils after their use, including soils where mining works have been conducted.

The *Soil Fertility Law* (2000) sets up requirements for land owners, leasers and land users to protect fertile top layer of soils during any construction activities. The Law fixes specific time frame for restoration soil fertility as 3, 3.5 and 5 years based on specific soil characteristics.

The *Law on Industrial and Domestic Wastes* (1998) determines main principles of the state policy in solid waste management; obligations of the state authorities responsible for solid waste management, including allocation of plots for waste processing and disposal, coordination of waste recycling activities, setting rules for trans-boundary transportation of wastes, licensing of waste generating activities etc.; and also describes property rights.

The Law specifies requirements for design, construction and reconstruction activities, for waste collection, transportation and disposal (prohibited within residential city areas and other residential settlements, in resorts, forest and recreational zones, in the areas where underground and potable water is available and in the zones of mining activities), for waste processing sites (shall be properly equipped with waste processing tanks, signage and control access points shall be available). The Law also encourages introduction of technologies for minimization of waste generation by industrial enterprises. The Law envisages both state and community (public) control over the waste generating activities and waste management, and imposes payments for collection, disposal, use and processing of wastes. The *Law on Public Health* (1999) sets out basic principles for public health protection and the health care system. The Law also assigns liability for harmful impact on public health, stipulating that damage to health resulting from polluted environment shall be compensated by the entity or person that caused the damage.

In addition, a large number (some 75+) of Decisions of the Cabinet of Ministers have been issued to help interpret the body of environmental legislation and related Presidential Degrees and Orders. Furthermore, Azerbaijan is a party to several international conventions regulating the EIA process and waste management issues including: (i) the Aarhus Convention on Access to Information, Public Participation in Decision-Making, and Access to Justice in Environmental Matters; (ii) the Espoo Convention on EIA in Trans-boundary context; and (iii) the Basel Convention on Hazardous Wastes Transportation.

3.4. LEGAL FRAMEWORK OF WASTE MANAGEMENT

The waste management is relatively new area in Azerbaijan legislation and administrative activities like in the majority of the countries in the region. At present the waste management is one of the priorities for the Government of Azerbaijan. The following are the legal-normative documents related to the waste management in Azerbaijan (including hazardous wastes).

- "*On Industrial and Domestic Waste"* The Law of RA (June 30, 1998, No514– IQ).
- "*On Industrial and Domestic Waste"* The Law of RA (May 22, 2007, № 341-IIIQD) on amendments and additions to the Law of RA
- *"On Environmental Protection"* The Law of RA (June 08, 1999, No 678-Q)
- *"The State Strategy on Hazardous Waste Management in RA"* Decision of the Cabinet of Ministers of RA (August 21, 2004)
- *"On the Municipalities"* The Law of RA (November 30, 1999)
- *"On the Environmental Safety"* The Law of RA (June 8, 1999, No 687QG).
- *"On Charges for the Natural Resources, Charges for Emission of Contaminating Substances into the Environment and Use of Resources Generated From Those Charges"* Decision of the Cabinet of Ministers of RA (March 03, 1992, No 122), together with the Decision No. 216 dated 1993 on the amendments related to the "Charges for the emission of wastes into the environment"
- *"Rules of regulating the settlement areas in accordance with the sanitary rules, hygienic and ecological regulations, temporary storage, regular transportation and processing of domestic waste ".* Decision of the Cabinet of Ministers of RA (April 21, 2005, No 74)
- *"Rules of defining the charges for collecting, disposal, use and processing of wastes"* Decision of the Cabinet of Ministers of RA (August 12, 2008, No 185)
- *"Rules of issuing special permissions (Licenses) for waste processing and disposal"* Decision of the Cabinet of Ministers of RA (December 6, 2000, No 217).
- *"Rules of passportization of hazardous waste"* Decision of the Cabinet of Ministers of RA (March 31, 2003, No 41)
- *"Rules of inventory of industrial waste",* Decision of the Cabinet of Ministers of RA (January 25, 2008, No 13)
- *"Instructions on the inventory rules and classification system of waste generated in operation and service areas"*, Ministry of Justice, (July 01, 2003, Certificate No 419).
- "On improvement of the rules of issuing special permissions (licenses) for some activity types", Decree of President of RA, (September 2, 2002, № 782)
- "Additional conditions required for issuing special permissions (licenses) depending on the characteristics of the activity types", Decision of the Cabinet of Ministers of RA (November 7, 2002, No. 174)
- "Additional measures for issuing special permissions (licenses) depending on the characteristics of the activity types", Decree of President of RA, (December 29, 2006, № 510)
- *"Rules of issuing special permissions (Licenses) for industrial waste processing and disposal",* Decision of the Cabinet of Ministers of RA (December 6, 2000, No 217).
- "Rules of transportation of hazardous cargo by vehicles", Decision of the Cabinet of Ministers of RA (January 27, 2000, No 10)
- "Rules of Trans-border transportation of hazardous cargo" Decision of the Cabinet of Ministers of RA (July 25, 2008, No 167)

3.4.1. COMMENTARY TO THE CORRESPONDING LEGISLATION

3.4.1.1 "LAW ON THE ENVIRONMENTAL PROTECTION" OF REPUBLIC OF AZERBAIJAN

"Law on the Environmental Protection" of RA (June 08, 1999, No 678-Q) is of framework character in the environmental protection area. The Law identifies the legal, economic and social bases of the environmental protection. There are a number of provisions regarding waste management, ecological requirements in this area in the Law.

Article 38 of the Law (Ecological requirements set forth the construction and reconstruction of enterprises, installations and other industrial units). The qualitative standards of environment should be taken into account when enterprises, installations and other industrial units are constructed or reconstructed.

Recultivation of land, rehabilitation and proper utilisation of natural resources, general and sanitary improvement of the territories must be carried out simultaneously with construction work.

Article 47 of the Law (Protection of environment from industrial and domestic waste) Collection, destruction and burial of industrial and domestic waste should be carried out in the places as agreed upon and specified by the relevant executive bodies and local self-government institutions.

The ecological requirements set forth industrial and domestic wastes are also regulated by the normative legal acts on waste besides this Law.

3.4.1.2. LAW "ON INDUSTRIAL AND DOMESTIC WASTES" OF REPUBLIC OF AZERBAIJAN

The comments on the Law of RA "On Industrial and Domestic wastes" are given taking into account the Law of RA on amendments and additions to the Law of RA "On Industrial and Domestic wastes"(May 22, 2007 № 341-IIIQD)

The Law "On Industrial and Domestic wastes" (June 30, 1998, No 514 – IQ) is of framework character. The Law determines the state policy of RA and legal relations in waste management area in order to prevent the hazardous impact of industrial and domestic waste (hereinafter referred to as "waste"), except hazardous gases, waste water and radioactive waste, on the environment and human health, reduce their hazardous impact, provide the ecological balance in nature as well as to involve those wastes as raw material sources in economic circulation.

This document covers the industrial (hazardous) as well as municipal wastes. But the main attention is paid to industrial waste. The principles of the state policy in the area of waste management are identified by this Law.

Chapter 1 (Articles 1-6), determines main concepts related to industrial and domestic wastes, the principles of the state policy related to waste, the responsibilities of state authorities in the area of regulating of legal relation regarding waste, the property relations and the area of the law application related to waste.

Article 4 of the Law **(State policy principles in relation to waste management).** The following shall constitute the principles of the state policy in relation to waste management: control over compliance with requirements for the protection of nature, norms of ecological balance, hygienic norms and sanitary rules, utilisation and processing of hazardous and other waste in the vicinity of sources of their generation using the procedures that proved themselves as satisfactory from the ecological point of view, taking into account the public opinion when taking decisions on protecting the interests of the population.

Article 5 of the Law (**The responsibilities of the state authorities in regulating the relations related to waste management)** includes the requirements related to the majority of normative-regulatory documents, including the rules, norms, standards, etc. which are necessary for its implementation. The responsibilities of the state authorities include *"…allocation, upon agreement with the relevant executive authority, of plots of land for location, burial and processing of wastes;… designing and construction of facilities for storage, use and neutralisation of wastes;, ensuring economic, social and legal framework in the area of use and reduction of level of accumulation of wastes"*.

Chapter 2 (Articles 7-14). Requirements in relation to design, construction and re-construction of enterprises, facilities and other installations, conditions of waste processing, requirements for waste processing places, disposal, transportation, at the same time for cleaning up the residential areas from domestic wastes are commented.

Articles 9 and 10 of the Law, stipulate **the conditions for waste processing and the requirements for the places of waste processing.** The following requirements related to waste processing are also put forward parallel to the others:

- environmental safety of technological processes designed to reduce volume of wastes, applied for the purpose of wastes processing and wastes neutralisation;
- in case not provided by the technology, inadmissibility of mixing hazardous and safe wastes in course of processing;
- reduction of volume, processing and neutralisation of wastes through biological, physical-chemical, mechanical-technical, thermal and other methods.

The following requirements are also put forward regarding the places of waster processing:

- Opinion of the relevant executive authorities (MENR and the Ministry of Health-care) drawn on the basis of requirements imposed by the ecological examination in relation to the harmful effect upon health and environment shall be taken into consideration in course of selection of places and technologies for the processing of wastes.
- Environmental monitoring shall be carried out for the purpose of identifying an impact of places of waste processing on the environment.
- Activities of the enterprises engaged in waste processing should be directed to reduction of waste volume and its neutralisation.
- Enterprises engaged in the wastes processing activities should be in possession of the accident prevention plan approved by the relevant executive authority.

Article 11 of the Law reads that:

- Waste disposal is carried out based on a permit of corresponding executive authorities [MENR, Ministry of Health-care, local Executive Powers] and according to the requirements of the normative acts.
- Special researches (geological, hydrological, etc.) with the permission of the relevant executive authorities (MENR, State Committee of Geology and Mineral Reserves,

Melioration and Irrigation Committee under the Cabinet of Ministers of RA and local Executive Powers) shall be carried out and, where necessary, public opinion shall be obtained in course of selection of a place for the construction of facilities designed for location and neutralisation of wastes.

- Burial of wastes shall be prohibited within the territories of cities and other residential settlements, in resort, treatment-health, forest and recreation zones, in places of location of underground waters, industrial and drinking water reservoirs, as well as in zones of location of mineral resources and areas of execution of mountainous-mining operations.
- Places of burial of wastes shall, in accordance with the procedures established by the relevant executive authorities (the Cabinet of Ministers of RA), be entered into the state register of wastes burial locations.
- Monitoring of places of burial of wastes shall be carried out by the owner in accordance with the procedures agreed with the relevant executive authorities (MENR and local Executive Powers)
- Owners of facilities and areas of location of wastes shall undertake the appropriate reinstatement works upon completion of the period of operation of such facilities and areas.

Article 13 ***specifies the requirements for waste transportation:*** Procedures applicable to transportation of wastes in the appropriate means of transportation, requirements (norms and regulations) associated with loading and unloading operations and ensuring ecological safety shall be established by the relevant executive authority.
The rules of transportation of hazardous industrial and domestic waste as well as hazardous medical waste by the vehicles are specified based on the state standards and regulatory acts existing in this area.

Chapter 3 of the Law (Articles 15-17) is devoted to the legal regulation of the control implementation over the waste related activities. For this purpose, Article 15 of the Law comments the area of state control over the activities related to industrial and domestic waste. So, the following is included in the sphere of state control over: compliance by legal entities and physical persons with the requirements imposed by the legislation, bringing guilty legal entities and physical persons before liability specified by the legislation, passing decision on limitation, suspension or termination of operations which may cause potential danger for the public health and environment, control over import, export and transit of wastes.

According to article 16, the enterprises and organisations carrying out the economic activities related to waste have to arrange the operational control in this area. The purpose of the operational control is verification of compliance with ecological, sanitary and other requirements. Rules of arranging for production control shall be established by enterprises and organisations in accordance with the applicable legislation.

According to Article 17, public control over activities associated with wastes shall pursue the purpose of verification of compliance by state authorities and municipalities, as well as legal entities and physical persons with the requirements imposed by this Law.

Chapter 4 of the Law (Articles 18-21) identifies the economic regulation in waste-related activity area. This Chapter specifies norms, state registration and report, state cadastre of waste from the legal point of view.

Chapter 5 of the Law (Articles 22-24) stipulates the international cooperation in waste-related activity area, solution of disputes related to waste and responsibilities for the violation of legislation. As described in Article 23, the disputes related to waste are solved by the corresponding executive bodies and courts in compliance with the rules specified by the

legislation. But according to Article 24, legal entities and physical persons breaching requirements of the legislation on wastes shall bear disciplinary, administrative, criminal and civil-procedural liability specified by the legislation of the Republic of Azerbaijan.

3.4.1.3. "RULES OF REGULATING THE SETTLEMENT AREAS IN ACCORDANCE WITH THE SANITARY RULES, HYGIENIC AND ECOLOGICAL NORMATIVES, TEMPORARY STORAGE, REGULAR TRANSPORTATION AND PROCESSING OF DOMESTIC WASTE"

These Rules have been approved by the Decision of the Cabinet of Ministers of RA No 74 dated April 21, 2005,
The Rules are directed to domestic waste management in connection with the application of the Law of RA "On Industrial and Domestic Waste".

According to Section 7 of the Rules, solid and liquid domestic waste processing is carried out based on the permission of the MENR in specially allocated plot (landfills) or in special treatment and processing installations. Disposal of waste in any place or its use as fertilizer in the agricultural area is prohibited.

Solid domestic waste has to be transported to the improved landfills, composting enterprises, the specialised installations for treatment and incineration but liquid domestic waste has to be transported to sewage disposal or cleansing stations.

These Rules have been prepared according to the Law of RA "On Industrial and Domestic Waste". They define the Rules of regulating the settlement areas in accordance with the sanitary rules, hygienic and ecological normatives, temporary storage, regular transportation and processing of domestic waste. Besides, the rules also specify **collection of solid and liquid domestic waste,** cleaning-up the streets and privatised entities, responsibility for cleanness of residential and rest areas as well as the requirements during the registration of domestic waste.

3.4.1.4. "RULES OF DETERMINATION OF THE CHARGES FOR COLLECTION, PLACEMENT, USE AND DISPOSAL OF WASTES".

The Rules have been approved by the Decision of the Cabinet of Ministers of RA No 185 dated August 12, 2008

These Rules regulate the mechanism of determination of the charges for collection, placement, use and disposal of wastes.

According to the Rules, payment of fee for wastes shall not exempt a user of nature from the responsibility for taking environmental protection measures, as well as from penalty sanctions for breaches of ecological laws and indemnification of damage caused to economic entities, lives of citizens, and their property as a result of environmental pollution in accordance with the existing legislation.

Calculation and payment of charges for waste are carried out in accordance with the instructions drawn up and approved by the MENR as agreed with the MED.

Reduction of fee for wastes depending on the type of activity of the user of nature or exemption from payment of such fee shall be carried out by the Cabinet of Ministers of the RA on the basis of an instruction issued by the MENR

3.4.1.5. CLASSIFICATION OF WASTE

Until 2003, when classifying waste including hazardous waste in Azerbaijan a system used in the former Soviet Union was used. A system consisting of 4 (four) hazardous classes based on the toxic characteristics of waste was used in this system. Lately safe waste as 5th degree waste was accepted. Waste under the first class is that which is the most hazardous according to the toxic characteristics.

The definitions of waste and hazardous waste were not corresponding to their essence and were not in conformity to the systems used in the international practice nowadays. At present series of work has been carried out in the area of approximation of waste definition system used in Azerbaijan with that used in the international practice and this work is going on (for example, a catalogue of wastes and a list of hazardous wastes is being worked out).

New description system of waste in Azerbaijan is specified based on "Instructions on the inventory rules and classification system of waste generated in operation and service areas", *(Officially registered with the Ministry of Justice of RA, Registration No. 2986 dated July 01, 2003)* and "Instructions on the inventory rules and classification system of waste generated in operation area", *(Decision of the Cabinet of Ministers of RA No 13 dated January 25, 2008).* These documents prepared on the basis of materials of one of the projects called "Technical assistance for the establishment of hazardous waste management system in Azerbaijan" that was implemented in Azerbaijan in accordance with the Order # 898 of President of the RA dated 28th September, 1998 on "Approval of the Agreement on Credit for the Development" signed between Azerbaijan and International Development Association, regulates the relations connected with waste generated in operational and services areas except hazardous gases, waste water and radioactive waste.

3.5. INSTITUTIONAL FRAMEWORK IN THE AREA OF WASTE MANAGEMENT

State control over waste management in Azerbaijan is implemented by the **MENR** and **the Ministry of Health-care** as well as local Executive Powers and municipalities in the framework of their authority.

The **MENR** is responsible for ensuring compliance with the legal framework governing **solid waste classification and management**. The most significant functions of the MENR are the **preparation of regulations on monitoring and auditing on solid waste management**. These important functions are not enough for the implementation of solid waste management EU level.

The **MENR** has ensured that following issues are to be considered:

- Implementation of the existing legislation regarding waste management;
- Giving permission related to waste discharged into the environment or their elimination;

- Giving special permission (license) for industrial and domestic waste utilization;
- Giving permission (ecological expertise comment) or licenses to the enterprises engaged in waste management (treatment) depending on their activity characters;
- Implementation of state control over waste management activities;
- Researches and analyses in the field of waste management;
- Collecting, analyzing of information and giving information.

The rights and responsibilities of the **Ministry of Health-care** its Hygiene and Epidemiology Centres in cities and districts in the field of waste management are regulated by the Law of RA "On Health", Regulations on Hygiene and Epidemiology Centres and other regulatory acts and include the following:

- Control over the observance of sanitary rules in the streets, yards and other settlement areas, other places used by the population;
- Approval of the Rules of industrial and solid domestic waste collection, temporary storage, transportation and processing;
- Control over the observance of sanitary rules and requirements during the design, construction and reconstruction of the enterprises and installations engaged in industrial and domestic waste treatment;
- Preparation and implementation of measures aimed to normalize the environment based on the analysis of industrial and domestic waste impact on the environmental and human health;
- Implementation of regular preventive measures against spreading of epidemic and infectious diseases in the areas.

In the Baku City, functions related to the collection and logistics of domestic solid waste generated by the state establishments, institutions and organizations of Baku, waste collection points, machine mechanisms and equipments for the execution of these functions have been given to the **Baku City Executive Power (BCEP)[4].**

The **BCEP** is not a municipal body in the generally accepted sense. The role of the BCEP is to co-ordinate the implementation of the Government Policy for provision, the services themselves being provided by the 11 Housing Communal Services Specialized Sanitary Administration Offices (HCSO) within the City. The BCEP consist of different services.

One of the services under the BCEP is the **Department of Housing and Communal Services** (**DHCS**), which is responsible for overall provision of solid waste services, which includes street cleaning and maintenance of communal areas in the apartment blocks belonging to the City.

Authority for Special Services of Collection of Solid Waste (ASSCSW), which is also working under the DHCS is responsible for collection of solid waste in the Baku City.

According to the administrative structure of the residential areas in the Baku City, there are 13 **Housing and Communal Services Specialized Sanitary Administration Regional Offices (HCSO),** which are also working under the DHCS. They have been established for 11 region providing communal services for the public, to create competition conditions in the management structure. Moreover, to have competition within the communal service provision, inside the structure of the HCSD, 1 and 2 numbered specially assigned HCSDOs have been established.

[4] ISWM Project. Draft Report on "Existing Solid Waste Management System in the Baku City". Ekodenge Ltd, June 2011.

These are namely: Yasamal, Narimanov, Sabail, Sabunchu, Nasimi, Surakhany, Binagadi, Khatai, Garadag, Nizami, Khazar.

In the Baku City, under the HCSO, there are 138 **Housing and Communal Services Specialized Sanitary Administration District Offices (HCSDO),** which are also named as **"MKIS"** or **"JEK"**. These are situated in each of the regions of Baku and they are responsible for collection of the street sweepings, gross solid wastes and providing of containers. HCSDOs have also been authorized to make contracts with independent solid waste transporters.

In the Baku City, 40.6% of the population is living in the responsibility area of 11 **HCSDO**. The rest of the population corresponding to ~60% of the total population, who are not in the service area of the HCSD, are provided for the solid waste collection and transportation service by the **authorities of the buildings**, where they live. These are governmental, **private and commercial sector,** which are responsible from solid waste collection and transportation in Baku. Those are namely:

- UP Int. (German – Azerbaijani partner)
- Kasco Waste Int. (Finn — Azerbaijani partner)
- SOCAR,
- Municipalities,
- Ministry of Defense,
- Ministry of Justice, etc.

Tamiz Shahar OJSC (Clean City) was founded for solid domestic waste management, placement and utilization in the Baku city. **TS** has also been authorised to sign contract with the responsible solid domestic waste collectors for the treatment, recycling and disposal (destruction) of solid domestic waste.

3 official landfills, Balakhany, Surakhany and Garadagh, for domestic waste disposal in Baku are under the management of **Tamiz Shahar OJSC**. In short, there is no monopoly for solid domestic waste collection in Baku and control over this waste management is too straggle.

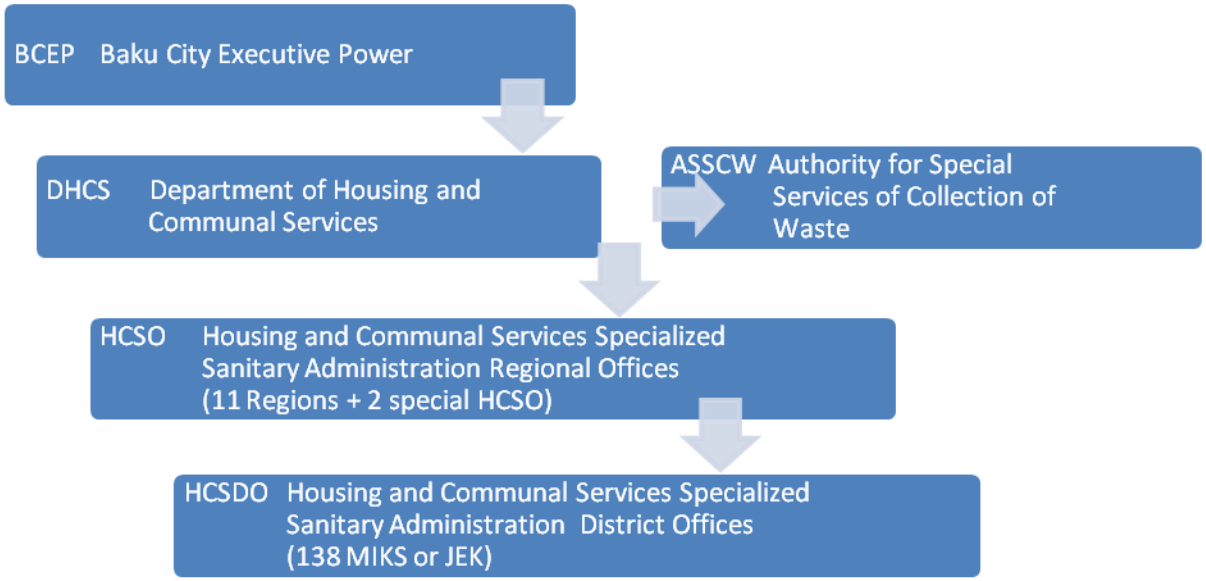


Figure 3.1. Main Services Under the BCEP

3.6. REGULATORY STANDARDS AND RULES

Sanitary-hygienic and ecological regulations – Permissible Turbidity Limit (PTL) – is used for identification of the environmental quality, assessment of impact on human health and control. PTL is different for residential areas, work places and recreation zones.

PTL does not identify facilities having impact on the environment (impact sources) and does not regulate their activities. Permissible Emission Limit (PEL) and Permissible Flow Limit (PFL) norms (Annex 2) can be used for regulation of the quantity of hazardous substances discharged by the enterprises into the environment, determination of waste limits and coordination of these limits with authoraty bodies.

Rain and waste water (filtrate) from Balakhany landfill area will be cleaned in cleaning facilities and flow in the Boyuk Shor Lake. For this reason, when calculating PFL the requirements put forward for water facilities of cultural-domestic category as accepting water facility should be followed.

The requirements determined by the legislation are put forward for soil contamination, noise, vibration, electromagnetic radiation. These requirements (standards) are described in Annex 2.

The following principle constitutes the basis of application of environmental normatives: the quantity of any mixture in water, air and soil has to meet the requirements of sanitary-hygienic norms under the condition that the enterprises located in the region follow those regulations.
Below a list of main legal-regulatory documents in the field of environmental norms and standards in Azerbaijan is given.

- Decision of the Cabinet of Ministers of RA # 112 dated 13 July 2002 on the "Rules of State registration of hazardous substances discharged in atmosphere and hazardous physical impacts on it".
- Decision of the Cabinet of Ministers of RA # 63 dated 15 April 2002 on the "Rules of inventory of hazardous substances discharged in atmosphere and sources of physical impact on it".
- Decision of the Cabinet of Ministers of RA # 63 dated 15 April 2002 on the "Rules of the implementation of atmospheric air protection by the legal entities being a source of hazardous chemical, biological and physical impact on atmospheric air".
- Preparation of PEL (PFL) normatives project by the enterprises and recommendations on its content. State Committee on Ecology. Baku, 1994
- "Rules of protection of ground water contamination by waste water". State Committee on Ecology and Control Over Nature Use. Baku, 1994
- Decision of the Cabinet of Ministers of RA # 216 dated 22 September 1998 on the "Rules of water facilities use for rest and sport purpose".
- "Instructions on the inventory rules and classification system of waste generated in operation and service areas", Ministry of Justice, (July 01, 2003, Certificate No 419).
- GOST 17.2.1.03-84. Environmental protection, Atmosphere. Terms and definitions of contamination control. M. 1984
- GOST 3223-85 "Sanitary norms of permissible noise level at work places", M.1985
- OND-86 State Committee on Hydrometeorology. The calculation methods of concentration of substances contained in waste from the enterprises in atmospheric air. Hydrometeo-publication. 1987.
- GOST 17.2.3.01-86. Atmosphere. Rules of air quality control in residential areas. 1986

- RD 52.04.52-85. Regulation of waste in unfavourable meteorological condition.. L.: Hydrometeo-publication. 1987
- GOST 17.2.3.02-78. Environmental protection, Atmosphere. Rules of determination of hazardous substances as permissible waste by enterprises. M.1978
- GOST 12.1.005-88. Safe standards system of labour. The general sanitary-hygienic requirements put forward for working area air. M. 1988
- Instructions on standardizing discharges of hazardous substances in atmosphere and water facilities. State Nature Committee of the USSR. M. 1989
- Regulatory documents in the area of nature protection and effective use of natural resources. State Ecological Committee. 1994
- GOST 17.0.0.01-76. Environmental protection and standard system in the area of environmental use.
  GOST 17.4.3.06-86. Environmental protection. Soils. General description taking into account soil impact with chemical substances.
- The methodical rules for assessment of soil contamination with chemical substances for determination of soil contamination degree. M., Ministry of Health of the USSR, March 13, 1987, № 4266-87.
- GOST 27535-87 "Internal and external noise from vehicles. Permissible degrees and calculation procedures" , M.1987
- GOST 12.1.002-84. SSBT. Electric site of industrial frequency. Permissible voltage of electric field in the working area and its control requirements.
- "Norms of vibration and noise contaminations that can have a negative impact on the environment and human health" Order of President of RA # 796 dated July 8, 2008.
- GOST 12.1.003-83. SSBT. Noise. General requirements for safety.
- GOST 12.1.012-90. SSBT. Vibration safety. General requirements.
- SanPiN 42-128-4433-87. Sanitary norms for permissible turbidity of chemical substances in soil.
- SNİP 2811-83. Sanitary norms for structure and maintenance of landfills for solid domestic waste.

3.7. NATIONAL ENVIRONMENTAL IMPACT POLICY AND LEGISLATION

The current EIA system in Azerbaijan is rooted in the old Soviet central planning system and largely follows the procedure of State Ecological Expertise (SEE) adopted by the former Soviet Union in the late 1980s. Unlike EIA, and in line with the definitions of SEE in the ***Law on Environmental Protection*** (LEP), the core purpose of the SEE system lies in the formal verification by state authorities of all submitted developments for their possible environmental impacts, regardless of their scale, sector type or nature.

The ***LEP*** states that SEE is the official EIA procedure in Azerbaijan, but it is not a specific EIA related legislative document. According to Article 54.2 of the LEP, EIAs are subject to SEE which means that the environmental authority - MENR - is responsible for the review and approval of EIA reports submitted by developers. The LEP establishes the basis for the SEE procedure, which can be seen as a stand-alone check of compliance of the proposed activity with the relevant environmental standards (e.g. for pollution levels and discharges, noise). In addition, the LEP determines that projects cannot be approved without a positive SEE resolution.

The basic procedures for the conduct of EIA are laid down in the 1996 ***Handbook on the EIA Process in Azerbaijan.*** Although these provisions are not technically legally binding,

compliance with them is to all intents and purposes regarded as mandatory. The *EIA Handbook* introduces the main principles of the 'western'-type EIA process to the country, and details

- The EIA process, i.e., the sequence of events, roles and responsibilities of applicants and Government institutions, charges;
- The purpose and scope of the EIA document;
- Public participation in the process; (environmental impact review); and
- Environmental review decision.

It defines EIA as a process aimed at identification of, evaluation of, mitigation of, or avoiding, possible negative impacts of development proposals, but also mentions principles of integrated approach of such assessment. It is acknowledged to introduce transparency in the process of decisionmaking through involving the interested public in the discussion of the proposed activities and taking the public opinion into account . The EIA definition also suggests that not only should the developer design their proposals in a way least harmful for the environment, but they also should consider certain activities under each proposal to eliminate or minimize its possible negative impacts.

The EIA Handbook also outlines the main parties to the EIA process, which are the Developer, the Environmental Authority (MENR), the Experts and the Public. The Developer is responsible for preparation of all EA related documentation, and for further implementation of proposed mitigation measures. The MENR has to review the documentation submitted by the Developer, and make a decision on issuing environmental Permission. The Experts are involved in analyzing all applications and drawing their conclusions on the proposed activities. The Public is expected to provide its feedback to the proposed activities through various types of public involvement techniques.

The EIA principles outlined by the Azerbaijan's legislation is in general consistent with international principles, calling for transparency, integration of environmental, social, engineering, economic and other assessments. In terms of timeframes, the EIA Handbook provides for one month for the Environmental Authority to make a decision on EIA scope, and for 12 months for the Developer to submit EIA after the Environmental Permission is issued by the Environmental Authority.

Not all EIA stages are adequately covered by the local legislation. A distinctive screening list with activities that are likely to cause significant environmental impact is not established either by the LEP nor by the EIA Handbook. Consideration of alternatives is not explicitly required by any of the two basic legal EA documents. However, in practice most of the developers, in an effort to meet requirements of international donors and achieve higher environmental performance do cover alternatives and their impacts in their EIAs. On the other hand, the reporting requirements are specified in detail in the EIA Handbook.

In relation to public participation, the LEP and the EIA Handbook do not contain clear regulations/procedures on public participation and the access for the public to the relevant information and thus do not meet international requirements for public participation at the present time. Public participation is mainly understood as public access to EIA documentation, but has no role in the decision-making process. Public consultation requirements for this Project are outlined in Chapter 8.

Monitoring and post-project analysis are among the weak aspects of Azerbaijani EIA system, covered only by rather vague requirements of the LEP and Handbook for monitoring and audit of economic activities. This can partially be explained by the lack of adequate mechanisms of

monitoring and up-to-date system of internationally applied indicators. This procedure will be mandatory for the project works investments under the proposed Project.

3.8. PUBLIC PARTICIPATION IN DISCUSSION OF ENVIRONMENTAL ISSUES

Public discussions are required as one of the conditions for financing the projects by the WB, for the projects to be sustainable depending of the characteristics of the project. As the project is of B Category, public discussions will be carried during the ESIA preparation process and the discussion results will be taken into account in the final document.

The public (citizens) participation rights in discussions of the environmental issues and taking decisions related to the environment have been identified in accordance with the requirements of the international Convention ratified by Azerbaijan as a main legislative act. (Articles 7, 58).

Based on Article 3 of the Law on EP, one of the main principles in the environmental protection area is a compulsory participation of citizens and public unions in the discussions related to the environmental issues.

According to the Regulations on ESIA process, designer of the project has to inform the society about the decisions taken on the project issues through mass media, provide them with the copies of reports and additional information. Documents prepared as a reply to the public comments has to be described in this information.

3.8.1. NON-GOVERMEN ORGANIZATIONS (NGOS)

There are a lot of NGO's engaged in the environment issues and more than 50 of them have been recently founded and are dealing with the issues related to environmental pollution by the oil-extracting industry since the Soviet time. Many of NGO's receive support from international organisations including the Eurasia Foundation, International Development Programme (USAID), UNDP and the World Bank and link with the Caucasian Environmental Network. A number of NGO's participated in public discussions for this project.

4. CURRENT ENVIRONMENT

In this Section, information is given about the current social-economic status of the areas where the project activities are directly carried out or the areas that can be directly or indirectly exposed to potential impact as a result of the project activities (areas located close to landfills) in order to characterize impact of the project activities related to landfill closure on the social environment. It is necessary from the point of view of assessment and comparison of a possible negative impact of the planned project activities on the environment and separate components of the environment.

The environmental description is written based on the published facts, reports, information on the basis of multiannual observations made by various departments, expert assessments and the results of certain field researches conducted by experts at the stage of document preparation. The reports used as a reference material when assessing the environmental impact during the project activities in the area and accepted as an official document for objective assessment of the future activities impact on the environment (as agreed with the State Expertise Department of the MENR) were used when writing this Chapter (Literature section).

The description was made on physical, biological and social-economic environments in compliance with the Regulations "On the process of environmental impact assessment in Azerbaijan".

In spite of the fact that it is planned to carry out the project activities in the limited area, the description and assessment of the environmental condition taking into account the impact character covered the neighbouring areas.

4.1. THE CLIMATIC PECULIARITIES AND ATMOSPHERIC POLLUTION

Dry hot semi-desert climate is characteristic for the area. Atmospheric processes over the Eurasia droughty zone, relief of the Caucasian mountains, the area of the Caspian Sea and Pre-Caspian semi-desert area have an impact on the formation of the district climate. The synoptic condition over the area is governed by the frequent changes of air mass during all the seasons, but in different cases by considerable daily falling and rising of atmospheric pressure of the air. More intensive meridional atmospheric processes are observed in the area. Drastic changes of atmospheric pressure are observed during appearance of deep cyclones and strong anticyclone passage. In winter, that area is under the impact of the atmospheric pressure of Central Asian's maximum and Iceland's minimum, during hot seasons of the year, it is under the impact of south-east periphery of Azov's and Siberian's maximums, close to autumn, Asian and Iceland anticyclones again get wide range.

Thermal regime. The air temperature is strongly exposed to the changes. General baseline mark of thermal regime is of positive sign all over the year for the mentioned district. The climate is moderate-hot. The average annual temperature is 14.5°C. The highest temperature of the hot season reaches 42°C. The average temperature of summer is usually 26.4° C and in winter it drops to 3.4° C. The maximum temperature is observed in July - August and reaches 40- 42°C, the absolute minimum is observed in December – January in the district and drops to –14÷ 18° C. The minimum temperature usually does not drop lower than –7 °C. Winter in the district is warm and the weather is very seldom frosty, summer is very hot and long lasting. Here summer comes in June and lasts 90-100 in average and it lasts until middle of September. During this

time, a stable period is observed with temperature higher than 20°C. The daily changes of the temperature is 2-6°C and the highest falling and risings are characteristic for the hot period of the year (Table 4.1)

Atmospheric precipitation is not much. It is amount is 220 mm a year. 64% of annual precipitation is observed in spring and autumn. (33—36 and 28—30%). 8% (23 mm) of the annual precipitation falls to snow's share, mixed precipitation (sleet) is 12% (39 mm). Within a year, duration period of precipitation is 500 hours. Snow cover happens in January – February in different years. In some cases the height of snow cover reaches 5 – 10 cm. The duration of snow cover in Hajigabul district is 106 days. In abnormal years it snows even in spring.

The main reasons of precipitations in cold seasons of the year are high pits of cold masses over the Caucasus, the Caspian Sea and Scandinavia. While high pressure area is widening over the European north regions south cyclone develops over South Caucasus. The air masses are exposed to agitation when passing the South Caucasus mountain chains. Frontal zones are formed that of accompanied with precipitations.

Wind regime. The wind characters over the district are determined by the wide range of impact of atmospheric circulation as well as by the local atmospheric circulation and thermal condition. Location of the Caucasian mountains in the west and of the Caspian Sea in the east are the condition of often repeted north-eastern (25.6%) and north (23.8%) wind, also other rhumb winds are observed in the area. Strong wind blowing with a speed more than 15 m per second can happen any time, but it is more characteristic for the summer season of the year.

According to information from the Alat mete-ostation, an average annual speed of wind is equal to 4.6 m per second and maximum speed reaches 28-32 m per second. Repeatition of the windless weather is 22-25 % during the year.

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	İl
Garadag project site													
Air tmperature, ^{0}C -max - min	 3,4 22 -16	 4,2 27 -10	 6,7 32 -5	 11,7 33 -1	 18,3 36 5	 23.3 37 7	 26.4 40 12	 26.1 41 12	 21,9 39 8	 16,6 34 1	 10,7 28 -6	 6,1 25 -14	 14,6 41 -16
Precipitation, mm	20	20	23	23	18	11	4.0	6	11	26	32	23	218
Wind speed, m/s	3.3	3.9	4.0	3.7	3.9	4.1	4.1	4.1	4.2	3.6	3.4	3.3	4,6
Surakhany project site													
Air tmperature, ^{0}C -max - min	 3,4 22 -16	 3,8 27 -10	 6,3 32 -5	 10,8 33 -1	 11,7 36 5	 22,4 37 7	 25,5 40 12	 25,4 41 12	 21,5 39 8	 16,6 34 1	 10,8 28 -6	 6,4 25 -14	 14,2 41 -16
Precipitation, mm	30	22	25	23	12	9	6	8	15	25	38	52	247
Wind speed, m/s	6,1	6,6	6,9	6,5	6,2	6,5	6,8	6,3	6,2	6,1	5,7	5,6	6,3

Table 4.1 General meteorological kharakteristics of the project sites (On the based Alat and Earport meteorolojical stations)

Dust storms. Dust storm is among the dangerous events connected with the wind activity. Availability of dry semi-desert climate and possibly bare soil surface and weakly hardened coastal sand ia a reason for dust storm happening during the hot season of the year. In that

district, dust storms can be observed during the winds blowing with speed more tha 20 m per second and the number of dust storm days can be up to 23 days a year.

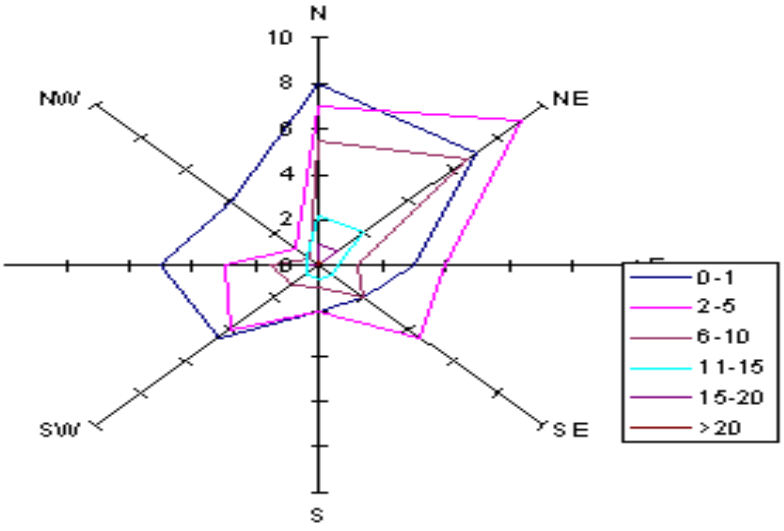


Figure 4.1. Wind rouze (*Alat meteo stations)*

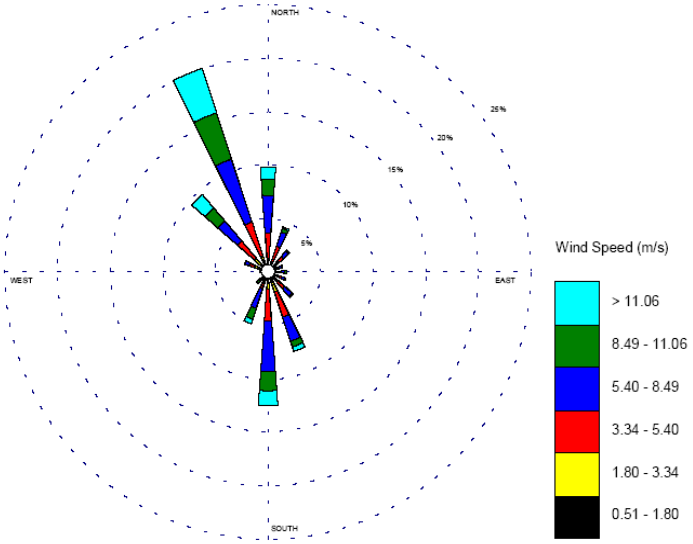


Figure 4.2. Wind rouze (*Earport meteo stations)*

4.1.1. ATMOSPHERIC AIR POLLUTION STATUS

The atmospheric air of the Absheron Peninsula is basically polluted with hazardous substances emitted in the environment by the oil and gas production, oil extraction, oil and chemistry, energy, machine building and other industrial enterprises and vehicles.

According to the statistic report of 2009, the annual amount of waste discharged by the enterprises (stationary sources) was 333,8 thousand tones and the amount of hazardous

substances discharged by vehicles was 528,6 thousand tones and this being by 11.5% and 5.7%, respectively more compared with 2006.

The Peninsula is one of the most favourable areas regarding spreading of substances over the area. But in spite of this fact, important industrial potential located on the Absheron Peninsula and hundreds of thousand vehicles always keep the atmospheric air pollution degree at a high level.

The highest concentration of contaminating substances in the atmospheric air of the Peninsula is observed during the unfavourable meteorological condition period (June – September). At this time, inversion and windless weather processes are repeated often in the above ground atmospheric layers and this has a direct impact on the collection of chemical compounds in the above ground air masses.

Mainly natural (climate, relief, temperature, etc.) and anthropogenic factors have a direct impact on the formation of the background chemical composition of atmospheric precipitation.

Annually 11 thousand tones of solid substances, 9.8 thousand tones of sulphuric dioxide, 17.5 thousand tones of carbon dioxide, 8 thousand tones of nitrogen oxide and 280 thousand tones of carbon hydrogen are emitted in atmosphere by the industrial enterprises located on the Absheron Peninsula. Besides, 7-17 thousand tones of different hydrochloric compounds enter the atmosphere during the evaporation processes taking place in the sea. The impact of these wastes on the chemical composition of precipitation on the Peninsula area was of local scale, but their background chemical composition was mainly formed in the area of Ukraine, Russian Federation and south-eastern European countries.

Based on the results of the long term observations carried out in Absheron, hydro-carbonates, sulfates, chlorine, calcium and natrium ions prevail in the composition of rains falling in the area of Absheron. Their annual concentration was between 20-250 mg/l, 12-170 mg/l, 10-120 mg/l, 5-25 mg/l and 3-23 mg/l, respectively.

It should be noted that only in sulfates, hydro-carbonates and calcium indicators out of those chemical substances mentioned above the seasonal changes have been observed.

As the evaporation processes have a miserable impact on other chemical substances including nitrates, ammonium, phosphates and magnesium concentrations their indicators usually do not change during the year. The annual concentration of these chemical substances is between 5-45 mg/l, 0,8-4 mg/l, 0,01-0,16 mg/l, respectively.

According to the corresponding description of the precipitation salinity indicator (hydrogen ion) of the Peninsula, they belong to alkali and weak acid class and the pH indicator of their composition is between 5.5 - 7.5. This demonstrates that there is no relevant natural condition in the Absheron Peninsula region for the formation of acid precipitation.

4.2. GEOLOGICAL STRUCTURE

4.2.1. GARADAG PROJECT SITE

The area under consideration is located within the boundaries of the southern oil and gas basin of the Caspian Sea and included in the Alpine mixed zone.

Geology of the area in the vicinity of the Caspian Sea consists of Cenozoic deposits from the Paleozoic century to the Pleystocene century. It consists of various clay layers of different thickness. These deposits were generated in the direction from the Caucasian Mountains chain to north-east. These layers are located on touchstone foundation in the depth of 20 km. The Oligocene, Miocene, Pliocene and Pleystocene deposits were found in the examined area. They were composed mainly from clays and clay rocks were also found.

Mainly Upper Pliocene deposits (Agchagil stage) are spread in the area. The lithologic content of deposits consists mainly of clay rocks and separate flint layers. It was determined that those layers, more truly flints possess good collector characteristics. The thickness of white clay and Absheron stages jointly reach 650 m.

The project site is located in the vicinity Lokbatan settlement, not far from the Caspian Sea, about 10 m above sea level. The project site and the area adjacent to it consists of the mountain chain and plain located near the site. The altitude of the area in the northern and north-western direction is 100 – 400 m above sea level on the area generated by dormant volcanoes. The surrounding area stretches down from the north-east to south-west, the Caspian Sea.

The area topography was formed as a result of the mud volcanoes activities, systematic generation of relatively precipitous mountain feet, pits, ravines and formation of baring connected with local impact of lime stone beds.

Drastic changes of climate and relief, alternation of precipitation beds of sea and continental origin in geological era, unstable lithology of beds in cuts, mainly alternation of clayey, sandy beds and other factors were the reason of continuous development of soil erosion. There are a lot of erosion channels and valleys, they are dry in summer but they are full of water during heavy and continuous precipitation.

4.2.2. SURAKHANY PROJECT SITE

The area under study located in the eastern part of the Peninsula has simple structure from the tectonic and orographic point of view. From the tectonic point of view, the area covers Zigh monoclinal bloc together with Surakhany anticlinal terraced, abrasion-accumulative plain in the eastern part of the peninsula. The wide central part of the area where the project site is located corresponds to the tectonic mould. This area covers the former Garachukhur oil fields area. The relief of the area where the project site is located was completely retrograded by anthropogenic processes. Most of the hollow places are of relief form generated in the place of former quarries and sand-pits. Abrasion fields contain mainly lime-stones and are covered with cockleshells with broken surfaces. Small and low blocs are formed at the sites where lime-stones come outside. Salty lakes and salty swamps are formed in the bottoms of quarries.

4.3. HYDROLOGY

There are more than 200 lakes on the Absheron Peninsula with total area of 3325 ha (see figure 4.3). According to their areas the biggest lakes are Boyuk Shor (12 км^2), Masazir (10 км^2),

Mirzaladi (6.5 км^2), Haji Hasan (2 км^2). These lakes are mainly fed with atmospheric precipitation. At the same time, some of these lakes (for example Boyuk Shor, Masazir, Zira lakes) are also fed with ground water. Underground water and soil beds of the lake areas became salty. That is why, water of those lakes are salty and cannot be used for economic purposes. Mineralization degree of water in those lakes is equal to from 2-10 to 100 g/l, sometimes to 300g/l. Water of the lakes contain sulfate chloride and sodium-magnesium.

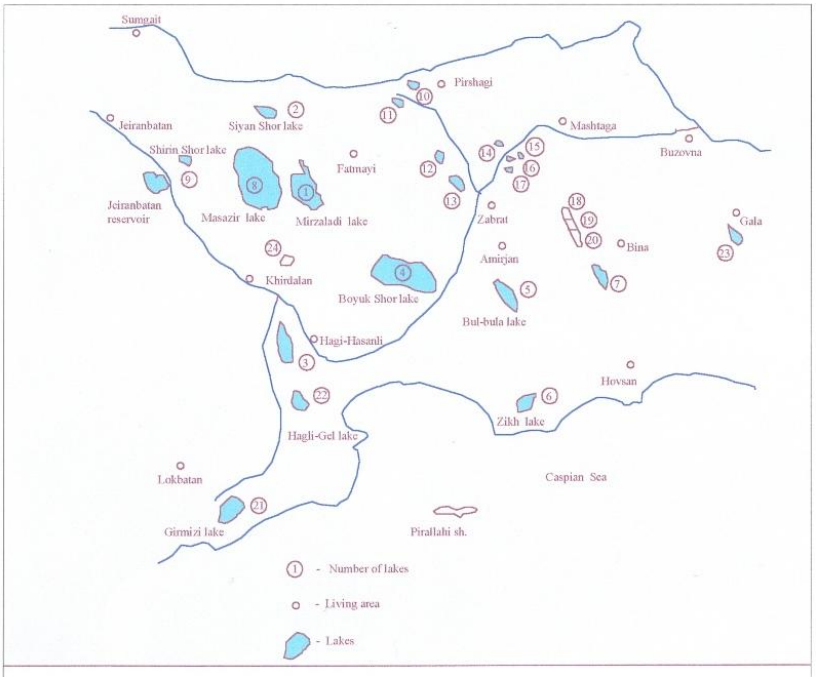


Figure 4.3 Schematic map of the Absheron Peninsula lakes

The characteristic feature of the Absheron Peninsula is that oil bed waters play significant role in water supply to many salty lakes; for this reason, the regime of these lakes has drastically changed. During a year, 41.5 mln. m^3 of leachate flow into these lakes. The mostly contaminated lakes are: Boyuk Shor, Bulbula, Gyrmyzygol, Haji Hasan and Chukhurdara lakes.

4.4. HYDROGEOLOGY

From the hydrogeological point of view, the project sites relates to the Absheron-Gobustan hydrogeological region and II hydrology zone (Figure 4.4).

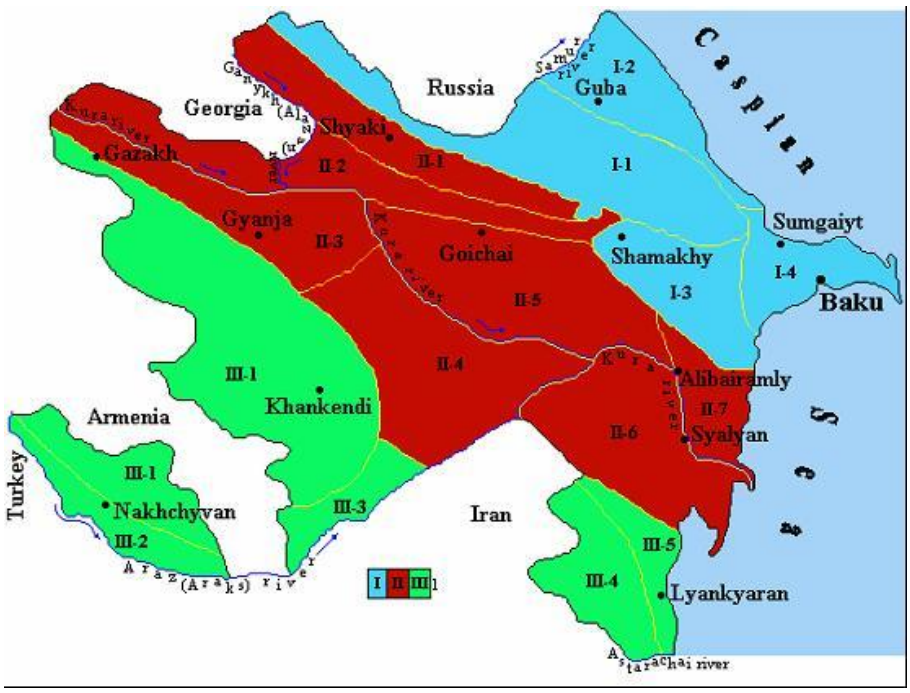


Figure.4.4. Hydrogeologic zones in Azerbaijan: I - Greater Caucasian hydrogeological basin; II - Kura depression hydrogeological basin; III - Lesser Caucasian hydrogeological basin. Scale 1:500.000

According to its hydrogeological condition, the Absheron Peninsula is divided into 2 groups – western and eastern Absheron. The border between them stretches from Nardaran settlement located on the northern coast till Hovsan Cape in the south.

The Western Absheron is characterised by the Pleystocene clay sands. Underground waters relate to the Fourth quarter and upper pliocene sand deposits, they are of high mineralization degree. Soil water was connected with separate 4th grade sand deposits and is of high mineralization degree. While sometimes fresh underground water of weak mineralization degree is met in the lower Pleystocene and Absheron deposits, waters of the main bearing stratum were of high mineralization degree and had relations with oil and gas deposits; it is proven by the existence of iodine, bromide, potassium and other microelements in their content.

The eastern Absheron is widely spread and is characterised with soil water related to the Upper Absheron and Pleystocene deposits (Figure 4.5).

The location depth of these waters can be 20 m or more depending on the relief, but its hypsometric condition can be from 30 m to minus 31 m. The direction of soil water stretches from the central part to the Caspian Sea coasts. Its mineralisation degree and chemical content was different, it changes from fresh calcium carbonate content to chloride natrium magnesium content.

From the geological-lithological point of view, different deposits are widely spread in the area starting from the Pleystocene new modern Caspian deposits to the deposits of Pliocene age.

1. Sand deposits of New Caspian age (mQıv) cover the beach flat on the sea coast. Their spreading strip width changes between 0.5-1.0 km, thickness - between 5-10 m. The slope depth of soil water in these deposits change between 0.5-5.0 m, their salinity changes between 1-10 g/l. Quite often waters possess sulfate and chlorine aggressiveness.

2. Deposits of Khvalyn age (Qıı hv) are represented by different size sands, clay stones and weak, short lasting flints. They created wide and smooth 2-grade terrace. Its width reaches 1.0-1.5 km. Soil water is available in the depth of 5-10 m.

3. Deposits of the Khazar age (Qıı hr) lay on higher terrace, they are represented by sands, clays, clay stones and lime-stones. The width of described lithological cuts change in wide range (2-20 m). Soil water exist here in a bigger depth and usually are sulfate aggressive.

4. Middle and Lower Absheron stages ($N_2^3ap_2$, N_2^3ap) of Upper Pliocene age in the area close to the south-east wing of Baku mould and in the larger area along the sea coast come out to the land surface. But in some areas, they lay under the sea deposits of smaller thickness (up to 5-10 m) of Modern-New Caspian (mQıv), Xvalın (Qıı hv) and Khazar (Q_{II} hr) age.

From the lithological point of view, Absheron age deposits are represented by clay and clay stones (30-80 m), lime stones (10-25 m) and different sands (8-10 m). It is necessary to note that the general mineralisation degree of soil water in these soils being of from little salinity to saline degree (2.3-81 g/l), are drastically sulfate and middle chlorine aggressive.

5. Agchagyl stages (N_2^2ag) of Upper Pliocene age deposits, from the lithological point of view, are composed of sand stones, lime stones and different sands horizonts. General mineralisation of water is 0,5-4,6 g/l and from the chemical point of view they are of sulfate-hydrocarbonate calcium-sodium type. They were discovered in a range of 20–320 m by means of exploratory wells and the effective thickness of water horizons is 5-75 m.

Formation of soil water in natural way mainly happens through condensation of atmospheric precipitation and air steams, and their consumption is regulated through underground flow (discharge) in the Caspian Sea and evaporation.

In general, general mineralization degree of soil water in the area changes between a very large range, from 1-3 g/l to 80 - 100 g/l. Soil water of higher mineralization degree is spread in the areas where the clayey rocks are widely spread but soil water of lower mineralization degree is spread in the areas where sand and sand stone is widely spread.

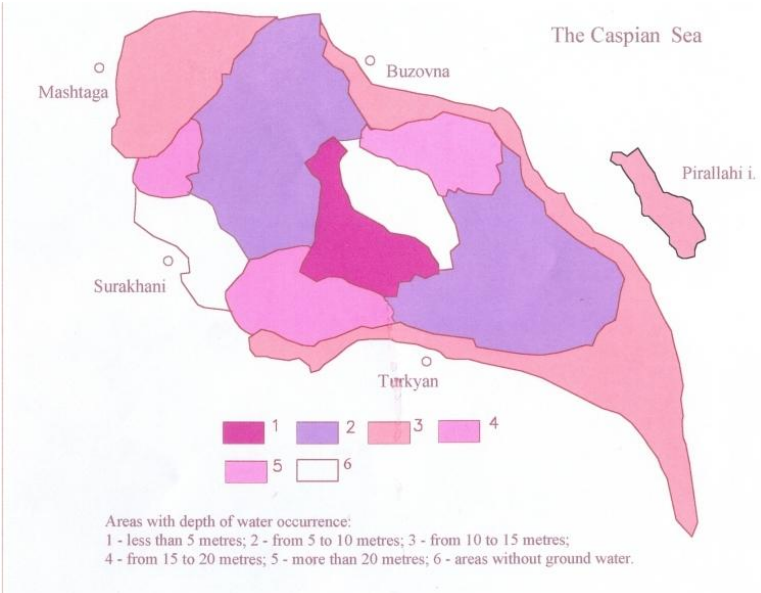


Figure 4.5 Schematic map depths of ground water occurrence of eastern part of the Absheron Peninsula

4.4.1. GARADAGH PROJECT SITE

Ground water is available in Pleistocene sediments, local sites. In majority of places they are highly mineralized and not useful for use. The general mineralization of water leads to ratio increase of clayey beds as space filling material along the under ground water movement from 0.5-1.6 g/l to 10-20g/l and even more. For this reason, water type changes from hydro-carbonate calcium to sulfate-chlorine natrium in the chemical composition of water. As lithophases of beds are not stable, water horizons of the Fourth era are often substituted with water-proof stratum.

4.4.2. SURAKHANY PROJECT SITE

The project site is located in Bulbula-Garachukhur-Zigh erosion – denudation – deflation lake-saline valley.
Deposits of the Caspian age (Qıı hr) lay on higher terrace and they are represented by sands, clays, clay stones and lime-stones. The width of the described lithological cuts changes in wide range (2-20 m). Soil water exists here in a bigger depth and usually is sulfate aggressive.

It is necessary to note that the general mineralization degree of soil water in these soils being of from little salinity to saline degree (2.3-81 g/l), are drastically sulfate and middle chlorine aggressive. Soil water of higher mineralization degree is spread in the central and western part of the area where the concentration of clayey bed is high, soil water of lower mineralization degree is spread in the eastern part of Hovsan settlement, at the sites where sand and sand stone deposits are widely spread.

Taking into account that the natural flow of underground water is directed to the Caspian Sea in the area under study it is necessary to note the role of soil water the hydro-chemical composition of which is contaminated under the impact of artificial factors participating in the change of the environmental condition of the Caspian Sea.

4.5. LANDSCAPES AND SOILS

4.5.1. LANDSCAPES

The Absheron Peninsula area is characterized with change and degradation of the natural landscapes. The natural landscapes have been changed with the anthropogenic landscapes in the majority of areas.

The main landscape complex of the Peninsula is of semi-desert type. This landscape type is distinguished with arid climate, low relief and mainly clayey complexes. Salt-ridden lands and salty lakes prevail in this area and this is one of the characteristics of semi-desert landscape type.

The following landscape types developed in the semi-desert area:

Ephemeral – camelthorns landscapes on the weakly shattered bloc slopes, on gray soil. Main plants consist of ephemers, saltworts (Salsola), crops, and camelthorns. The amount of humus in these gray soils is 1-2%, it is carbonated grainy. Sandy-clayey lenses are observed in soil profile. About 40% of the vegetative cover is weed. Camelthorns amount to 20-25% of the total vegetative cover on the surface. Camelthorns is mostly developed in the areas of relative humidity collection.

Ephemeral – camelthorns landscapes on the weakly shattered, smooth bottomed hollow places bloc slopes, on gray soil. Landscapes of this type cover the wide areas around the lakes. Deflation process is getting stronger during the summer months as a result of lake drying. Sandy gray soils develop in the relatively high areas situated between separate hollow places. Closer to the sea coast, sand prevails in the content of soil, the vegetative cover contains mainly camelthorns.

Ephemeral landscapes of the weakly shattered sloping plain where saline gray soil developed. The relief surface mainly consists of lime stone and its weathering materials, the amount of humus in saline gray soils is not more than 1.20%. Salts amount to 1.5-2.7% of the total volume. Soils are of prism and granular structure. Carbonate content is equal to 2-4% in the upper layer of soils but in deeper layers it is equal to 12-16%. The areas in the vicinity of oil wells are contaminated with oil and it weakens the development of soil and vegetation. The basic vegetative cover of the natural landscape consists of ephemeral grasses (70-75%), different other grasses and wormwood.

Saltwort and Salsola rich landscapes on gray soil of the weakly shattered sloping plain. Salsola (50-60%) and saltwort (20-25%) vegetative cover develops in the lower part of the area. At the background of the general vegetative cover, crops and cereals, ephemers are found in a small amount.

Modern beaches, coastal sand blocs, accumulative sea flats deprived of sand-vegetation cover. Landscapes of this type cover sand blocs and beaches formed on the modern coastal line. As a result of the sea level hesitation and especially the rise of the level, the most part of the area is covered by new swamps. Main vegetation cover in swamps is cane. Tamariks bushes develop on the sands.

The natural landscape of the area was very young, it was exposed to often changes as a result of the level hesitation. Small sand hills are encountered on the beaches composed of sand and cockleshells. Camelthorns and saline-type wormwood grow there. The vegetative cover makes up 2-3% of the modern landscape.

4.5.2. SOILS

The diversity of relief, native grounds that came out on the surface, dry climate and soil cover was a reason of generation of soil types.

The weak development of the vegetative cover and the lack of atmospheric precipitation do not create the necessary condition for collection of organic substances in soil. Little collection of vegetation remnants in soil and high temperature lead usually to mineralization. Consequently, the amount of humus in soil is very little all over the Peninsula.

As the coastal zone has younger relief the soil cover cannot develop properly under the impact of often repeated strong winds. In the majority of Peninsula areas soils are of light mechanical content and are usually weakly developed.

Sand deposits cover the modern coastal line of the Peninsula and they formed a wide and smooth (1.0 – 1.5 km) sea terrace. Small sand hills are encountered on the beaches composed of sand and cockleshells.

Closer to the sea coast, sand prevails in the content of soil. Sandy gray soils develop in the relatively high areas situated between separate hollow places.
Soils develop on the Peninsula over salty and saline beds.

Mainly brown semi-desert, gray-brown and saline soils developed on the Peninsula. Brown semi-desert soils are spread in the part of the Peninsula of the plain sea origin. These soils are characterized with granular structure and high carbonate content. These soils also tend to saltinization process. In salty type soils the maximum salt collection is observed in the first layer above 50 cm but in saline type soils it is observed lower than 50 cm layers. Clay amount in salty soils is 67-70%. Sulfate and chlorine acids amounts increase in the profile of these soils in the deeper layers.

Salty gray soils developed in sloping plains. Humus amount in salty gray soils is not more than 1.2%. Salts make up 1.5-2.7% of the total volume. Soils are of prism granular structure. Carbonate content is equal to 2-4% in the upper layer of soils but in deeper layers it is equal to 12-16%. Being characterized as a mixture-passage of brown and gray soils, these soils combine the characteristics of both soils. These soils also contain carbonates. They contain clay in the upper layers. Saltinization of soils begins from the depth of 0.5 m and their water passage ability is weak. Nitrogen amount is from 0.5% to 0.18%, phosphorus changes by 1.4 mg in each 100 g of soil in the upper layer and it decreases in lower layers.

Salt-ridden lands cover wide area on the Peninsula and the role of native beds is great in their formation. Instantly soluble salts generated as a result of weathering are not absorbed by the deeper layers under hot-dry climate conditions thus being a reason for saltinization of the upper layer. Relief plays a leading role in saltinization of soils. The washed salts from relatively higher areas are collected in lower areas and lead to formation of salty soils in these areas.

4.5.2.1. GARADAGH PROJECT SITE

The project site is located in the vicinity Lokbatan settlement, not far from the Caspian Sea, about 10 m above sea level. The landscape origin was formed mainly as a result of volcano and erupting volcano. But in the area of location of three landfills no exogenous geological activity was observed.

The area's topography was formed as a result of mud volcano activities and systematic formation of relatively precipitous mountain feet, valleys, ravines and denudation of limestone beds under the local impact. A lot of erosion channels and valleys are available in this area; they are dry during the summer season but are full of water during the heavy rainfall period.

Ground water play a significant role in formation of the natural landscape of the area. In the areas where ground water is close to the surface the natural landscapes are more different and

fertile. In the foothill diluvial plains where ground water is deeply located the natural landscapes are monotonous.

At project site saline gray soils are spread**.** The surface of these soils is rich with instantly soluble salts. Low fertility of soil and bare sites has impact on soil utilization.

This fact was a reason of utilization of areas close to the project site mainly for economic purposes, for shopping centre.

Assignment of neighbouring area lands surrounding Garadagh sites

The area surrounding the Garadagh open landfill is characterized mainly by recovery of limestone in the form of four cornered stone at the high level, industrial activities including oil sector.

Besides, the uncontrolled landfill containing continuously burnt different types of waste as is located adjacent to the site, at the top site of the north-western part (at the eastern side of the road stretching from Lokbatan to Gobu).

The Lokbatan settlement is located to the east of the landfill. A distance between the settlement and landfill is about 1 km. The landfill area is also close to the seasonal lakes (Gyrmyzy Gol) located in the direction from the Lokbatan settlement to the sea. Inactive oil well is located inside the waste landfill, in its northern part. Another oil well is located in the north-eastern part of the landfill, not far from the asphalt road.

2 electric lines are available along the north-eastern part of the Garadagh site together with the gas pipe-line and from 35 m to 45 m wide protected area. Entrance to the site is possible through the parallel city road and the district roads generally suitable for services.

The agricultural productivity in the region is low because of the dry climate and infertile soil. The agricultural activity of the area is limited with cattle grazing and winter-lands. In a larger territory, small areas are available for cultivating fruits and vegetables, especially sub-tropic products like fig, almond, olive and medlar. As the area is not at the high altitude for herbivorous animals, the number of sheep and goats is small here and pastures are very rich in nature. Nevertheless, the small flocks have a very negative impact on growing new vegetation in that disadvantageous landscape.

4.5.2.2. SURAKHANY PROJECT SITE

The project site is distinguished with complete change and degradation of its natural landscape. The natural landscapes have been completely changed with mine-anthropogenic landscapes all over the area.

For project site’s area the main landscape complex is of semi-desert type. Low relief, clayed lithological complex, salt-ridden lands and salty lakes are characteristic for this landscape type.

At project site deflation (wind) processes play considerable role in generation and development of soil cover. As the project site has younger relief, the soil cover cannot develop properly because of often repeated strong wind impact. At this area, soils are formed on salty and saline deposits; soils are of light mechanical content and are usually weakly developed.

Soils contaminated with oil prevail in the low parts of the site, 2 m lower than horizon. The ecological system has been fully destroyed in these soils.

As a result of contamination of soil with oil their morphogenetic, physical and chemical, agrochemical characteristics change completely. All soils of the area, even sea coastal beach sandy soils are contaminated with oil products, especially mazut (black oil). In some places, contamination with mazut reaches the depth of 30 cm around the oil wells inside the area.

Quite often the bottoms of former quarries and sand pits are full of salty oil and domestic water. In summer, these lakes get dried and change into salinity or swamps.

Assignment of neighbouring area lands surrounding Surakhany sites

The Surakhany landfill is in the vicinity of the settlement located 150 m to the south. The operations in the Surakhany landfill were stopped in 2008 as a result of complaints from the neighbouring settlements about those operations and their conditions.

However the area is also characterized with high level industrial activities and recovery of lime and stone including large oil fields in a distance of less than 200 m from the site. There is a gas pipe-line belonging to the 100 m wide protection area (50 m in each corner) along the northern and partially western boundaries of the Surakhany area and a water pipe-line of a small diameter at the southern end of the area.

Entrance to the site is possible by the district roads which upper surface has been recently renovated and are generally suitable for service.

The agricultural productivity in the region is low because of the dry climate and infertile soil. The agricultural activity of the area is limited with cattle grazing and winter-lands. In a larger territory, small areas are available for cultivating fruits and vegetables, especially sub-tropic products like fig, almond, olive and medlar. As the area is not at the high altitude for herbivorous animals, the number of sheep and goats is small here and pastures are very rich in nature. Nevertheless, the small flocks have a very negative impact on growing new vegetation in that disadvantageous landscape.

4.5.3. CONTAMİNATİON STATUS OF SOILS

Both sites and neighbouring areas under examination have been strongly exposed to the anthropogenic impact. Based on the visual studies results, land plots contaminated locally with oil hydrocarbons, exposed to erosion, contaminated with industrial, ground and waste water are available at the project sites or neighbouring areas.

Oil and gas extraction site, shopping centre, industrial enterprises, many concrete producing plants and other industrial entities, highway and roads to the enterprises and residential areas located in the area under study and close to it are a reason of different type contamination of soil cover in the area.

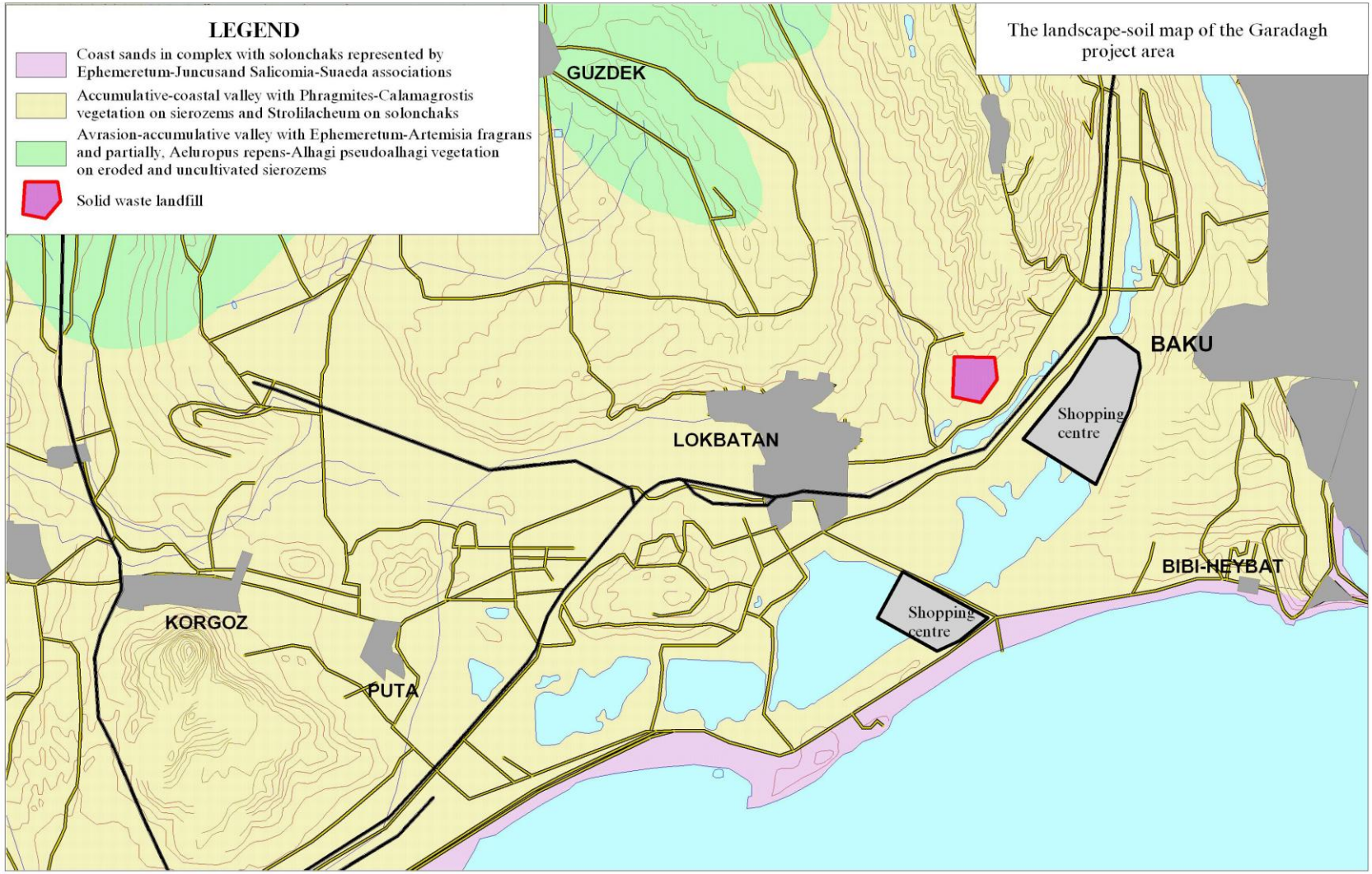


Figure 4.6. The landscape map of the Garadag project area

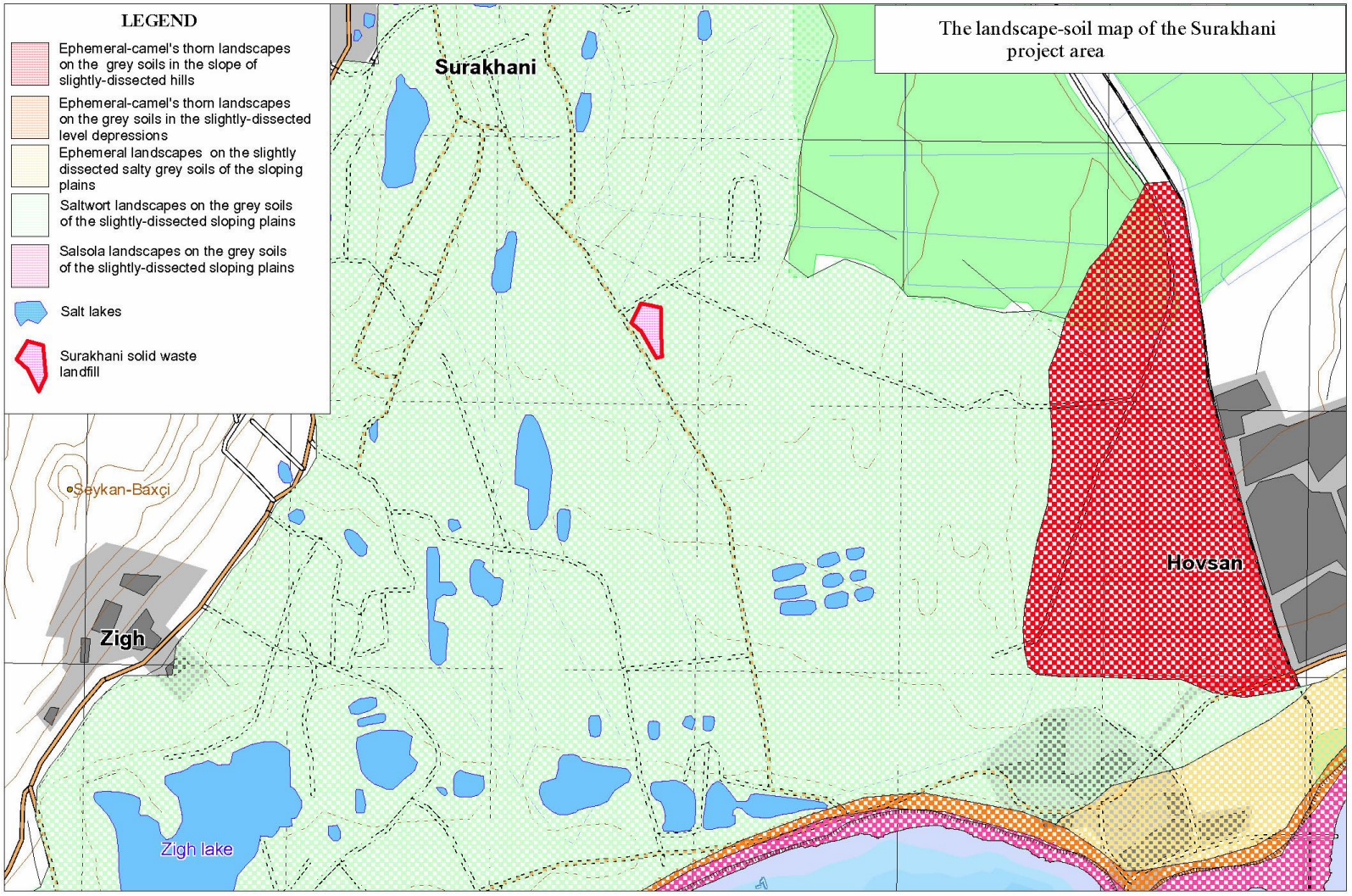


Figure 4.7. The landscape map of the Surakhani project area

4.6. FLORA AND VEGETATION

4.6.1. FLORA

Out of 4160 plant species registered in Azerbaijan 729 species are spread on the Absheron Peninsula including 426 species of annual grasses, 252 species of multi-year grasses, 27 species of small bushes and 24 species of bushes.

Flora content has been represented by more than 90 types of vegetation species for desert and semi-desert complexes. Particularly, flowering plants (Compositae), mayetiola (Poaidae) and four-petaled flowers (Cruciferae) families are more often met here. The variety of other families is less. The seasonal development dynamics and characteristics was in relation to the vegetation duration and situation and are conditioned by their edificators.

The following plant species included in the "Red Book" of Azerbaijan grow on the Absheron Peninsula: *Stipa pellita, Avena ventricosa, Ammochloa palaestina, İris acutiloba, Ophris caucasica, Anabasis brachiata*

4.6.2. VEGETATION

Mainly semi-desert and desert vegetation type is characteristic for the project sites. The vegetation cover is divided into the following types relevant to the relief of the sites: wormwood-ephemeral, wormwood-saline, ephemeral semi-desert and their complexes.

Wormwood develops in semi-desert salted, slightly salted and saline gray and grayish brown soils. Ephemeral plants in typical wormwood phytocenosis include Poa bulbosa and a number of annual ephemers, cereals, four petal flowers, Lamiales, etc.

Content of phytocenosis changes appropriately depending on mechanical and chemical composition of salts, humidity and such other aspects. Most of ephemeral grain-crop plants have been grown in a low alkaline soil with prevailing bulbous bluegrass (Poa bulbosa), (Aegilops squarosa, A.cylindrica), (Eremopyrum triticeum, E.orientale) and some others.

Representation of various grass species in plant associations is very characteristic for the vegetation cover of the area. Grasses like white germanders (Teucrium polium), desert gold-dust (Allysum desertorum), Chamaemelum praecos are found here.
The structure of typical phytocenosis species are of three varieties. At the first stage – wormwood, at the second - ephemers (annuals) and ephemers rich with grasses in spring (multi-year), and at the third stage – bluish green water plants (Nostos) and lichens. .

Swamp and bush-meadow plants develop in hollows, humid hollow places and around small lakes. The following formations of these plants prevail here: Giant reedy (Phragmites communis); Giant reedy-rushy (Phragmites communis, Bolboschoenus maritimus); rushy (Bolboschoenus maritimus); swamp grass (Carex sp. dir.); spiny rush (Juncus acutus, J. litoralis)

Small number of desert and semi-desert plant species develop in rocky – precipitous, stony height peaks covered with lime-stone. Shrub like Ehedra distachya grows in the cracks of rock plates and between stony bed remnants.

Some plants growing in the project sites are of indicator type. Thus, appearance of buds in plant families is connected with the availability of copper. The availability of thistle (Alhagi pseudoalhagi) is a sign of local fertility increase of soil (as a rule for the account of nitrogen). If it is observed in light grey soil it is treated as an ecological damage factor. Discovering of some ephemeral species, wild barley (H. leporinum), grain barley (Eleporinum iziteceum), plantain (Plantago praecox), small black lucerne (Medicaso minima), is a sign of salinity increase in soil. Rising of salt from lower layers can be a reason for this. The availability of weeds - safflower (Carthamus) and chicory (Cichorium inthybus)- in plant families can be accepted as intra – sequence. It is considered as a negative factor for semi-desert.

As oil industry and residential complexes developed in that area, semi-desert and desert plants are used as pastures only on preserved virgin lands.

Construction of new residential houses and contamination of the site with domestic waste that create a danger for destroying the natural vegetation cover in the areas became a usual practice.

4.6.2.1. GARADAGH PROJECT SITE

Mainly Artemysetum family is spread at the project site and surrounding areas. Availability of green grass in winter is characteristic for this. The latter is a sign of semi-desert dry sub-tropic nature. Besides, a Salsoletum family is typical for the district and usually wormwood prevail

Primitive, meadow plants developed on brown, not fully developed, not thick, heavy clayey soils. At the higher places of relief, tamariks, ephemerals, elm and other plants prevail.

Assessment of the ecological condition of plants at the project site showed that changes of the vegetation cover depend mainly on the changes of soil type and level of their clay content.

4.6.2.2. SURAKHANY PROJECT SITE

The area consists of the lime containing clayed and hilly sandy sites. The vegetative cover is weak at the project site and surrounding areas. The vegetative cover is mainly of ephemeral desert type. Mainly cereals are widely spread at the background of ephemeral vegetative cover: Eremopurum triticeum, Aegilops triastata, Poa bulbos.

Saline shrubs including Salsola ericoides, Salsola verrucosa grow 40 – 50 cm from each other at the ephemeral vegetation background as well as Peganum harmala, Alhagi pseudoalhagi, Eringium biebersteinianum shrubs. Besides, ruderal types plants grow at this site including: Cardius arabicus, Cirsium vulgare, Onopordon heteracanthum, Sinapis arvensis.

Though the wormwood – ephemeral type semi-desert vegetative cover was destroyed under the anthropogenic (roads, quarry, aertificial vegetation) impact in the direction to quarries from the project site there are the sites making up 80% of the vegetative cover. Though wormwood prevails here as plant species (Artemisisa arenaria) the following plants create the background: Avena barbata, Trisetum lineare, Lolium rigidum, Aegilops triaristata.

Ruderal plants like Carthamus lanatus, Onopordon heterocanthium, Alhagi pseud

oalhagi, Onosma bicolor can be found.

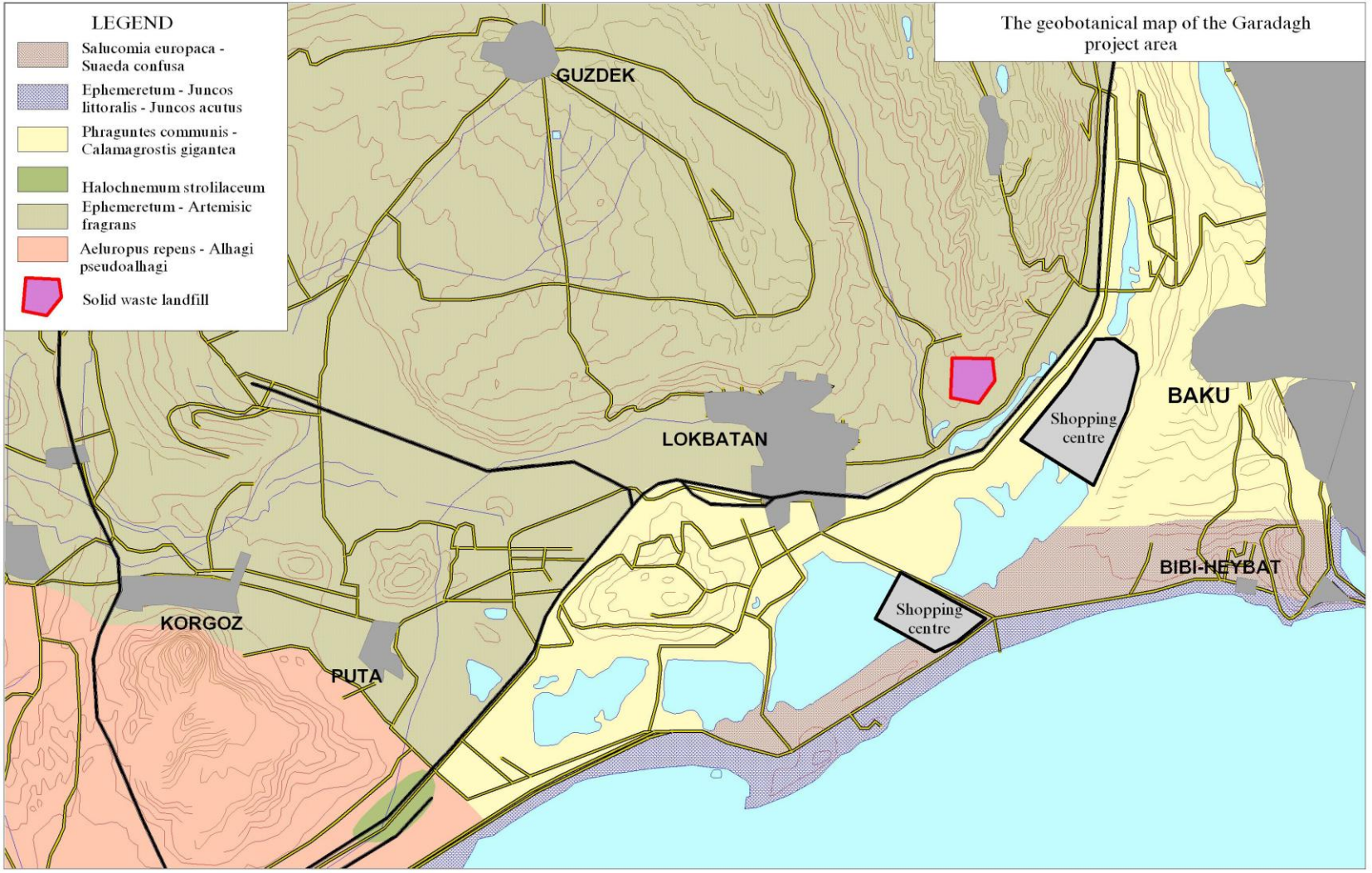


Figure 4.8. The geobotanic map of the Garadag project area

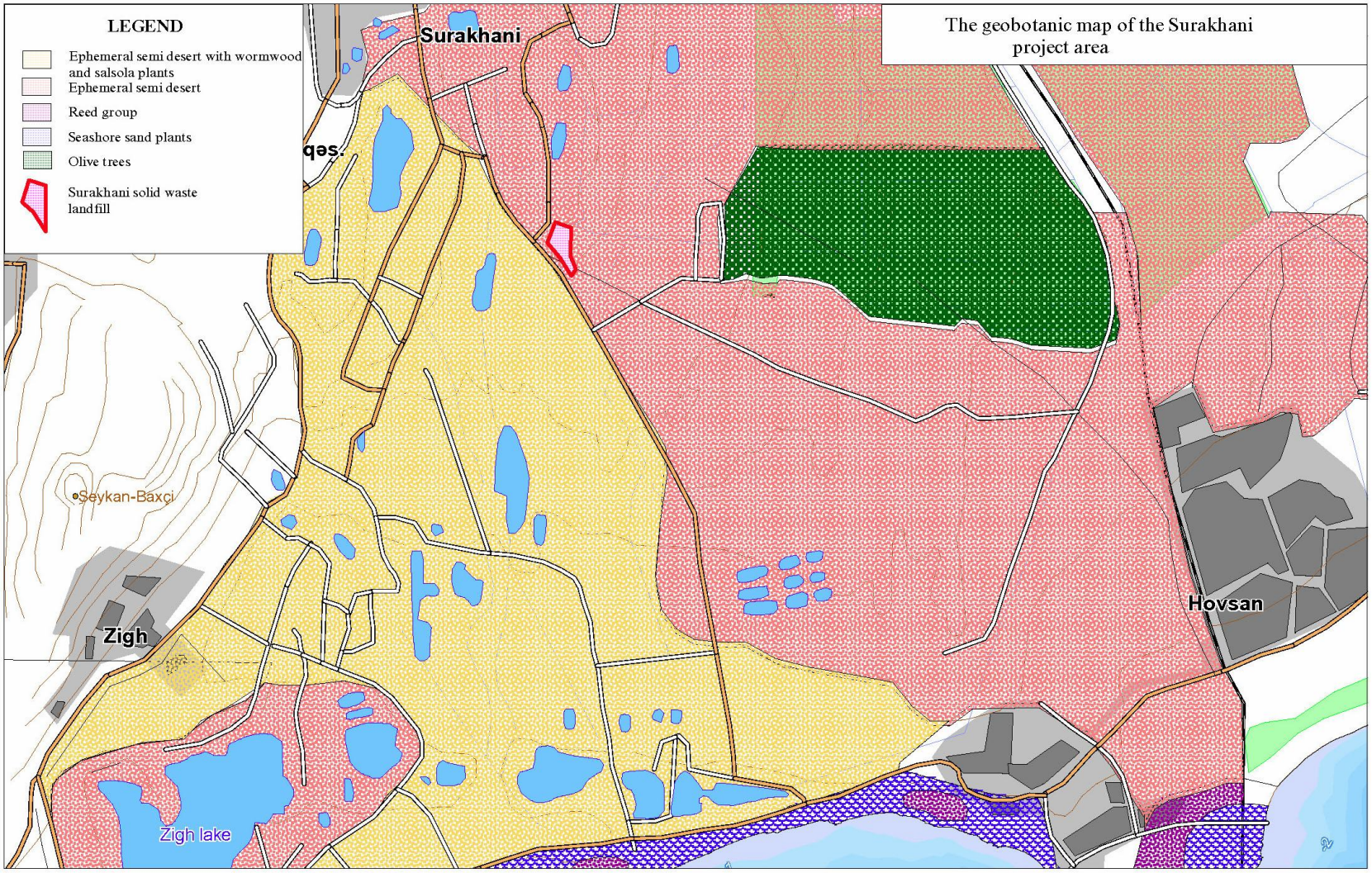


Figure 4.9. The geobotanic map of the Surakhani project area

4.7. FAUNA

4.7.1. GARADAG PROJECT SITE

There is sufficient literature information about the fauna diversity of the Absheron Peninsula

Amphibians consists of 2 species: *Bufo viridis and.Rana ridibunda*

Reptiles consists of 3 groups comprising 14 species: *Testudo graeca, Cyrtopodion caspius, Eumeces schneyderi, Stellio caucasius, Ophisops elegans, Eremias velox, Eremias arguta, Typhlopidae vermicularis, Eryx jaculus, Natrix tessellata Laurenti, Eirenis collaris, Telescopus fallax, Molpolon monspessulanus, Macrovipera lebetina obtusa.*

Mammals. There are 23 species of mammals in Absheron residential areas including the species mentioned below:
Hemiechinus auritus, Rhinolophidae hipposideros, R. ferrumedinus, Barbastella leucomelas, Vespertilio pipistrellus, V. kühli kühli, V. sorotinus;
Allactaga williamsi,. A.elater, A.sylvatucus, Rattus norvegius, R. Rattus, Mus musculus. Cricetulus migratorius, Meriones erytrourus.
Lepus europeus, Oryctolagus cuniculus;
Canis lupus, C. auerus, Vulpus vulpus, Mustella nivalis, Vermela peregusna, Phoca caspica

Birds. According to the information from literature 236 bird species were registered in Absheron-Gobustan. 33 species of them (*Pelicanus crispus, P.onocrotalus, Phalacrocorax pygmaeus, Platalea leucorodia, Phoenicopterus roseus, Cygnus olor, C.beviskki, Anser erytropus, Branta ruficollis, Marmaronetta angustirostris,Aythya nyroca, Oxyura leucosephala, Pandion heliaetus, Haliaeetus albisilla, Circus macrourus, Aegipius monachus, Aguila rapax, A.chrusoetos, A.clanga, A.heliaca, Circaetus gallicus, Porphyrio porphyrio, Otis tarda, Tetrax tetrax, Chettusia gregaria, Numuneus tenuirostris, Gallinago media, Clareola nordmanni, Pterocles orientalis, Falco cherrug, F.biarmicus, F.peregrinus, F.naumanni*) are in the *Red Book of Azerbaijan and IUCN Red List of Threatened Species.* Besides, Absheron-Gobustan is located on the migration route of many bird species. During migration the majority of birds fly to the southern part of the Caspian Sea for wintering.

Water and coastal birds create big gatherings especially in the shallow waters of the Caspian Sea when they fly through Absheron-Gobustan and during wintering there. The bird species belonging to Laridae (gulls) family are nesting in a big number on Absheron and Baku archipelago islands. Shallow waters of the Caspian Sea are a dwelling place of a great number of water birds of international importance during migration and wintering.

The fauna diversity is relatively weak at the project site and surrounding semi-desert areas. It is related to the strong anthropogenic impact on the local natural environment and areas during a long period of time.

During the visual studies carried out at the project site and surrounding areas hare (*Lepus europaeus),* fox (Vulpes vulpes) and a number of rodents, reptiles including snakes (*Vipera libertina*) and lizards and bird species were discovered. Information about dwelling site of wolves (*Canis lupis*) in the Shahgaya area is available. In general, the stone-cutting activities

carried out in the periphery of Sahil area have a strong negative impact on flora and afuna of the area.

Generally, there is a lack of literature sources giving information about the fauna of Gobustan-Baku region and among them, it is impossible to identify exactly the fauna of the areas depicted in the map. At the same, the following animals are registered in this area based on the published literature about the Azerbaijan fauna.

Amphibians consists of 2 species: *Bufo viridis and.Rana ridibunda*

Reptiles. The Gobustan area is a unique arid eco-system. Since this natural area was under relatively little impact of human activities the biological diversity was well protected here. 3 groups divided into 19 species of reptiles being the main integral part of the fauna of Gobustan are known. Golden-neck turtle group (Cryptodoria) is represented by 2 species: *Testudo graeca* and *Glemmus caspica*. Out of these, *Testudo graeca* as a rare and threatened species is included in the Red Book of Azerbaijan and the Red List of IUCN. Wormwood sunwatcher (*Phrynocephalus helioscopus)* is included in the Red Book as a rare species. It is necessary to note that the only areal of this species in Gobustan that has been strongly exposed to human activities in connection with the construction of the Sangachal terminal is located not far from Sangachal. Besides, the Caucasian adder (*Viera lebetina*), one of the most valuable reptiles of the Caucasus exists here.

Bird species included in different ecological groups occur at the project site and surrounding areas. Species, spreading and number of birds are considerably different during migration, wintering and nesting period.

In the Caspian coastal strip of the South-western part of Gobustan, gray and foxy heron, separate types of big and small white heron occur during migration period. Long-legged snipe, grass snipe, cheepy snipe, wood sandpiper, big sandpiper, white-tailed sand snipe, etc. are met here in a very small number.

Mass autumn flying of birds included in the light field and semi-desert, synanthropic and tree-bush ecological group takes place in September – October. The birds characteristic for open sites including wild pigeon, meadow lark, crested lark, gray (lesser short-toed) lark and small lark, synanthropic birds including starling, Spanish sparrow, common sparrow, common swallow, martin, bank swallow, tree-bush birds including forest sparrow, common greenfinch occur here in a big number.

In winter, 81 bird species were registered in Absheron – Gobustan and shallow water areas of the Caspian Sea. 43 species out of them are the birds swimming in water and dwelling near the water area. The main representatives of the birds swimming in water and dwelling near water are river and sea ducks, coot and silver gulls. Among river ducks: green-head duck, Fiji teal, among sea ducks: red-headed duck, crested diver and sea diver prevail. Based on the studies carried out on January 13-14, 2001 in Sangachal-Alat coastal strip of the Caspian Sea, the number of green-headed duck was 1200, of Fiji teal – 600, , of red-headed duck – 1650, of crested diver – 2100, of sea diver – 800, of coot – 3000, silver gull – 230, small cormarant – 120, big cormarant – 340. In the above mentioned areas, only 30 individual species of mute and crying swans were observed. A few species of birds included to Charadriidae family were registered (Babayev, personal information).

From open field and semi-desert birds the following prevail in number at this site in winter: wils pigeon, crested lark, , starling, rook, common sparrow, Spanish sparrow, gray crow, magpie.

In Absheron-Gobustan and Baku archipelago islands, 107 species of birds including sedentary forms were registered in the nesting period. 30 species out of them are the birds swimming in water and dwelling near the water area. Gulls prevail among the nesting birds and they nest 6-12 km away the Contract site borders in Gil, Khara-Zira etc. islands.

Rare and exterminative bird species. 32 species of birds occuring in Absheron-Gobustan and Caspian coastal water are included in the Red List (European Red List, 1992; Red Book of Azerbaijan, 1989). 9 of them – small cormarant, white-fronted goose, white-eyed duck, big eagle, Pallid Harrier, wild kestrel, common wedge-beaked, lazy snipe, little curlew are included in IUCN Red List of Threatened Species, 13 of them – pink pelican, spoonbill, flamingo, mute swan, small swan, river blackbird, steppe eagle, common short-toed snake eagle, saker falcon, the Mediterranean falcon, falcon, partridge, gallinule, black-bellied sandgrouse are included in Azerbaijan Red List, 10 of them – curly - feathered pelican, red-breasted goose, marble teal, white-headed duck, Eastern Imperial eagle, white-tailed eagle, great bustard, little bustard, forked-tail snipe, sociable plover are included in Azerbaijan Red List as well as in IUCN Red List of Threatened Species.

Several kilometers from the project site, not far from the Deep Water Offshore Platform there are two neighbouring shallow lagoons separated from the Caspian Sea by sand, gravel coast and cane strip. During winter months, more than 20 000 water fowls occur in the area. The availability of 44500 water birds in November 2002 was registered at the site. One of the mostly spread bird species is coot *(Fulica atra)* that is of International importance and covers approximately half of the area. In winter, the number of also red-headed grebes *(Netta rufina),* grebes *(Aythya ferina)* and crested black duck *(A. fuligulä)* regulary increases by 1% compared with their migration number. Those lagoons are located over the vital migration route (Migration route to the Central Asia) of the water fowls. In this area, three bird species included in the Red List – small cormarant *(Phalacrocorax pygmaeus),* Bewick's swan *(Cygnus bewickii)* and mute swan *(Cygnus olor)* encounter during winter months and migration period. One of the included in the IUCN Red List, *Pygmy cormorant,* is of international importance species.

Mammals. According the information from literature (Vereschagin, 1942, 1959; Hidayatov, 1965, 1969; Rakhmatulina, 1974, 1983; Gygelis, 1980), the following species are characteristic for Gobustanın semi-desert area: European hare (*Lepus europaeus),* small Asian mountain jerboa (*Allactaga williamsi),* small five-toed jerboa (*A. Elater), Lybian jird (Meriones erythrourus),* common vole (*Microtus socialis),* eared hedgehog (*Hemischinus auritus).*

Besides, there are also the species here which are widely spread all over Azerbaijan including *Rattus norvegicus,* M*us musculu), Cricetulus migratorius, Eptesicus serotinus, Canis lupus, Canis aureus), Vulpes vulpes, Mustela nivalis, Crocidura guldenstaedti.*

Among the mammals mentioned above, the number of Meriones erythrourus, Microtus socialis, Pipistrellus kuhli, Vulpes vulpes species is relatively more, but the number of Allactaga elater, Crocidura guldenstaedti, Rhinolophus hipposideros, Barbastella leucomelas, Eptesicus bottae species is much less than the others. The number of vermin like Canis lupus, C. aureus, Mustela nivalis depends much on the quantity of food resources and the availability of water around. A number of species (Mus musculus, Rattus norvegicus, Cricetulus migratorius) are dwelling quite often in the places not far from the human settlement. Rattus norvegicus often occur in rock and stone heap shrubby places.

At this site, some bats - *Barbastella barbastella,* B. leucomelas, Vespertilio murinus, Nyctalus noctula, Pipistrellus. Nathusii – are migrating or wintering in the old buildings (Rakhmatulina,

1984, 1988).

4.7.2. SURAKHANY PROJECT SITE

The major part of the project site is under the residential areas, industrial-technological and other communication types or they became completely useless contaminated by waste or waste of oil origin. Though the other small part consists of the sites isolated from each other and having relatively independent and natural elements, repeatedly rehabilitated landscapes, it is under strong anthropogenic impact. Anthropogenic impact is still increasing nowadays. Inasmuch as the settlement is going on in the area, impacts of technogenic and domestic character are getting stronger.

The majority of fauna species spread in the area (amphibians, reptiles and mammals) are very sensitive from the environmental point of view against anthropogenic factor impacts and for this reason they are pushed out from their natural dwelling places

During the visual studies carried out at the project site and surrounding areas were discovered:

Amphibian- *Rana ridibunda Pallas.*

Reptiles **-** *Ophisops elegans, Eremias velox, Cyrtopodion caspius, Typhlopidae vermicularis, Typhlopidae vermicularis, Natrix tessellata, Telescopus fallax* . Besides, the Caucasian adder (*Viera lebetina*), one of the most valuable reptiles of the Caucasus exists here.

Birds. The following birds species are characteristic for site: Passer domesticus, Columba livia, Galerida cristata, Delichon urbica, Sturnus vulgaris, Larus argentatus, Panurus biarmicus

Mammals. The following mammals species are characteristic for site: *Allactaga williamsi,. Rattus norvegius, R. Rattus, Mus musculus, Cricetulus migratorius, . Meriones erytrourus , Lepus europaeus, Vulpes vulpes,Canis aureus*

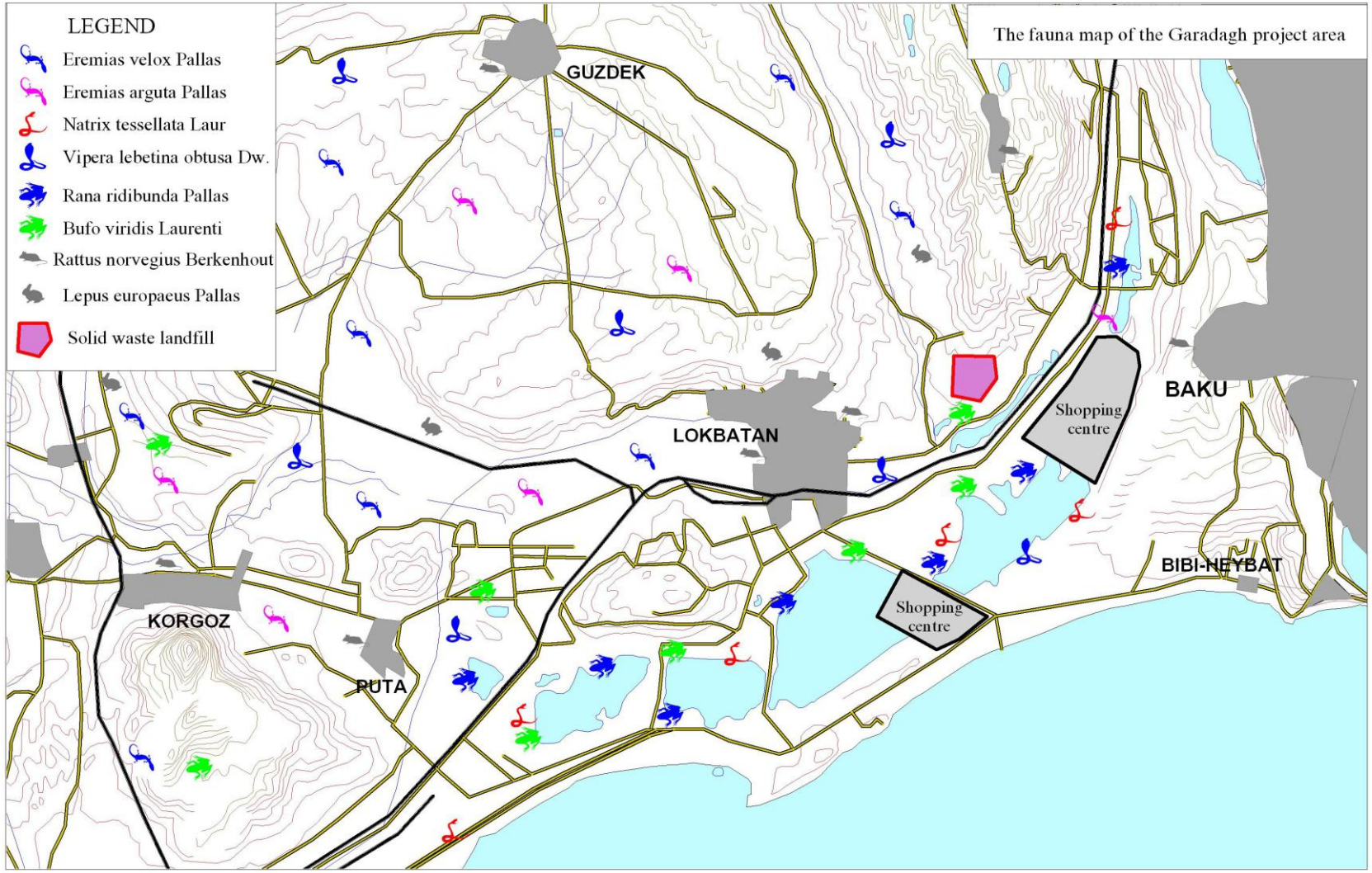


Figure 4.10. The fauna map of the Garadag project area

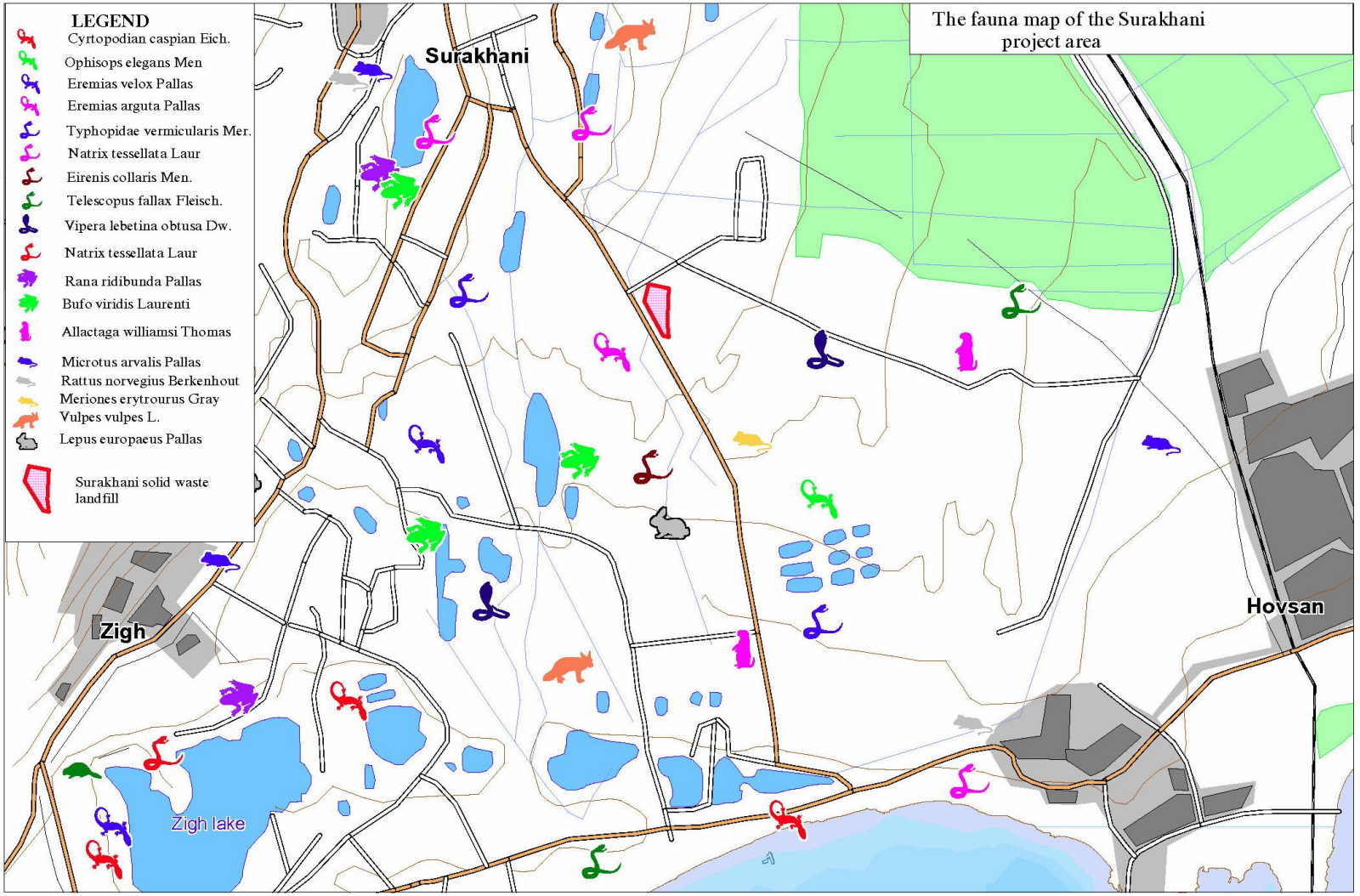


Figure 4.11. The fauna map of the Surakhani project area

4.8. DIVISION OF THE PROJECT SITES INTO ZONES ACCORDING THE ECOLOGICAL SENSITIVITY

The ecological risk of different activities of the sites is comprised of sign collection characterizing the environment of the site, current ecological limits and the technological parameters of the project solution.

The following initial materials are used for the sensitivity assessment: geo-morphology of the site, differentiation of landscape and soil cover, vegetation cover and animal settlement places.

Based on the accepted four categories of the sensitivity the ecological sensitivity map of the environment has been drawn up:

I. Infertile gray soils, settlement areas, mine and industrial sites contaminated with oil belong to the low sensitivity category. These areas are distinguished with their biodiversity and are not used for agricultural needs.

II. Salt-ridden sites of plains and hollow places, semi-desert landscapes on gray soils of weakly split low-hilled slopes belong to the middle sensitivity category.

III. Weakly swamped meadows, ephemeral woodworm meadows, littoral accumulative plains, gardens and greenery around the settlement belong to the high sensitivity category. These areas are distinguished with fauna diversity not used for agricultural needs.

IV. As the areas of very high sensitivity distinguished with rich biodiversity and especially high settlement of species included in the "Red List" are not observed in the areas under study they apply only to the 3 categories mentioned above.

Garadagh project site. At the project site, coastal accumulative plain areas outside the settlement areas and industrial sites are shown in a map-scheme as the sites of middle sensitivity category.

The natural settlements in the form of narrow strip in the Caspian Sea coastal zone are shown in the map-scheme as the sites of high sensitivity (Fig. 4.12).

Surakhany project site. The major part of the area has already lost its ecological sensitivity because it has been loaded exceedingly by the anthropogenic impact and exposed to man-induced contamination. Nevertheless, there are the sites (in saline semi-deserts) of the middle sensitivity category aside the settlement areas, mine and industrial sites contaminated with oil and they were shown in the map-scheme. At the project site, the slopes of weakly split blocs, ephemeral-woodworm landscapes on gray soils and olive garden were shown in the map-scheme as a site of high sensitivity category (Fig 13)

Anthropogenic impact is still increasing in the area under study. Settlement is going in the areas, impact of anthropogenic and domestic character is getting stronger.

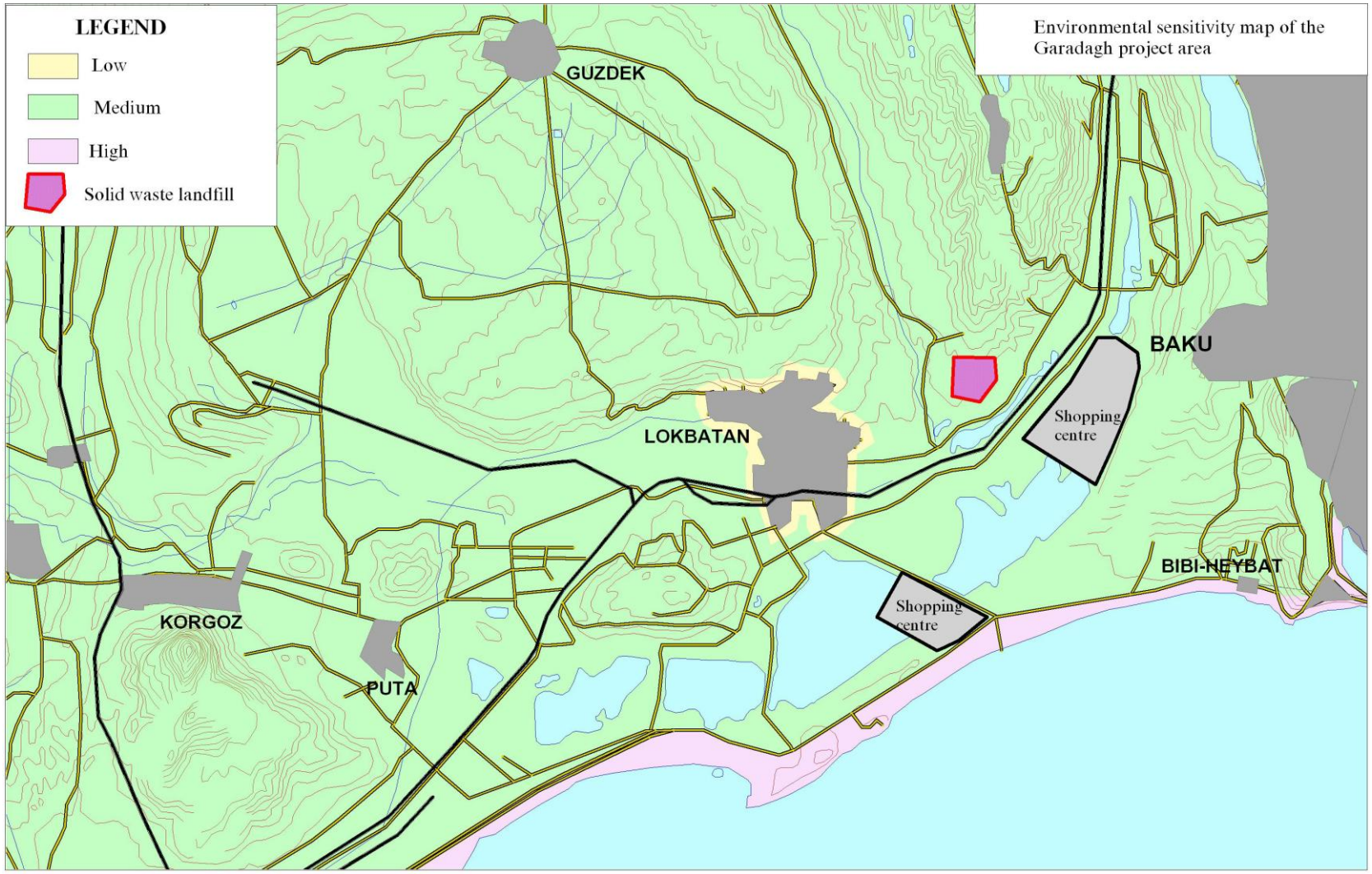


Figure 4.12. Environmental sensitivity map of the Garadag project area

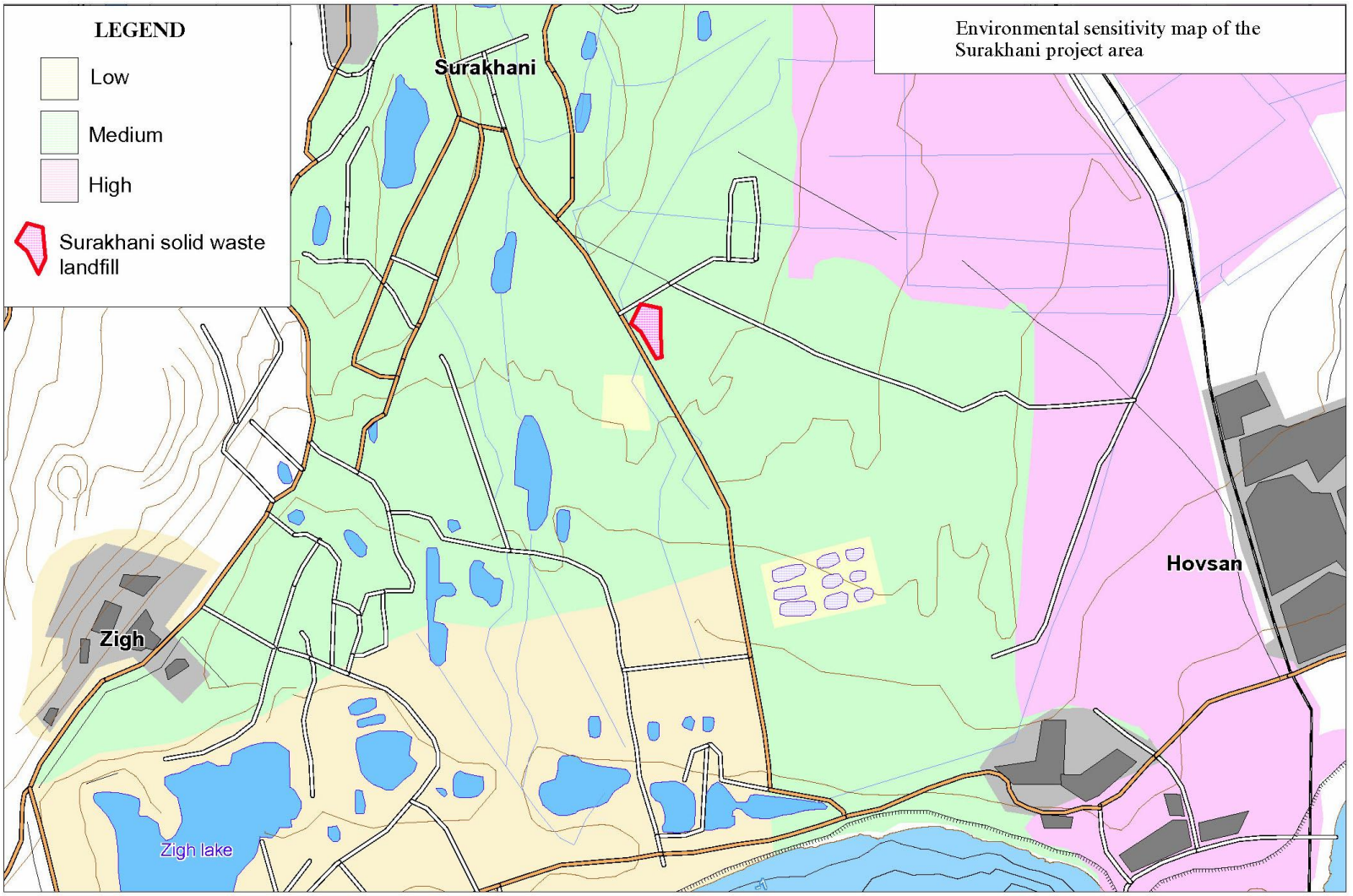


Figure 4.13. Environmental sensitivity map of the Surakhani project area

4.9. SPECIALLY PROTECTED NATURE AREAS

Specially protected nature areas (SPNA) have been established and function in order to protect the existing natural complexes and study the development of natural processes and events. They usually include various State nature reserves having the preservation status, national parks, state game reserves and natural monuments.

At present, the total area of SPNA in Azerbaijan is 925.2 thousand ha (847 thousand ha – land area or 9.8% of the land area of the country, 78.2 thousand ha is offshore area). There are 11 state natural reserves, 8 national parks, 25 state game reserves and natural monuments (37 paleonthology/geological entities, 4.5 thousand ha of relict/reference forest areas, 2083 different trees aged more than 100 years) in the country that function.

3 SPNA's are located in the Greater Baku area: State Natural Reserve of Baku and the Absheron Peninsula Mud Volcanoes Group, Absheron National Park and Binagadi Paleonyhological Nature Monument.

STATE NATURE RESERVE OF BAKU AND THE ABSHERON PENINSULA MUD VOLCANOES GROUP

Mud volcanoes are mostly developed in the eastern part of Absheron, South and Central Gobustan and in the south-eastern part of Caspian plain joined with the Caspian Sea.

52 mud volcanoes received a status of state natural reserve as a result of establishment of "State Natural Reserve of Baku and the Absheron Peninsula Mud Volcanoes Group" based on the Order of President of Azerbaijan Republic # 2315 dated August 15, 2007 in order to organise elimination of the anthopogenic impact on mud volcanoes located in Baku and the Absheron Peninsula and their protection, protection of these natural resources taking into account the great scientific and practical value of study of their activities and their disposal to future generations, promotion of the natural heritage of Azerbaijan in a wide range.

Inventory was carried out in the Reserve covering 20 thousand ha, map-scheme and schematic geological maps were produced through determination of the area boundaries, the real status of those mud volcanoes which suffered mostly from the human activities (Pirakushkul, Keyraki, Garadagh, Dashgil, Bozdagh, Gobu, Hokmali, etc.) was assessed, organisational work on their protection, comprehensive study from the scientific point of view and prevention of construction work at these sites was carried out.

Lokbatan mud volcano is located 15 km to the south – east of Baku, on the Caspian Sea coast, Lokbatan oil field area of Garadagh district. It consists of two dome-type heights on the volcano peak. A spiracle site is located between these two heights. This volcano is relatively 130 m above the land surface, its absolute height is 98 m. All eruptions are accompanied by burning of gases, flame height reaching sometimes 300-400 m, coming out a lot of volcano breakages on the land surface and its spreading 200-300 m alongside a slope (volcano breakage cover embraces a territory of 425 ha). Lokbatan, a "World record" holder in the number of eruptions, is the most active mud volcano in Azerbaijan. Since 1829 it has erupted 23 times. Last time, the volcano erupted on February 4, 2010 and spread yellowish mud mass over the territory of 1.5ha.

Figure 4.14. Lokbatan mud volcano

4.10. THE SOCIAL AND ECONOMIC CHARACTERISTIC OF THE GARADAG AND SURAKHANY DISTRICTS

The review of the contemporary state of social and economic characteristics of Garadag and Surakhany districts is based on analysis and assessment of information from the Baku city Office of Statistics under the State Statistical Committee of RA and Baku city Health Department of the Ministry of Health.

Background

Garadag district stretches from the south of Baku along the Caspian Sea coast to the south of Alat settlement. The coastal line length is 106 km in the district area. City-like Lokbatan settlement is a centre of Garadagh district
The area of district is 1008 km^2, i.e. 47.3% of the total area of Greater Baku. The population density of the district is 109.4 people per square kilometer. The district consists of 13 settlements

Surakhany district is located in the north-west of Baku, in the center of Absheron peninsula. The area of district is 122 km^2, i.e. 5.73 % of the total area of Greater Baku. The population density of the district is 1614 people per square kilometer. The district consists of six settlements (Bulbule, Amirjan, Hovsan, Garachukhur, Yeni Surakhani and Zigh) with municipalities having 6955 ha of lands under their jurisdiction.

The population size

The population size of **Garadag *district*** as at the beginning of 2010 was 109.371 people (males - 49% -53607 people, females - 51% -55764people). In addition, 10487 internally displaced people from 2567 families and 10487 refugees from 459 families have also settled in the district.

The district population has increased by 12.8 thousand people since 2000 and by 1.68 thousand people during 2009. The population growth is mainly due to the natural growth factors- thus annual population growth rate was 15.7 per thousand people. The national composition of the district population (according to information list of 1999) was as follows: Azerbaijanis – 91 %, Russians – 2.5 %, Lezgins–2.5 %, Tatars–1.5 %, Ukrainians–2 %.

The population size of ***Surakhany district*** as at the beginning of 2010 was 196.704 people. In addition, 15631 internally displaced people from 3347 families and 24017 refugees from 4967 families have also settled in the district.

The district population has increased by 28.9 thousand people since 2000 and by 2.6 thousand people during 2009. The population growth is mainly due to the natural growth factors- thus annual population growth rate was 11.6 per thousand people. In terms of gender and age groups the population is diversified as follows: males - 48,7% (96.236 people), females - 51,3% (100.488 people), up to 15 years of age – 29.7 %, over 65 years of age – 4.5 %.

The national composition of the district population (according to information list of 1999) was as follows: Azerbaijanis – 89 %, Russians – 5.2 %, Lezgins – 2.2 %, Tatars – 1.9 %, Ukrainians – 1 %

Education

As at the beginning of 2011 in the 20 preschool educational institutions operating in ***Garadag district,*** 2.081 children received their education. During the same academic year 21864 students received education in 26 daytime general educational schools of whom 15.6 % had attended schools in II and III shifts.

As at the beginning of 2011 in the 34 preschool educational institutions operating in ***Surakhany district,*** 4.091 children received their education. The number of students per 100 seats was 63. During the same academic year 34066 students received education in 35 daytime general educational schools of whom, 29.1 % had attended schools in II and III shifts.

Culture

The ***Garadag's*** large cultural events centers network comprised of 11 public libraries, 7 clubs, 1 museum, 10 culture and recreation parks

The ***Surkhani's*** large cultural events centers network comprised of 8 public libraries, 8 clubs, 1 museum, 3 culture and recreation parks and 1 historic and cultural monument (fire worshippers temple in the Surakhani settlement). There are no libraries and only two clubs in the Garachukhur, the biggest community of the Surakhani district.

Healthcare

The institutions providing healthcare in **Garadag district** as at the beginning of 2011 were as follows: 9 hospitals with number of beds totaling 740 (67 per 10 thousand people), 735 patient capacity 12 ambulatory policlinics (69.5 per 10 thousand people). Above healthcare institutions employed 381 physicians (34.5 per 10 thousand people) and 915 medium-level medical personnel (82.9 per 10 thousand people)

The institutions providing healthcare in ***Surakhany district*** as at the beginning of 2011 were as follows: 6 hospitals with number of beds totaling 465(23.1 per 10 thousand people), 2545 patient capacity 14 ambulatory policlinics (12.4 per 10 thousand people). Above healthcare institutions employed 445 physicians (22.1 per 10 thousand people) and 685 medium-level medical personnel. (34 per 10 thousand people)

The average monthly salary rates of people employed in the healthcare system amounts to 152.7 manat ($191), i.e. 35 % of the average monthly wages in the country.

Labor resources and employment

The number of able-bodied people in ***Garadag district*** as at the beginning of 2010 was 129.8 thousand, i.e. 66 % of the district population. The contract work employees in the district in 2008 numbered 21.790 on average, and further decreased to 21 443 – at the beginning of 2010.
In 2009 1555 new jobs were created in the district where 218 jobs were provided by newly established businesses and organizations; 39 jobs – by existing businesses and organizations and 1258 jobs – as private individuals.

The number of able-bodied people in ***Surakhany district*** as at the beginning of 2010 was 129.8 thousand, i.e. 66 % of the district population. The contract work employees in the district in 2008 numbered 21.790 on average, and further decreased to 21 443 – at the beginning of 2010. In 2009 1980 new jobs were created in the district where 262 jobs were provided by newly established businesses and organizations; 68 jobs – by existing businesses and organizations and 1650 jobs – as private individuals.

Unemployment is one of the major problems of the district community. According to International Labor Organization unemployment in the country is assessed to be at the level of 15 % of labor resources. The unemployment figures are considerably high among females and internally displaced people.

Unemployed males accounted for 5.2 % of the economically active men, while such figures for females were 6.9 %. The highest level of unemployment was observed among people aged 20-24 (30%); 25-29 (18.4 %) and 30-34 (14 %). The workless people having certain work experience accounted for 38.1 % and those without past work experience - 61.9% of unemployed population. Youth (aged 15-24) accounted for 5.2 % of unemployed population in Baku (17.6 % in the country), while the unemployed youth among young population accounted for 3.4 % (4.9 % in the country).

The number of unemployed registered with the state employment agency in Greater Baku in 2009 was 12407, including 999 entitled to unemployment allowance (in 2008: 11169, with 673 of them entitled to unemployment allowance). The average size of unemployment allowances in 2009 was 141.8 manat; in 2010 – 163.2 manat.

Economy

The following state programs (SP) are being implemented in the republic:

* SP on the improvement of fuel and energy complex for 2005-2015.

* SP on the poverty reduction in Azerbaijan Republic and economic development for 2008-2015.

* SP on social and economic development of the regions of Azerbaijan Republic for 2009-2013, measures focused on the socio-economic development of Baku and its surrounding settlements. .

The above mentioned programs envisage undertaking complex measures, through more efficient utilization of existing potentials in the capital, .aimed at the development of non-oil economy, expansion of entrepreneurship, increase of production activities in existing enterprises, creation of new businesses and jobs, acceleration of the use of information and communication technologies, improvement of social infrastructure as well as building and reconstruction of educational, scientific, healthcare, culture and sports events facilities and also construction of dwellings for invalids and war victim families, improvement of the employment level of population and poverty reduction.

By virtue of additions and amendments introduced to the Tax Code of Azerbaijan Republic for the purpose of the development of private business environment in the country and reduction of tax burdens imposed on entrepreneurs the upper ceiling of income taxes applied

onto physical persons was decreased from 35 % to 30 %, the income tax rate applicable to legal entities was reduced from 22 % to 20 % and the income tax rate levied on entrepreneurs carrying out business activities without incorporation was reduced from 35 % to 20 %.

To the effect that legal entities could qualify for simplified tax regime their income tax bases were increased from 90 thousand to 150 thousand manat per annum; educational services provided by preschool institutions were exempted from value added tax liabilities.

In order to increase the efficiency of investment activities portions of profits gained by banks, insurance and reinsurance companies directed to increasing share capital were exempted form taxation for the period of 3 years beginning from January 1, 2009 for the purpose of speeding up the development of financial sector, improvement of creditworthiness of banks and insurance companies and stimulation of increase of capitalization level of those businesses.

Also the interest rates paid by banks and other loan institutions on savings of individuals were exempted from income tax for the period of 3 years beginning form 1 January 2010.

At the beginning of 2011 state program on socio-economic development of Baku and its suburbs for the years of 2011-2013 has been adopted. Under the program 817 measures are supposed to be implemented in 16 directions. Over the coming three years measures will be undertaken throughout Baku and its suburbs aimed at the development of road and communication infrastructure complexes, information and communication systems, reconstruction of power stations, stimulation of the development of entrepreneurship, building schools and healthcare centers in suburban communities as well as restoration and modernization of cultural events facilities. The program also provides for the development and strengthening of material and technical supplies for sports facilities, improvement of social protection system and environmental rehabilitation.

Small businesses

In 2009 the number of small-size businesses in ***Garadagh district*** was 3989 (in Baku -78 603), of which 36.3% were industrial enterprises, 7.6% -construction. The number of small-size businesses per 1000 population was 38 (in Baku- 38). The number of contract work employees working at small-size businesses was 1941 (in Baku- 58177). The productivity of small-size businesses amounted to 67802.8 thousand manat (in Baku- - 1.847 mln manat).

In 2009 the number of small-size businesses in ***Surakhany district*** was 5398, of which 16% were industrial enterprises, 10.1% -construction. The number of small-size businesses per 1000 population was 30. The number of contract work employees working at small-size businesses was 3625 (up 24% compared to figures for 2008). The productivity of small-size businesses amounted to 64639.3 thousand manat

In the Greater Baku the fixed capital investments contributed by small-size businesses amounted to 81 mln and 297.5 thousand manat (in 2007: 186 mln. and 508 thousand; in 2008: 154 mln. and 459 thousand manat). In Surakhany district fixed capital investments totaled 2407.7 thousand manat (up 159.5 thousand manat compared to 2009).

Industry

As at the beginning of 2010 industrial enterprises operating in ***Garadagh district were 90*** in number ***(in Greater Baku*** 1380). The overall production volume from all industrial sectors in 2009 amounted to 654.8 mln. manat (in Baku 20.4 bln. manat); the finished product reserves at industrial enterprises was 4.8 mln. manat of worth . The major industrial production funds amounted to 102.4 mln. manat.

As at the beginning of 2010 industrial enterprises operating in ***Surakhany district were 93*** in number.The gross production volume of all industrial sectors in 2009 amounted to 135.3 mln.

manat; the finished product reserves at industrial enterprises was 1.5 mln. manat of worth . The major industrial production funds amounted to 58.6 mln. manat.

Construction. The economic crisis of 2009-2010 caused downward pressure on construction sector in the country. The number of construction companies in Baku in 2009 was 759 (down 9.2 % from 2008) and number of their employees was 37454 people (down 8.55 % from 2008).

In 2009 mew residential houses at cost of all financial resources with total area of 507471 m2 were presented to public use, of which the area of private households constituted 164.4 thousand m2 (in 2008: residential houses - 733.168 m2- up 30,8%; private households - 227.5 thousand m2 – up 27.7 %)

The fixed capital investments in construction sector amounted to 4 520.4 mln manat (1.4 times less than in 2008), including 2 371.1 mln manat (52.45%) in construction and assembly projects (1.35 times less than in 2008). The major funds commissioned for use in 2009 amounted to 3,46 mln manat. i.e. 1.8 times less than in 2008.

The number of construction companies in Surakhani district in 2009 was 32 (in 2008: 28) where 745 people (in 2008: 1329 people) were employed. The worth of construction projects implemented at their own resources (in actual figures) totaled 27.651,1 thousnad manat (in 2008: 38.700,3 thousand manat).

Communications. The communication services are of critical importance to the improvement of people's living conditions and development of favorable business climate.

There are 153 post offices operating in Baku and 156 ATSs (with total subscription capacity of 806 286 phone numbers), including 147 electronically operated ATSs (with total subscription capacity of 728 186 phone numbers). The number of phone sets per 100 population is 123 units. Cellular telephones are used by 3233,4 thousand people. The specific weight of electronically operated ATSs in Baku city is 95 %.

In 2009 the communication services provided by telecommunication units and post offices to businesses and population were at the worth of 940 mln. manat, more by 2.2 times than in 2005.

Commerce. Baku city has broad commercial network (comprised of 18.916 stores with total area of trading floor of 1.6 mln m^2, 133.84 thousand catering facilities, 1.364 booths).
The retail commodity turnover in Baku in 2009 totaled 5 862.5 mln manat, 2.5 times more than in 2005. The specific weight of Baku city in the overall countrywide commodity turnover was 49,6%. The detail commodity turnover in per- capita terms amounted to 2 63 mln manat, 2.3 times more than in 2005.

The paid services provided to the population were at the worth of 2.715. mln manat, 4.26 times more than in 2005. The share of paid services per-capita amounted to 1216.67 manat (3.9 times more than in 2005). The total value of provided household services amounted to 359.4 mln manat (2.6 times more than in 2005). The share of household services per-capita amounted to 161 manat (2.4 times more than in 2005).

Automobile transport. In 2009 39 680 ton cargos were transported by individuals and legal entities operating in the auto-transport sector of Baku city (up 66 % compared to the figures for 2005). The cargo turnover increased by 1.6 times from 2005 and amounted to 4 556.6 mln ton per kilometer. Auto-transport's passenger traffic in 2009 totaled 511 mln. 715 thousand people, up 74 % compared to figures for 2005 (see table).

The number of automobiles in Baku is 549.5 thousand units (185 times more than in 2005). Lorries account for 8.9 % (48.9 thousand), buses – 3.3 % (18218), passenger-carrying automobiles 86 % (472458). Personal cars numbered 44, 5 thousand (1.9 times more than in 2005). The number of personal cars per 100 people is 88.

LIVING STANDARDS OF POPULATION

Cash incomes and expenses of population. Nominal cash incomes of the country population in 2010 increased by 13.3 % and reached 25.6 bln manat, with per-capita share of 2.866 manat, up 11.9 % from the previous year. According to official data the annual average inflation rate was 5.7%, while unofficial sources put that indicator at 11.45 %. The amount of wages, pension and benefit assignments in 2010 totaled 3,7 bln manat, i.e. 31.5 % of all expenditures (up 3.3. % from 2009)

Cash expenses were 70 % of end consumers, 8.6 % -taxes, social insurance and voluntary membership contributions and 19.8 % - funds reserved as savings or contributed to the increase of equities. The incomes of households in Baku city in per-capita terms amounted to147.4 manat ($184.25) of which 53.3. % were employment wages; 23.5% - private entrepreneur incomes and 9.4 % - pensions.

Salaries and wages. The development of state budget revenues provided conditions for the increase of monthly average wages of people involved in employment activities in all spheres of national economy. Thus, the average monthly wages of people employed in economic sector in 2010 amounted to 321.2 manat, up 7.7 % from 2009. The base amount of minimum salaries and pensions increased to 85 manat from 75 manat in 2010.

The nominal average monthly wages of contract work employees in Greater Baku as at the beginning of 2010 amounted to 429,8 manat ($ 537) (as at the beginning of 2009: 396.5 manat-$495.6).

According to data from SSC highest wages are paid to qualified employees involved in ore mining (including oil production), construction and financial sectors as well as lease and consumer service fields. In particular, the monthly average wages to people working in ore extraction amounted 998.6 manat ($1248.2) - 643.2 manat (($804) in governmental organizations and 1564.6 manat ($1955.8) in non-governmental organizations; the rates in processing industries were 269 manat (($336.3), 307.6 manat ($384.5) and 239.7 manat ($299.6) accordingly.

The nominal average monthly wages in Greater Baku were 567 manat ($810) in industrial sector, 450 manat ($562.5) to construction projects employees, 665 manat ($831.2) to communications sector employees, 381 manat ($476.2) to transport sector employees. Real wages of industrial sector employees increased by total of 3.1%

The average monthly wages of qualified employees working in finance and insurance sector organizations amounted to 830.2 manat ($1037.8) - 727.6 manat in governmental organizations and 840 manat ($1050) - in non-governmental organizations.

The educational sector employees' average monthly wages amounted to 259.8 manat ($324.8) - 256.2 manat ($320.2) in governmental organizations and 498 manat ($622.5) -in non-governmental organizations.

Healthcare sector employees' average monthly wages amounted to 152.7 manat ($191) - 146.8 manat ($183.5) in governmental organizations and 304 manat ($380) – in non-governmental organizations.
The average monthly wages of people working on multi-job assignments amounted to 176 manat ($220), and of people, having contract based employments – 293.6 manat ($367).

The nominal average monthly wages of state servants amounted to 572 manat ($715), with 832.5 manat ($1040.6) paid to administrative position executives where 816 manat was the share payments to females ($1020).

Pension benefits and social allowances

The average monthly pension benefits in the county as at the beginning of 2010 was 100.4 manat ($125, 5), where 100,4 manat was old age pension benefits; 98.5 manat ($123.1) – disability pension benefits; 99.2 manat ($124) – pension allowance due to loss of family head. The increase in such allowances was 54.8 % - in respect of old age pension benefits 75.4 % - in respect of disability pension benefits; 42.4% - in respect of pension allowances due to loss of family head and 39.7% - in respect of social benefits and pension allowances accrued for employment years. The average pension benefit paid on the basis of social insurance provisions amounted to 138.92 manat in 2010.

.

The number of pension beneficiaries in **Garadagh district** as at the beginning of 2011 was 1480 people of whom 9.801 (66 % of beneficiaries) were people receiving old age benefits, 3093 (20.5% of beneficiaries) – people receiving disability benefits, 1.906 (13 % of beneficiaries) – people receiving pension allowances due to loss of family head. The average monthly pension benefits allocated on social insurance contribution basis amounted to 142.48 AZN ($188.8). 8912 people from low income families received target state social aids. The average monthly per capita social aid amounted to 22.88 manat ($28.7).

The number of pension beneficiaries in **Suraxany district** as at the beginning of 2011 was 27922 people, of whom 18848 (67.14 % of beneficiaries) were people receiving old age benefits, 6250 (22.2% of beneficiaries) – people receiving disability benefits, 2824 (10.5% of beneficiaries) – people receiving pension allowances due to loss of family head. The average monthly pension benefits allocated on social insurance contribution basis amounted to 116.05 manat ($131.6). 16.853 people from low income families received target state social aids. The average monthly per capita social aid amounted to 24.55 manat ($31.4)

Households According to estimates there are 491.7 thousand families living in Baku (25.4 % of families in the country). The average number of family members was 4.2 people (4.7 people in the country). The average size of households was 4.2 people, where males aged over 18 accounted for 1.5 people, females – 1.8 people and children – 0.9 people.

The total area of the housing stock in Baku as at the beginning of 2010 amounted to 27.74 mln m^2 (24.8 % of the country's available housing) of which 5.35 mln m^2 was government property (48.8% of such housing in the country) and 22.39 mln. m^2 – non-government property (22.2 %.of such housing in the country)

THE SOCIAL AND ECONOMIC CHARACTERISTICS OF THE LOKBATAN SETTLEMENT

Background. The area of the Lokbatan settlement is 67 km^2 that constitutes 6.65 % of the entire area of Garadag district (1008 km^2). The population density in the settlement is as much as 512 persons per 1 km^2.

Population size. The population of the settlement was 34,5 thousand people (32 % of the population of Garadag district) The birth rate in the settlement in 2009 was 675 – 19.7 births per 1000 people (in Garadag district: 21 births per 1000 people). The death rate was 199 people – 5.8 deaths per 1000 people (in Garadag district: 5.1 births). The natural population growth rate was 476 – 13.9 individuals per 1000 people (in Garadag district: 15.9 individuals). The marriage rates in Lokbatan in 2009 were 388 – 11.3 marriages per 1000 people (in Garadag district: 10.6 marriages).

Education. There is 8 preschool educational institution operating in the settlement, which provides care to 736 kids. In academic year of 2009/2010 7055 students received their education in 5 general educational schools. There is also one music school in the settlement.

Culture. Among cultural facilities in the settlement are 2 public library, club and museum

Healthcare. The institutions providing healthcare in Lokbatan settlement as at the beginning of 2011 were as follows: 2 hospitals with number of beds totaling 280 (81.6 per 10 thousand people), 240 patient capacity 3 ambulatory policlinics (92.8 per 10 thousand people). The medical institution employs 143 physicians (41,7 per every 10 000 people) and 312 medium-level (90,1 per every 10 000 people) medical personnel.

Labor resources and employment. The number of able-bodied people in the settlement in 2010 was 23 thousand, i.e. 67% of the community population. The specific weight `of males in economically active population was 65%, females - 35%. People aged between 22 and 46 account for the most economically active population of the settlement.
Unemployment is one of the major problems encountered by the settlement community. The unemployment rates in the settlement are assessed at 40 % of local labor resources. According to the local municipality governor, the unemployment rate was significantly high among young population (50 %).

Pension benefits and social allowances. The number of pension beneficiaries in the settlement as at the beginning of 2010 was 5728 people (16.7 % of the population) of whom 3783 (11 % of the population) were people receiving old age benefits (66 % of beneficiaries); 1242 (3.62 % of population) – people receiving disability benefits (21.7 % of beneficiaries); 703 (2 %) – people receiving pension allowances due to loss of family head (12.3 % of beneficiaries). The average monthly pension allowance of above pension beneficiaries amounted to 96 manat ($120).
As at the beginning of 2010, 1052 people (8.1 % of the population) from low income families (217 families) in the settlement received target social allowances with average monthly per-capita allowance amounting to 24.1 manat ($30).
The number of social allowance beneficiaries in the settlement registered from 2009 were 1240 people (3.6 % of the population) with average monthly per-capita allowance of 35 manat ($43.8) of whom 33 people were old age beneficiaries with average monthly per-capita allowance of 45 manat ($56.3); 348 people - disability allowance beneficiaries with average monthly per-capita allowance of 36 manat (45 USD); 97 people - beneficiaries receiving allowance for loss of family head with average monthly per-capita allowance of 40 manat ($50).
The number of children with limited health abilities aged under 18 in the settlement in 2009 was 193 with average monthly per-capita social allowance of 50 manat ($62.5): registered as beneficiaries of social allowances for utility, transport and other services were 350 people with average monthly per-capita allowance of 24 manat ($30.4); as beneficiaries of social allowances

for large families (number of kids) were 146 people with average monthly per-capita allowance of 5.8 manat ($6.6); as beneficiaries of social allowance for having kids aged under 1 were 49 people with average monthly per-capita allowance of 20 manat ($25).

Economy. In the settlement located 6 industrial enterprises with various business ownership structures

4.11 THE RESULTS OF THE SOCIOLOGICAL SURVEY CONDUCTED AMONG THE LOKBATAN AND YENI SURAKHANY SETTLMENTS RESIDENTS

Sociological survey was conducted by ACEP in fevral-April 2011 related to waste management in Baku. When selecting places for sociological survey, the areas located close to waste landfills and landfills were taken as a basis.

Sociological survey covered Lokbatan and Surakhany settlments and 60 resident respondents participated in the survey. Summary of the survey results are described below. The report produced on the basis of the sociological survey is given in Annex 6.

Social-demographic indicators:

Lokbatan settlement
20 males (66.7%) and 10 females (33.3%) respondents participated in the survey.
Age group of respondents: 18-35 years old – 26.7%, 36-45 years old - 20%,
46-55 years old – 33.3%, 56+ years old – 20%.
Marital status of respondents: married –83.3%, single – 16.7%).
Education of respondents: higher-40%, secondary professional-36.7%, secondary –23.3%.
Professional employment of respondents: government sector – 23.36%, municipality sector – 16.7%, private sector – 33.3%, pensioners – 10%, unemployed – 10%; students -6.7%.
Financial status respondents: good -13.3%, middle – 70%, low - 16.7%

Yeni Surakhany settlement
23 males (76.7%) and 7 females (23.3%) respondents participated in the survey.
Age group of respondents: 18-35 years old - 30%, 36-45 years old - 20%,
46-55 years old – 36.7%, 56+ years old – 13.3%.
Marital status of respondents: married –73.3%, single – 26.7%).
Education of respondents: higher - 30.3%, secondary professional - 36.4%,
secondary –27.3%, incomplete secondary – 6.0%.
Professional employment of respondents: government sector – 17.6%, municipality sector– 3.3%, private sector – 20%, pensioners – 10%, unemployed – 43.3%; students -6.7(%.
Financial status respondents: middle – 63.3%, low - 36.7%

1- Information about solid domestic waste collection:

*In **Lokbatan settlement*** the following Figure was registered: 73.3% of respondents drop litter to waste bins, 10.0% of them drop litter to the fenced site not far from their houses, 16.6% of them drop litter to any other places. 73.3% of respondents mentioned that there are waste bins or places for waste collection near their houses (or in yards), 10% of them mentioned the availability of fenced site, 16.7% of respondents informed that the waste collection places near their houses are not relevant. 36.7% of respondents mentioned that the waste bins located near

their houses are emptied once a day, 46.7%- once in three days, 6.7% - once a week, 3.3 % of them mentioned that the waste bins are empties rarely.

*In **Yeni Surakhany settlement*** the following picture was registered: 43.4% of respondents drop litter to waste bins, 40% of them drop litter to the fenced site not far from their houses, 16.6% of them drop litter to any other places. 73.3% of respondents mentioned that there are waste bins or places for waste collection near their houses (or in yards), 40% of them mentioned the availability of fenced site, 16.6% of respondents informed that the waste collection places near their houses are not relevant. 43.3% of respondents mentioned that the waste bins located near their houses are emptied once a day, 43.3%- once in three days, 6.7% - once a week, 3.3 % of them mentioned that the waste bins are empties rarely.

2- Perception of solid domestic waste sorting out by the population:

*In **Lokbatan settlement*** 83.3% of respondents understand the reason and importance of domestic waste sorting out, 83.3% of them do not sort out waste at home. 56.7% of respondents see the reason of not sorting out wastes in irrelevant condition.
*In **Yeni Surakhany settlement*** 90.0% of respondents understand the reason and importance of domestic waste sorting out, 83.3% of them do not sort out waste at home. 50.0% of respondents see the reason of not sorting out wastes in irrelevant condition.

3- Information about especially hazardous waste:

*In **Lokbatan settlement***, 73.3% of respondents consider thermometer, battery, accumulator, luminous tubes, radio, television, computer parts, etc. as especially hazardous wastes. 53.3% of respondents mentioned that they drop hazardous waste into the same waste bin as domestic waste, 46.7% informed that they put hazardous waste in a separate bag/box and drop into waste bin.
*In **Yeni Surakhany settlement***, 76.7% of respondents consider thermometer, battery, accumulator, luminous tubes, radio, television, computer parts, etc. as especially hazardous wastes. 80.0% of respondents mentioned that they drop hazardous waste into the same waste bin as domestic waste, 20.0% informed that they put hazardous waste in a separate bag/box and drop into waste bin.

4 – Unauthorised Landfills

*In **Lokbatan settlement,*** 30.0% of respondents mentioned that there are unauthorized landfills in the area they live. 70.0% of respondents noted the negative impact of domestic waste dropped in prohibited place on human health, 16.7% of them noted its negative impact leading to soil and water contamination. 30.0% of respondents think that waste dropping in prohibited places can be prevented through allocation of relevant collection plots, 56.7% - through education and 6.7% - by imposing a fine. 46.7% of respondents would like to get information about the environmental impact of landfills, 36.7% - about the future activities of landfills.

*In **Yeni Surakhany settlement,*** 36.7% of respondents mentioned that there are unauthorized landfills in the area they live. 56.7% of respondents noted the negative impact of domestic waste dropped in prohibited place on human health, 40.0% of them noted its negative impact leading to soil and water contamination. 3.3% of respondents think that waste dropping in prohibited places can be prevented through allocation of relevant collection plots, 40.0% - through education and 56.7% - by imposing a fine. 40.0% of respondents would like to get information about the environmental impact of landfills, 26.3% - about the future activities of landfills.

5- Payments

*In **Lokbatan settlement***, 86.6% of respondents pay for transportation of waste; 76.3%- to Housing and Public Services Department, 6.7%- to waste transporting vehicles, 3.3% to municipalities.
*In **Yeni Surakhany settlement***, 93.4% of respondents pay for transportation of waste; 86.7%- to Housing and Public Services Department, 6.7%- to waste transporting vehicles, 3.3% to municipalities.

4.12. MONUMENTS OF HISTORICAL, CULTURAL AND RELIGIOUS VALUE

The Absheron Peninsula is very rich with archeological monuments and this fact confirms once again the human settlement in these areas from the ancient times. Generally, there are a lot of barrows of human dwelling related to the Bronze Age and the Early Iron Age all over the Peninsula. Also ancient stone-cut grave-yard complexes of anthropomorphic figures having a plot painting on them (Dubandi, Turkan, Khashakhuna, Mardakan, Shuvalan settlement) are discovered here. It is impossible to find similar complexes in other parts of Azerbaijan and Caucasus. Ancient human dwellings have been discovered on Pirallahy island, the Zigh Lake, Binagadi and Amirjan settlements (B.C.III-I millenniums).

Archeological materials discovered in Baku confirm that this area was an ancient residential settlement. Archeological findings discovered in Pirallahy, around the Zigh Lake, Gala, Shuvalan, Mardakan, Binagadi, Amirjan and other settlements relate to B.C. III-I millenniums.

Division of the State protected historical-cultural monuments of districts according to their value (2009) is shown in Table 4.2.

	Greater Baku	***Garadag district***	***Surakhany district***
World value monuments			
Archeological	1	1	-
Architectural	4	-	1
Country value monuments			
Archeological	71	35	3
Architectural	114	11	2
Local value monuments			
Archeological	26	6	3
Architectural	1675	-	16

Table 4.2. A list of the State protected historical-cultural monuments according to their value

No historical, cultural and religious monuments were registered exactly at the Garadag and Surakhany project sites.

The closest protected area – two-peaked hill – is located to the east from the Garadagh cement factory, between Sahil and Lokbatan settlements, 8-9 km from the project site at the altitude of 383 m. This hill called “Baku ears” is a protected nature area.

As the nature area is located 8.5 km from the project site and if to take into account the fact that the planned activities will not have considerable impact on the current ecological environment no impact on the protected area eco-system is expected.

5. ENVIRONMENTAL IMPACT

5.1. OPEN DUMPS PROBLEMS

One can say that all human activities create wastes in a certain form. Most of the separate parts of wastes, including those from houses and offices are not directly hazardous in itself for the public health. But when those wastes are taken (or not taken) kept, collected and unloaded they can create risks for the environment and public health. The control over those risks is regulated by the environmental and public health related Laws and Regulations.

Indeed, some of the earliest Regulations on the environment and public health relate to the solid waste management in the cities and prohibition of their unloading in the streets.

Big heaps of uncontrolled decaying materials in the residential areas are easily accessible for rodents that spread diseases.

Creation of the environment for some infectious diseases with arboviruses as well as for the propagation of insects and flies is connected with wastes. Some flying insects are directly the sources of endemic diseases conducting. Wastes that are not collected also block the drainage channels thus increasing the health problems connected with the stagnant water collection. Besides, waste that is not collected always creates danger for people, especially children living not far from those places to be physically injured.

In general, the environmental protection, clean and healthy living condition in the cities, settlements and villages is impossible without the reliable and regular collection and elimination of waste. It is true that a lot of efforts have been demonstrated in Baku and settlements for the improvement of waste collection services. Now, it is high time to pay that attention to the improvement of waste unloading standards. Open unloading is neither safe nor hygienic.

It is clear that simply collecting wastes from the city streets and their unloading around the city or the sites near the settlements in order to prevent the risks is not realistic at present.

If wastes are not rendered harmless at the sites which do not comply with the relevant standards and they are unloaded at the open site, this can have a negative impact on the environment's components described below:

Impact on surface water
This impact mainly happens when effluents containing hazardous components in unauthorised waste mix with surface water. Toxic sodium chlorides, organic matters (BOD, COD) and nitrogen compounds dominate in metals (heavy metals) contained in effluents.

Impact on ground and ground water

The main reasons for this impact are wastes and effluents containing various contaminators.

Impact on atmosphere

Illegal open dumping of organic, or partly organic waste, results in an anaerobic degradation of the waste and consequently a production of landfill gas, consisting mainly of methane and carbon dioxide. If the landfill gas is not collected and burnt it can cause odour problems in the

neighbourhood and will also contribute to an increase of greenhouse gases in the atmosphere.The whole period of landfill gas generation from the site depends on the waste type and anaerobic activity in the landfill. When mixed with oxygen the landfill gas poses a risk for explosions and the occurrence of landfill gas also increases the risk for fires at the landfill.Aerosols from the leachate treatment facility may also be emitted and windblown. There are two main sources of odour at the site: odour from the degradation of the organic waste (landfill gas) and odour from the leachate ponds.

Impact on human health

Open landfills also have a strong negative impact on the human health. In general, four categories of impacts of badly projected and operated waste disposal sites on the human health can be identified:

1. Direct physical hazards as a result of spreading out of unstable waste heaps, explosions and fires, suffocation and traffic accidents connected with wastes and similar accidents.
2. Bacteriological and protozoal pathogenes and similar infectious agents appeared as a result of biological contamination of wastes and further their infectious transfer. The hand-mouth and hand-food-mouth transfer ways are the most probable for the waste collecting workers and sweepers, contamination of water supply or swallowing from the food chain can affect the great mass of the population.
3. The similar transfer ways can also be applied to the chemical contaminators available in wastes and that impact on the target organs or the regulating and managing functions of the body. Chemical initiation of carcinoma appearance is also possible from the theoretical point of view.
4. Impact of the chemical or microbiological contaminators on the reproductive activity, especially the birth of dead children, very light weight of infants or certain delivery defects is also known. Health problems and death cases as a result of impact of thrown organic chemical compounds and even radioactive materials have also been registered.

Disposal of the remnant waste on the ground is inevitable. This is the last point of any waste management system. But the sites for the waste unloading have to be accordingly built and operated, otherwise the city authorities and local population will continue thinking that their health problems are only connected with waste collection. Open disposal of waste is the mostly spread disposal method. If the last leaving place for waste is the open landfill, then no careful waste collection or treatment can mitigate the hazards of disposal for the health. The main impact ways of open landfills on the environment is schematically shown infigure 5.1.

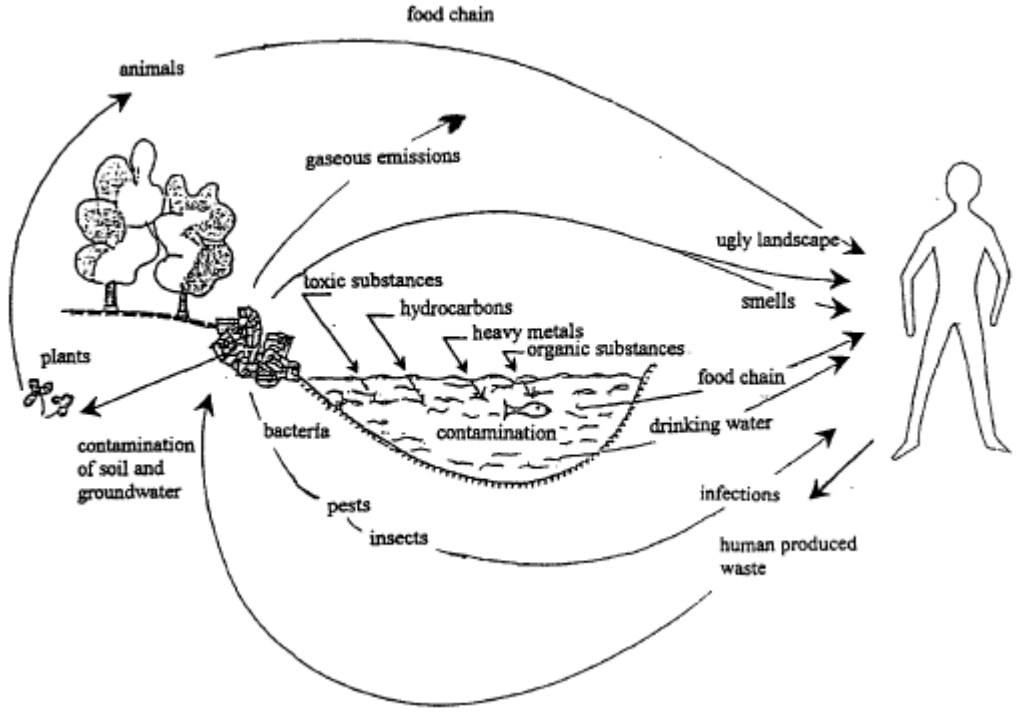


Figure 5.1. The ways of exposure to hazardous impact because of the open landfills (Source: Solid Waste Landfills in the countries with Medium- and Low Income: Technical Instructions on Planning, Construction and Operation. WB, Technical Article №. 426, WB, Washington, D.C. 1999)

5.2. IDENTIFICATION OF THE ENVIRONMENTAL IMPACTS

5.2.1 INTRODUCTION

Any kind of changes connected with the activities relating to solid waste management in the environmental condition can be accepted as the ecological impact. The main aim of the impact identification is the exact defining of separate (concrete) areas that can be exposed to impact in the process. Impact can be hazardous or useful. Identification of impacts begins at the vision and analysis of work volume stage. As ESIA analyses still go on, "new" impacts requiring further examinations can be identified.

The quantitative description of impacts is the most difficult side of ESIA. But, for the Solid Waste Management sector this, in certain degree, can be done on the basis of corresponding processes and technologies used.

5.2.2. TYPES OF IMPACTS

The following types of impacts have to be examined:

- Biophysical impact
- Social-economic impact

- Cultural impact

5.2.2.1. BIOPHYSICAL IMPACT

Biophysical impact has to cover physical impacts on the biophysical reserves connected with the implementation of SWM project, for example:

- Air, water, ground and general natural system;
- Flora and fauna of the site;
- Ground or place forms or ground erosion, appearance of tendency for flooding and silting, geological stricture, surface water and underground water, etc.

5.2.2.2 SOCIAL-ECONOMIC IMPACT

The assessment of social-economic changes connected with the implementation of the SWM project shows the social-economic impact condition inside and outside the project site. The impact can be positive (for example, chance for new work places for the local population) or negative (e.g. social conflict).

The social-economic impact should be examined based on the following:

- Loss of the best agricultural ground/forest area;
- Number of the families to be dislocated;
- Impact on the human health (hazards for health connected with risk and professional activities);
- Loss of natural area having scientific, educational and landscape value;
- Impact on income distribution.

5.2.2.3. CULTURAL IMPACT

Impact of the SWM project on the cultural and religious environment of the site should be studied. The historical places and traditional experiences (rules) that can have an impact are included in those studies.

5.2.3. NATURE OF IMPACTS

Due to their nature, impacts can be classified as follows:

- Direct (Initial) impact
- Indirect (Second) impact
- Cumulative (accumulative) and synergic impact

a) Direct impact: The direct impact means the direct changes of the current ecological condition being the result of the project activities, e.g. bad smell from the uncovered or full containers from where the waste falls down and spreads in the accumulation places, keeping wastes for

several days in the transportation station, uncontrolled waste disposal in landfills without its covering with sand.

b) Indirect impact: The indirect impact is also known as the second impact; it appears when the impact of environment's one component creates the reciprocal impact for other related components. The direct impact can have long-term (with serious ending) results and depending on the concrete system structure and function accepted by the project it can create a number of indirect impacts. High-performance economic activity connected with building a new entry road to the landfill inside and outside the project area is an example of indirect impact on the landfill project (with long-term results).

c) Cumulative impact: Though an impact of a separate activity on the environment can not be so significant, at the same time the joint impact made of a series of similar impacts created by one or more projects can be significant. Special attention should be paid to the cumulative impacts similar to those created by the solid waste management projects that have an impact on the identified site distributing common reserves. For the project implementation with less expenditure, distribution of the central waste transportation station and/or solid waste landfill for many residential areas inside the district is an example of cumulatively profitable impact. Cumulative impact can be predicted beforehand through accumulation of individual impacts.

5.2.4. CHARACTERIZATION OF LANDFILL PROJECT IMPACT AS A FUNCTION OF WEAKNESSES

The specialists of ACEP Company made an inventory of unauthorised landfills (UDS) in the Greater Baku area. The representatives of "Tamiz Shahar" ("Clean City") OJSC also participated in the inventory process. The reports prepared on the inventory materials have been agreed with TS OJSC.

During the next process, the field researches were carried out with the representatives of HPC-PASECO Ltd Company that prepared the Feasibility Study and Conceptual Design reports on the Components included in the Advisory services for the "Designing of the rehabilitation and/or closure of facilities designed for making the wastes in the *Greater* Baku area including the Balakhany landfill harmless". ACEP representatives participated in the process of ODS risk assessment done by HPC-PASECO Ltd Company.

The risk assessment for each area was carried out including the criteria described below
Specific site criteria for each landfill (distance to the nearest water supply source, the depth of waste filling, distance to critic natural environment like swamp and protected forests, distance to surface water facilities, distance to the nearest settlement area, public sympathy, etc.)

- Criteria for waste characteristics at landfills

After the risk assessment and identification of impacts as shown above (5.2.2), a method of functions of impacts' weak points was used during the assessment of the environmental impact of the unauthorised landfills and the project on the closure/rehabilitation of landfills.

The weak points based on the characterization of the project impacts are reviewed in the Table 5.1. given below.

Low level weakness	**Medium level weakness**	**High level weakness**
Characteristics of the environment		
Flat or rough relief	rough relief (15-35%	Mountainous relief (› 35%

Low level weakness	Medium level weakness	High level weakness
(‹ 15% inclination)	inclination)	inclination)
dayanıqlı ground	Medium erosion potential	High erosion potential
No watersheds, swamped grounds, or sensible sites are discovered	watersheds, swamped grounds are available at the impact site	watersheds, swamped grounds are available at the direct impact site
No underground water basins are discovered	Underground water basins are available at the impact site	Underground water basins are available at the project site
Sites without any risk of flood	Time to time the sites are flooded	Sites are often flooded
The sites used for alternative purposes and adapted to the project	The sites used for certain purposes and that can be available parallel to the project	The sites used for certain purposes and that cannot be available parallel to the project
Natural living environment		
No forest is available	Second layer forest (greenness) is available	First layer forest is available
No protected site from the ecological point of view	Certain sites protected with the local ecological rules are available	Certain sites protected with the local ecological rules are available
No unusual ecosystem and dwelling areas including disappeared species are discovered	Sensible ecosystems and dwelling areas of relative importance	Unusual ecosystems and residential areas of species exposed to disappearance danger
Non-availability of species that can change their feeding peculiarities and dwelling areas due to landfill operation or waste	The included species can change their feeding peculiarities and dwelling areas due to landfill operation or waste	Availability of species (included and local) that can change their feeding peculiarities and dwelling areas due to landfill operation or waste
Social characteristics		
Non-availability of any site having the historical, archeological or any paleontological value	The sites of historical interest and important from the archeological and paleontological point of view and the certain elements of which can change their places	The sites of historical interest and important from the archeological and paleontological point of view and that must be locally protected
No dislocation takes place	Less than 10% of houses are required to be dislocated	More than 10% of dislocated houses are required to be sold

Table 5.1. Characterization of landfills and unauthorised landfills closure projects' impact as the function of weak points

During the next process, the recommendations were prepared for the project activities regarding the closure of unauthorised dump sides in the Greater Baku area based on the discussions held between the representatives of "Tamiz Shahar" OJSC and HPC-PASECO Ltd Company, Advisor *for "Designing of the rehabilitation and/or closure of facilities designed for making the wastes in the Greater Baku area including the Balakhany landfill harmless"* . When preparing the recommendations, besides the environmental issues the economic criteria

(expenditure) that is one of the main factors for the project sustainability were also taken into account.

5.3. THE ENVIRONMENTAL IMPACT ASSESSMENT

In this section are given: the results of assessment of the current condition of ODS impact on the environment and

- impact of the planned project activities on the environment

5.3.1. ASSESSMENT OF OPEN LANDFILLS IMPACT ON THE ENVIRONMENT

Destruction of solid waste in the open landfills is a general primitive procedure and at the first sight is considered to be a profitable economic alternative. But this procedure requires very high ecological expenses regarding safe waste management.

The population living close to the project site and neighbouring area is exposed to heavy social and health risks.

The following is included in the environmental problems of general character related to the open landfills:

- *Impact Regarding the Air Contamination*: atmosphere contamination as a result of waste decay and waste incineration (CH_4, CO, CO_2, NO_x, SO_2, as a result of stink, other gases including dioxine emissions). Emission of toxic gases as some industrial wastes are also observed to be disposed to these site.

- *Social Impacts and Impacts on Health*: spread of infection circulators from the sanitary point of view (parasites, breathing and contacts of waste with skin increase a risk of transmissible diseases, gas and aerozol emissions can cause serious health problems). These impacts can increase due to the availability of pathogene and dangerous microbes. When moving (in the transport) deterioration of existing roads and transports also create negative impacts. The availability of places where a poor strata of population lives and which are mainly not far from the waste sites (unofficial workers live in inadequate places and are engaged in collecting selected waste, child labour is also used here, the working condition is very bad and the income is nor enough to cover the necessary requirements). Also, high risks are available regarding nutrition and sanitary. All these problems are also directly connected with poverty and unemployment.

- *Impact on Water Quality.* Generation and dispersion of effluents from water masses. Contamination of surface and ground water.
- *Impact on Ground*: Contamination of ground due to disposal and incineration of waste not in properly managed way.
- *Impact on Landscape:* Spreading of waste in large areas affect the landscape of those areas.
- *Impact on Flora and Fauna*: Improper management of waste, its disposal in the areas has a negative impact on the surrounding areas, natural residential environment, natural water basins and ground water zones thus affecting fauna and flora.

5.3.1.1. RESULTS OF ASSESSMENT OF ODS IMPACT ON THE ENVIRONMENT

ACEP Company examined the landfills of Garadagh and Surakhany districts and carried out the risk assessment regarding the risks created by these landfills for the human health and environment together with HPC-PASECO SP ltd experts who prepared the Feasibility Study.

The Risk Assessment was carried out HPC-PASECO Ltd Company with the participation of ACEP specialists representatives based on criteria shown below for each site:

*Specific criteria for each landfill (distance to the nearest water supply *source, the depth of waste filling, distance to critical natural environment like swamps and protected forests, distance to surface water facilities, distance to the nearest village during the windy day, public sympathy, etc.)
*Criteria for waste characteristics at landfill.
Proximate calculation of period for rehabilitation (time required for covering and elimination)
*Environmental impact of landfills

The final results of risk assessment prepared taking into account the closure criteria for each landfill by HPC-PASECO Company are given in Table 5.2

Table 5.2. Risk ranking of landfills

№	Location and parameters	Description	Problems caused	1) Groundwater Risk Ranking:	2) Surface Water Risk Ranking for Small Landfills:	3) Gas Risk Ranking:	4) Surface Contact Risk Ranking:	Overall characterisation
1	The site is located in the south-eastern part of Lokbatan settlement, in the distance of approximately 1 km and 800 m from the Sadarak Shopping Centre. There are small lakes in the vicinity of the landfill and the electrical lines pass directly through the site territory.	General landfill consists of three sites and its area is 25 ha, about 5.85 ha of it was used for the waste processing. The landfill was established in 1994 and up to 750,000 m^3 of waste was downloaded here. Officially the site has been closed but unofficial and illegal waste downloading still continues. There is a small lake in the vicinity of the landfill and the electrical lines pass directly through the site territory.	▪ İntensive odor ▪ Nuisances and Hazards ▪ Flies, pests etc. breeding ▪ Risk of diseases carried by birds ▪ Risk of surface water pollution ▪ Risk of ground water pollution ▪ Fire risk ▪ Waste drifted around by wind ▪ Risk of waste spreading around area ▪ Risk of dust and smoke polluting environment	Low risk	Medium Risk	Medium Risk	Medium Risk	Medium Risk

№	Location and parameters	Description	Problems caused	1) Groundwater Risk Ranking:	2) Surface Water Risk Ranking for Small Landfills:	3) Gas Risk Ranking:	4) Surface Contact Risk Ranking:	Overall characterisation
2	It is located about 3 km to the east of Surakhany village, 600 m from Dede Gorgut settlement along the road in the hollow place.	General landfill area is about 2.5 ha and its small part was used for the waste processing. The landfill was established in 1994. At present, the site is not in use.	▪ Nuisances and Hazards ▪ Flies, pests etc. breeding ▪ Fire risk ▪ Risk of dust and smoke polluting environment	Low risk	Low risk	Low risk	Low risk	Low risk

5.3.2. THE ENVIRONMENTAL IMPACT OF THE PROJECT

5.3.2.1. POTENTIAL POSITIVE ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROJECT

Nowadays, the improvement of waste management methods, mitigation of impact on the environment and human being are considered all over the world as main problems for the environmental protection.

Prevention or minimization of emission of landfill gases, disgusting odour, hazardous matters as a result of regularly observed open incineration of landfill gases and waste, waste water and dirty effluents into the environment will result in mitigation of impact on the environment and human health.

From this point of view, the project will help to improve the health condition of people through the following ways:

*Reduction of disease risks and thus having positive impact on the human health.
*Reduction of disgusting odour that can cause unpleasant conditions such as headache and nausea through the improvement of waste management..
*Reduction of dust and aerosol emission that can have a negative impact on the sense of sight and cause respirator and lights diseases.
*Reduction of noise impact that can cause the hearing problems, headache, nervousness, hypertonia and tension.
*Reduction of direct odour, landscape impact that does not create a good temper.
*Reduction of direct water and ground pollution impact or their impact through food that can create intestine and respiratory diseases.
*Support to the development of regional systems for waste treatment and recycling. Such kind of concentrations will help to decrease the number of landfill in the country and facilitate the effectiveness of solid waste management.
*Reduction of waste generation and making the activities on waste recycling official. Before recycling or disposal of wastes in the area of origin (source) their selection can be a good source of income. But when the traditional waste collectors are changed a plan of the productive activities changing must be prepared.
*Creation of new work places like cleaning and waste management in the places where unofficial waste management is implemented.

5.3.2.2. POTENTIAL NEGATIVE ENVIRONMENTAL AND SOCIAL IMPACT OF THE PROJECT

The implementation of the project activities can have negative environmental and social impact. Especially, the following impacts are possible:

- *Loss of income sources.* Closure of open landfills and improvement of landfill management experience can reduce or eliminate the income of those who are engaged in waste collecting and population who live in the vicinity of those sites. Also, if the landfill operator (manager) changes certain changes can take place in formal work structure.

- *New expenses*. It is possible that for poor families it will be difficult to pay expenses for waste management services.

- *Geomorphological changes.* Landscape and geomorphological changes can take place.

- *Emissions.* Emission can happen as a result of blow out of air contaminators and disposal of odorous waste and this can have impact not only on landfill but also on the transport corridor passing not far from this area.

- *Effluents.* Effluents can be generated as a result of organic decay of collected and distributed waste. A risk of hazardous contamination of water and soil exists.

- *Erosion.* When working on ground during the construction work soil and slopes can have unstable condition and erosion can happen.

- *Loss of earth blanket*. Boring work and soil filling can cause loss of fertile soil and vegetation cover.

- *Risks for health*. People working at landfills can be exposed to the impact of wastes and potential diseases.

5.4. THE ENVIRONMENTAL AND SOCIAL IMPACTS AT THE DIFFERENT STAGES OF ACTIVITIES ON ODS CLOSURE/ELIMINATION

5.4.1. THE ENVIRONMENTAL AND SOCIAL IMPACTS AT THE CONSTRUCTION STAGE

General potential environmental and social impacts created at the construction stage are shown below:

- *Impact on soil:* Impact on the upper layer of soil will have an effect on its density changing, quality and fertility, will change its structure and create erosion risk for soil. Changes taking place in the area and ground work can change surface drainage process, increase erosion in the dry and windy areas. Soil contamination can happen because of waste, leakage and spilling of oil products, waste water.

- *Impact on Flora and Fauna:* ground-construction work, loss of upper fertile layer of soil will have a negative impact on the local fauna and flora. Cleaning and

flatting of the area, transportation of soil required during the construction stage turn to the direct impact that reduce the natural living areas for species exposed to an impact. In addition, an anxiety caused by heavy equipment, transport, a dust and noise have a temporary impact on fauna and make them to migrate to other areas.

- *Impact on the air quality and noise:* Construction work can cause an atmospheric contamination; noise, odours, aerosol and gases are included here. Such contamination will not create an impact of certain significance because it has a temporary character and a landfill is located far from the residential area.
- *Impact on water quality:* Along the roads under construction and use of fine materials as a part of any infrastructure work increase an erosion risk from water. During this stage, an impact of liquid waste (oil, fuel, waste water) on water sources can happen.
- *Potential social impact:* Temporary work places can be opened. But involvement of workers from other areas for construction-assembly work and closure of landfills can have a negative impact on the residents living near those landfills who were engaged in waste collection and recycling.

5.4.2. GENERAL ENVIRONMENTAL AND SOCIAL IMPACTS DUE TO LANDFILL CLOSURE/ELIMINATION

Contact surface between the main part of the closed landfills and the natural structures formed morphologically is an area possessing high risk for the environmental contamination.

Wastes at the landfills are exposed to the structural shattering as a result of chemical, physical and biological process combination. Consequently, solid, liquid and gaseous products are formed and closed landfills play a role of a biochemical reactor.

As a result of waste shattering, methane and carbon dioxide, nitric oxides, hydrogen sulphide, mercaptan and other matters are decomposed.

Installation of landfill gas collection, transportation and burning system after the closure of landfills will achieve minimizing of these impacts on the environment. Effluents and waste water (mainly due to rains), are the most hazardous liquid wastes in the closed landfills. Parallel to the availability of a number of hazardous matters in effluents generation of bacteria that can cause infectious diseases is an often case. Collection of effluents and their treatment in the future installations will reduce those impacts.

Besides those described above, the general potential environmental and social impacts generated in the closed landfills are given below:

- *Impact on Landscape*: gradual rehabilitation of vegetation cover and fauna.

- *Landscape:* Landscape will improve after the vegetation cover recuitivation and rehabilitation works.
- *Land utilization:* Land utilization potentials will remain limited due to gas generation and soil settlement.
- *Soil:* The quantity of leachate will decrease over the years and therefore soil quality will improve over time.
- *Potential impact on water*: Contamination of surface and underground water; as, due to inadequate management after the closure effluents can move inside and under landfills. Besides, there is a possibility that effluents that are not cleaned and waste water can contaminate surface and ground water.
- The quantity of leachate will decrease over the years and therefore water quality will improve over time
- *Potential impact on the air quality*: An inadequate management of collected gases and effluents at the closed landfills can cause emission of unpleasant odour and hazardous matters. Besides, because of the availability and formation of different cracks in the closed landfill cover emission of landfill gases into the atmosphere is possible.
- Air quality will improve since there will be a reduction of dust and odours since the sites will be covered, remediated and recultivated. Gas emissions will decrease gradually.

- *Traffic and noise:* There will be no traffic around the sites anymore and the landfill equipment will not be used any more so noise, dust and gas emissions will stop.
- *Flora/ fauna/ ecosystems:* No impacts will be generated on these site and ecosystems will be balanced.

- *Social impact:* Creation of necessary conditions in certain areas for use by the local communities. Rise of land prices in the neighbouring areas. Reduction of employment sources: closure of landfills can have a negative impact on the residents living near those landfills who were engaged in waste collection and recycling.

5.4.3. POPULATION EXPOSED TO A RISK

The following people are among those who suffer from the potential environmental (ecological) and social impacts:

- Families with low income who must pay for solid waste management services.
- Residents of the neighbouring residential areas exposed to the high potential impact of infection circulators.
- Waste collectors who can lose their income source and spread diseases among other people.
- People who are engaged in solid waste management activities and can lose their work place because of involvement of new operating companies.

- Population exposed to the ecological impact created by wastes of other residential areas

6. ANALYSIS OF THE ALTERNATIVES

6.1. INTRODUCTION

In this Section, the planned project alternatives including "no activity is implemented" are presented in conformity with the WB policy and best practice. The variants consisted of "no activity is implemented" and "closure of open landfills".
One of the main purposes of EIA report is to analyze the environmental relations of each existing variant and then to compare these variants for comparison of environmental performances for complete project design together with cost-benefit and other factors. In spite of this, there is no specific information on general site related to the aspects like the current environmental impact of open landfills including unauthorised landfills. This can be explained by improper control of environmental impact of those sites by the controlling bodies (authorities) and absence of systematic environmental impact assessment. For this reason, the current limited information for the alternative comparison, general conclusions and the practices used during the similar situation in international practice were used during the project alternatives assessment.

6.2. ALTERNATIVE 1. NO PROJECT WILL BE IMPLEMENTED, THE CURRENT STATUS WILL BE KEPT

Based on the expenditure, no project implementation is desirable (effective) from economic, ecological as well as social point of view. At first sight, this alternative seems to be economically effective but in reality it needs more expenditure. Insomuch as, keeping the open landfills in the current condition will have a negative impact on the natural resources (soil, water, flora, fauna) and human health and it will lead to unnecessary expenses connected with mitigation of these factors and management of this area.

The population living at the project site and neigbouring areas are exposed to big health and social risks.

Existence of open landfills in the current condition will be a reason for regular air pollution. Destruction of waste and regular burning of wastes (this is unavoidable problem because of the process of methane gas segregation from waste) leading to spreading smoke, odour, different hazardous organic and inorganic and more hazardous sustainable organic polluters (POP's) over the large area, spreading of insects and rodents at large areas as a result of fertile environment created by landfills, will be a reason for creating big risks for environment and human health. In this situation, it is necessary to take into account that the residential areas, shopping centres, recreation zones, schools and other entities are located in the vicinity of open landfills (ODS). The number of windy days in the Absheron is big and winds carry the hazardous gaseous waste and odour to the residential areas.

Surface water and filtrates collected from the landfill areas and containing hazardous substances will be a reason of contamination of surrounding areas, under ground and surface waters.

Improper management of waste, its disposal to the sites will have a negative impact on flora and fauna through impacting on neighbouring areas, natural dwelling environment, water basins and soil water. The environmental impact of ODS when having the current status have been described in Chapter 5.

At present, in fact it is impossible to follow the environmental standards at unauthorised landfills and the areas surrounding them.

6.3. ALTERNATIVE 2. CLOSURE/ELIMINATION OF OPEN LANDFILLS

The positive environmental and social impacts of the project are described in section 5.3.1. Closure and rehabilitation of garadagh and surakhani landfills will be a reason for considerable improvement of the surrounding areas. Covering of landfills will lead to reduction of filtrates, littering and emission of odour and other substances in the air.

It will also lead to complete elimination or considerable reduction of the negative environmental impacts described in Alternative 1.

Social effectiveness of closure of open landfills means the better neighbouring environment. Nowadays, open open landfills are risk sources for children and anyone who can enter these sites. Covering of landfills will lead to reduction of hazardous risks as well as health dangers.

The risks of traffic accidents will be reduced through prohibition of waste carrying vehicles movement here.

Suspension of work at unauthorised landfills will considerably reduce a risk level for waste collecting people.

It will be possible to achieve the reduction of risks for human health through reduction of regular contamination of ODS site, grazing domestic animals in the neighbouring areas, using their meat and milk, reduction of feed for different insects and rodents at ODS site, measures taken against them.

At the same time, the landfills are places for informal rehabilitation of materials and recycling activities. Some people engaged in recycling activities are dealing today with selection of waste that can be recycled. If the sites are closed or covered these people will be unemployed. The measures related to recycling of waste activities will be included in the project. This will refer to those people for whom the landfills were an income source.

Stabilization of ecological status in the areas surrounding the landfill to be close/eliminated will lead to rise of land prices in the neighbouring areas.

Thus, the implementation of the project stipulating the closure of Garadag and Surakhany landfills and their substitution with the landfills conforming to the WB requirements and Directives of RA will lead to the considerable improvement of the environmental impact at all the levels.

Thus, the ecological, economic, social effectiveness of the presented project is relatively higher than the alternative proposing no project. Stabilization of ecological status in the areas surrounding the unathorised landfill to be close/eliminated will lead to rise of land prices in the neighbouring areas.

7. THE ENVIRONMENTAL AND SOSIAL MANAGEMENT PLAN (ESMP)

The ESMP purpose is to ensure keeping any potential environmental negative impacts at a satisfactory level during the construction and utilization of the closed landfills. ESMP includes the environmental requirements, environmental monitoring, preventive measures, and environmental audit during the construction work at the site for the successful implementation of mitigation measures.

A Contractor should be responsible for the implementation of mitigation and extraordinary measures. He must ensure the conformity of work to all environmental legislation, regulations and conventions.

TS OJSC and the WB are authorised for the implementation of the environmental monitoring. ESMP has to describe examination of the site and its design, environmental impact assessment, the stages and standards of construction, monitoring and afterward service procedures in order to solve the environmental issues (ground and under ground water contamination, generation of sewage water and production of gases in landfill are of special significance).

Summary of the environmental management Table is given in Annex 4.

7.1. FIELD STUDIES

For closure/recovery of the areas it is necessary to understand the state of the landfills. With the view of obtaining more specific information and developing recovery measures there will be required detailed investigation of each area.

The main researches on this area are given below:

- Topographic survey: field, waste handling area, the average thickness of the waste, perimeter, geology, etc.;
- The situation related to water: the depth of the ground water level and risk of pollution from the sewage waters;
- Leachate: Water samples for investigation of the leachate;
- Gas volumes and discharges: for definition of discharge gas volumes it is necessary to carry out the analyses of waste samples;
- Waste composition: the composition of waste is very important for the development of appropriate measures.

The results of the investigation in this section are given in FS report (“Design for rehabilitation and/or closure of the waste disposal facilities in Greater Baku area, incl.

Balakhani landfill". a.Task 2: Feasibility Study and Conceptual Design. Surakhani Waste Disposal Site. b.Task 2: Feasibility Study and Conceptual Design. Garadagh Waste Disposal Site. HPC-PASECO Ltd. 2011). In accordance with the results of this investigation there were prepared risk assessment and project proposals for closure of open landfills.

7.2. PLANNING AND CONSTRUCTION

The relevant planning for each site has to be carried out before the beginning of final rehabilitation work. At least the following measures should be included in the planning:

- removal of the site structures;
- additional hardening;
- completion of closure;
- completion of the vegetative cover formation;
- filtrate management;
- management of gases (biogas) generated from the organic waste;
- management of surface water.

Besides, the decision has to be taken related to the proper site planning, rehabilitation and further utilisation as well as afterward service plan before any planning.

7.2.1 REMOVAL OF THE SITE STRUCTURES

All the structures that do not comply with the final utilisation of the site should be removed from the landfill. Structures that can hamper the site rehabilitation process and do not comply with the final utilisation of the site should be removed. The fences can be kept during the rehabilitation work as they are useful for the site safety and help to be isolated from grazing animals.

7.2.2. ADDITIONAL HARDENING

Waste has to be compressed as much as possible in order to minimize looseness related instability before the final closing and rehabilitation work. It becomes necessary to remove properly and destroy bulky waste coming out from sides of not properly buried or full sites.

7.2.3. COMPLETION OF CLOSURE

The site closing and repeated planting of trees must ensure barriers for changing surface water to waste, management of emissions in water and air, management of hard soil, prevention of hazards and protection of convenience.

The site covers must ensure that the expected leakage speed of water leaking from cover through landfill gasket will be not more than 75%. The humidity inside the cover must be rather stable to prevent cracking or other deformations.

The covering layer must be so that drainage is possible from the side. Steep slope being maximum 1 vertical to 3 horizontal will be created with general gradient. The final covering and laying of the vegetative cover can be implemented only after the subsidence of the placed waste and stabilisation of the area.

A number of landfill covering configurations must be considered before the selection the most proper one for the site. In general, clay covering and/or clay and geo-membrane composite can be added to the constructions.
Information about closure for both sits given in 2.5.1.3 and 2.5.2.3.

7.2.4. PLANTS

Plants must be selected based on special area and local species. Plants must be selected after consideration of the factors shown below:

- Local climate (e.g. shower, wind) and soil condition;
- Long-term resilience;
- Requirements for the current technical servicer;
- Design of landfill cover;
- Possibility for protection of landfill cover from erosion;
- Final utilization of the site.

7.2.5. FILTRATE (WASTE WATER), GAS AND SURFACE WATER MANAGEMENT

Rehabilitation of landfill must ensure that discharge of waste water, waste gas and surface water will not affect the environment.

Surface water management

i. Drainage must be constructed so that any flow from the planned area can be directed sideward.
ii. Possibility of drainage construction around site area.
iii. Organisation of shower water removal from the area by mobile pumps through the dug or clay under-ways.

Surface water management system

As surface water is the main culprit of filtrates (waste water) the following factors can be included in the project:

i. Properly graded and well designed drainage installation.
ii. Clay gasket should be gradually placed on foundations for preventing collection of shower water.
iii. Storage reservoirs should be constructed for collection of water flowing sidewards in order to minimize downward flow.

Besides, consideration of below mentioned issues during the construction and planning work will be necessary:

- Drainage pipe-lines can be instructed at the both sides of the proposed site in order to remove surface waste.
- Trees can be planted along the entry roads and at the site in order to provide the necessary nourishment of the natural soil for resisting heavy rains and floods.
- Storage reservoirs can be constructed inside the site for collection of surface water. These reservoirs can serve for water storage during surplus flow that will be useful for meeting the water needs and for water supply.
- Waste water must be collected in storage reservoir using already existing waste water flow.

7.3. AFTER-CARE (TECHNICAL SERVICE)

After-care technical service to the closed landfills continues from 25 to 30 years after the date of ceasing waste acceptance at the site. After care must be continued until the regulating body approves termination of this activity. After-care technical services requirements usually change by decreasing when time passes. After-care technical services to landfills consist of two main activities – monitoring of closed landfills and technical service.

7.3.1. TECHNICAL SERVICE

After-care (technical service) programme has to be prepared in order to guarantee that the landfill will not have environmental hazard after the closure of the site. The programme must pay special attention to prevention of discharges in water, atmosphere, protection of land utilization and convenience. The technical service must continue until the Regulating body (MENR) approves termination of activities.

The following can be included in rendering technical services to landfills:

• identification of the project contours (i.e. addition of filling materials in hollows / upper layer of soil);
• covering any cracks to prevent water leakage; and
• planting of trees and bushes /their rehabilitation to prevent erosion.

Regular technical service to filtrate (waste water) collection and cleaning systems, waste gas discharge system and surface water deposits control equipment will minimize the damage risk of those systems and equipment. Technical service schedule must be prepared to determine the type of technical service to be rendered and the frequency of the technical service (e.g., rendering technical service to pumps). In case the monitoring regime discovers any defect technical service can be required.

7.3.2. SITE CLOSURE

"TS" OJSC must ensure that the site will not accept any waste material for elimination after the completion of landfill activities. Each waste material allowed to be used during the rehabilitation work must be strictly documented and reports must be produced similar to those for the site. The landfill operator must give information including company's file and media notification about the landfill closure. The site must be protected to prevent informal waste disposal.

"TS" OJSC must inform the residents living near the site about the contact person who can discuss with them any issues they are interested in. Registration of complaints, must be carried similar to that during the activity period.

7.3.3. SITE DELIVERY

Before termination of rendering after-care (technical service) to landfills, TS OJSC must clearly show that the landfill does not create any danger for the environment. As a rule, monitoring must be carried out at landfills for about 30 years after their closure but if this landfill is designed, utilized and rehabilitated in compliance with high standards, this time frame can be reduced. Before addressing the Regulating body (MENR) regarding termination of after-care it is obligatory to provide comprehensive information about the prolonged period. Approval of after-care (technical service) termination can be considered only in the following cases:

- The level of gas concentration decreased by 1.5% than surface level carbon dioxide in 12-month period;
- Wastes are stabilised and waste placement did not take place for the last two years. This can be defined by waste water content changing in direction of low level contamination that do not create hazards for the environment;
- Monitoring of under ground water shows that this water is not contaminated;

- Surface evaluation shows a stable and effective drainage of surface water;
- The documents on the approved plans related to rehabilitation and after-care (technical service) have been completely prepared.

7.4. MONITORING

7.4.1. MONITORINQ DURING CONSTRUCTION

Monitoring must be implemented at the construction stage in order to ensure conformity to environmental and social requirements and standards.
At the construction stage:

- Dust monitoring;
- Noise monitoring;
- Solid waste monitoring;
- Leachate monitoring;
- Soil monitoring must be implemented.

Environmental monitoring reports included in the monthly report prepared by Contractor must be presented to the PMG. Also PMG must be immediately informed about any unimplemented activities.

As a part of environmental management programme, Contractor has to keep the environmental reports. These reports must be made according to possible reports.

The reports must contain:

- Monitoring reports;
- Any audit reports carried out for Contractor;
- Complaints;
- Registration of environmental events including prophylactic/ preventive activities and photoes;
- Reports of meetings and corresponding conformity;
- Environmental permits and/or licenses.

Monotoring reports must be prepared by "Tamiz Shahar" OJSC.

7.4.2. MONITORINQ AFTER CLOSURE

The potential landfill impacts must be deeply studied as it was during the operation of landfill. Monitoring must determine the failure of environmental protection measures time

to time and must continue unless they follow the requirements of the Regulating body (The Ministry of Ecology and Natural Resources).

The environmental monitoring actions are related to the environmental control that should be exercised on the responsibility of the Managing Agency of the rehabilitated area during the period of Post-closure care.

The rehabilitated waste disposal site must be monitored for several years after its closure. The monitoring is based on observation of the correct operation of all infrastructure and the possible effects on the surrounding environment and population. In terms of the monitoring, a minimum program of measurement of parameters is determined. Monitoring ensures the effective protection of the environment by the rehabilitation infrastructure and it can help prevent the spreading of pollution or contamination if an unexpected event happens.

The overall monitoring system of the landfill will consist of the following parts:

- Groundwater (vadoze zone & groundwater);
- surface water;
- filtrates (sewage water);
- landfill gas;
- surface settlement; and
- plants.

The monitoring of the relevant parameters will show the condition of the aforementioned areas of interest and the frequency of the sampling is shown in the table below:

	POST CLOSURE CARE ACTIONS	**MONITORING FREQUENCY**
1	Leachate volume	every six months
2	Leachate composition	every six months
3	Surface water quality	every six months
4	Groundwater level	every six months
5	Groundwater quality	every six months
6	Gas emissions (CH_4, CO_2, O_2, H_2S, H_2) and atmospheric pressure	every six months

Table 7.1. Environmental monitoring program

All data collected from the monitoring systems must be kept in appropriately organized records, reviewed and analyzed regularly, in order to take promptly appropriate remedial measures.

Groundwater: Regular representative sampling must be carried out in order to provide an early analysis of contamination with filtrates to show conformity to any legal requirements.

For the long term environmental monitoring for potential leaks of landfill leachate and biogas, three (3) monitoring/sampling wells have been installed at the perimeter of the poliqon site, during the geotechnical campaign that has been recently conducted onsite by the Consultant.

Ground water levels and water samples for chemical analysis will be taken from these three (3) monitoring/sampling wells at prescribed periods.

Groundwater quality could also be controlled by taking samples from the nearest irrigation and water supplying wells located upstream and downstream of the site.
The sample extraction in the unsaturated zone will be implemented by using special sampling devices called lysimeters.

The water samples analysis will be will be conducted in accredited private laboratories or competent state agencies (State General Laboratory, etc.) properly equipped. The analysis will include the following parameters:

pH , COD, BOD, Conductivity, Turbidity, Temperature, Phenols, As, Cd , Cu , Hg, Zn, Volatile cyanides, Fluorides, Total Phosphorus, Nitrogen, Total, suspended and dissolved solids .

A strict protocol will be followed during the sampling / measurement / analysis of groundwater levels & quality according to international standards. All data and procedures will be recorded and kept in organized files.

It is very important that the personnel responsible for collecting and handling samples maintain protocols for ensuring that the water samples do not degrade while they are being transported to the laboratory.

Surface water : Regular monitoring of surface water must be implemented in order to reveal any contamination at landfill and take necessary measures to show conformity to any legal requirements.

The monitoring of surface water quality, as well as of all the other parameters, will be exercised by the Managing Agency of the rehabilitated area by taking samples from the perimetric stormwater drainage ditch of the rehabilitated landfill in at least two points, one upstream and one downstream of the site. The monitoring frequency will be every six months, and the control parameters are identical to those of groundwater described above.

Filtrates: Regular monitoring must be implemented to determine the filtrate quality and evaluate relevant management variants. Monitoring points must be located in the collecting precipitation tank of sewage water on the gasket foundation of local landfill and, if necessary at the points of upper and lower water flow direction at the landfill.

Waste gas: Regular monitoring of effectiveness and consumption of gas content, burning in order to make possible the preparation of annual reports on system discharges at the place of installation of waste gas collection system. As an alternative, waste from smoke duct can be measured immediately after burning. If waste gas is not collected, regular monitoring must be implemented to know whether waste gas odour source is available or not or whether the explosion or poisoning danger is created or not as well as to assess emission of green-house gas.

Waste gas monitoring must include surface as well as under surface programmes.
Monitoring should be carried out once a every six months and at least methane concentration must be measured during monitoring. If odour creates special inconvenience also hydrogen sulfide must be measured during monitoring. If no emission is discovered Operator can apply for changing of sampling frequency 5 years after closure of disposal area.

As described in previous chapters of the present report, the biogas production per m^2 of the rehabilitated landfill surface is considered negligible.

However, it is proposed that biogas measurements should be taken at the rehabilitated area as well as in the surrounding area taken by using portable gas detectors, to monitor biogas levels in the air and minimize the possibility of unforeseen situations (e.g. explosions). The gas detecting devices should be appropriate for use for gas controlling in landfills. It should detect gases such as methane, CO_2, CO etc in range 0-5% and provide accurate measurements even in the presence of other gases.

At the rehabilitated area the biogas levels will be measured at the location of the six (6) biogas vertical wells that will be installed to vent the waste site and at the three (3) monitoring boreholes that have been installed onsite during the geotechnical campaign conducted by the Consultant. In addition air quality measurements should be taken at the area around the landfill to ensure that no migration of any possible biogas quantities has occurred.

Regular monitoring of *soil sedimentation* must be carried out. Two years after closure plants must be checked up once a quarter for determination of weak growth and area drying, successful species, soil condition, soil humidity degree and other parameters as required.

Settlement is an important parameter to monitor because of its impact on landfill cap integrity. The cap functions to ensure long-term integrity and to support post-closure uses of the landfill site, such as maintaining a vegetative layer. The cap must be maintained to prevent loss of soil via an effective stormwater management plan.

In order to measure settlements, the so-called “settlement plates” are installed on the waste surface (in the areas where final waste height has been reached).
The number of required settlement indicators at the cap of the rehabilitated Surakhani and Garadakh waste disposal sites is 5.

These plates include a steel plate (square 1m x 1m x 4 mm thickness) where a steel pipe (2'' diameter) is welded. The base of the settlement plates is installed 0.5 m underneath the final surface of the final cover, secured in its position by a layer of concrete (thickness 20 cm).

The iron pipe is used to measure height reduction. The elevation of the pipes is measured and compared with the elevation of stable points.

Monitoring plan is given in Annex 3.

7.5. INSTITUTIONAL CAPACITY BUILDING

The project management potential has been established affiliated to "Tamiz Shahar" OJSC. For better coordination and management of the project activities the Project Implementation Group (PIG) has been established in "Tamiz Shahar" OJSC. PIG is responsible for the project implementation. The project leader and WB's expert group will supervise the activity of PIG.

Control over EMP implementation will be executed by PIG and WB during the WB mission period.

PIG manager will guarantee the conformity to EMP conditions during the project implementation. PIG can involve short term highly qualified experts to follow the ecological requirements in the project framework, to solve monitoring and ecological issues. This person must know the WB Environmental assessment procedures very well and guarantee that the project activity is implemented based on the environmental assessment procedure meeting the WB requirements. PIG manager will build working relations with the officials of State Ecological Expertise Department of the MENR and Environmental inspectors.

All the project activities related to closure/rehabilitation of open landfills will be implemented by Contracting organisations based on the contracts signed with PIG. Contractor will be responsible for all the environmental issues during the project duration and the related provisions will be included in contracts signed with Contractor.

7.5.1. GENERAL MITIGATION DURING CONSTRUCTION

In accordance with the Contract, Contractor must implement the activities in conformity with requirements stipulated in EIA and EMP and as a Customer must provide the Project Implementation Group of "TS" OJSC with reports.

There are a number of mechanisms of giving guarantee related to both general and site specific mitigation during construction described in EIA. One mechanism is to demand further from Contractor storage of fuel and oil, waste management and transport management and prevention of contamination through designing individual Management Plans. This approach serves the project as it creates condition for early assessment of these aspects by Contractor and prepares Management Plans that can be checked, approved and audited during the monitoring process in that area. The IM content to be prepared by Contractor is presented in Table 7.1 and this activity will be supported by the environmental staff of the WB in Baku together with the environmental advisor of PIG, "TS" OJSC.

Environmental Plan	Summary of Content
Waste management	Reduction of quantities, control, separation, reserve, removal of waste from the site and utilisation. Monitoring, require-ments for inspection and reporting. Training for storage and control over different types of hazardous materials.
Filtrate management	Control measures for prevention of contamination, collection, cleaning-up or recycling of filtrates from different sources.
Control over air quality	Reduction of emissions to air from different sources and control measures. Monitoring, requirements for inspection and reporting
Dust control	Measures for reduction and removal of dust from roads, work places and construction activities. Monitoring, requirements for inspection and reporting
Noise and vibration control	Reduction of noise and vibration from all equipment at work site and transportation activities and control measures. Monitoring, requirements for inspection and reporting
Responsibility for preventive measures	Procedures regarding the responsibility for grade of events and extraordinary situations. Monitoring, requirements for inspection and reporting
Transport management	Transport disorder and procedures for reduction of entry to public buildings, especially to hospitals and schools
Archeological and Cultural heritage	Measures for reduction of negative impacts on cultural heritage during construction work. If further implementation of activities are required for any discoveries, in this case guarantee for "safe keeping" must be given according to legislation.
Storage of oil and fuel and refueling	Specification for storage of oil and fuel for providing the environmental protection and procedures for refueling vehicles, installations and equipment.
Site inspection	Site inspection and reporting procedures in case of no implementation warning.
Processing of complaints and discontent	Procedures of complaints processing including answering to plaintiff and reporting
Environmental training	- Introduction to the project; - Talks before work

	Content of training, checking-up and training purposes and procedures including certain target groups.
Storage and utilisation of hazardous products and substances	Registration, registration of information papers material safety and risk assessment of materials and chemical substances must be used in the project. Documenting requirements.
Rehabilitation plan	Plan of removal of all equipment and materials from temporary working sites and rehabilitation of the areas in accordance with standards at least as initial construction conditions.

Table 7.1. A List of Management Plans

7.5.2. PREVENTIVE MEASURES

Plan of preventive measures has to be prepared by Contractor during the construction stage. Preventive measures plan must identify the requirements for unexpected events and accidents and correspondingly build contacts with the Services on Extraordinary situations. Contract must identify preventive measures procedures for the construction stage.

Requirements for preventive measures and planning basis are designed, first of all, for preventing the accidents and secondly for reduction of hazards of any events. The priorities for protection against the situations regarding preventive measures are as follows:

- Human life and health;
- Environment;
- Equipment related to Customer and Contractor;
- Normal activity management at site.

Human life and health and environmental protection must be in conformity first of all with the Environmental, Health and Safety plans of Contractor. Contractor also has to take all necessary measures for prevention soil contamination as a result of water, air any other event, if necessary reduction of this contamination and elimination of any contamination during the work implementation.

Contractor must inform “TS” OJSC and MENR of any important events.

7.6. TRAINING

“TS” OJSC has already gained certain positive experience in the field of waste management. There is an adequate infrastructure in “TS” OJSC regarding waste management issues and a personnel who worked in the past in the field of waste management and has certain knowledge and skills has been formed and work in this areas is going on.

At the same time, there is a need for certain training in the area of best international practice in waste management and environmental aspects. The following topics including the aspects of open landfill closure/rehabilitation should be a part of training programme:

- Legal issues and WB's Safety policies;
- Environmental impact assessment;
- Cost-benefit analysis;
- Process of decision making;
- Design/construction- Quality assurance (QA)/ Quality control (QC)
- Public participation, discussions and disclosure.

Training should be arranged for the administrative and technical management, technical personnel and monitoring groups. Representative of PIG and TS OJSC should participate in these training courses. Participation of interested citizens and NGO representative should be provided at the sessions where public relations issues will be discussed.

Training programmes can be prepared by local experts with the participation of international experts engaged in open landfill closure/rehabilitation problems. Training courses may be of two stages:

I Stage:

- Legal issues and WB's Safety policies;
- Environmental impact assessment;
- Process of decision making,
- Public participation, discussions and disclosure

II Stage:

- Process of decision making,
- Cost-benefit analysis,
- Design/Construction- QA/QC ;
- Public participation, discussions and disclosure

Expert in training, recommendation providing, monitoring at the construction stage and control over QA/QC procedures in open landfill closure projects and two training specialists will be involved.

Initial assessment cost for institutional building is 150,000 US$.

7.7. SCHEDULE OF EMP IMPLEMENTATION

- *Impact reduction activity* : Begins at the planning stage of the project implementation and continues through the whole period of the project implementation.
- *Monitoring activity* : Begins with the implementation of the project, starting from the construction stage through the whole period of the project implementation.
- *Training activity* : Begins at the planning stage of the project implementation. Starting from the planning stage of the project implementation until the beginning of operation.

Summary of environmental management in Table form is given in Annexe 3..

8. PUBLIC DISCUSSIONS AND INFORMATION DISCLOSURE

"Closure And Rehabilitation of Garadagh and Surakhani Landfills" project executed in the framework of the "Integrated Solid Domestic Waste Management" project is implemented by the Government of Azerbaijan and the WB. In accordance with the existing legislation of Azerbaijan and the WB Rules (Section 2.8), the public discussions have to be carried out in the framework of this project and its sub-projects and the public has to be well informed about the envisaged project activities.

So far, the ISDWM project, the ecological aspects of the project have been widely discussed in TV programmes, press, electronic information sources. The following can be noted especially regarding the public information area:

- Report on "Integrated solid domestic waste management on the Absheron Peninsula. Environmental impact assessment" prepared by Currie & Brown International Limited Company has been downloaded in the MED and MENR sites. The report describes the purpose of ISDWM project and "Balakhany landfill closure/rehabilitation" to be implemented under this project, the environmental aspects of solution of the problems regarding the open landfills in the Greater Baku area. Later, on the 20th of February, 2008, the public discussions of the mentioned report were carried out.
- According to the assignment of ACEP, this Company conducted sociological survey in 5 large settlements of Baku (Balakhany, Binagadi, Lokbatan, Yeni Surakhany and Shuvalan) in February – March 2011 regarding the waste management in the Greater Baku area including the environmental and sociological impacts of open landfills. The results of these sociological studies are given in Annex 5.

The main aspects of the "Environmental and social impact assessment" report prepared for the "Closure And Rehabilitation of Garadagh and Surakhani Landfills" project were discussed with the direct participation of the interested parties on February 10, 2011 in Balakhany settlement of Sabunchu district, on March 17, 2011 in Lokbatan settlement of Garadagh district, on April 6, 2011 in Shuvalan settlement of Khazar district, on April 21, 2011 in Binagadi settlement of Binagadi district, on April 26, 2011 in Yeni Surakhani settlement of Surakhany district. Also public consultations were conducted on the environmental and social impact of the project with the residents of the mentioned settlements of Baku. A list of these consultations participants and the results of the consultations are given in Annex 6.

D-r Manaf Suleymanov, ACEP expert informed the participants about the Environmental and social impact assessment document and the results of the sociological survey.

The results of the discussions were described in the presented ESIA report.

After the completion of ESIA draft report on "Closure And Rehabilitation of Garadagh and Surakhani Landfills*" project* the copies of the report will be presented to the PIG for getting their comments and recommendations. PIG will facilitate provision of the local groups exposed to the impacts during the implementation of the project and non-government organizations with the report on the ESIA. After this report is presented officially to the Bank and disclosed locally, it will be disclosed for public through Bank's Infoshop system.

In case of conflicts with the local population during the implementation of the project they will be solved through mutual discussions.

In case conflict of interests plaintiff can apply to "Tamiz Shahar" OJSC or the MED. If they do not get satisfactory answers to their questions, they can apply to the local and central executive power bodies in compliance with the legislation.

ANNEX 1. THE WORLD BANK SAFEGUARD POLICIES

Environmental assessment (OP/BP/GP 4.01)	The Bank requires environmental assessment of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable and thus to improve decision making. For this reason, the Bank requires the environmental assessment of these projects, environmental and social risk assessment, public participation in decision making.
Natural Habitats (OP/BP 4.04)	The Bank promotes and supports natural habitat conservation and improved land use by financing projects designed to integrate into national and regional development the conservation of natural habitats and the maintenance of ecological functions. Furthermore, the Bank promotes the rehabilitation of degraded natural habitats. The Bank does not support projects that, in the Bank's opinion, involve the significant conversion or degradation of critical natural habitats.
Pest Management (OP 4.09)	In assisting borrowers to manage pests that affect either agriculture or public health, the Bank supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides. The Bank requires that any pesticides it finances be manufactured, packaged, labeled, handled, stored, disposed of, and applied according to standards acceptable to the Bank
Management of Cultural Property (OPN 11.03, being revised as OP 4.11)	When saying "Cultural Property" the places of archeological, paleonthological, historical, religious and natural importance are understood. For this reason, the cultural property covers all that is left from ancient inhabitants (sacred places and battle-field) as well as unique natural environment, e.g. canyons and waterfalls. The Bank does not support projects that can damage unique cultural properties and will only support the projects aimed to prevent such damages.
Involuntary Resettlement (OP/BP 4.12)	This policy is aimed to minimize resettlements, assist the population exposed to involuntary resettlement, hamper decreasing of their income and living standards, compensate for the damages occurred during their resettlement, loss of their source of income and residence. Resettlement planning and policy description is required.
Local population (OD 4.20, being revised as OP 4.10)	This policy is aimed to respect human rights, economy and cultural heritage of local (indigenious) people, ethnic minorities and kin groups, prevent negative effects on the local population during the project implementation.
Forestry (OP/BP 4.36)	The management, conservation, and sustainable development of forest eco-systems and their associated resources are essential for lasting poverty reduction and sustainable development, whether located in countries with abundant forests or in those with depleted or naturally limited forest resources. The Bank does not finance projects that, in its opinion, would involve significant conversion or degrada-tion of critical forest areas or related critical natural habitats.
Safety of dams	The Bank distinguishes between small and large dams. Small dams are

(OP/BP 4.37)	normally less than 15 m in height. This category includes, for example, farm ponds, local silt retention dams, and low embankment tanks. For small dams, generic dam safety measures designed by qualified engineers are usually adequate.
Projects in disputed sites (OP/BP/GP 7.60)	Projects in disputed areas may raise a number of delicate problems affecting relations not only between the Bank and its member countries, but also between the country in which the project is carried out and one or more neighboring countries. In order not to prejudice the position of either the Bank or the countries concerned, any dispute over an area in which a proposed project is located is dealt with at the earliest possible stage.
Projects on nternational water ways (OP/BP/GP 7.50)	This policy applies to the following types of international waterways: (a) any river, canal, lake, or similar body of water that forms a boundary between, or any river or body of surface water that flows through, two or more states, whether Bank members or not; (b) any tributary or other body of surface water that is a component of any waterway described in (a) above.

ANNEX 2. ECOLOGICAL MONITORING STANDARDS

2A. REQUIREMENTS FOR WASTE WATER CONTENT

In Azerbaijan Republic, the normal environmental standards are not used for leachate leaking from separate sources (for example, from separate industrial entities: machine-building plants, metal processing enterprises, food industry enterprises, agricultural processing enterprises, etc.)

Standards of harmful substances quantity contained in waste water is regulated by a character of effluent and requirements set for surface water body standards. All standards have been worked out and apply for the following types of water bodies, subject to their content and characteristics:

a. household-drinking,
b. cultural-household ,
c. fishing activity .

These standards specified in the laws of Azerbaijan Republic allow for warning and protection from contamination of water bodies, rivers, lakes, water reservoirs, canals especially while using them for household and drinking, cultural-household, as well as fishing activities.

Standard quantity of a harmful substance in a waste water is expressed as a density (concentration), characterising guantity of such substance in a unit volume.

Optimal distribution of discharged harmful substances among the water users, determines standards of Permissible Effluent Discharge Limits for each pollutant, subject to protection of water reservoir and Permissible Effluent Discharge Limits for discharged harmfull substances.

While determining Permissible Effluent Discharge Limits, content and characteristics of effluent discharged into water body from the described facility, location of connection points, hydological regime characterising water body status specifying a harmful impact level of specific mixtures contained in waste water, availability of waste water outlets above water outlets, content and characteristics of water at this point, possibility of changing hydrological regime and factors such as mixture and deposition rate of water body and waste waters should be taken into consideration.

Once waste water (mostly treated through treatment plant, filtrates to be dischaged) from Balakhani landfill is designed to to be discharged into Boyuk Shor lake, cultural-household water requirements will be applied to calculate Permissible Discharge Limits.

As mentioned above, BBAH (waste limits) must be identified for hazardous substances contained in leaking water and these norms have to be settled with the MENR. When

calculating BBAH, the requirements assigned for water entities of resort and sports category as water receiving entity must be followed.

A.1. Waste water standards.
While determining standards for waste waters from Balakhani landfill, it is expected that waste water will be discharged into Boyuk Shor lake. Requrements set out in "Basic rules of using water bodies for recreation and sports" confirmed by decree No. 216, of the Cabinet of Ministers of AR, dated from 22 Oktober 1998 and sanitary-hygienic standards, SanPiN N 4630–88 adopted in 1998 will be used for waters with cultural-household category.

A.2. Hygienic requirements relating content and characteristics of running waters and water reservoirs used for recreation and sports.

(A copy from "Background of rules of using water bodies for recreation and sports" confirmed by decree No. 216, of the Cabinet of Ministers of AR, dated from 22 Oktober 1998.)

Characteristics and content of water bodies
For water bodies within boundaries of public swimming areas, sports as well as residential areas

Suspending agents-
Quantity of suspending substances should not exceed 0, 75 mg/l. Increase of suspending substances is allowed around 5 % in water bodies containing more than 30mg/l mineral substances in average level of water. If deposition rate exceeds 0,4 mm/sec in waters flows and 0,2 mm/sec in water reservoirs, it is forbidden to discharge suspending substances into water bodies.

Swimming mixtures (substances)
There should not be any suspending substances on the surface of water bodies (thin turbid layers, oil tracks or spots, various additions or other mixtures).

Odours, tastes
Alien odours or tastes in water should not exceed a level of 2 scores (level of human feeling). Alien tastes or odours should not pass to the meat of caught fishes.

Colour
Should be appeared in a 10sm water column.

Temperature
Temperature of discharged effluent in summer months should not be higher than 30C, average annual hottest temperature of water in the last 10 years.

Hydrogen indicator (pH)
Should not exceed 6,5—8,5.

Mineral content
Is normalized with "Tastes" indicator.

Dissolved oxygen
Should not be less than 4 mg/l in a sample taken until 12 a.m. at any period of a year.

Biochemical oxygen demand (BOD)
Should not exceed 6,0 mg/l at 200C of water temperature.

Chemical oxygen requirement (COR)
Should not exceed 30,0 mg/l.

Disease-producing factors
There should not be any disease-producing factors in water

Quantity of Coliphages
Should not exceed 100 in 1L.

Quantity of lactose bacteria relating colon bacillus
Should not exceed 5000 in 1L.

There should not be any living threadworms (teniasis, toxocarosis, fasiol), & living cysts of pathogenic colon bacillus

Chemical substances should not exceed
Permissible Concentration Limit(PCL) or Permissible Approximate Limits (PAL).

A.3. Sanitary-Hygienic Standards

Table A2.1. Permissible Concentration Limits of harmful substances in household-drinking and cultural-household water bodies (water bodies, water canals, etc)

N	Description of substances	PCL or PAL	Hazard index	Permissible concentration limit mq/l	Danger class
1.	Barium	PCL	s-t.*	0,1	2
2.	Benzpyrene	PCL	s-t.	0,000005	1
3.	Berillium	PCL	s-t.	0,0002	1
4.	Bora	PCL	s-t.	0,5[3]	2
5.	Brome	PCL	s-t.	0,2[3]	2
6.	Vanadium	PCL	s-t.	0,1-	3
7.	Bismuth	PCL	s-t.	0,1[3]	2

N	Description of substances	PCL or PAL	Hazard index	Permissible concentration limit mq/l	Danger class
8.	Tungsten	PCL	s-t.	0,05[3]	2
9.	Dioxonium	PCL	s-t.	0,000035	1
10.	Ferrum (including ferrum chloride) calculated on Fe	PCL	Orq[***]._color	0,3[3]	3
11.	Cadmium	PCL	s-t.	0,001[3]	2
12.	Cobalt	PCL	s-t.	0,1[3]	2
13.	Silicium(as per Si)	PCL	s-t.	10,0	2
14.	Lithium	PCL	s-t.	0,03	2
15.	Manganese	PCL	Org.-color.	0,1[3]	3
16.	Copper	PCL	Org.-taste	1,0[3]	3
17.	Methane	PCL	s-t.	2,0	2
18.	Molybdenum	PCL	s-t.	0,25	2
19.	Natrium	PCL	s-t.	200,0	2
20.	Natrium chloride	PCL	Org.-taste.	20,0	3
21.	Oil-containing sulphur	PCL	Org.-foam.	0,1	4
22.	Other oil	PCL	Org.-foam.	0,3	4
23.	Nickel	PCL	s-t.	0,1[3]	3
24.	Niobium	PCL	s-t.	0,01[3]	2
25.	Nitrates (NO_3)	PCL	s-t.	45,0	3
26.	Nitrates (on NO_2)	PCL	s-t.	3,3	2
27.	Mercury	PCL	s-t.	0,0005[3]	1
28.	Lead	PCL	s-t.	0,03	2
29.	Selenium	PCL	s-t.	0,01[3]	2
30.	Bronze	PCL	s-t.	0,05[3]	2
31.	Hydrogen sulfide	PCL	Org.-odour.	1,0	4
32.	Sulphate (SO_4)	PCL	Org.-taste.	500,0	4
33.	Sulphate	PCL	Gen[**].	Absence	3
34.	Antimony	PCL	s-t.	0,05[3]	2
35.	Thallium	PCL	s-t.	0,0001[3]	1
36.	Tellurium	PCL	s-t.	0,01[3]	2
37.	Phenol	PCL	Org.-odour.	0,001	4

N	Description of substances	PCL or PAL	Hazard index	Permissible concentration limit mq/l	Danger class
38.	Elementary phosphorus	PCL	s-t.	0,0001	1
39.	Fluorine	PCL	s-t.	1,2	2
40.	Furan	PCL	s-t.	0,2	2
41.	Active Chlorine	PCL	Gen.	Absence[6]	3
42.	Chlorides ($C1^-$)	PCL	Org.-taste.	350,0	4
43.	Chromium (Cr^{3+})	PCL	s-t.	0,5	3
44.	Chromium (Cr^{6+})	PCL	s-t.	0,05	3
45.	Cyanide	PCL	s-t.	0,1[7]	2
46.	Zinc	PCL	s-t.	1,0[3]	3

Source: SanPiN 4630–88 , 1988-ci il ; Normative documents on natural protection and efficient use of natural resources. State Ecological Committee. 1994

Abbreviation:

*- **s-t**. –sanitary-toxicological

** -Gen. – General sanitation

***-org. – Characterises changes of organoleptic characteristics (odour, taste, color, bubble and surface layer) of organoleptic water.

The quality of underground water

The quality of underground water conforming to the IS 10500 standards described in Table 1.5 must be checked at least in three places every season. Use of underground water in the plant area and outside it for any reason including for drinking purposes and irrigation is possible only after its quality has been ensured.

Table A2.2 Water quality standarts for monitoring of ground waters

S. No	Parameters	İS 10500:1991 MPC
1	Arsen, mg/l	0.05
2	(Cd), mg/l	0.01
3	Crom mg/l	0.05
4	(Cu), mg/l	0.05
5	Sianamid, mg/l	0.05
6	(Pb), mg/l	0.05
7	(Hg), mg/l	0.001
8	(Ni), mg/l	-
9	(NO), mg/l	45
10	PH	6.5-8.5

S. No	Parameters	İS 10500:1991 MPC
11	Fe, mg/l	0.3
12	($CaCO_3$), mg/l	300
13	(Cl), mg/l	250
14	Soluble solid substances, mg/l	500
15	(C_6H_5OH), mg/l	0.001
16	(Zn), mg/l	5
17	(SO_4), mg/l	200

ANNEX 2B. REQUIREMENTS FOR DISCHARGED HARMFUL SUBSTANCES

Harmful substances discharged into air from enterprises and facilities are regulated, technical standards and their permissible levels are determined.

When determining a Permissible Emission Level of harmful substance, a surface density of harmful substance is calculated through a special program and a distribution chart of a harmful substance is developed, considering meteorological parameters specifying spreading of those substances in air, background data of contamination area, sources of emission and emission parameters. Standards harmful substance discharge are determined on the basis of these calculations.

The document of PEL s include the following measures:

- Environmental impact, including air quality standards of concrete enterprises and facilities;
- possible spreading and accidental emissions;
- measures for emission reduction (temporarily agreed emission limits), in case of exceeding determined limit values;
- control of determined specified emission limits;
- atmospheric emission regulation in an unsuitable metereological conditions

Permissible Emission Level determine limit values of permits given to enterprises and organizations on harmful atmospheric emissions.

B.1. PCLs

Table A2.3. Permissible Concentration Limit standards for calculating Permissible Emission Level for some substances emitted into atmosphere from landfill

Pollutants	PCL o.m.	PCL a.d.	Danger class
Methane	50 (ALEI)	-	2
Nitrogen dioxides (NO2)	0.085	0.04	2
Nitrogen oxides (NO)	0.40	0.06	3
Sulphur oxide (SO2)	0.5	0.05	3

Pollutants	PCL o.m.	PCL a.d.	Danger class
Carbon oxide (CO)	5,0	3,0	4
Hydrogen sulfide	0,008	—	2
Hydrogen chloride	0,2	0,2	3
Dioxonium (2, 3, 7, 8-terrachlorodibenzene-1,4-calculated on dioxonium)		$5*10^{-12}$ q/m3	1
Benzpyrene (3,4-Benzpyrene)		0.000001	1
Ammoniac	0.200	0.040	4
Ammoniac	0.200	0.040	4
Benzene	1.500	0.100	2
Trichloromethane	-	0.030	2
Carbon-4 chloride	4.00	0.700	2
Chlorobenzene	0.100	0.100	-
Vanadium (V) oxide	-	0,002	1
Manganese and its compounds (calculated on manganese)	0,01	0,001	2
Cadmium nitrate (calculated on cadmium)		0,0003	1
Lead and its compounds (calculated on lead)	0,001	0,0003	1
Metallic Mercury	—	0,0003	1
Vanadium (V) oxide	-	0,002	1
Ozone	0,16	0,03	1
Soot	0.15	0.05	3
Suspending agent (non-differentiable as per dust content)	0,5	0,15	3
Florids (calculated on F)	0.2	0.03	2
Hydrocarbons	1,2 (TTTS)	-	4
Ozone	0,03		3

Source: GOST 17.2.3.01-86. Atmosphere. Air quality control at populated areas. 1986, Normative documents on natural protection and efficient use of natural resources. State Ecological Committee. 1994

Legend: o.m.- one-time maximum,
a.d.- average daily
ALEI-approximate level of emission impact

B.2. AIR QUALITY STANDARDS FOR WORKING AREAS

Table A2.4 – PDLs of main harmful substances emitted into atmosphere from the landfill at the working area

Pollutants	**PCLs o.m.**
Methane	-
Nitrogen dioxide (NO2)	5.0
Sulphur oxide (SO2)	0.5
Carbon oxide (CO)	20
Hydrogen sulfide	10
Ammoniac	5.0
Benzene	1.500
Trichloromethane	-
Carbon-4 chloride	20.00
Chlorobenzene	100.0
Dust	4.0
Gaseous fluorides (calculating for floride)	2.5
Hidrogen cloride (HCl)	0.5/01
Cadmium (yodid, nitrat, okside, sulfate, clorid (Cd)	0.05
Cobalt, (Co)	0.5
Cr (Cr-VI) (CrO_3)	1
C) birləşmələri - okside/ Cloride - sulfide/ sulfat / clorat - trixlorofenol	1/0.5
Hg	0,01/0,005
Ni	0.05
(Mn)	0.3
(Pb)	0,01/0,005
(Sb) -okside/diokside	1

Source: GOST 12.1.005-88. Labour safety standards system. General sanitary-hygienic requirements of working area. M. 1988

B3. INTERNATIONAL AND NATIONAL STANDARTS FOR THE QUALITY OF ATMOSPHERE

Table A2.5. Gaseous substances

Substance	**Unit**	**Azerbaijan**	**IFC**	**EU Comission**

		Max in day	Daily average	Hour	Daily average	Average year	Hour	Daily average	Average year
(CO)	mq/m^3	5.0	3.0	-	-	-	10.0 (8 saat)	-	-
(NO_2)	mkg/m^3	85	40	200 (G)[5]	-	40 (G)*	200[6]	40	30[7]
(NO)		400	60	-	-	-	-	-	-
(SO_2)		500	50	500 (10 dəq)	125/50/20 (T1/T2/G)[8]	-	350[25]	125	[50]* 20[9]
(HCl)		200	200	-	-	-		-	-
Gaseous fluorides (calculating for floride)		20	5	-	-	-	-	-	[0.4]

Table A2.6 . Heavy metals (consentration (mkg/m^3) and sedments (mkg/(m^2 day)

Substance	**Unit**	**Azerbaijan**		**IFC**	**EU Comission**	**German TA luft**
		Max in day	Daily average	No	Average year	Average year
(As)	mkg/m^3 mkg/(m^2*day)	- -	3 -	-	0.006(T)*[10] -	- 4
Cadmium (yodid, nitrate, okside, sulfat, cloride (Cd)	mkg/m^3 mkg/(m^2*day)	- -	0.3 -	-	0.005(T)* -	0.02 -
Cobalt, (Co)	mkg/m^3	-	1	-	-	-
cobalt sulfate	mkg/m^3	1	0.4	-	-	-
(Cr-VI) (CrO_3)	mkg/m^3	1.5	1.5	-	-	-
(Cu) - okside/ cloride - sulfide/ sulfate /clorate - trichlorophen	mkg/m^3	 - 3 6	 2 1 3	 - - -	 - - -	 - - -
Hg	mkg/m^3 mkg/(m^2*day)	- -	0.3 -	- -	- -	- 1
Mn	mkg/m^3	10	1	-	-	-

Ni	mkg/m^3 $mkg/(m^2*day)$	- -	1 -	- -	$0.02(T)^*$ -	- 15
Pb	mkg/m^3 $mkg/(m^2*day)$	- -	300 -	-	0.5 -	0.5 100
Sn -okside/diokside	mkg/m^3	- 	20 	-	-	-
Tl carbonate	mkg/m^3 $mkg/(m^2*day)$	- -	0.4 -	- -	- -	- 2
Vanadium (V) okside (V)	mkg/m^3	-	2	-	-	-

2C. PERMISSIBLE DENSITY LIMITS OF SOME CHEMICAL SUBSTANCES CONTAINED IN SOIL AND PERMISSIBLE LEVELS DEPENDING ON THEIR DANGER INDEX

Table A2.7Standards for soil contamination level assessment.

Substance	**Form, composition**	**PCL, mg/kg, including background**	**Level of harmfulness (K_{max})**				**Danger index**
			Translocation ,К1	**Migration**		**General sanitary К4**	
				Water $К_2$	**Air $К_3$**		
Copper	Moveable	3.0	3.5	72.0	-	3.0	2
Chromium	-"-	6.0	6.0	6.0	-	6.0	2
Nickel	-"-	4.0	6.7	14.0	-	4.0	2
Zinc	-"-	23.0	23.0	200.0	-	37.0	1
Cobalt	-"-	5.0	25.0	>1000.0	-	5.0	2
Fluorine	Water solubility	10.0	10.0	10.0	-	25.0	1
Arsen	Bulk content	4.5	4.5	4.5	-	50.0	2
Manganese	-"-	1500.0	3500.0	1500.0	-	1500.0	3
Vanadium	-"-	150.0	170.0	350.0	-	150.0	3
Manganese + Vanadium	-"-	1000.0 + 100.0	1500.0 + 150.0	2000.0 + 200.0	-	1000.0 + 100.0	3
Lead	-"-	30.0	35.0	260.0	-	30.0	1
Antomony	-"-	2.0	2.0	15.0	-	10.0	1
Mercury	-"-	2.1	2.1	33.0	2.5	5.0	1
Lead + Mercury	-"-	20.0 + 1.0	20.0 + 1.0	30.0 + 2.0	-	50.0 + 2.0	1
Potassium chlorine	-"-	560.0	1000.0	560.0	1000.0	5000.0	3
Nitrates	-"-	130.0	180.0	130.0	-	225.0	2
Benzpyrene	-"-	0.02	0.2	0.5	-	0.02	1
Isopropylbenzene	-"-	0.5	3.0	100.0	0.5	50.0	1
Styrene	-"-	0.1	0.3	100.0	0.1	1.0	2
Xylene	-"-	0.3	0.3	100.0	0.4	1.0	2
Sulphur compounds:							
Hydrogen-sulfide	-"-	0.4	160.0	140.0	0.4	160.0	3
Elemental sulfur	-"-	160.0	180.0	380.0	-	160.0	3
Sulphuric acid	-"-	160.0	180.0	380.0	-	160.0	1

Source: (Methods of assessing contamination of soil with chemical substances during determination of soil contamination level. M., Ministry of Health of USSR, 13 March 1987, No. 4266-87.)

2C.1. REFERENCE DATA OF HARMFUL SUBSTANCES IN SOILS

Table A2.8. Reference data of harmful substances in soil as per forms of using soil (Refernce data)

(in compliance with standards of foreign countries)

Forms of using soil	Category	Quantity of elements (mg/kg)										
		As	Be	Cd	Cr	Cu	Hg	Ni	Pb	Se	Ti	Zn
Multipurpose	I	20	1	1	50	50	0.5	40	100	1	0.5	150
Playgrounds for children	II	20	1	1	50	50	0.5	40	200	5	0.5	300
	III	50	5	10	250	250	10	200	1000	20	10	2000
Vegetable garden - gardening	II	40	2	2	100	50	2	30	300	5	2	300
	III	80	5	5	350	200	20	200	1000	10	20	600
Sports and football stadiums	II	35	1	2	150	100	0.5	100	200	5	2	300
	III	90	2.5	3	350	300	10	250	1000	20	20	2000
Recreation parks and squares, soft squares with soft plant cover.	II	40	5	4	150	200	5	100	500	10	5	1000
	III	80	15	15	600	600	15	250	2000	50	30	3000
Industrial and storage sites not covered with waterproof surface	II	50	5	10	200	300	10	200	1000	15	10	1000
	III	150	20	20	800	1000	20	500	2000	70	30	3000
Industrial and storage sites covered with waterproof surface and plant cover	II	50	10	10	200	500	10	200	1000	15	10	1000
	III	200	20	20	300	2000	50	500	2000	70	30	3000
Non-agricultural ecosystems	II	40	10	5	200	50	10	100	1000	5	2	300
	III	60	20	10	500	200	50	200	2000	10	20	600

ANNEX 2D. ELECTROMAGNETIC RADIATION

Health impact of industrial frequency (50 Hz) is regulated on the basis of GOST12.1.002-84 and SanPiN 2971-84.

Table A2.9. Permissible Levels of electric field (PL)

Location , area	**Electric field voltage E, кW/м**
Inside residential buildings	0.5
In residential areas	1
Outside residential buildinds and areas	5
At I-III category highway cross-sections of high voltage power lines	10
At non-residential areas, accessible for transport	15
Regions which are difficult of access	20

Note – Electric field voltage E, is determined at a 2 m height from ground surface. .

D. NOISE.

Usual level of noise, infra- and ultra-noise in the residential complex area and buildings is regulated by the "Contamination norms of vibration and noise having negative impact on the environment and human health", Decree of President of Azerbaijan Republic # 796 dated July 8, 2008 and GOST 12.1.003-83, GOST 23337-78, GOST 20444-85 and sanitary rules (SNIP 3077-84 and SNIP 42-128-4948-89)

Level of noise equivalent in areas, directly close to residential areas, equals to 55 dBa. Equivalent and maximum level of noise generated by vehicles and equipment in the area, is measured by dBa and can be 10 dBa more than routine case (Δ = + 10dBa), so that permissible level of equivalent noise equals to 65dBa.

E. VIBRATION

Vibration safety is regulated by the "Contamination norms of vibration and noise having negative impact on the environment and human health" (Decree of President of Azerbaijan Republic # 796 dated July 8, 2008), GOST 12.1.012-90, GOST 12.4.012-83 and sanitary rules (SNIP 3077-84 and SNIP 42-128-4948-89) in the residential complex areas and working places

ANNEX 3. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

ANNEX 3.A.MITIGATION MEASURES PLAN

Phase	Issue	Mitigating Measure	Cost	Institutional Responsibility
Planning	Collection of all the data related to planning and implementation. Organising the final project.	Determination of the current morphological, geological, hydro geological structure of the area. A temporary changing will occur at the project area. But after finishing the operation, top of the landfill area (lots) will closed and covered with soil.	Project budjet	MED(TS)PIU; WB; Consulting Company;
	After care use is not known causing difficulties in planning	The after-care-use of the sites should be decided in advance.	It is not considered as a separate cost item.	MED(TS)PIU; WB; Consulting Company;

Phase	Issue	Mitigating Measure	Cost	Institutional Responsibility
	Notification and Worker Safety	• The local construction and environment inspectorates and communities have been notified of upcoming activities • The public has been notified of the works through appropriate notification in the media and/or at publicly accessible sites (including the site of the works) • All legally required permits have been acquired for construction and/or rehabilitation • All work will be carried out in a safe and disciplined manner designed to minimize impacts on neighboring residents and environment. • Workers' PPE will comply with international good practice (always hardhats, as needed masks and safety glasses, harnesses and safety boots) • Appropriate signposting of the sites will inform workers of key rules and regulations to follow.	Criteria/ specifications to be incorporated into bidding and contract documents.	MED(TS)PIU; WB; Consulting Company; Construction contractor
Construction	Destruction of natural landscape (relief, soil cover, vegetation, eco-systems, habitats and wildlife) on the main work-site. Character of impact: immediate drastic changes of landscape at the construction sites;	*Mitigation strategy* - prevalence of preventive measures: Optimal site selection and alignment option (no valuable landscapes, ecosystems, Pre-entry survey and prevention of damage to fauna. No biorestoration required. Only reinstatement of the wind breaking plantation. Elaboration and implementation of the Sanitary protection zone landscaping plan and design; Top-soil storage and use for reinstatement and landscaping long-term (remediation): – see mitigation strategy for operation phase	Landscape plan and project costs has been included in the project costs;	Contractor, MED(PIU), Supervise and monitor Engineer;
Construction	Earthworks may immediately trigger intensive erosion during construction and drastic increase of sedimentation	Mitigation strategy: prevention through implementing temporary antierosion measures – temporary drainage, biomatting or geo -textile cover, berms etc. • Limitation of earth moving to dry periods. • Protection of most susceptible soil surfaces with mulch. • Protection of drainage channels with berms, straw or fabric barriers. Installation of sedimentation basins	Criteria / specifications to be incorporated into procurement proposal and contract documents.	Contractor , MED(PIU), Supervise and monitor Engineer;

Phase	Issue	Mitigating Measure	Cost	Institutional Responsibility
Construction	Topsoil losses due to improper storage and handling	*Topsoil Protection* The topsoil will not be handled by Contractor when the following conditions are observed: • The topsoil is frozen; • The site is experiencing persistent rainfall; • The topsoil is saturated; *Topsoil Storage* The storage of topsoil in stockpiles, no more than 2m high with side slopes at a maximum angle of 450, will take into consideration the following: • storage locations that prevent the stockpiles being compacted by vehicle movements or contaminated; • Segregation from subsoil stockpiles; • No storage where there is a potential for flooding; • No storage at less than 25m from streams, subject to site specific topography. *Topsoil erosion prevention measures:* • installing erosion matting over the stockpiles if further surface compaction and/or seeding fails. • protect the stockpiles from flooding and run-off by placing berms or equivalent around the outside where necessary. *Reinstatement of Topsoil* Topsoil removed from the landfill site will be used for reinstatement of the topsoil in the adjacent construction sites affected by the project activities. Topsoil will be reinstated separately from subsoil, with care taken to avoid mixing of the materials.	Included in the project construction/ supervision budget	Contractor , MED(PIU), Supervise and monitor Engineer;
	Immediate Impact: Fresh road cuts may immediately trigger intensive erosion during construction and drastic increase of sedimentation	Mitigation strategy: prevention through implementing temporary antierosion measures – temporary drainage, temporary sediment catchments etc. Protect susceptible surfaces with fabric. Establishment of retention ponds to reduce sediment loads before water enters streams	Criteria / specifications to be incorporated into bidding and contract documents.	Contractor, MED(PIU), Supervise and monitor Engineer;

Phase	Issue	Mitigating Measure	Cost	Institutional Responsibility
Construction	Soil and water contamination during construction by oil, grease, fuel and paint at the Construction sites and equipment yards.	Collect and recycle lubricants. • Avoid accidental spills through good practice. • Avoid refueling near watercourses (50m); • Vehicle maintenance, cleaning, degreasing etc will be undertaken in designated areas of hard-standing, not over made ground. Maintenance points will not be located within 50m of any watercourse, well or dry gorge. • The storage of potentially polluting materials, refueling and maintenance of mobile plant within 50m of all watercourses/water bodies, dry riverbeds and within designated wetlands and aquifers will be prohibited. • Ensure proper maintenance of equipment and fueling of the vehicles and machinery. Check vehicles (leaking of fuel etc.) and refueling equipment • Use absorbent pads and/or straw at refueling stations to minimize spill impacts • Immediately remove polluted ground • Soiled ground and absorbents will be removed, stored and treated as hazardous waste. • Isolate concrete, earthwork and other works from water courses by using sealed formwork; • Equipment and storages will be isolated and guarded to prevent pollution due to cases of stealing or vandalism. • The personnel involved in the handling of fuel, hazardous and nonhazardous waste will undergo specific training in: fuel and lubricant handling procedures, waste management	Criteria / specifications to be incorporated into bidding and contract documents.	Contractor , MED(PIU), Supervise and monitor Engineer;

Phase	Issue	Mitigating Measure	Cost	Institutional Responsibility
Construction	Poor sanitation and solid waste disposal in construction camps and work sites (sewerage, sanitation, waste management)	Provide adequately located and maintained latrines and waste disposal facilities All waste from the construction site will be disposed of in accordance with Azerbaijan environmental regulations and at sites approved by the MENR of Azerbaijan. Special contractors having permits for waste disposal will be used. The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in waste handling , waste treatment and waste storage. Burning of waste on any construction site is forbidden.	Criteria / specifications to be incorporated into bidding and contract documents.	Contractor , MED(PIU), Supervise and monitor Engineer;
Construction	Impact of construction wastes at the construction sites. Disposal of excess soil and rock.	Provide for disposal facilities agreed with the MENR of Azerbaijan. Allow local communities to utilize any excess rock, which may be left following reuse. For the rock disposal licensed borrow pits could be used. Rock disposal pits used for final disposal must meet the MENR requirements for Inert Landfills. All waste from the construction site will be disposed of in accordance with local environmental regulations and at sites approved by the Baku City Executive Power (BCEP). Hazardous wastes (contaminated rags; oil residue, paints etc.) will be disposed as agreed with MENR. The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in waste handling , waste treatment and waste storage	Criteria / specifications to be incorporated into bidding and contract documents.	Contractor , MED(PIU), Supervise and monitor Engineer;

Phase	Issue	Mitigating Measure	Cost	Institutional Responsibility
Construction	Air pollution from vehicle operations during construction in populated areas - notably Great Baku areas or densely settled rural areas. Local dust.	*Emissions and noise will be mitigated through:* o Adherence to engine maintenance schedules and standards to reduce air pollution. All vehicles and engines will be checked and repaired in case of need to eliminate increased emission due to damaged parts. All vehicles shall be maintained so that their noise and emissions do not cause nuisance to workers or local population. o Vehicle refueling will be undertaken so as to avoid fugitive emissions of volatile organic compounds through the use of fuel nozzles and pumps and enclosed tanks (no open containers will be used to stored fuel). *Mitigation measures against dust will include:* o Periodically water down or lightly oil temporary roads. o Wet or cover trucks carrying stone/ sand/ gravel; o Haul materials in off peak traffic hours. o The construction site will be watered as appropriate. o Apply sheeting of construction materials and storage piles; o Provide protective equipment to workers as necessary.	Included in the construction/rehabilitation cost. Criteria / specifications to be incorporated into bidding and contract documents.	Contractor , MED(PIU), Supervise and monitor Engineer;
	Potential indirect impact of the increased quarrying activities on ichthyofauna, groundwater and landscape	Control validity of licenses. (The license is given with description of exploration limits and reinstatement commitments). Control of vehicle operations. Avoid traverse of watercourse. Exclude leakage of oil or fuel. Check the condition of vehicles.	It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;
Construction and after care	The potential impacts related to the construction and operation of the camp could be summarized as follows: • Potential damage of topsoil • Contamination related to fuel storage and fuelling operations • Sewerage related contamination • Waste management	Proper waste management. • Organize sewerage according standards. • Pollution prevention strategies: proper organization of fueling, waste management; • Proper storage of topsoil • Reinstatement of topsoil and vegetation cover;	Included in the construction/rehabilitation cost.	Contractor , MED(PIU), Supervise and monitor Engineer;
	Impact of stagnant water bodies in borrow pits, quarries, etc. suited to mosquito breeding and other disease vectors.	Remove all created pools till spring-time. Reinstate relief and landscape.	Included in the construction/rehabilitation cost.	Contractor , MED(PIU), Supervise and monitor Engineer;

Phase	Issue	Mitigating Measure	Cost	Institutional Responsibility
	Impacts on archaeological sites and remnants	Permanent monitoring during land clearance and excavation activities. Stoppage and suspension of construction activities in case of archaeological findings. Completion of required archaeological works before restarting construction activities. Conservation of remnants	It is unknown at this stage of the project	Contractor , MED(PIU), Supervise and monitor Engineer;
	Hazardous driving conditions where construction interferes with pre- existing roads.	Provide in design for proper markers and safety signs on roads, including lights. Instruct the drivers	It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;
Construction	Lanscaping and establishment of sanitary protection zone; Final Reinstatement and Long-term Anti-erosion Measures	All the work sites (except permanently occupied by the facilities) should be reinstated to its initial conditions (relief, topsoil, vegetation cover). So far as very limited woodcutting and bush clearance is required for the highway upgrading, preservation of top-soil is sufficient for reinstating the natural grass vegetation cover. However, antierosion planting and special planting programme for landscaping should be implemented.	Included in the construction/rehabilitation cost.	Contractor , MED(PIU), Supervise and monitor Engineer;
Planning and Construction	Toxic / hazardous waste management	• All hazardous substances separated from the sites during waste transportation/disposal and held temporarily will be kept in tanks having information about waste content, characteristics and processing rules. • In order to prevent dissipating of those capacities, leakage of filtrates from the tanks they will be placed in hermetic containers. • Hazardous waste has to be transported by the organizations having a license for this type of activity. • Elimination/processing of hazardous waste has to be carried out by the organizations having a license for this type of activity. • Paints containing toxic components, leaden-based paints and solvents will not be used at the sites.	Included in the construction/rehabilitation cost. It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;
	Instability of the capping / dump due to the presence of voids.	Before final capping and rehabilitation, waste should be compacted as much as possible to minimize instability due to the presence of voids. Bulky waste that was improperly buried or protrudes from the edges of filled areas may need to be removed and disposed of correctly.	Included in the construction/rehabilitation cost. It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;
	Water migration contributes to leachate, causes instability, creates pollution etc.	Proper capping and vegetation as described in Section 5.	Included in the construction/rehabilitation cost. It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;

Phase	Issue	Mitigating Measure	Cost	Institutional Responsibility
	The gas emissions to atmosphere causes risks and pollution	Proper capping and gas collection/ control system should be implemented.	Included in the construction/rehabilitation cost. It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;
	Moisture within the cap must remain sufficiently stable to prevent cracking or other deformation.	Site caps must ensure that water infiltration through the cap is no more than 75% of the anticipated seepage rate through the landfill liner.	Included in the construction/rehabilitation cost. It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;
	The capping layer must be shaped to allow lateral drainage.	Steep slopes must be battered with the overall gradient being a maximum of 1 vertical to 3 horizontal.	Included in the construction/rehabilitation cost. It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;
	Instability of the site due to early application of capping and vegetation	Final capping and re-vegetation should be applied only after deposited refuse has settled and the area has become stable.	Included in the construction/rehabilitation cost. It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;
	Encrustation occur at the gas drainage layer	To prevent encrustation, the calcium carbonate content of the layer should not exceed 10% by weight.	Included in the construction/rehabilitation cost. It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;
	Cracking in the clay cap	A clay cap should not be left exposed for prolonged periods of time, as this will probably lead to cracking, which will increase infiltration rates. Clay will need to be replaced if cracking or desiccation occurs	It is not considered as a separate cost item.	Contractor/PIU
	Excess drainage cause restricted growth of vegetation as well as cracking of the cap.	A drainage layer comprised of coarse sand, pebbles or gravel directly above the clay layer will allow more rapid shedding of water and will reduce percolation through the cap. The drainage layer should be designed so that sufficient moisture remains in the final layer to support vegetation and prevent the cap from drying out and cracking. Water balance calculations incorporating local rainfall data should be used to confirm that these parameters will be met.	Included in the construction/rehabilitation cost. It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;

Phase	Issue	Mitigating Measure	Cost	Institutional Responsibility
	Compacted top soil restricts vegetation growth	Loose tipped soils will encourage deeper roots, providing wind stability, water and nutrient availability, and most importantly shoot growth.	Included in the construction/rehabilitation cost. It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;
	Surface Water contributes to leachate	A proper surface water drainage system to be established	Included in the construction/rehabilitation cost. It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;
	Restricted disposal of leachate accumulated in leachate tank cause operational and environmental problems	Proper solutions for each specific site may include treatment; or transport to a treatment plant; or recycling by watering the cap.	Included in the construction/rehabilitation cost. It is not considered as a separate cost item.	Contractor , MED(PIU), Supervise and monitor Engineer;
After-Care	Emissions to water, emissions to the atmosphere, and protection of land use and local amenity after site closure/rehabilitation.	A proper maintenance program should be implemented to avoid any such risks.	Included in the budget of the next technical service	TS/waste management operator; municipiality
	Large number of birds act as disease vectors	Increasing the number of cover up layers	Included in the budget of the next technical service	TS/waste management operator; municipiality
	Lack of a methane collection system causes a fire hazard	Using a gas torch to burn off the generated gas	Included in the budget of the next technical service	TS/waste management operator; municipiality
	The landfill and its operational facility may be aesthetically unpleasing	Placing a buffer zone around the site	Included in the budget of the next technical service	TS/waste management operator; municipiality
	Unauthorized dumping	The site should be secured to prevent unauthorized dumping.	Included in the budget of the next technical service	TS/waste management operator; municipiality

ANNEX 3.B. ECOLOGICAL MONITORING PLAN

Phase	**What** *parameter is to be monitored?*	**Where** *is the parameter to be monitored?*	**How** *is the parameter to be monitored/ type of monitoring equipment?*	**When** *is the parameter to be monitored-frequency of measurement or continuous?*	**Why** Is the parameter to be monitored (optional)?	**Cost (if not included in project budget) (US$)**	**Responsibility**
Construction	Landscape degradation;	At the construction site	Performance compliance;	Periodical (weekly) visits to the site	Landscaping of actual landfill site; Reinstatement of construction sites	Included in the budget for supervision of construction	Supervise and monitor Engineer11; Contractor;12 MED/PIU13
	Soil erosion.	In the areas of excavation works, cutting areas and steep slopes.	Performance compliance; Soils mechanical information	Weekly; During and after construction work	Antierosion measures (berms, drainage etc.)	Included in the budget for supervision of construction	Supervise and monitor Engineer; Contractor; PIU ;
	Soil and water pollution.	In the watercourses.	Performance compliance; Analyses of water samples.	Weekly; Before the construction starts and during construction	Pollution prevention measures (refuelling, maintenance, oil spill kits, runoff catchments etc.)	Included in the budget for supervision of construction	Supervise and monitor Engineer; Contractor; PIU ;
	Ground water pollution.	In the wells in the area incl. the observation well made during the feasibility survey.	Performance compliance monitoring; Analysis of water samples.	Weekly; Before and during construction works.	To mitigate potential negative effects.	Included in the budget for supervision of construction	Supervise and monitor Engineer; Contractor; PIU ;

11 Project supervision engineer bears responsibility for adherence to the contract and project implementation supervision in accordance with the terms of the contract.
2 Contractor bears responsibility for the project implementation in compliance with the environmental protetcion regulations and Ecological Monitoring Plan.
3 MED (PIU) is responsible for control and implementation of the project

Phase	What *parameter is to be monitored?*	Where *is the parameter to be monitored?*	How *is the parameter to be monitored/ type of monitoring equipment?*	When *is the parameter to be monitored-frequency of measurement or continuous?*	Why Is the parameter to be monitored (optional)?	Cost **(if not included in project budget) (US$)**	Responsibility
Construction	Air pollution/dust	At working site	Site inspection. Performance compliance monitoring;	Daily; During earth work. Every 2 months; unannounced	To assure compliance with the Air Pollution Control Regulation in order to mitigate any potential negative environmental effects.	Included in the budget for supervision of construction	Supervise and monitor Engineer; Contractor; PIU ;
	Noise	At working site	Site inspection and measuring the noise levels (dB); equipment	Once a month or on complaint	To assure compliance with the Noise Control Regulation in order to mitigate any potential negative environmental effects	Included in the budget for supervision of construction Additional cost in case of portable equipment usage – 15000 US$	Supervise and monitor Engineer; Contractor; PIU ;
	Conservation of Eco resources	At working site	Inspection	Preentry survey; When cutting and restoring used areas. Landscaping;	Preentry survey and preconstruction mitigation measures; Reinstatement	Included in the budget for supervision of construction	Supervise and monitor Engineer; Contractor; PIU ;
	Construction Wastes; Spoil disposal;	At working site Disposal site	Performance compliance monitoring;	Daily Monthly	To assure compliance with the Waste Removal Regulation	Included in the budget for supervision of construction	Supervise and monitor Engineer; Contractor; PIU ;
	Handling of hazardous materials.	On site	Inspection	Unannounced inspections during work	To assure compliance with the Hazardous Waste Removal Regulation	Included in the budget for supervision of construction	Supervise and monitor Engineer; Contractor; PIU ;

Phase	What *parameter is to be monitored?*	Where *is the parameter to be monitored?*	How *is the parameter to be monitored/ type of monitoring equipment?*	When *is the parameter to be monitored-frequency of measurement or continuous?*	Why Is the parameter to be monitored (optional)?	Cost **(if not included in project budget) (US$)**	Responsibility
	Handling Asbestos Containing Material	At the illegal dumps and final Disposal Site	In accordance with the plan be prepared. inspection; observation	In accordance with the plan to be prepared.	To assure compliance with the Directive for Handling of Asbestos Products in order to mitigate any potential negative environmental effects	Included in the budget for supervision of construction	Supervise and monitor Engineer; Contractor; PIU ;
Construction	Transportation inert materials	Quarries;	Performance compliance monitoring;	Unannounced inspections during work.	Quarries License	Included in the budget for supervision of construction	Supervise and monitor Engineer; Contractor; PIU ;
	Staff safety	At work site	Inspection	Unannounced inspections during work	Use of protective equipments, following the safety rules.	Included in the budget for supervision of construction	Supervise and monitor Engineer; Contractor; PIU ;
	Overall workers' camp site conditions.	On the camp site during construction activities	Inspection	According to the existing regulations	To assure protection of workers at site	Included in the budget for supervision of construction	Supervise and monitor Engineer; Contractor; PIU ;
Construction	Groundwater quality -Contamination -Groundwater flow -Quantity variations	In the wells in the area incl. the observation well made during the feasibility survey.	Sampling and analysis	Every 6 months.	To mitigate potential negative effects.	40000 US$	Contractor; PIU ; TS/ Solid Waste Operator;

Phase	What *parameter is to be monitored?*	Where *is the parameter to be monitored?*	How *is the parameter to be monitored/ type of monitoring equipment?*	When *is the parameter to be monitored-frequency of measurement or continuous?*	Why Is the parameter to be monitored (optional)?	Cost **(if not included in project budget) (US$)**	Responsibility
	Surface water quality -contamination -flow	Downstream of site	On the basis of groundwater sampling.	Monthly	To observe the effect of the existing dump on SW, and to determine any leaks in the protective layers	15000 US$	Contractor; PIU ; TS/ Solid Waste Operator; Supervise and monitor Engineer;
	Leachate	Leachate treatment facilities: a) collector b) Outlet	Sampling and analysis	Monthly	To prevent pollution of the environment, to determine the composition of the leachate and its potential risks	10000 US$	Contractor; PIU ; TS/ Solid Waste Operator; Supervise and monitor Engineer;
	Released gas	At the exit end of the pipe	Sampling and analysis	Monthly	To prevent release of pollutants, Green house gasses to atmosphere	Additional cost in case of Portable equipment usage -20000 US$	Contractor; PIU ; TS/ Solid Waste Operator; Supervise and monitor Engineer;
	Air pollution/dust	At working (glossed waste dumps) site	Sampling and analysis	Every 2 months; unannounced	To assure compliance with the Air Pollution Control Regulation in order to mitigate any potential negative environmental effects.	Additional cost in case of Portable equipment usage -10000 US$	Contractor; PIU ; TS/ Solid Waste Operator; Supervise and monitor Engineer;
	Noise	At working site	Site inspection and measuring the noise levels (dB); equipment	Every 6 months	To assure compliance with the Noise Control Regulation	Additional cost in case of portable equipment usage -10000 US$	Contractor; PIU ; TS/ Solid Waste Operator; Supervise and monitor Engineer;

Phase	What *parameter is to be monitored?*	Where *is the parameter to be monitored?*	How *is the parameter to be monitored/ type of monitoring equipment?*	When *is the parameter to be monitored-frequency of measurement or continuous?*	Why Is the parameter to be monitored (optional)?	Cost **(if not included in project budget) (US$)**	Responsibility
	Conservation of Eco resources	At working site	Inspection	When cutting and restoring used areas.	When cutting and restoring used areas.	Included in the budget for supervision of construction	Contractor; PIU ; TS/ Solid Waste Operator; Supervise and monitor Engineer;
After Care	Atmospheric water collection	On site	Observation	After major deposition of water Once a 6 month	To prevent increase in liquid collection and possible spreading of pollution.	Criteria / specifications to be incorporated into proposal and contract documents.	TS/ Solid Waste Operator; MED (PIU); MENR
	Landslides	On site	Observation	Bimonthly, - during the other routine observations	To prevent re-opening of the site.	Criteria / specifications to be incorporated into proposal and contract documents.	TS/ Solid Waste Operator; MED (PIU); MENR
	Leachate seepage	On site, Downstream of the landfill	Groundwater bore holes, sampling and analysis	At least once a every six months	To observe the variations after the site has been closed	Included in the technical service cost. 10000 US$	TS/ Solid Waste Operator; MED (PIU); MENR
	Groundwater quality -Contamination -Groundwater flow -Quantity variations	Downstream of the landfill	Groundwater bore holes, sampling and analysis	At least once a every six months	To observe the variations after the site has been closed, to monitor contamination	Included in the technical service cost. 20000 US$	TS/ Solid Waste Operator; MED (PIU); MENR
	Surface water quality -contamination -flow	Downstream of the landfill	Sampling Downstream of landfill	At least once a every six months	To observe the variations after the site has been closed, to monitor contamination	Included in the technical service cost. 10000 US$	TS/ Solid Waste Operator; MED (PIU); MENR

Phase	What *parameter is to be monitored?*	Where *is the parameter to be monitored?*	How *is the parameter to be monitored/ type of monitoring equipment?*	When *is the parameter to be monitored-frequency of measurement or continuous?*	Why Is the parameter to be monitored (optional)?	Cost **(if not included in project budget) (US$)**	Responsibility
After Care	Landfill Gas* / Released gas	On site	On release end of the pipes	At least once a every six months	To observe the variations after the site has been closed, to monitor contamination. Where landfill gas is not collected, regular monitoring should be undertaken to detect whether landfill gas presents a source of odour or an explosion or toxicity hazard, and to estimate greenhouse gas emissions.	Included in the technical service cost. Additional cost in case of Portable equipment usage -20000 US$	TS/ Solid Waste Operator; MED (PIU); MENR
	Land Settlement	On Site	Visual and or by installments	Regular basis, and more frequent during heavy rains and storms	Precautions to prevent big landslides and deformation of the cap	Insignificant Included in the technical service cost.	TS/ Solid Waste Operator; MED (PIU); MENR
	Vegetation	Topsoil/ vegetation	Visual	Regularly within first 2 years	to identify areas of stunted growth or dieback, successful species, soil condition, soil moisture levels, and other parameters as required.	Insignificant Included in the technical service cost.	TS/ Solid Waste Operator; MED (PIU); MENR
						TOTAL: 180000 US$	

* - In the places with peculiar odour the ground monitoring should include hydrogen sulfide concentration.

ANNEX 4.THE MINUTES OF THE PUBLIC DISCUSSIONS

MINUTES
of public debates held in Lokbatan settlement of the Garadag district

17.03.2011

Participants:

Experts of ACEP Company –Suleymanov Manaf and Garayev Asif
Chairman of the settlement municipality - Namazaliyev Nizami;
Member of the settlement municipality- Babayev SHahyar, Qurbanova Xayala, İsmayılov Ruslan**,** Dashdıyev Azer, Hyuseynova Qaranfil, Ahmedov Tural;
The settlement residents – Bayramov Seyfeddin, Valiyeva Zeynabxanım, Mammedov Vyuqar, Salmanova Vyusala, Hyuseynov Azer,

Agenda: *Information about the project component "Assessment of the impact on environment for the waste dumps rehabilitation/closure activities in the Bigger Baku area including the Balakhany solid waste landfill" implemented by ACEP Company in the framework of the "Integrated Solid Waste Management" project and conducting social survey among the settlement residents*

The following participants spoke at the meeting:

Suleymanov Manaf, Expert spoke about the aims of the project and survey.

"Integrated Solid Waste Management" project supports the improvement of solid household waste management in the Baku city area, its achievement the international standards level. The project components are:
1. Rehabilitation and Management of the Balakhany Sold Household Waste Landfill. Improvement of operations carried out in the modern solid household waste landfills, prevention of these operations' negative impact on the environment and closure and rehabilitation of dump sites that are not used.
2. Closure and cleaning of illegal dump sites. Abolition of all illegal dump sites and transportation of waste collected here to the Balakhany landfill or other landfills made formal, rehabilitation of areas.
3. Closure of Surakhany and Garadagh landfills, their improvement for continuation of their activities or changing into transfer points.
4. Provision of waste collection equipment for a number of districts in the Baku city area (provision of waste-carrying transport, containers, waste bins).

As a result of the implementation of this project, the significant positive changes will take place in Baku in the area of waste management, systematic transportation of waste will be achieved.

ACEP LLC Company has been entrusted to implement the project component "Assessment of the impact on environment for the waste dumps rehabilitation/closure activities in the Bigger Baku area including the Balakhany solid waste landfill" in the framework of the "Integrated Solid Waste Management" project

Environment and Social Impact Assessment document will consist of 3 parts:

1-Plan of mitigating measures with Tables containing the impact characteristics, mitigating measures, public responsibility, estimated expenditures and schedule of these measures performance; 2- Plan of the Environment monitoring; 3- Evaluation of the institutional capacity for the implementation of ESIA and the activities for the capacity building, if necessary.

As the Lokbatan settlement is in the project area, we are conducting this meeting and we would like to know your opinion regarding the main problems of the settlement and, first of all collection of solid household waste collection.
The second issue is conducting a survey among the residents of your settlement and its aim is identifying waste collection and transportation problem in separate blocks of your settlement.
The presented questionnaire consists of 14 questions related to solid household waste. You are requested to kindly support us in the implementation of survey and participate in this survey.

Namazaliyev N.,* Chairman of Garadagh settlement municipality*: The role of Ilham Aliyev, President of Azerbaijan is very considerable in the development of the Garadagh district's Lokbatan settlement. The communal services to the settlement residents are rendered by the Departments of Housing and Public Utilities (DHPU), including collection and transportation of solid household waste and the difficulties in this area are solved immediately. The main difficulty is a lack of waste bins and waste collecting transport.
The Garadagh solid household landfill is situated in the settlement and its closure or change into transfer point will lead to opening of new workplaces, improvement of the ecological situation.
A part of the settlement residents participate in today's meeting and I hope that they will participate in the social survey.

QUESTIONS:

1. Namazaliyev N: One of the project components means closure of the Garadagh landfill, its improvement or changing into transfer point. What is recommended by the project?
2. Ismayilov R: Some districts of Baku will be provided with necessary waste collecting equipment. Are the Garadagh district and Lokbatan settlement Binagadi in that list?
***3.* Gurbanova Kh:** How will the information got during the survey be used?
4. *Bayramov S:* Will the public proposals and recommendations be reflected in the environment and social environment impact document?

ANSWERS TO QUESTIONS:

1. A question of the Garadahg landfill closure will be studied in the environment and social environment impact document. Its improvement or changing into transfer point is a matter of the future projects.
2. Inclusion of Garadagh district and Lokbatan settlement will be proposed.
3. Information got during the social survey will be used during the preparation of recommendations.
4. The proposals and recommendations received from 5 settlements will be used in the environment and social environment impact document.

MINUTES
of public discussions (debates) held in Yeni Surakhani settlement of the Surakhani district
26.04.2011

Participants:

Experts of ACEP Company –Suleymanov Manaf and Garayev Asif
Qəsəbə icra nümayəndəsi - Hacıyev Mirzə Əli o.;
Chairman of the settlement municipality - Babayev Elnur Arif o.
Member of the settlement municipality – Gafarov Emin, Ibrahimov Gabil, Melikov Vagif, Mammedova Saida, Rahimov Agasaf
The settlement residents – Nagıyev Syulhaddin, Bayramov Bahadır, Hyuseynov Nizami, Zakiyev Rafig

Agenda: *Information about the project component "Assessment of the impact on environment for the waste dumps rehabilitation/closure activities in the Bigger Baku area including the Balakhany solid waste landfill" implemented by ACEP Company in the framework of the "Integrated Solid Waste Management" project and conducting social survey among the settlement residents*

The following participants spoke at the meeting:

Suleymanov Manaf, Expert spoke about the aims of the project and survey.

"Integrated Solid Waste Management" project supports the improvement of solid household waste management in the Baku city area, its achievement the international standards level. The project components are:

1. Rehabilitation and Management of the Balakhany Sold Household Waste Landfill. Improvement of operations carried out in the modern solid household waste landfills, prevention of these operations' negative impact on the environment and closure and rehabilitation of dump sites that are not used.
2. Closure and cleaning of illegal dump sites. Abolition of all illegal dump sites and transportation of waste collected here to the Balakhany landfill or other landfills made formal, rehabilitation of areas.
3. Closure of Surakhany and Garadagh landfills, their improvement for continuation of their activities or changing into transfer points.
4. Provision of waste collection equipment for a number of districts in the Baku city area (provision of waste-carrying transport, containers, waste bins).

As a result of the implementation of this project, the significant positive changes will take place in Baku in the area of waste management, systematic transportation of waste will be achieved.

ACEP LLC Company has been entrusted to implement the project component "Assessment of the impact on environment for the waste dumps rehabilitation/closure activities in the Bigger Baku area including the Balakhany solid waste landfill" in the framework of the "Integrated Solid Waste Management" project

Environment and Social Impact Assessment document will consist of 3 parts:

1. Plan of mitigating measures with Tables containing the impact characteristics, mitigating measures, public responsibility, estimated expenditures and schedule of these measures performance; 2. Plan of the Environment monitoring; 3. Evaluation of the institutional capacity for the implementation of ESIA and the activities for the capacity building, if necessary.

As the Yeni Surakhani settlement is in the project area, we are conducting this meeting and we would like to know your opinion regarding the main problems of the settlement and, first of all collection of solid household waste collection.
The second issue is conducting a survey among the residents of your settlement and its aim is identifying waste collection and transportation problem in separate blocks of your settlement.
The presented questionnaire consists of 14 questions related to solid household waste. You are requested to kindly support us in the implementation of survey and participate in this survey.

Babayev Elnur**, **Chairman of Yeni Surakhany settlement municipality: Yeni Surakhany settlement is the youngest among the Surakhany district settlements (was founded in 1930-1936). Approximately 61% of the administrative area is unpopulated and the ecological situation there is very bad. In order to improve the ecological situation there, the work on renovation and draining the lakes formed at the mine site started together with SOCAR.
In order to improve the quality of communal services to the population, DHPU # 16 was established by SOCAR and the problems with collecting and transporting solid household waste lessened. Solid household waste landfill is located in the Surakhany district. But as its activities ceased, waste is transported to the Balakhany landfill. The ecological commission of the municipality keeps under control the cleaning work.

A part of the settlement residents participate in today's meeting and I hope that they will participate in the social survey.

QUESTIONS:

***1. Babayev E*:** Closure of the Surakhany landfill or its improvement or changing into transfer point is mentioned in the project you have presented. Which of the presented variants will be accepted?
2. Ibrahimov Q: There is a lack of solid household waste collecting equipment in Yeni Surakhany settlement (waste bins, containers, automobiles). Some districts of Baku will be provided with necessary waste collecting equipment. Can our settlement be included in that list?
3. Mammedova S: Will it be possible to get information about the waste landfills' ecological impact?

ANSWERS TO QUESTIONS:

1. A question of the Surakhany landfill closure will be studied in the environment and social environment impact document which is under preparation. Its improvement or changing into transfer point has not been accepted.
2. Yeni Surakhany settlement can be recommended for inclusion in a list for the supply of necessary waste collecting equipment.
3. The information about the ecological impact of waste landfills can be printed.

ANNEX 5. THE RESULTS OF THE SOCIOLOGICAL INQUIRY CARRIED OUT AMONG THE POPULATION OF THE BALAKHANY, BINAGADY, YENI SURAKHANY, LOKABATAN AND SHUVALAN SETTLEMENT

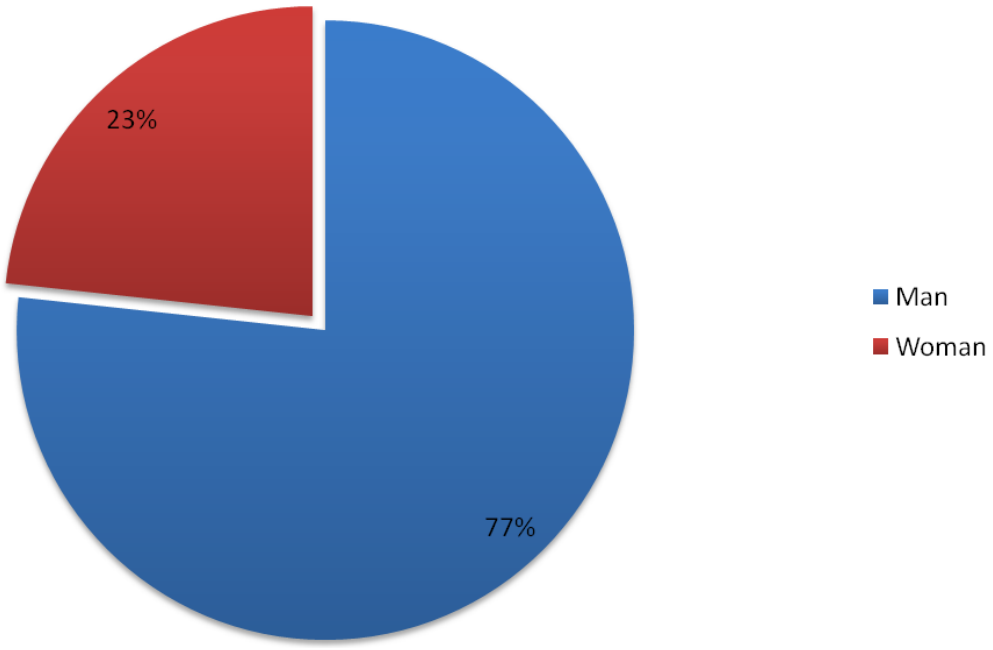
Table 1. Social and Demographic characteristics

Characteristics	Balakhany		Binagady		Yeni Surakhany		Shuvalan		Lokbatan		Total	
	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%
Demographic												
Sex	**33**	**100.0**	**33**	**100.0**	**30**	**100.0**	**30**	**100.0**	**30**	**100.0**	**156**	**100.0**
Man	13	39.4	19	57.6	23	76.7	18	60.0	20	66.7		
Woman	20	60.6	14	42.4	7	23.3	12	40.0	10	33.3		
Age group	**33**	**100.0**	**33**	**100.0**	**30**	**100.0**	**30**	**100.0**	**30**	**100.0**	**156**	**100.0**
18- 35 years	10	30.3	13	39.4	9	30.0	9	33.0	8	26.7		
36-45 years	1	3.0	11	33.3	6	20.0	7	23.3	6	20.0		
46-55 years	9	27.3	4	12.1	11	36.7	9	33.0	10	33.3		
56+ years	13	39.4	5	15.2	4	13.3	5	16.7	6	20.0		
Social												
Marital status	**33**	**100.0**	**33**	**100.0**	**30**	**100.0**	**30**	**100.0**	**30**	**100.0**	**156**	**100.0**
Single	8	24.2	9	27.3	8	26.7	5	16.7	5	16.7		
Married	25	75.8	24	72.7	22	73.3	25	83.3	25	83.3		
Financial status	**33**	**100.0**	**33**	**100.0**	**30**	**100.0**	**30**	**100.0**	**30**	**100.0**	**156**	**100.0**
High	0	0	4	12.2	-	-	-	-	4	13.3		
Average	22	66.7	21	63.6	19	63.3	8	26.7	21	70.0		
Low	11	33.3	8	24.3	11	36.7	22	73.3	5	16.7		
Education	**33**	**100.0**	**33**	**100.0**	**30**	**100.0**	**30**	**100.0**	**30**	**100.0**	**156**	**100.0**
Higher	10	30.3	21	63.6	11	36.7	12	40.0	12	40.0		
Specialized secondary	12	36.4	9	27.3	9	30.0	7	23.4	11	36.7		
Secondary	9	27.3	3	9.1	10	33.3	10	33.3	7	23.3		

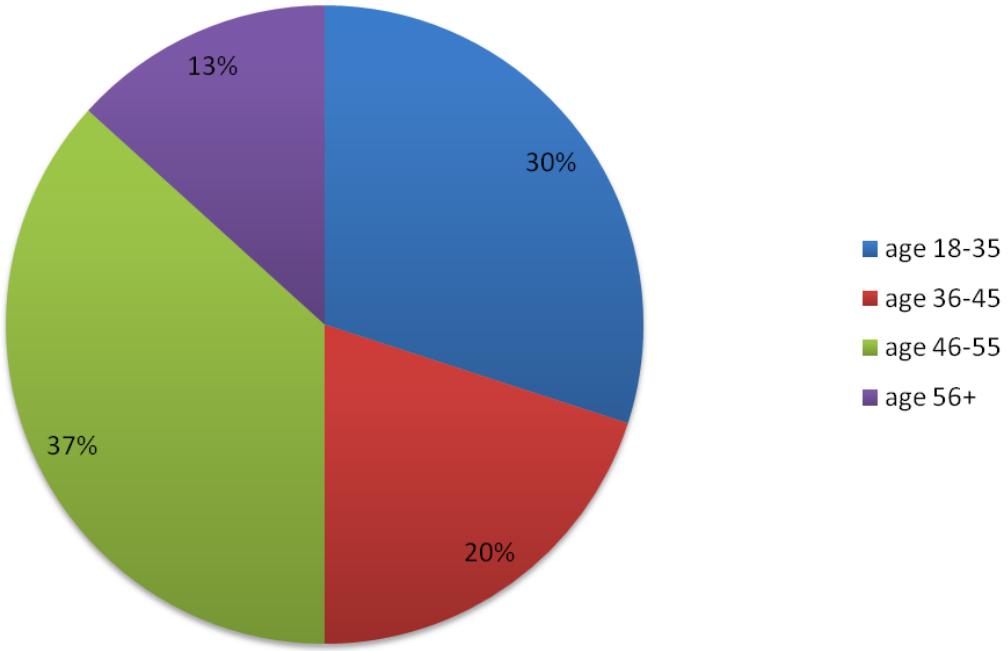
Post-primary	2	6.0	-	-	-		1	3.3	-	-		
Occupation	**33**	**100.0**	**33**	**100.0**	**30**	**100.0**	**30**	**100.0**	**30**	**100.0**	**156**	**100.0**
State sector	19	57.6	7	21.2	5	16.7	12	40.0	7	23.3		
Municipal sector	8	24.2	4	12.2	1	3.3	3	10.0	5	16.7		
Private sector	2	6.0	11	33.3	6	20.0	6	20.0	10	33.3		
Pensioner	1	3.0	1	3.0	3	10.0	3	10.0	3	10.0		
Unemployed	3	9.1	6	18.2	13	43.3	6	20.0	3	10.0		
Student	-	-	4	12.1	2	6.7	-	-	2	6.7		

Y. Surakhany settlement

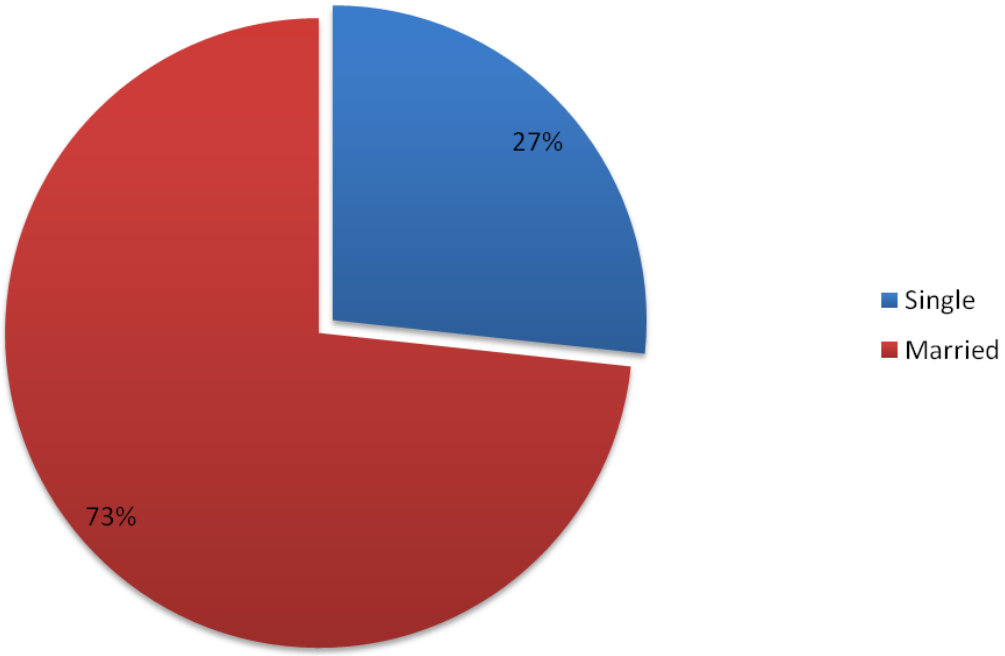
Among the respondents participating in the public inquiry there were 23 men (76.7%) and 7 women (23.3%).



Respondents' Age Group: 30% - 18-35 years, 20% - 36-45 years, 36.7% - 46-55, 13.3%-56+ years.

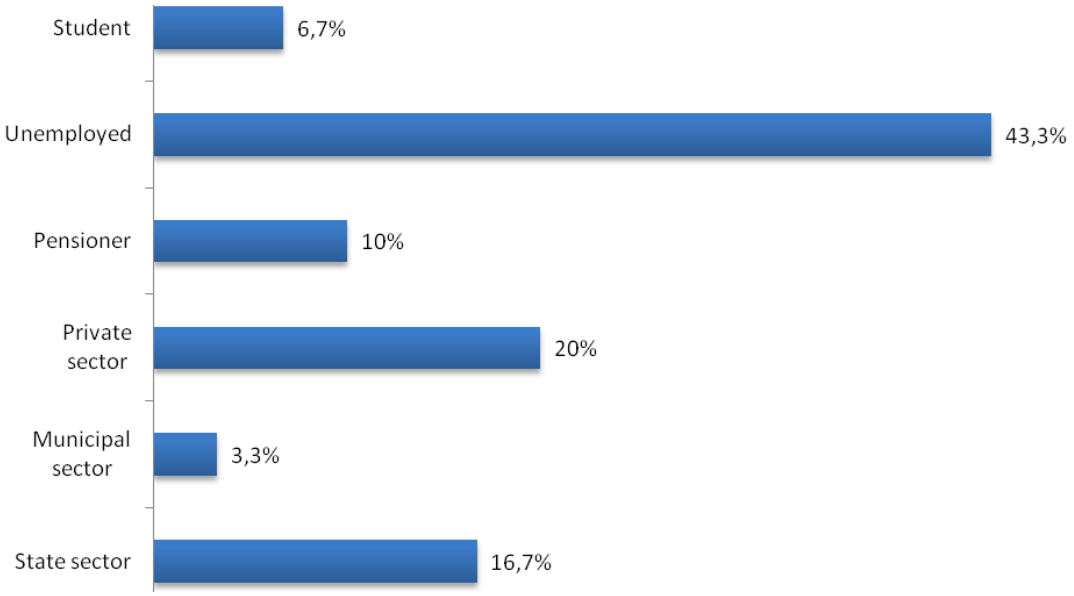


Raspondents' Marital Status: Married –73.3%, Singles – 26.7% .

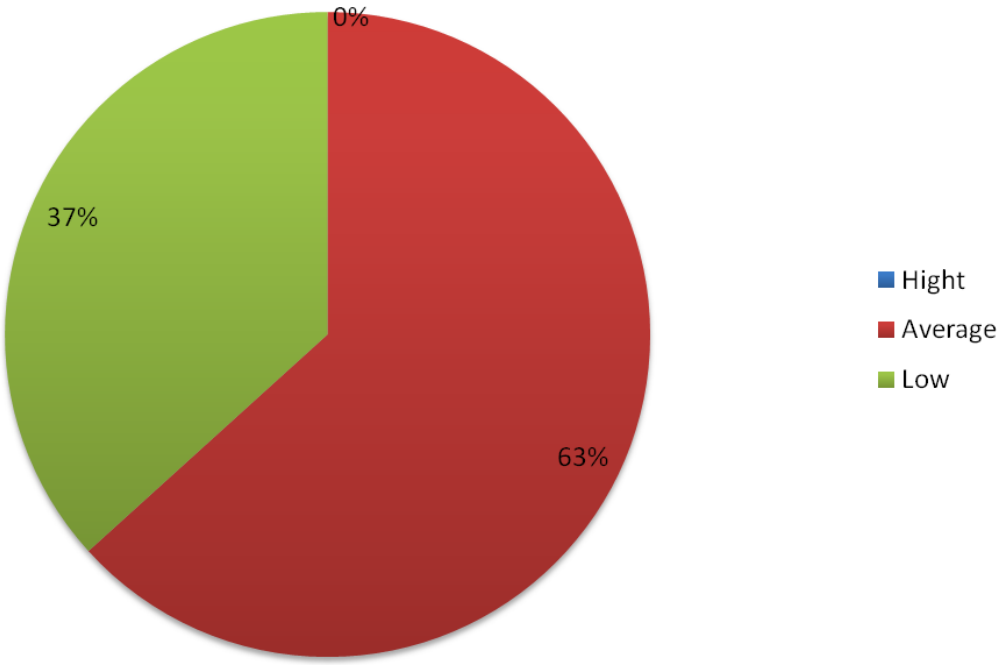


Respondents' Education: Higher - 30.3%, Specialized Secondary - 36.4%, Secondary –27.3%, Post-Primary - 6.0%.

Respondents' Occupation: State Sector – 17.6%, Municial Sector – 3.3%, Private Sector – 20.0%, Pensioner– 10.0%, Unemployed – 43.3%, Student -6.7%

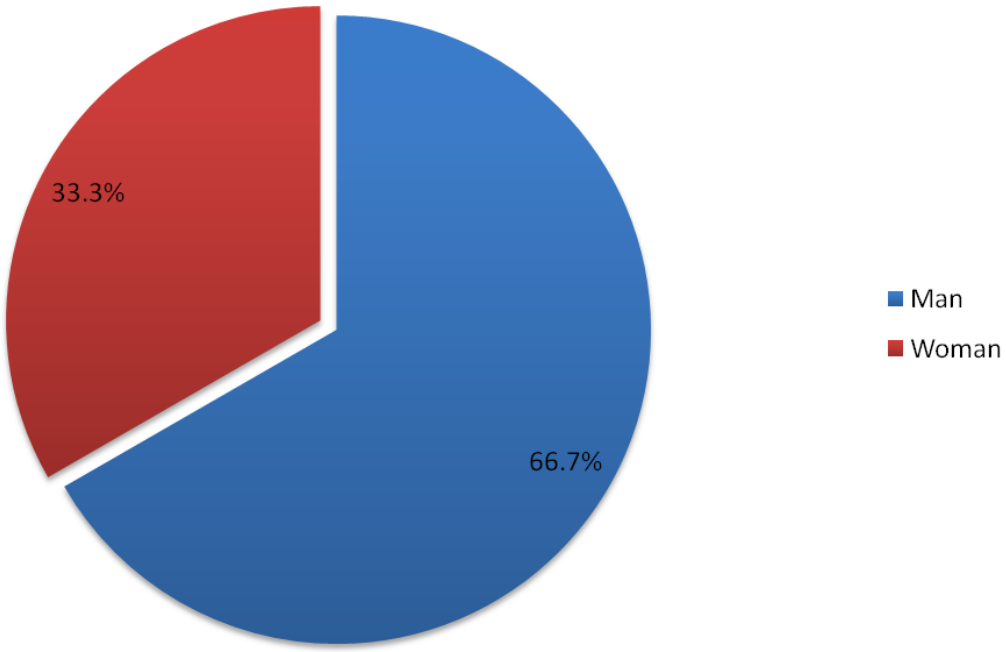


Respondents' Financial Status: 63.3% - Average, 36.7%- Low.

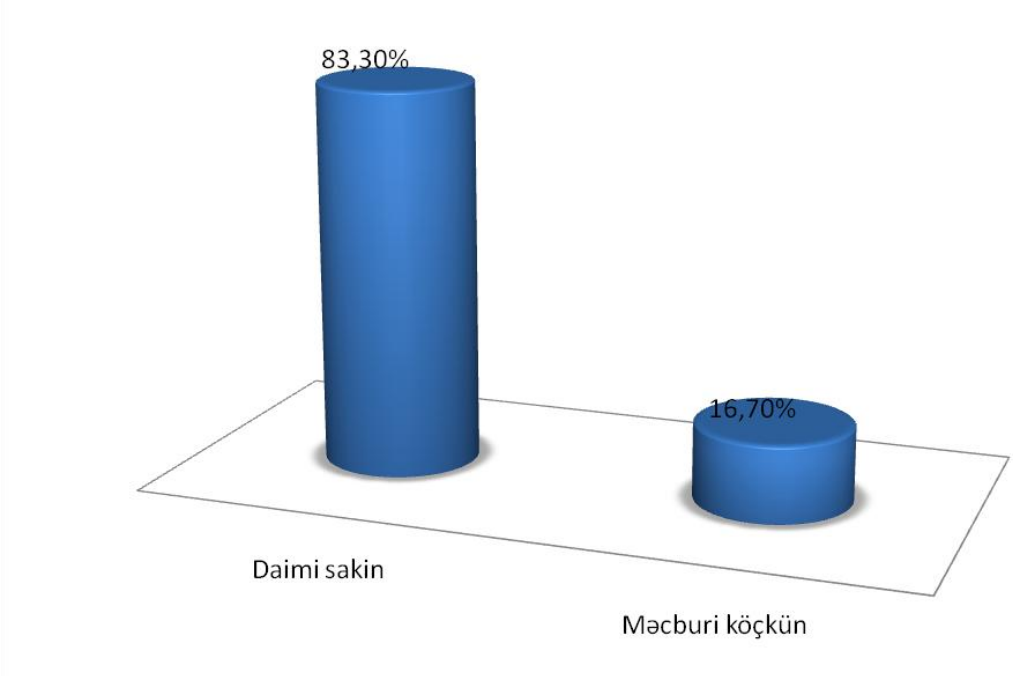


Lokbatan settlement

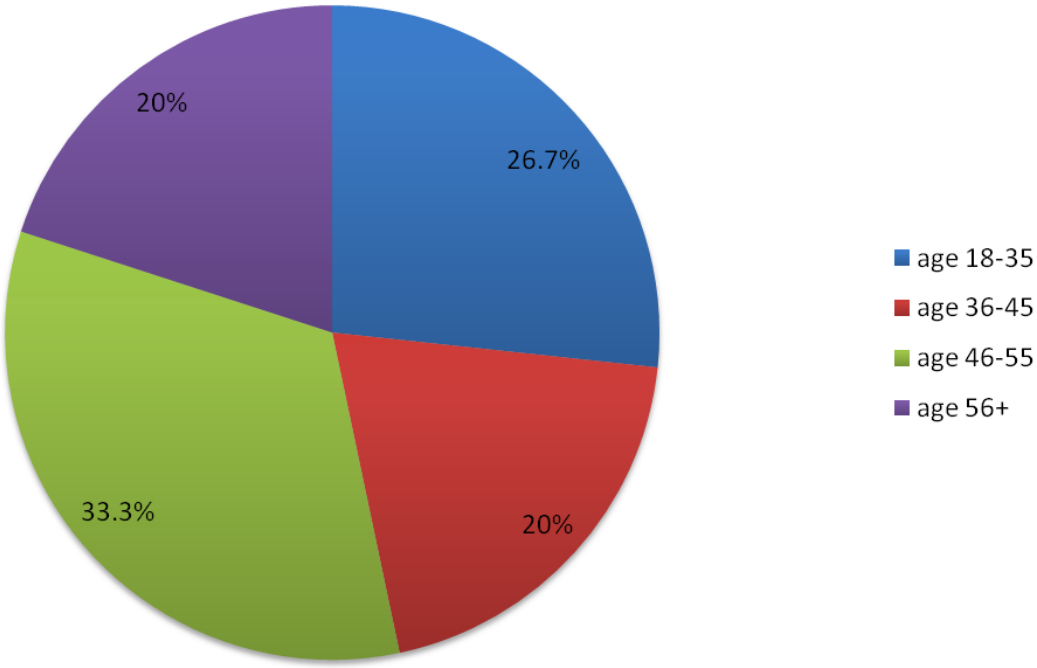
Among the respondents participating in the public inquiry there were 20 men (66.7%) and 10 women (33.3%).



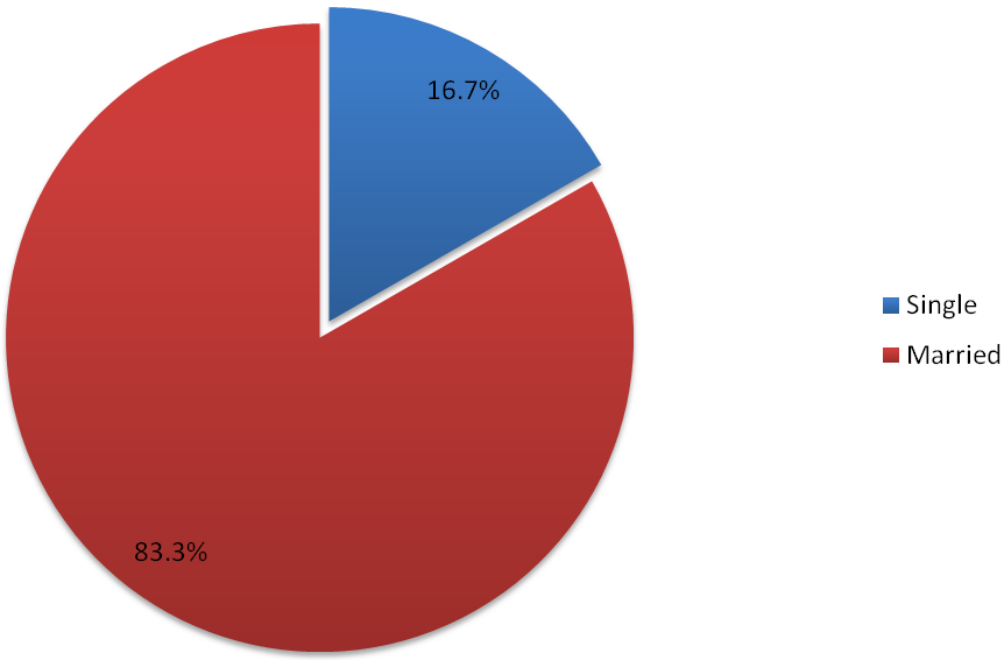
Among the respondents participating in the public inquiry there were 25 residents (83.3%) and 5 forced migrants (16.7%).



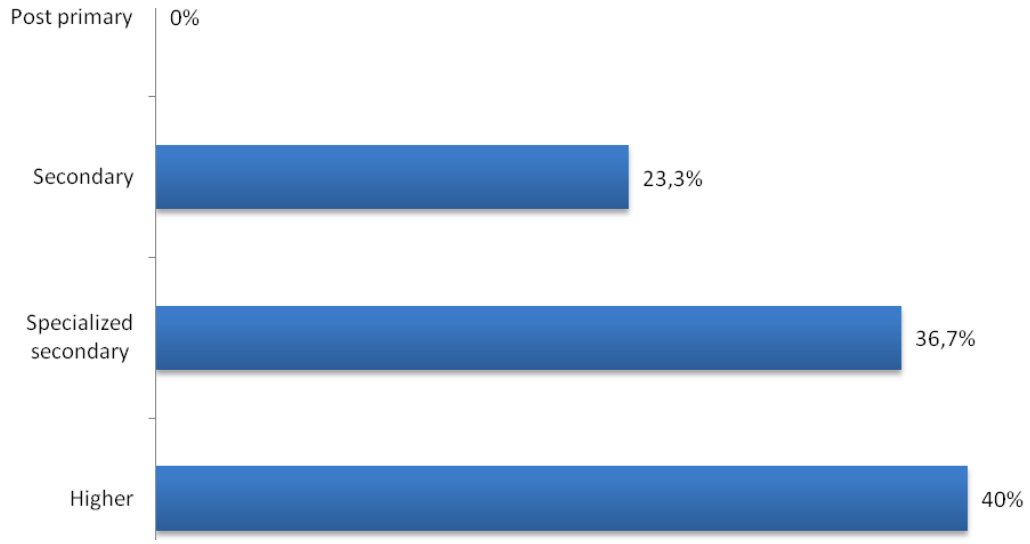
Respondents' Age Group: 26.7%-18-35 years; 20%-36-45 years; 33.3%-46-55 years, 20%-56+ years.



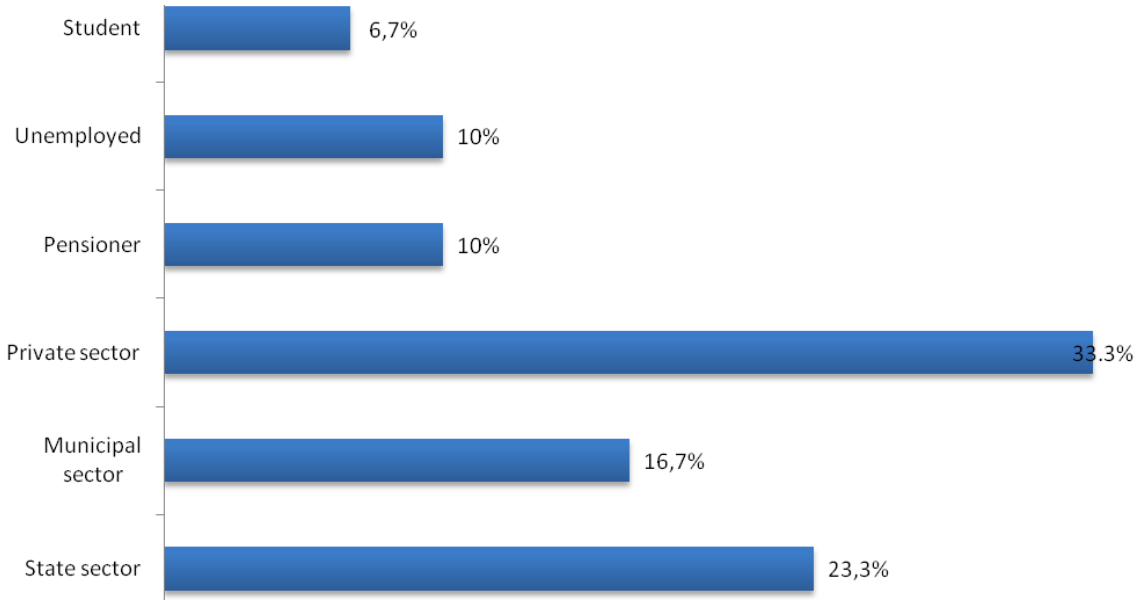
Respondents' Marital Status: 83.3% - Married; 16.7% - Singles.



Respondents' Education: Higher - 40%, Specialized Secondary - 36.7%, Secondary –23.3%.



Respondents' Occupation: State Sector – 23.3%, Municial Sector – 16.7%, Private Sector – 33.3%, Pensioner– 10%, Unemployed – 10%, Student -6.7%



Respondents' Financial Status: 13.3%- High; 70% - Average, 16.7%- Low.

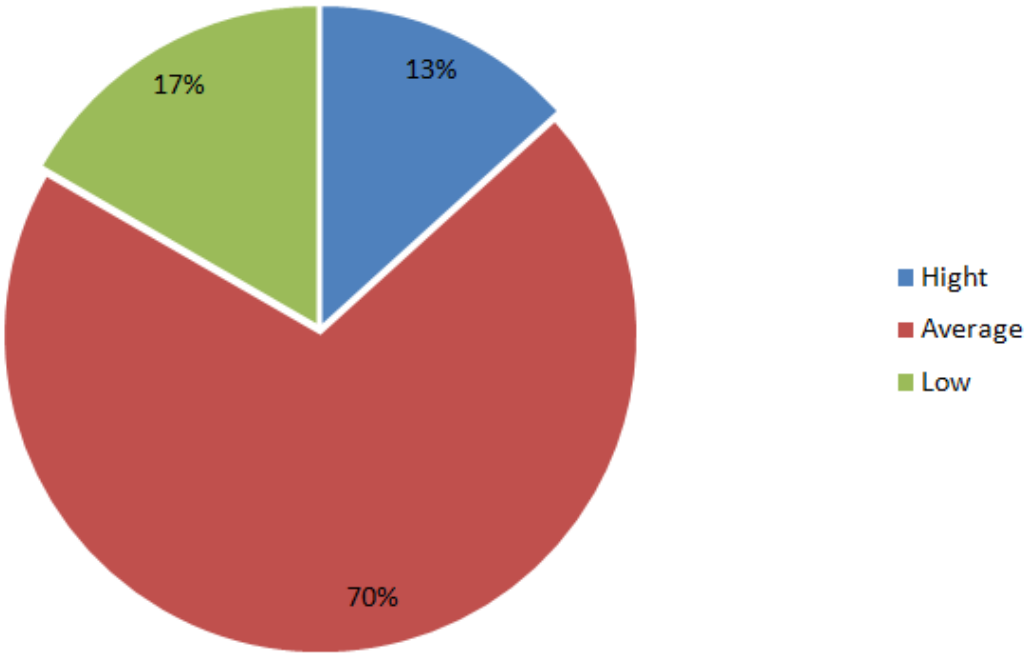


Table 2. Questions and Answers

	Balakhany	*Lokbatan*	*Binagady*	*Shuvalan*	*Yeni Surakhany*
1 – Collection of the Solid Waste					
1. Where do you usually discard your garbage?					
Garbage-cans	54.5	73.3	33.3	50.0	43.4
Fenced areas	18.2	10.0	57.6	26.7	40.0
Waste areas without appropriate conditions for the waste collection	27.3	13.3	3.0	23.3	13.3
Prohibited waste areas	0.0	3.3	6.1	0	13.3
2. Are there any waste collection sites near your houses?					
Garbage-cans	3.0	73.3	33.3	30.0	43.4
Fenced areas	9.1	10.0	54.6	30.0	40.0
Waste areas without appropriate conditions for the waste collection	30.3	16.7	3.0	20.0	13.3
No waste collection area	57.6	0.0	9.1	20.0	13.3
3. How often the garbage -cans are usually emptied?					
Once a day	3.0	36.7	21.2	36.7	43.3
Once every 3 days	9.1	46.7	54.5	23.3	43.3
Once a week	45.5	6.7	9.1	13.3	6.7
Rarely	36.4	3.3	9.1	13.3	3.3
Did not pay attention to this	6.0	3.3	6.1	13.3	3.3
2 – Sorting of the Solid Waste					
4. What do you know about the utilization of solid waste?					
Waste processing	18.2	33.3	78.8	60.0	60.0
Waste Re-cycling	51.5	50.0	15.6	26.7	30.0
Other	30.3	16.7	6.1	13.3	10.0
5. Do you usually sort your solid waste?					
Yes	12.1	16.7	9.1	10.0	23.3
No	87.9	83.3	90.9	90.0	76.7
6. If you do not sort your solid waste, please clarify the reason?					
All solid waste is usually discarded to the same garbage-cans.	42.4	30.0	27.3	16.7	50.0
There are no special-purpuse garbage-cans for each type of the solid waste.	45.5	56.7	69.7	76.6	50.0
Lack of time	12.1	10.0	-	6.7	-
Other	0.0	3.3	3.0	0	-
3 - Most dangerous types of solid waste					
7. Do you know that batteries, accumulators, luminous lamps, thermometers, radio/ TV /PC parts and others could be considered as the dangerous types of the solid waste?					
Yes	75.6	73.3	90.9	73.3	76.3
No	24.4	23.4	SAFEGUARD POLICIES6.1	20.0	20.0
Do not know	0.0	3.3	3.0	6.7	3.3
8. Where do you usually discard the dangerous waste?					

Together with the domestic garbage into the same garbage-cans.	87.9	53.3	90.9	66.7	80.0
In separate packages into the same garbage-cans.	12.1	46.7	9.1	33.3	20.0

	Balakhany	***Lokbatan***	***Binagady***	***Shuvalan***	***Yeni Surakhany***
4- Uncontrolled dumps					
9. Are there any uncontrolled dumps in your living area?					
Yes	45.5	30.0	30.3	23.3	36.7
No	39.4	66.7	60.6	70.0	63.3
Do not know	15.1	3.3	9.1	6.7	-
10. What negative impacts could have the discard of the soid waste on the prohibited areas?					
Human health	75.8	70.0	75.7	63.3	56.7
Pollution of soils and waters	18.2	16.7	24.3	30.0	40.0
Low impact or absence of the impact	0.0	3.3	-	0	-
Do not know	2.0	10.0	-	6.7	-
11. What is you opinion as to how could we prevent the uncontrolled discard of the solid waste to the prohibited areas?					
Clarifications	30.3	56.7	51.5	36.7	40.0
Penalties	12.1	6.7	21.2	13.3	56.7
Provision of the special areas for the solid waste collection purposes.	51.5	30.0	27.3	46.7	3.3
Do not know	6.0	6.7	-	3.3	-
12. What kind of information on the dump sites would you like to get from the ecologists?					
Ecological impact of these dump sites	33.3	46.7	69.7	36.7	40.0
Future status of these dimp sites	54.5	36.7	27.3	50.0	26.7
Do not know	12.2	16.6	3.0	13.3	30.3
5- Waste Fees					
13. Do you pay any fees for the waste removal?					
Yes	69.7	86.6	90.9	40.0	93.4
No	24.2	6.7	6.1	60.0	3.3
Do not know	6.1	6.7	3.0	0	3.3
14. What entity collects such waste fees?					
Local building-utilities administrative department	0	76.3	18.2	23.3	86.7
Minicipal housing department	24.2	3.3	45.5	0	3.3
Dumptrucks	45.5	6.7	27.3	16.7	6.7
Do not know exactly	30.3	13.3	9.1	60.0	3.3

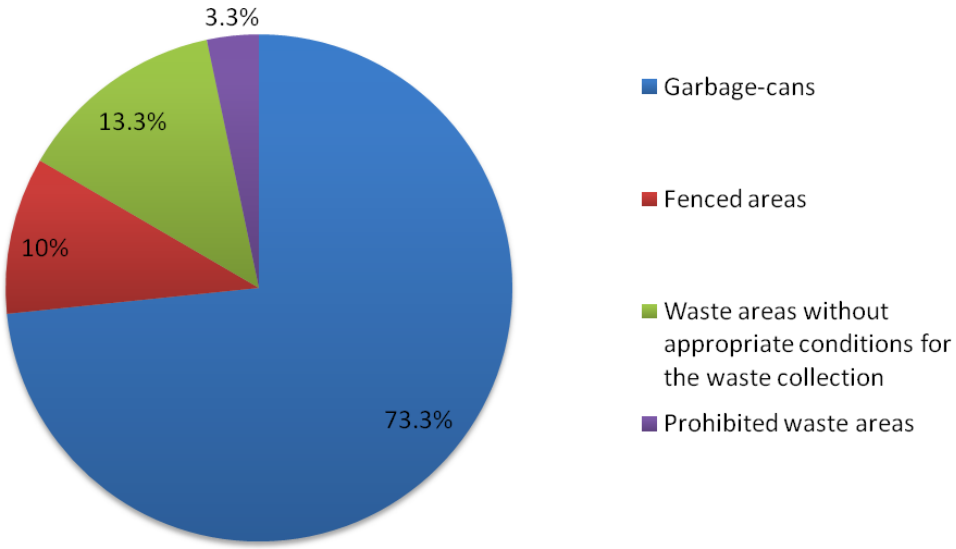
Summarize Infiormation

Lokbatan settlement

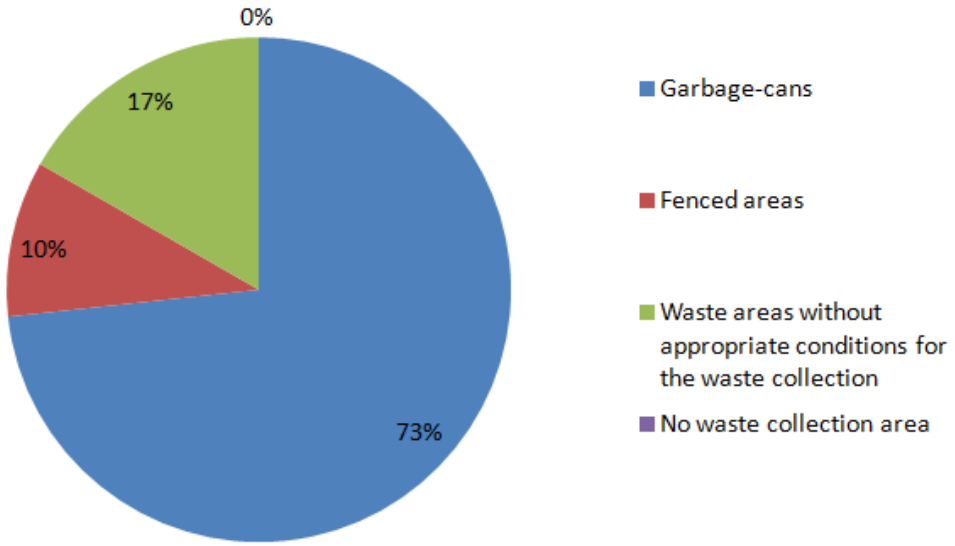
Upon the results of the review 30 questionaries have been considered as appropriate for the survey purposes.

1- Information on the collection of the solid waste:

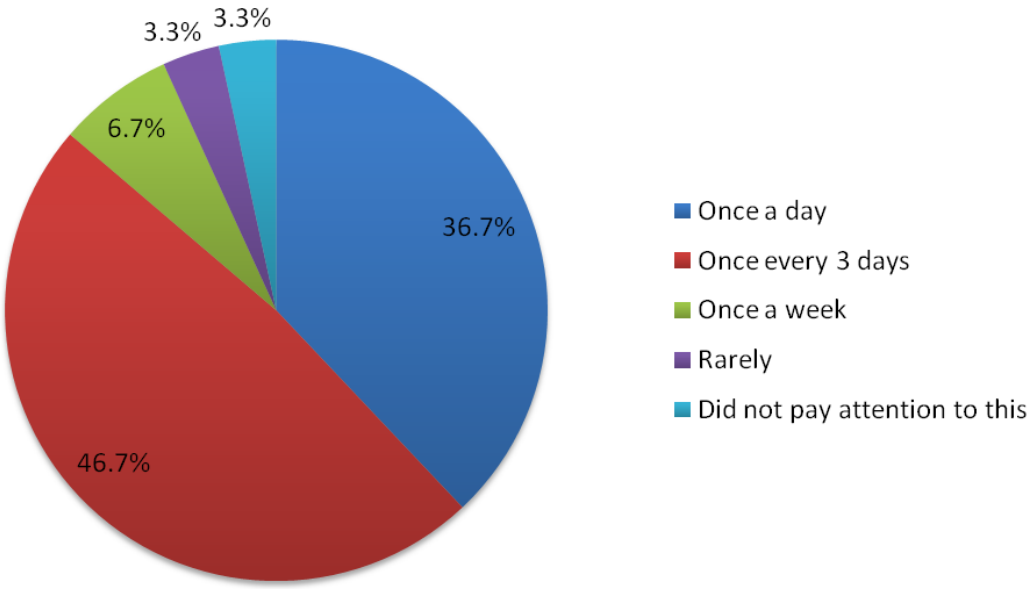
73.3% of respondents indicated that they usually discarded their waste into the garbage-cans, 10.0% - to the fenced areas and 16.6% - to some other areas.



73.3% repondents indicated that there were garbage-cans near their houses (in the yard), 10% said that there was a fenced area, and 16.7% stated that there was a site without appropriate conditions for the collection of garbage.

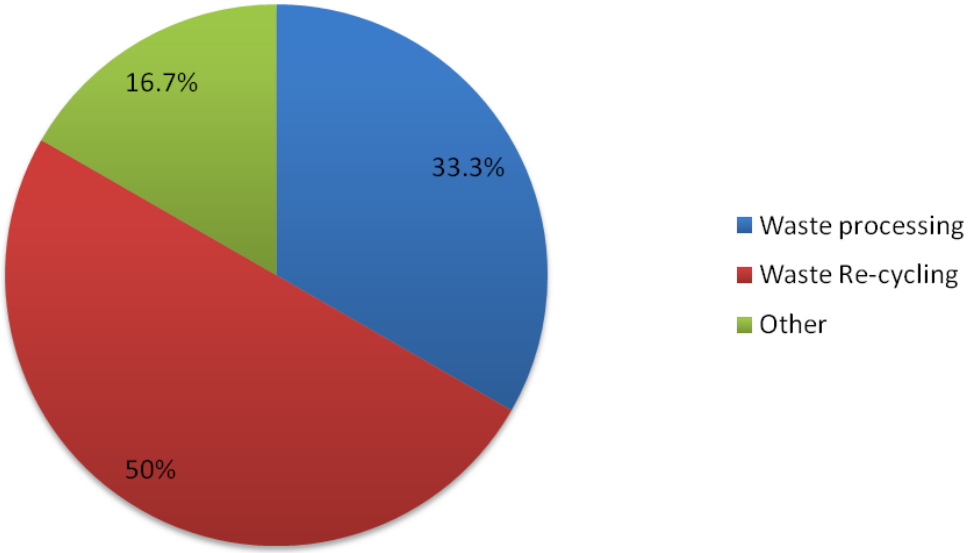


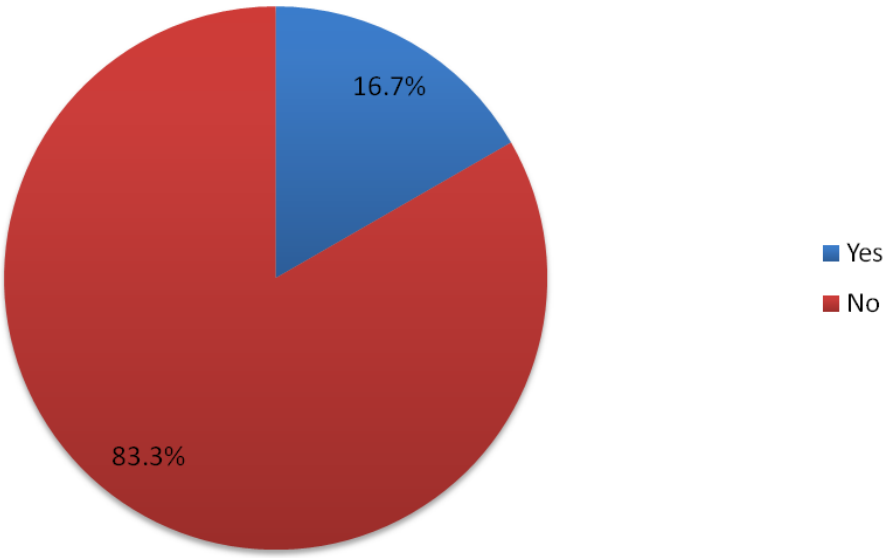
36.7% respondents noted that the garbage-cans near their houses were usually emptied once a day, 46.7% indicated that it happened every three days, and 6.7% said that the garbage-cans were emptied once a week. 3.3% indicated that the garbage-cans were emptied rarely.



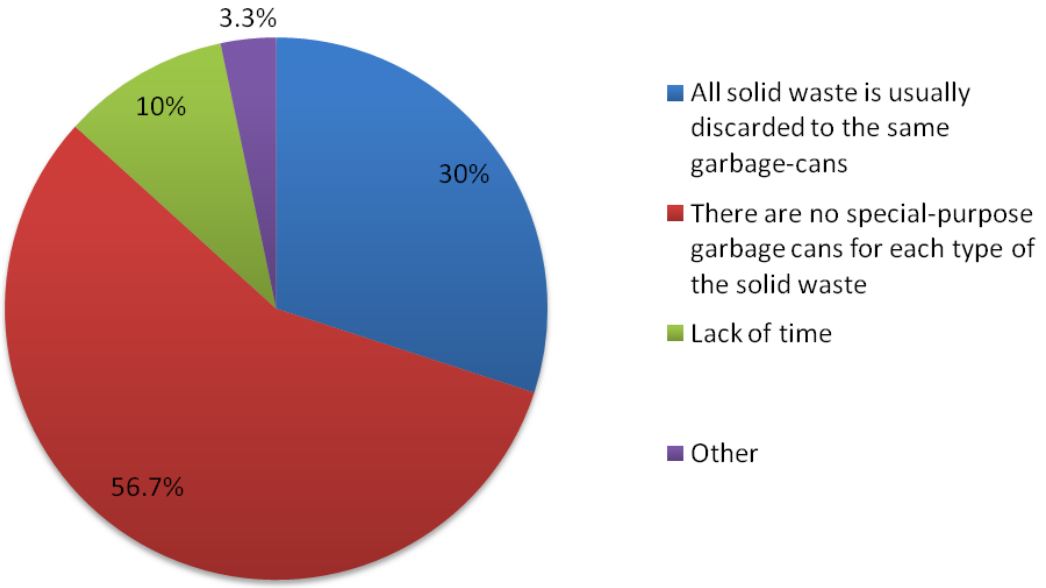
2 – Population's understanding of the issue the solid waste sorting:

83,3% of the respondents understand the reasons and importance of the solid waste sorting, however 83,3% do not sort domestic waste.



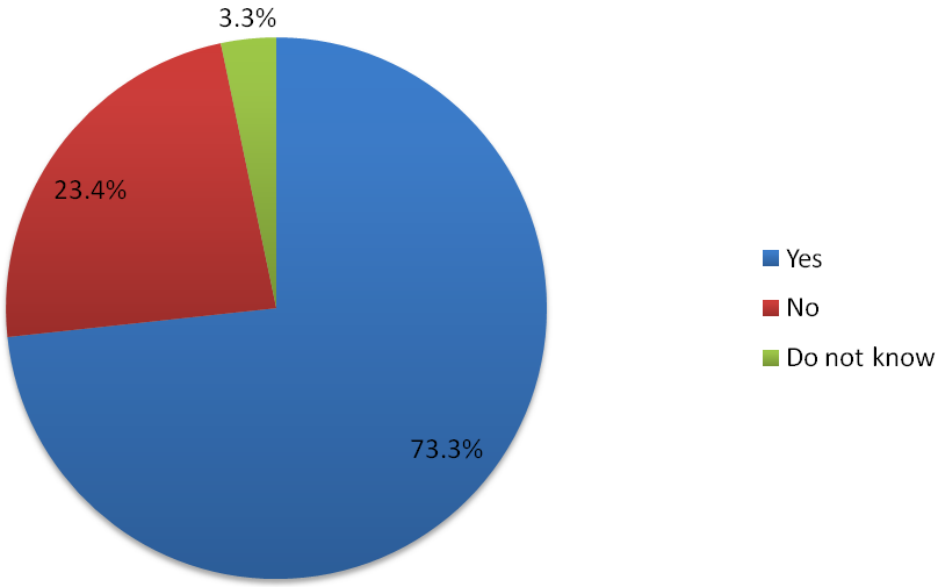


56.7% of respondents consider that the reasons for them not to sort the solid waste derived from the lack of the appropriate conditions (there are no special/separate garbage-cans for each type of the solid waste).

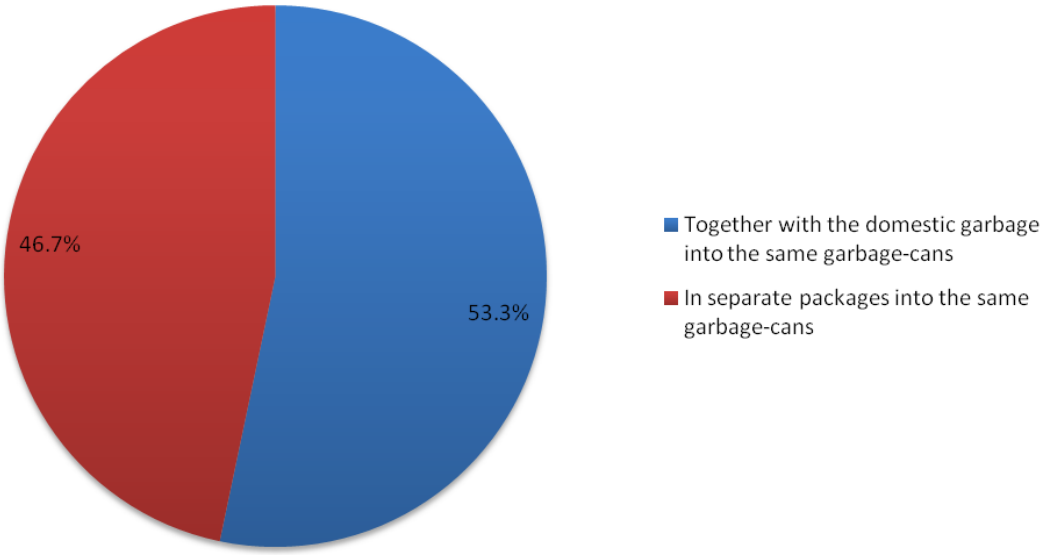


3- Information on the most dangerous types of the soid waste:

73.3% of respondets understand that the thermometers, batteries, accumulators, luminous lamps, radio/ TV /PC parts represent the dangerous types of the solid waste.

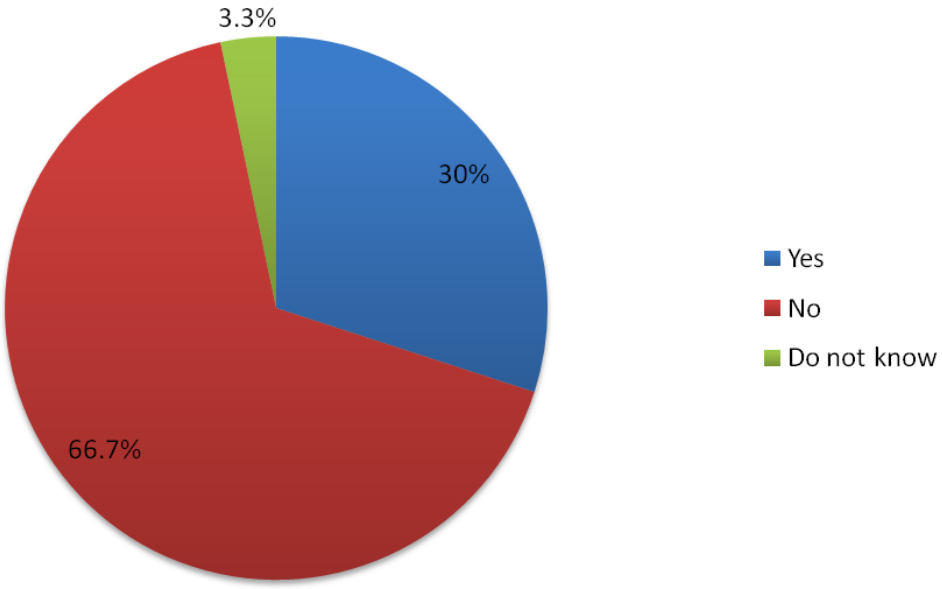


53.3% of respondents stated that they usually discard the dangerous types of the solid waste together with the domestic garbage, and 46.7% place it into the separate packages and throw out in the the same garbage-cans.

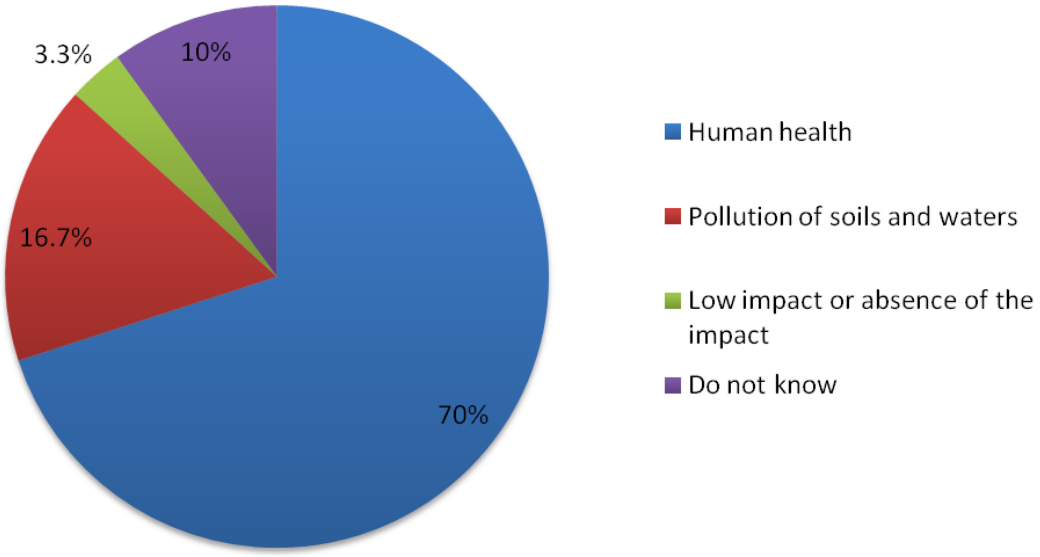


4- Unauthorized dumps

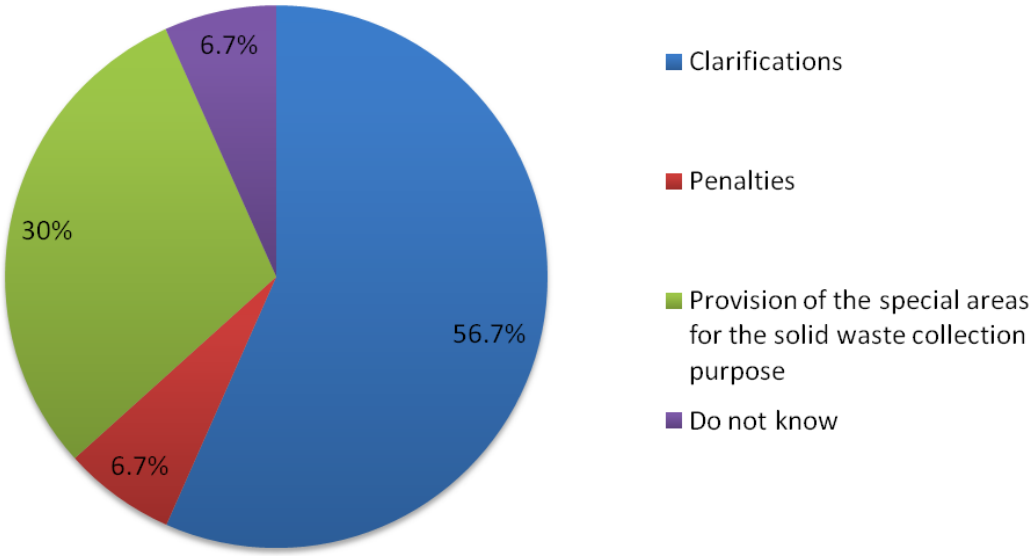
30% stated that there are unauthorized dumps in their area.



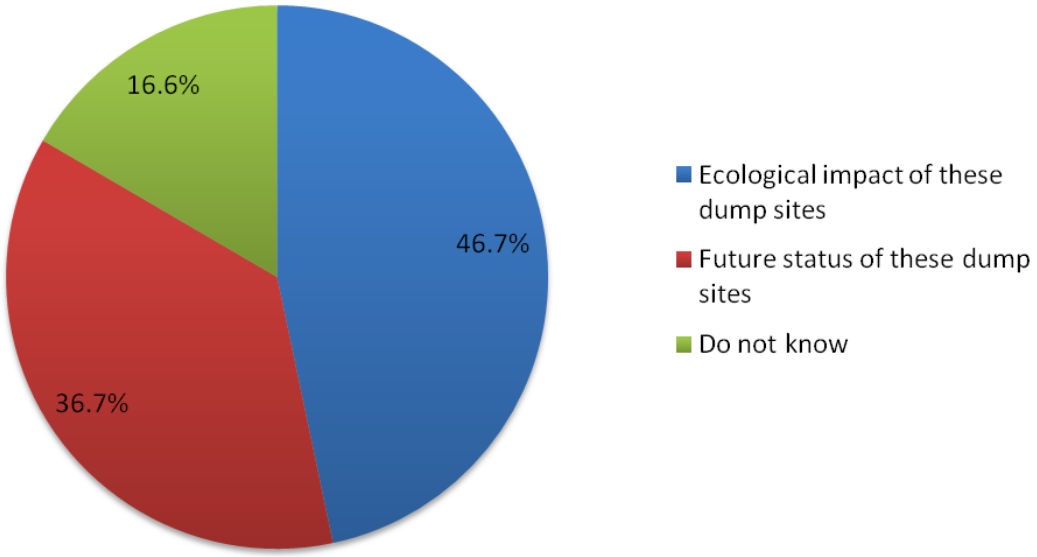
70% indicated that the discard of the solid waste to the prohibitied sites impacted the human health, and 16.7% noted that this resulted into pollution of the soils and waters.



30% of respondents think that there should be some special waste collection areas which will prevent the unauthorized and uncontrolled dump sites, 56.7% require clarifications and 6.7% penalties.

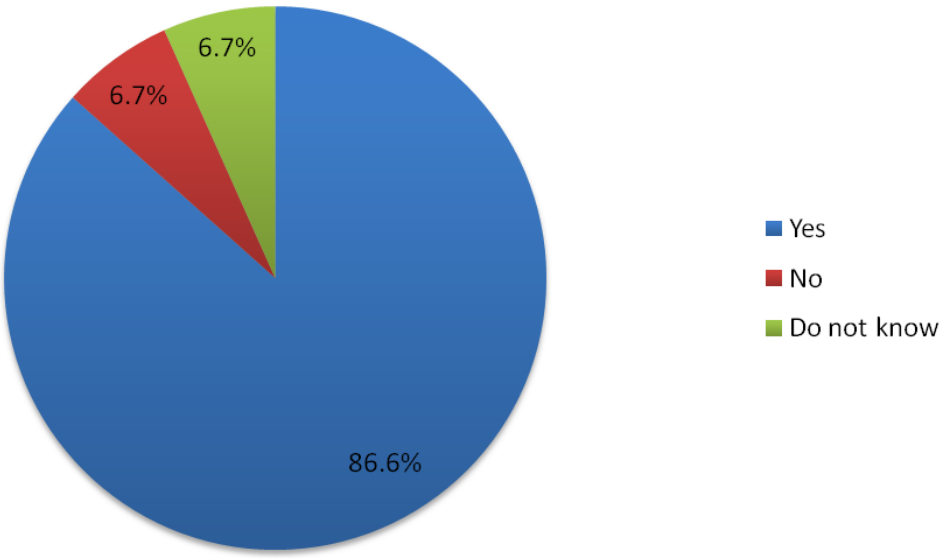


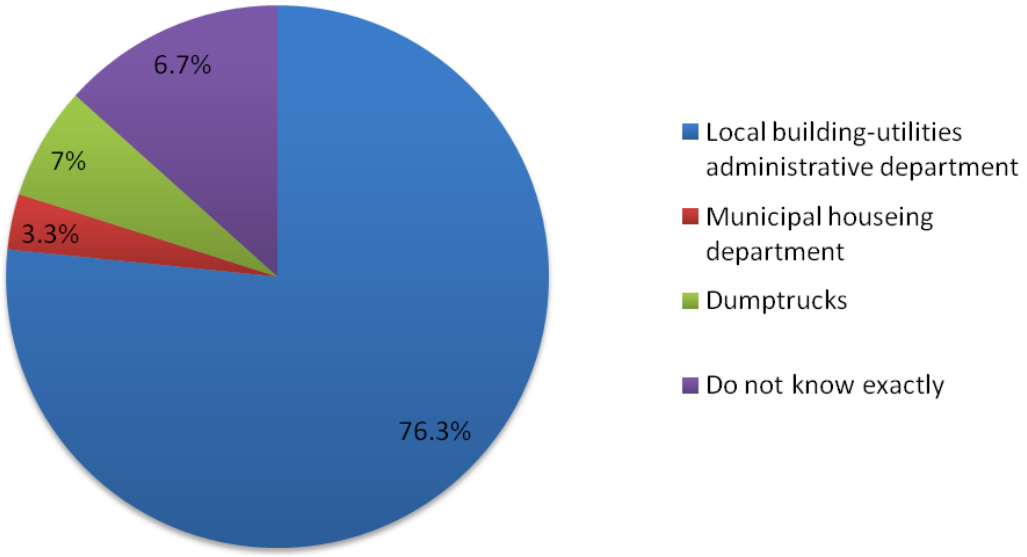
46.7% of respondents prefer to get the information on the ecological impact of the waste polygons, and 36.7% on the future status of such polygons.



5- Penalties

86.6% of respondents pay fees for the removal of waste, 76.3% pay directly to the Local building-utilities administrative department and 6.7% to the dumptrucks 3.3% to Municipal Housing Department.


6.7%
6.7%
86.6%
Yes
No
Do not know

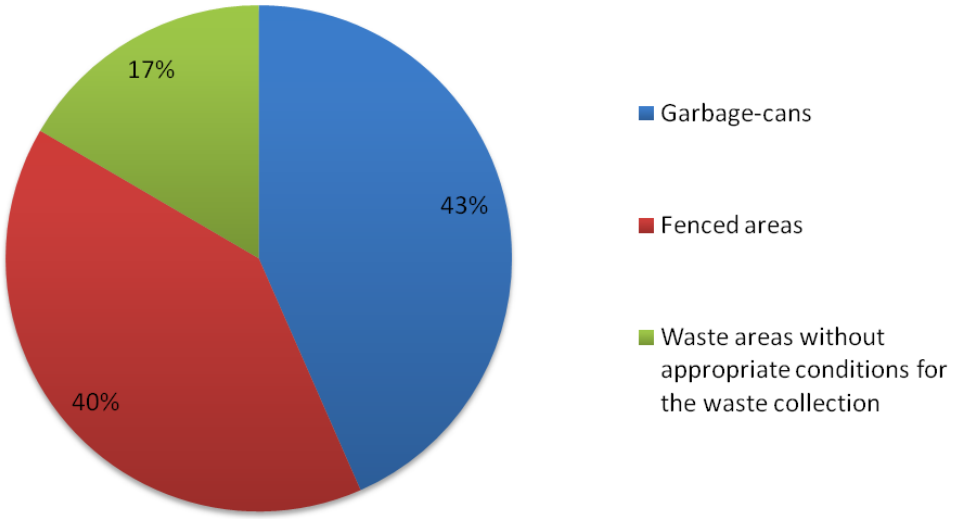

6.7%
7%
3.3%
76.3%
Local building-utilities administrative department
Municipal houseing department
Dumptrucks
Do not know exactly

Yeni Surakhany settlement

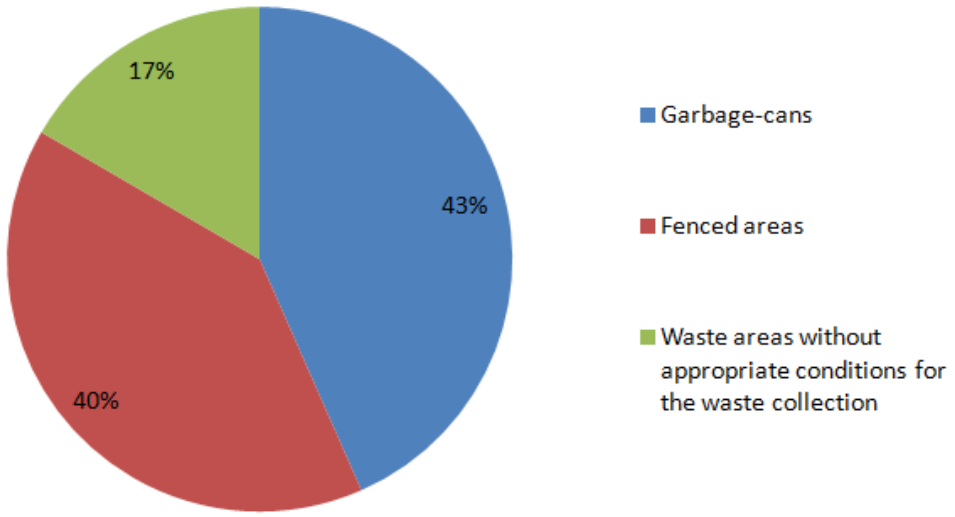
Upon the results of the review 30 questionaries have been considered as appropriate for the survey purposes.

1- Information on the collection of the solid waste:

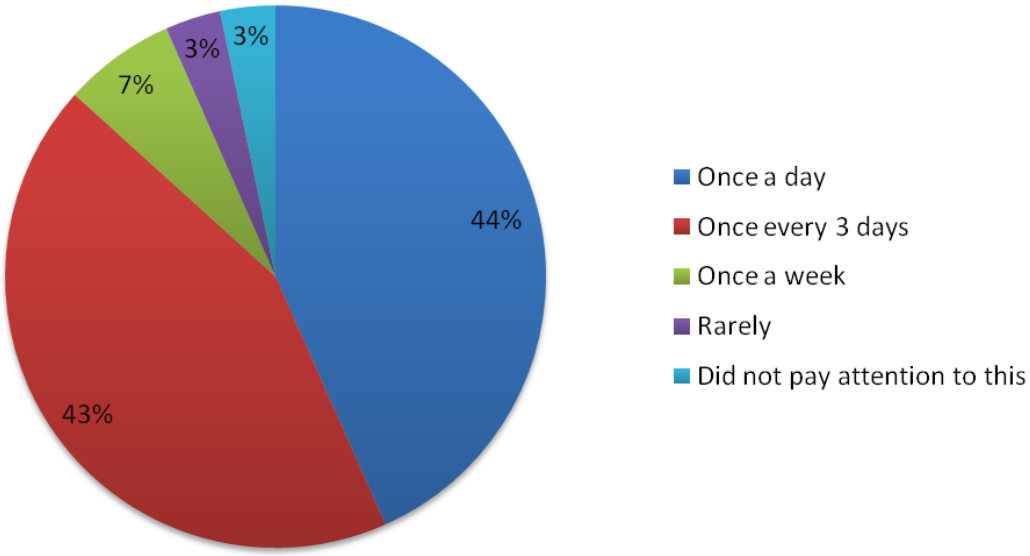
43.4% of respondents indicated that they usually discarded their waste into the garbage-cans, 40% - to the fenced areas and 16.6% - to some other areas.



43.3% repondents indicated that there were garbage-cans near their houses (in the yard), 40% said that there was a fenced area, and 16.6% stated that there was a site without appropriate conditions for the collection of garbage.

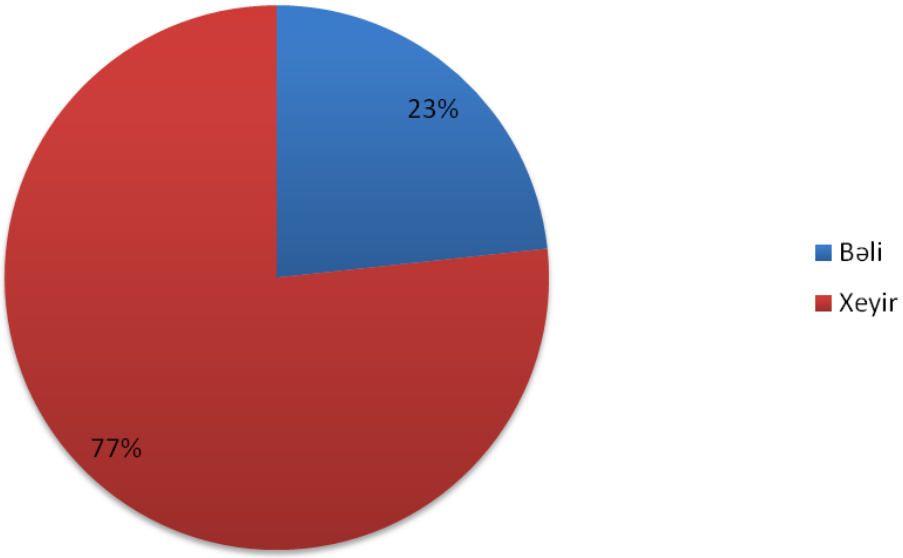


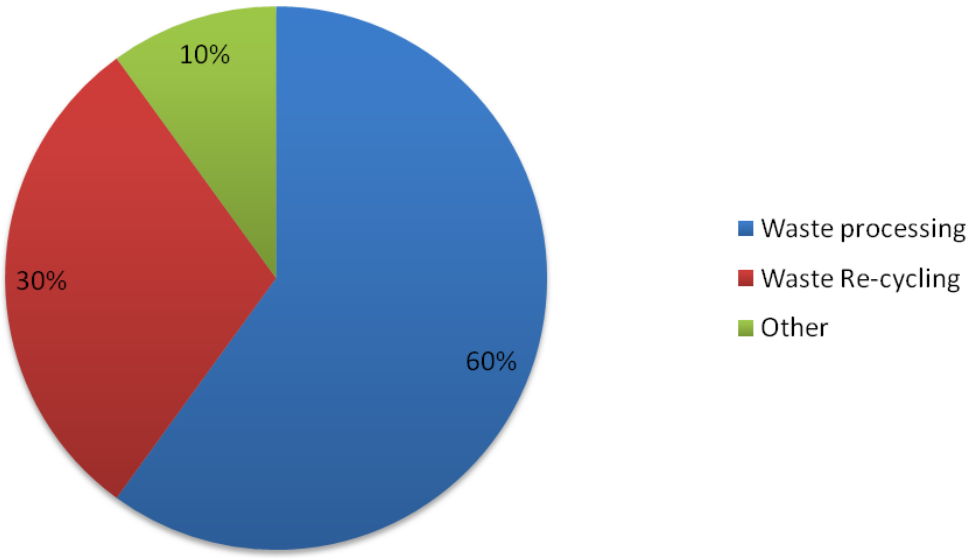
43.3% respondents noted that the garbage-cans near their houses were usually emptied once a day, 43.3% indicated that it happened every three days, and 6.7% said that the garbage-cans were emptied once a week, 3.3% indicated that the garbage-cans were emptied rarely.



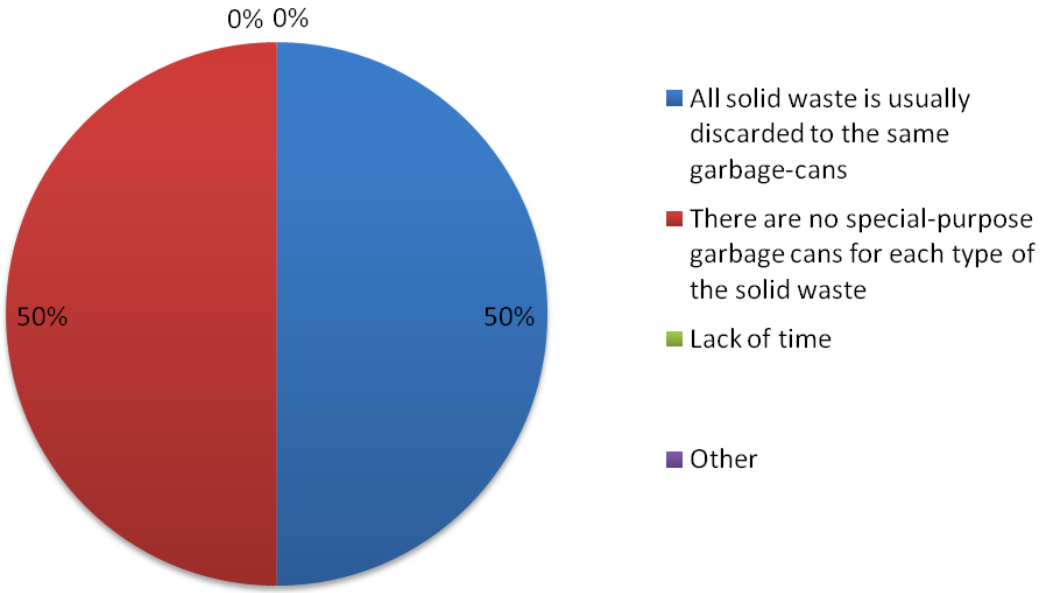
2 – Population's understanding of the issue the solid waste sorting:

90% of the respondents understand the reasons and importance of the solid waste sorting, however 83,3% do not sort domestic waste.



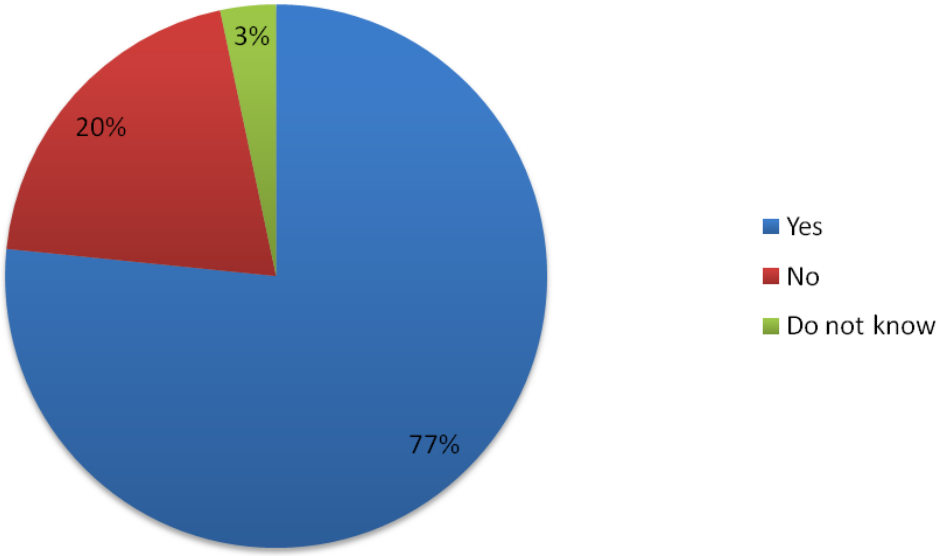


50% of respondents consider that the reasons for them not to sort the solid waste derived from the lack of the appropriate conditions (there are no special/separate garbage-cans for each type of the solid waste).

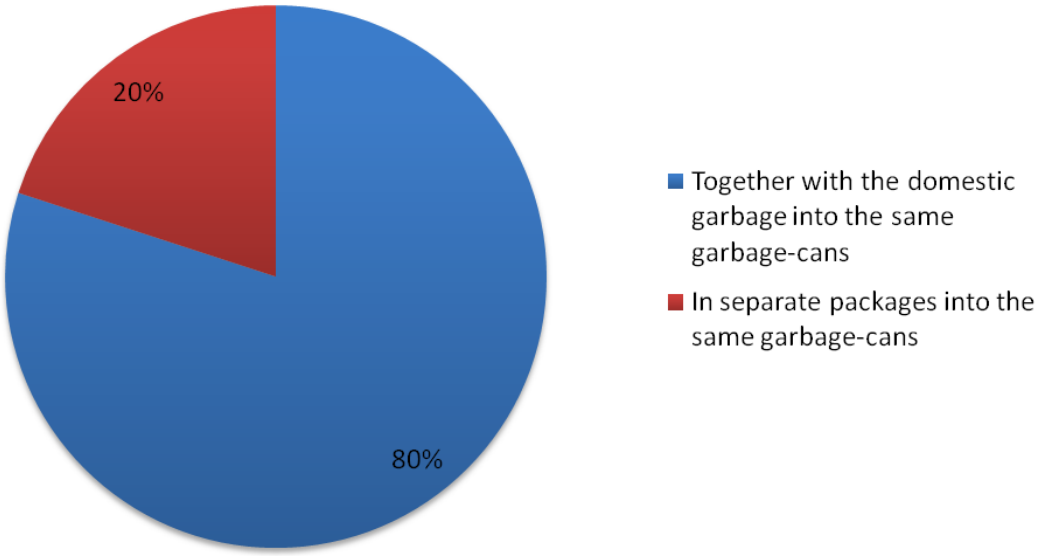


3- Information on the most dangerous types of the soid waste:

76.7% of respondets understand that the thermometers, batteries, accumulators, luminous lamps, radio/ TV/PC parts represent the dangerous types of the solid waste.

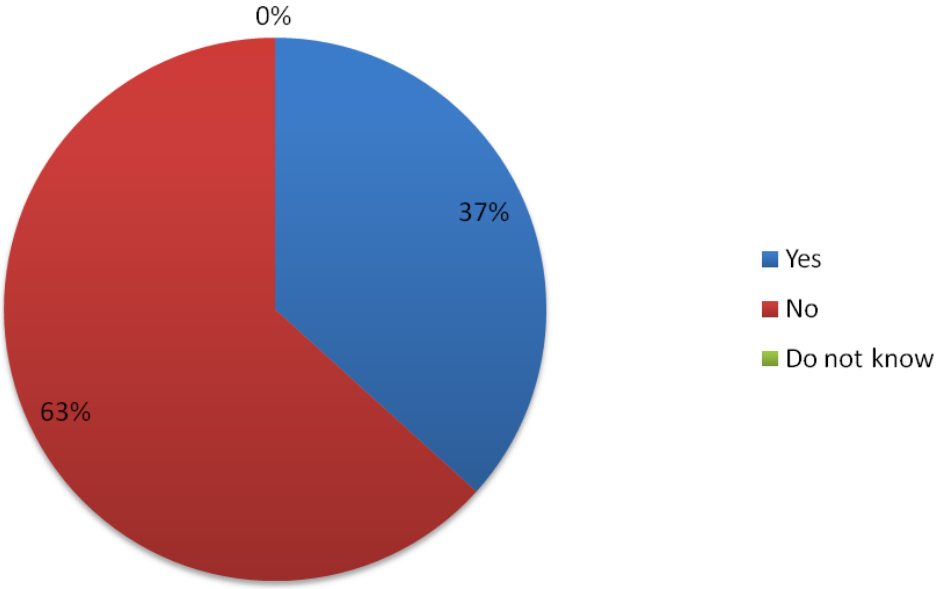


80% of respondents stated that they usually discard the dangerous types of the solid waste together with the domestic garbage, and 20% place it into the separate packages and throw out in the the same garbage-cans.

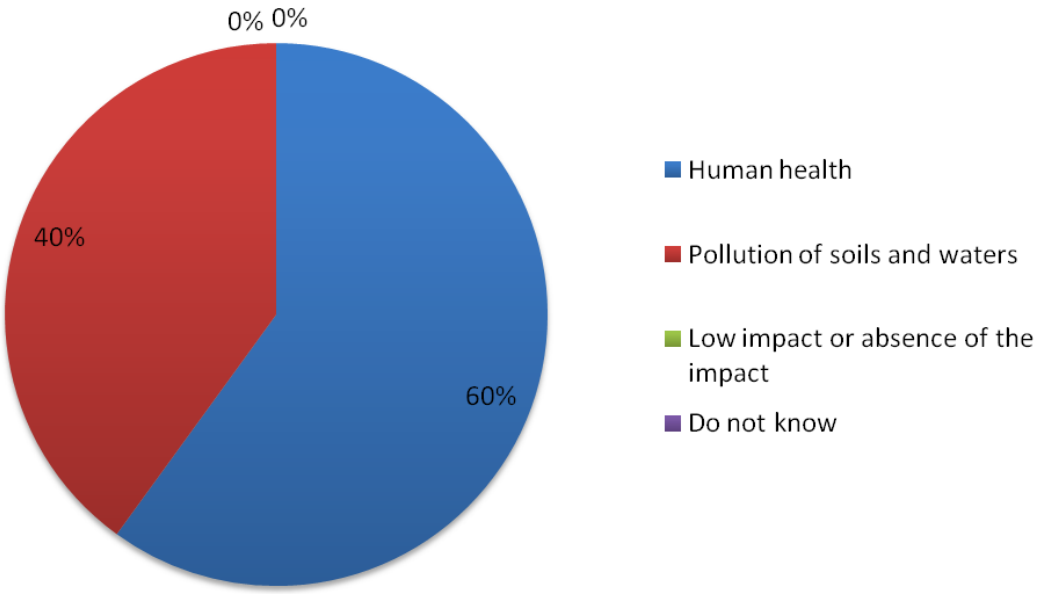


4- Unauthorized dumps

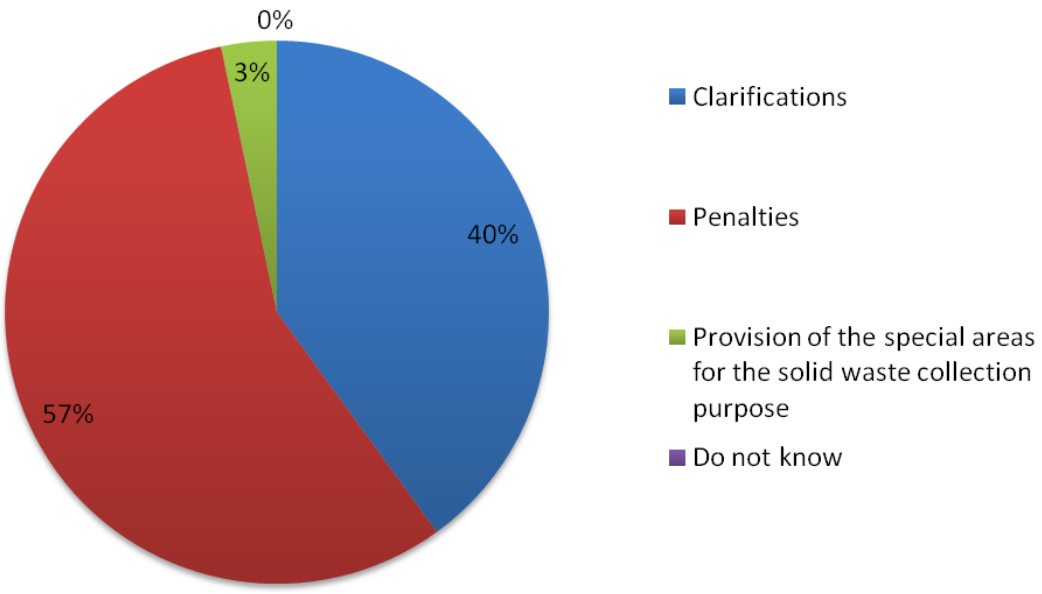
36.7% stated that there are unauthorized dumps in their area.



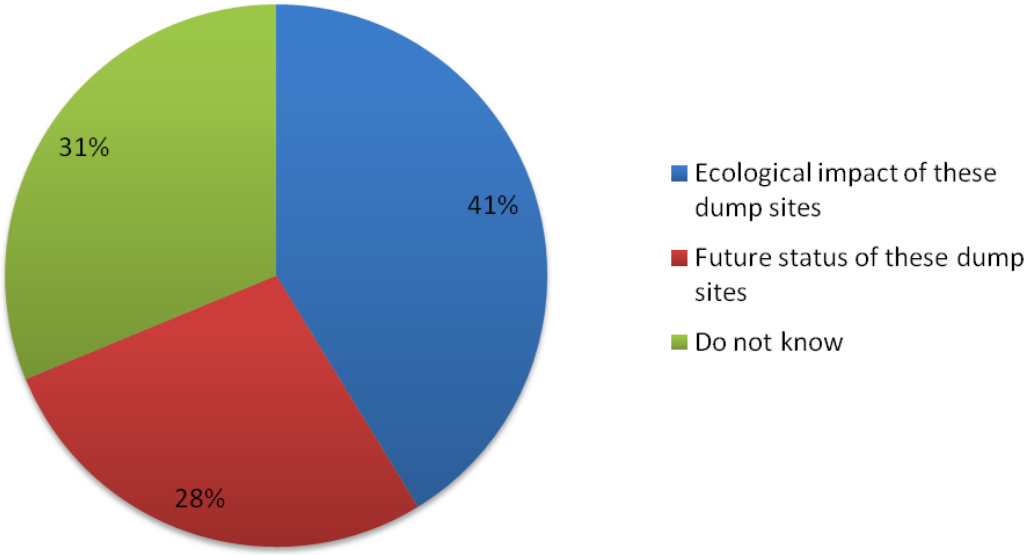
56.7% indicated that the discard of the solid waste to the prohibitied sites impacted the human health, and 40% noted that this resulted into pollution of the soils and waters.



3.3% of respondents think that there should be some special waste collection areas which will prevent the unauthorized and uncontrolled dump sites, 40% require clarifications and 56.7%- penalties.

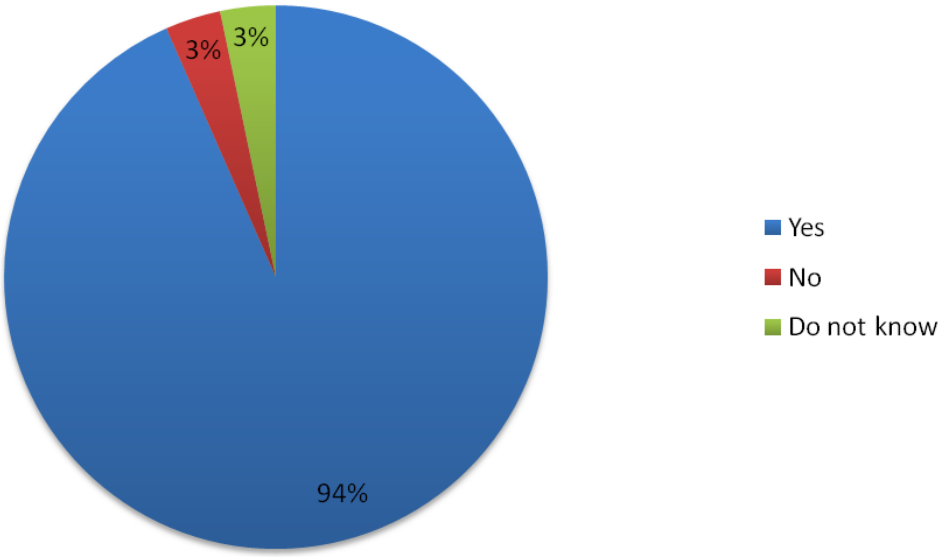


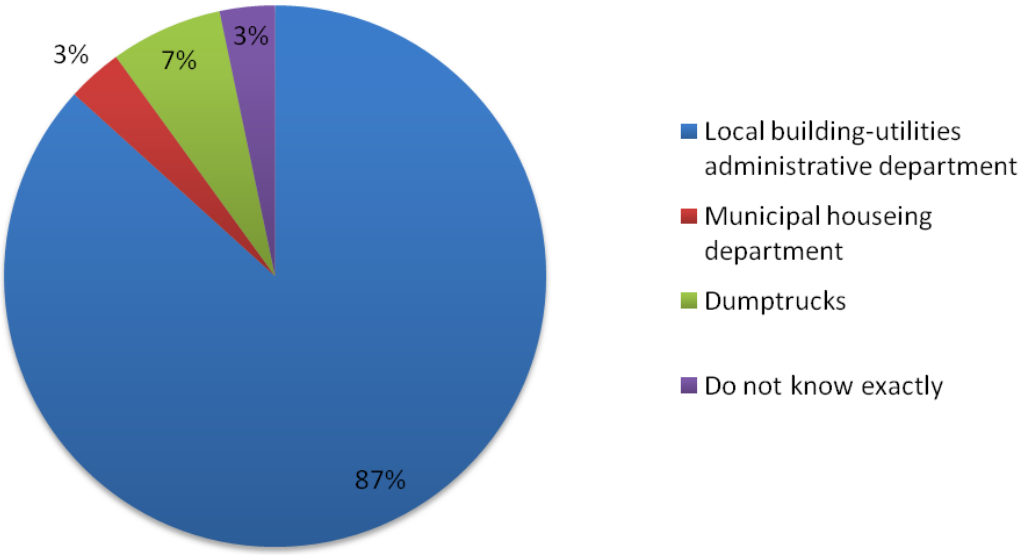
40% of respondents prefer to get the information on the ecological impact of the waste polygons, and 26.3%- on the future status of such polygons.



5- Penalties

93.4% of respondents pay fees for the removal of waste, 86.7% pay directly to the Local building-utilities administrative department, 6.7% - to the dumptrucks, 3.3% to Municipal Housing Department.





ANNEX 6

MINUTES

Of Public hearings on the "Closure/rehabilitation of Balakhany dump site/Construction of ditches for burial wastes at Balakhany dump site", "Closure or rehabilitation of Garadagh and Surakhany dump sites", "Elimination of

unauthorised dump sites in the area of the Baku city" projects implemented in the framework of the "Integrated Solid Waste Management Project (ISWMP)"

Baku city **May 02, 2012**

Participants: 28 people (List of participants is attached)

Speakers:

1. Faig Sadigov – Environmental specialist of the Project Management Group. Gave brief information about the project presented for the public hearing.

2. Demetris Ekonomidis – Project Director of "HPC Paseco" company. Presented broadly the engineering projects regarding Balakhany, Surakhany, Garadagh landfills and unauthorized dump sites (UTS) and answered the questions.

Questions and answers (discussions):

Question:
Latifa Huseynova (International expert)
1. As far as I know, a lot of mixed waste is discharged at Balakhany landfill. I would like to know, how far it is possible to sort waste and place it in the landfill.
2. Is the existence of control wells envisaged in the landfill for monitoring conducting?
3. How are sanitary strips earmarked in Balakhany?
4. Are the issues like direction of spreading of gases emitted into the atmospheric air, their impact on the city's atmosphere taken into consideration bearing in mind the windy days?

Answer:
Demetris Ekonomidis ("HPC Paseco")
1. Collection stations meeting the sanitary requirements will be built in the framework of ISWMP and waste will be sorted.
2. Existence of monitoring wells in envisaged in the project.
3. Creation of sanitary strips has been embodied in the project, a guide book will be published for the operational work, entrance of strangers to the landfill will be prohibited, a camera system will be used for control.
4. A collection system for landfill gases and its use (in heating/ electric energy production equipment) is envisaged in the project.

Tofig Hasanov ("ACEP" Ltd).
1. Besides, the construction of Waste Sorting Station implemented by "Tamiz Shahar" OJSC ("TSh" OJSC) is coming to an end. At this station, according to its assignment the rest of waste after being sorted will be:
a. buried in the landfill,
b. delivered to the Refuse Incineration Plant the construction of which is coming to an end,
c. sent to the composting site,
d. sent to recycling installation,
e. but dangerous waste will be sent to dangerous waste landfill or to the organizations having a license in the dangerous waste management field.

Question:
Telman Zeynalov (National Ecological Forecasting Centre)

Our Centre together with the Ministry of Ecology and Natural Resources (MENR) conducted monitoring of unauthorized dump sites in Baku in 2010 against the "TSh" OJSC's order. 38 big and about 2000 small dump sites have been revealed and mapped. But you have shown 68 big dump sites. What is the basis of this figure?

Answer:
Faig Sadigov (ISWMP)
Sites larger than 200 m² have been included in a survey list. "TSh" OJSC together with the MENR established a Working Group. The experts of "TSh" OJSC, the MENR "ACEP" Ltd and "HPC Paseco" companies conducted surveys (site areas, waste content, places of location) at these sites and specified the number of unauthorized dump sites (after 2010, the number of unauthorized dump sites in Baku was changed).

Sabit Zeyniyev ("TSh" OJSC)
So far, "TSh" OJSC Working Group has discovered 135 unauthorized dump sites whose area is larger than 200 m². 36 of them have been cleaned. 60,000 m³ of waste have been discarded. Nowadays also monitoring is conducted, new unauthorized dump sites are revealed and eliminated.

Question:
Fikrat Jafarov (Sustainable Economic Development NGO)
1. Some of unauthorized dump sites are included in the oil field areas. Whom will those lands belong to after they have been cleaned and who will be responsible for preventing repeated contamination of these areas?
2. It is necessary to change the mentality of people in order to prevent formation of unauthorized dump sites that have been cleaned thanks to big expenditures. Why are the educational activities in this direction not mentioned in your presentation?

Answer:
Faig Sadigov (ISWMP)
1. The project has its specific aim. Half of the 66 unauthorized dump sites are at the State Oil Company of Azerbaijan Republic's (SOCAR), and the rest are at the municipalities' area. After being cleaned, the mentioned sites will be delivered to the defined bodies in accordance with their assignment (SOCAR, municipalities, etc.) and the management of these sites in accordance with the existing norms will be their responsibility. Control will be executed by the MENR and "TSh" OJSC.
2. To change the mentality of people, public meetings will be organized, different means (mass media, projects, promotional actions, etc.) will be used in this field.

Question:
Azad Aliyev (Social Economic Researches Public Union)
1. Many legislative recommendations should be in such a big project financed by the World Bank. We did not hear such recommendations in the presentation. What kind of legislative recommendations are there for the implementation of the project?
2. After gaining the independence the volume of waste carried to landfills increased as a result of increase of Baku population and the ecological situation in the capital city is still tense. When will the results of such an important project prepared by you be seen?

Answer:
Faig Sadigov (ISWMP)
1. Very large strategy on the waste management is being elaborated by the World Bank in the framework of the Integrated Solid Waste Management Project and the legislative issues will be

covered there. The preparation of legislative recommendations has not been assigned to the companies presenting the project today.
2. The Balakhany landfill has been operating since 1963, a large quantity of waste is collected there. "TSh" OJSC has done a lot since 2009. Tender will be announced for conducting construction work, a construction company will be involved and the results will be achieved from the next year.

Demetris Ekonomidis ("HPC Paseco")
The main result of this project is building a sanitary landfill, establishment of sorting station, building of embankment on the shore of the Boyuk Shor Lake, installation of new equipment and conducting long-term monitoring, strengthening of control at the landfill area. After some time the results of implemented work will be achieved. Regarding the public mentality, education work starting from school to local executive bodies should be conducted. "TSh" OJSC has already started the public relations activities.

Tea/coffee break

Tofig Hasanov – Project Coordinator ("ACEP" Ltd). Presented the following 3 ESIA documents:

- ✓ ESIA document for the closure and rehabilitation of Balakhany dump site/ Construction of new ditches for burial wastes at Balakhany dump site;
- ✓ ESIA document for the closure and rehabilitation of Garadagh and Surakhany dump sites
- ✓ ESIA document for the elimination of unauthorized dump sites in the area of the Baku city.

Questions and answers around the presentation (discussions):

Question:
Telman Zeynalov (National Ecological Forecasting Centre)
1. You have mentioned that 2.4 mln m³ of waste was transported in Baku in 2007. It is equal to 1 kg of waste per person according to the number of the Baku population. In 2009, this figure increased to 3.9 mln m³, but the quantity per person was not shown.
2. A lot of mercury containing lamps are discharged in the landfills, the norm of mercury increases in the environment. How has this situation to be prevented?
3. Unsafe water passing through the landfill area will be used only for watering of vegetation and trees but the availability of nitrogen and phosphorus in these waters can enable watering of other plants too.
Answer:
Rauf Muradov ("TSh" OJSC)
1. The first question refers to "TSh" OJSC. The quantity of waste transported by vehicles has been presented in m³, it is not correct. Balances are required for weighing the vehicles; in this case we can indicate the waste quantity in kilograms. 1 m³ of waste can be transformed in kilograms by dividing the waste by 3.3-4 coefficient. As the number of the Baku population is not exact yet it is difficult to indicate the waste quantity per person.

Tofig Hasanov ("ACEP"Ltd)
2. Dangerous waste including the lamps will be separated during the waste sorting and as I mentioned in my report, dangerous waste will be sent to the dump landfill or the firms having a license and experience in the dangerous waste management field, in accordance with their assignment.

Only waste that can be placed in sanitary landfill will be placed in the landfill. The requirements to achieve this are mentioned in the report.
Initial checking of waste varieties has to be arranged as a part of the registration procedure. Besides, an operational staff, a bulldozer driver and others also have to check waste visually at the working site as the second control when waste is discharged.
As it is also mentioned in the report, the detailed research of waste creation, its content in the Baku city area have been conducted in the ISWMP framework. Information about the quantity and content of waste in the Baku city area for the last 20 years taking into account also the increase of the capital city population has been included in the report.

Demetris Ekonomidis ("HPC Paseco")
3. When leachate is processed it also contains mercury. These waters will be purified using Reverse Osmosis System and used for irrigation.

Latifa Huseynova (International expert)
I have two recommendations and one question regarding Mr Tofig Hasanov's presentation. My first recommendation is to prepare the advertisement videos and show them on TV in order to present the project to public in full scale. In addition, the project should be highlighted in press.
My second recommendation is connected with the Boyuk Shor Lake. We know that the Boyuk Shor Lake is quite often called a lake of anthropogenic origin but in this connection I have some comments. Inasmuch as the Boyuk Shor Lake is a relict lake. As you well know, even before Christ salt was carried by camels from this lake. At present, there are hazardous elements in the content of this lake water and it is impossible to use this water. My second recommendation is to separate the lake from the landfill by embankment to prevent the lake pollution during the operation of the landfill.

Question:
What kind of waste is allowed to be discharged in the solid domestic waste landfill? As I heard, until recently, the animal bodies and hazardous materials also have been carried to the landfill and buried there.

Answer:
Rauf Muradov ("TSh" OJSC)
There is a special department in "TSh" OJSC that is engaged in building public relations, preparation of advertisement videos and their demonstration on TV, organization of actions at schools, seminars and meetings in separate organizations.
As it was mentioned in the presentation of the project, there exactly will be embankment on the shore of the Boyuk Shor Lake.
Unfortunately, in the past the animal bodies were also buried in the landfill, luminous tubes were also found there. But since 2009, the solid domestic waste entering the landfill has been accepted on the roll.

Tofig Hasanov ("ACEP"Ltd)
The Boyuk Shor Lake issue is an object of discussions for a long time. A special place in the project is designated for the lake protection – 12-meter sanitary zone, building of embankment and preventing a contact with the lake, conducting long-term monitoring.

Demetris Ekonomidis ("HPC Paseco")
Contamination of the Boyuk Shor Lake with the oil residues is a big problem. The rain water contaminated by the oil can flow into the lake. A special canal has been prepared for the oil waste and all water will flow through this canal.

Question:
Fikrat Jafarov (Sustainable Development Society)
1. It is planned to implement major work around the Boyuk Shor Lake and this work is being done gradually, including dewatering of some part of the lake. During dewatering work it is expected that the raising of the level of the lake's other part by about 1 m will happen. Did you take into account this danger?
2. Waste incineration plant is being constructed in the vicinity of Balakhany landfill. Are there any calculations regarding waste entrance into that plant? Your position on this issue has not been disclosed in the presentation.
3. You have noted in your presentation that monthly 200-250 m³ of leakage water will be generated. Daily 56 m³ of filtrate will be purified by Osmosis system. How will this leakage water be purified in the landfill? You have mentioned that leakage water would be used for irrigation but where will this water be collected during the months when there is no need for irrigation? Will there be any rain-drainage system in the irrigated sites?

Answer:
Demetris Ekonomidis ("HPC Paseco")
1. We have used the available information about the work implemented around the lake. Change of the lake water level during dewatering has been taken into account.
2. The volume of waste to be incinerated in the Waste Incineration Plant is planned to be 480,000 m³ in 2013. During the landfill designing, the quantity of waste to be incinerated in the Plant, the quantities directed to other sites (recycling, composting, etc.) were taken into account in the report. .
3. A drainage system will be built in the new landfill area and leakage of rain water to any side will be prevented.

Question:
Fikrat Jafarov (Sustainable Development Society)
The landfill areas and the majority of land around them are on the balance of SOCAR. Which lands do directly belong to the landfill area? What is the size of the landfill?

Answer:
Rauf Muradov ("TSh" OJSC)
25 ha of Garadagh landfill and 5 ha of Surakhany landfill are on the balance of the "Tamiz Shahar" OJSC. The transfer station and a new landfill will be built in Garadagh landfill. The transfer point will be built in Surakhany. Establishment of Technopark is planned in Balakhany and its main direction will be waste recycling.

Tofig Hasanov ("ACEP"Ltd)
Balakhany landfill being the project site is on the balance of the "Tamiz Shahar" OJSC.

Faig Sadigov (ISWMP)
Let me express my gratitude to all the participants for sharing their time with us at this meeting. All your comments and recommendations will be taken into account in the final version of the report.

LIST OF PARTICIPANTS

Of public hearings on the "Closure/rehabilitation of Balakhany dump site/Construction of ditches for burial wastes at Balakhany dump site", "Closure or rehabilitation of Garadagh and Surakhany dump sites", "Elimination of unauthorised dump sites in the area of the Baku city" projects implemented in the framework of the "Integrated Solid Waste Management Project (ISWMP)"

№	Name of participant	Organisation/Position	E-mail address	Tel./Fax
1	Faig Sadıgov	MED/ISWMP	fsadigov@iswm.az	464 41 56
2	Salamzada Mehdi	MED/ISWMP	msalamzadeh@iswm.az	464 41 56
3	Gulana Hajiyeva	World Bank	g.hagiyeva@worldbank.org	492 19 41
4	Demetris Ekonomidis	HPC Paseco (Greece)	info@hpc-paseco.gr	+30 210 8258209
5	Hamidov Fikrat	Baku Committee of MENR		534 87 45
6	Abdurrahim Tan	AİM Texas	tan.abd@gmail.com	050 331 23 59
7	Mirzakhan Mansimov	Iqlim Ltd	climateat@gmail.com	050 220 22 67
8	Abdullayev Elchin	Iqlim Ltd	elchinabdullayev@mail.ru	055 276 55 56
9	Gasymov Nasir	Iqlim Ltd	azerinesir@mail.ru	055 593 93 03
10	Aliyev Azad	Social Economic Researches Public Union	azad_aliev@mail.ru	050 325 31 45
11	Mammadov Amin	Urban Planning and Architecture State Committee	amigo.ihp@gmail.com	050 351 06 03
12	Huseynova Latifa	International Expert	lmhuseynova@yahoo.com	050 371 23 76

13	Huseynova Gulshan	Independent Expert	h.huseynovagn@yahoo.com	070 313 41 78
14	Sabit Zeniyev	Tamiz Shahar OJSC	s.zeniyev@tamizshahar.az	055 703 70 55
15	Hasanov Tofig	ACEP Ltd, Project Coordinator	tofikhasanov@yahoo.com	050 329 29 71
16	Jafarov Fikrat	Sustainable Development NGO	f.jafarov@mail.ru	055 790 67 88
17	Telman Zeynalov	National Ecological Forecasting Centre	info@tzecoenco.org	050 352 55 16
18	Fuad Akhundzade	Nature and Life	fuad50@list.ru	050 676 62 68
19	Rauf Muradov	Tamiz Shahar OJSC	r.muradov@tamizshahar.az	050 225 08 90
20	Suleymanov Manaf	Azerbaijan Ecological Union	m.suleymanov@eco.az	539 61 23
21	Fuad Jafarov	City Planning specialist	fuadcaferli@gmail.com	055 669 53 47
22	Iskandarov Elchin	ACEP Ltd, Director	e.iskenderov@acep.az	510 14 20
23	Mammadov Balaga	ACEP Ltd, Deputy Director	a.mamedov@acep.az	510 14 21
24	Muradov Bakhtiyar	ACEP Ltd	b.muradov@acep.az	510 14 21
25	Karimov Ziyafat	ACEP Ltd, İT	z.kerimov@acep.az	510 14 21
26	Garayev Asif	ACEP Ltd	asif@acep.az	510 14 21
27	Aliyev Elchin	ACEP Ltd	e.aliyev@acep.az	510 14 21
28	Iskandarova Aytan	ACEP Ltd	a.iskenderova@acep.az	510 14 21