



Municipality of Yerevan

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ARMENIA: YEREVAN SOLID WASTE PROJECT – ENVIRONMENTAL AND SOCIAL DUE DILIGENCE

“ESDD7”

NON-TECHNICAL SUMMARY

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Client:

Municipality of Yerevan

Consultant: **Joint-Venture**



BERNARD Ingenieure ZT GmbH

Bahnhofstrasse 19

A-6060 Hall in Tirol, Austria



HYDRO INGENIEURE Umwelttechnik GmbH

Steiner Landstraße 27a

A-3504 Krems-Stein, Austria

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1. PROJECT DESCRIPTION

1.1 Project Rationale and Description

The Yerevan Municipality has envisaged the construction and operation of a new municipal solid waste landfill site adjacent to the existing landfill near to Yerevan's district Nubarashen. The new sanitary landfill site is projected to fulfill international standards. On request of the Yerevan Municipality, the European Bank for Reconstruction and Development (EBRD) commissioned a Technical Feasibility Study in 2012.

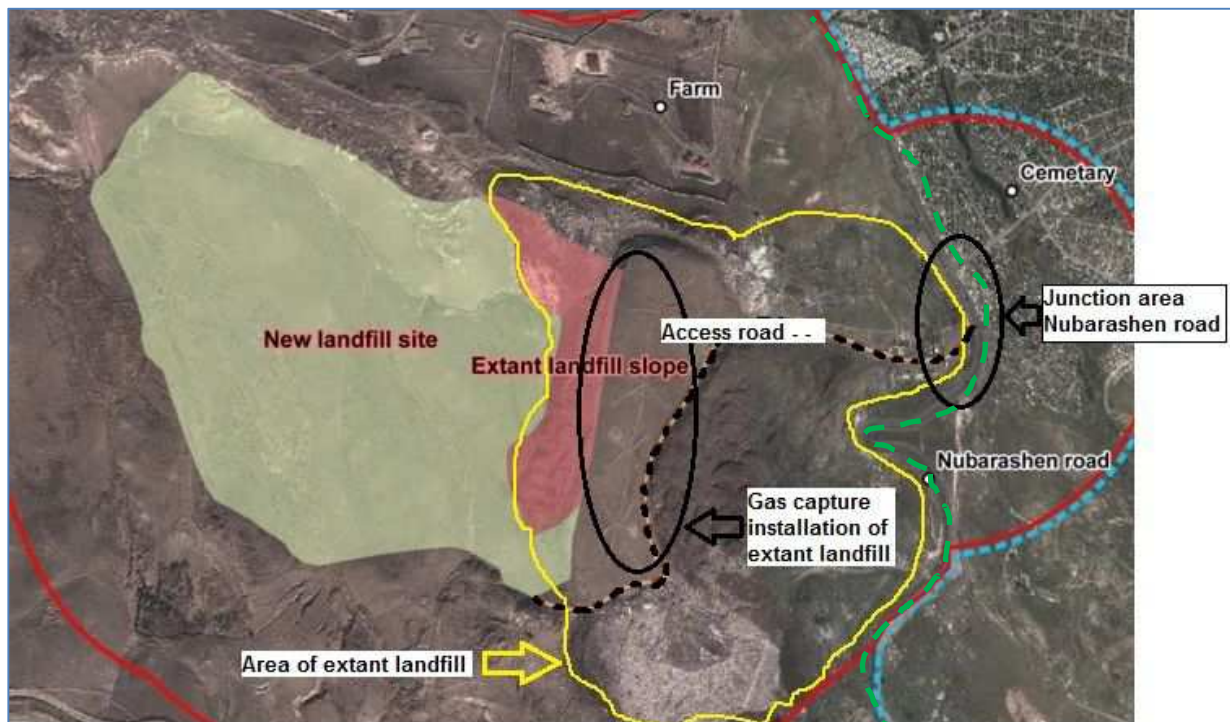


Figure 1: Location of associated facilities

The Nubarashen site was chosen as the best solution, as it fulfills the requirements to offer enough volume to deposit waste for the next 30 years. Furthermore the site is close to Yerevan City, affects no protected areas (e.g. in terms of habitats or water) and has also a limited demand for other infrastructure investments.

The expansion of the project area is about 1,000 m maximum length and about 400 m maximum width. The projected height reaches a maximum of 40 m. The overall size of the project area amounts to 30 hectares. The project will be connected to the road network by an access road. The impact area for the project consists of the following components: The extant landfill, the new landfill (including gas capture installation and the gas flare), an access road and the junction of Nubarashen road and the access road (see figure above).

The studied alternatives were the following:

- System alternative: As a system alternative, waste incineration linked with energy production was considered. It was not selected due to the absence of suitable district heating networks and due to low cost-efficiency.
- Site alternatives: In the 2012 Feasibility Study, site alternatives at Spandarjan and Jrvezh were considered, but discarded due to poor conditions and lack of technical facilities found at both sites.
- The Nubarashen site was chosen because of following characteristics: Enough space to deposit waste for the next 20 years, spatial proximity of Yerevan, no protected areas affected, low demand for new infrastructure for the landfill
- Design alternatives: A complete physical separation between extant and new landfill ("stand alone solution") was considered. It was not selected for the following reasons: The instable extant landfill would not be stabilized, so that risks of landslides could occur. The slope seal for the extant landfill would not be constructed, so that surface waters could seep into the extant landfill. This would result in the generation of more leachate and a further destabilization of the extant landfill. In addition, as less volume would be available, the lifespan of the landfill would be reduced from 28 years to 24 years.

1.2 Legal Framework

The project is designed in compliancy with the Armenian legal requirements (RA Laws), applicable European Union Directives and the EBRD's Performance Requirements (PRs).

EU-Directives

- The EIA-Directive – Directive 2014/52/EU of the European Parliament and the Council of April 16, 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects.
- EU-Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste.
- IED – industrial Emissions Directive

EBRD Guidelines

- EBRD Greenhouse Gas (GHG) Assessment Methodology, 2010
- EBRD Strategic Gender Initiative
- EBRD Gender 1 Guidance note
- EBRD Gender Toolkit 1 and 2
- EBRD Environmental and Social Policy, 2008

Armenian Legislation (RA Law)

- RA Law On Equal Rights and Equal Opportunities for Men and Women
- RA Law on Environmental Impact Assessment and Expertise, adopted on 21.06.2014.
- RA Law on Waste, November 2014

- RA Forest Law

Other Standards and Guidance Notes

- International Labour Standards by ILO (International Labour Organization)
- Final Draft BAT Guidance Note on Best Available Techniques for the Waste Sector: Landfill Activities by Environment Protection Agency, December 2011 (EPA–BAT)

The following chart gives an overview of the ESIA process according to Armenian Law (RA Law).



ESIA Process according to RA Law on Environmental Impact Assessment and Expertise, adopted on 21.06.2014

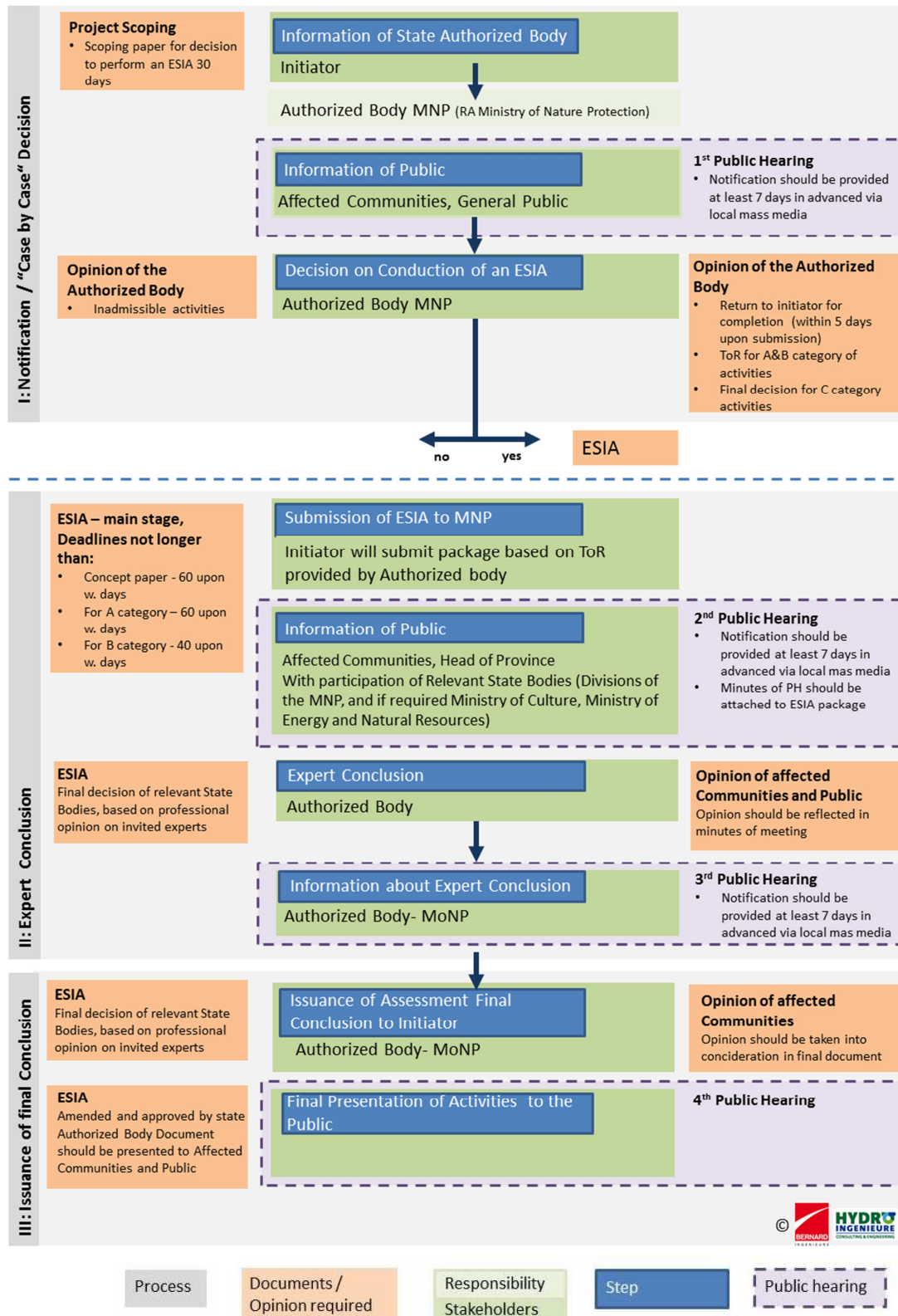


Figure 2: EIA Process in Armenia

1.3 Landfill Design

The landfill site is designed to be equipped with technical features to avoid adverse effects. The stability of surrounding slopes and the boundaries of the old landfill will be achieved by a slope sealing. These areas are currently regarded as instable. Infiltrations of leachate into the subsurface will be prevented by a base sealing. A coverage of the old landfill zone (not part of this project) is envisaged by the implementation of a surface sealing.

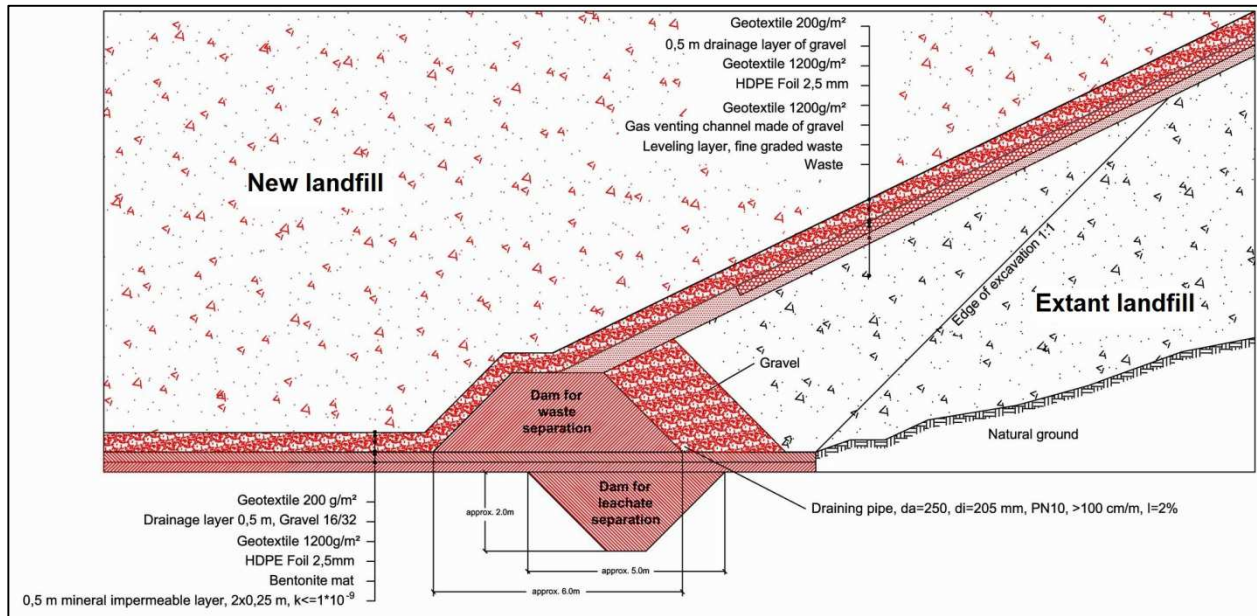


Figure 3: Schematic section of slope sealing between new and extant landfill (source: Technical Feasibility Study, 2012)

Within this structure a gas capture system will be implemented which is projected to collect the accumulating landfill gas. The collected landfill gas, especially methane, will be burned in order to reduce its global warming potential (flaring). Besides the technical features, the landfill is projected to be equipped with infrastructure facilities as fencing, weighbridge, waste registration system and temporary storage.

The new landfill consists of a base sealing to avoid infiltration of leachate into the subsoil. The results of the geotechnical survey and the analysis of existing data have shown, that a base sealing is necessary. A collection and discharge system, which is located at the top of the base sealing, conducts the leachate to a leachate reservoir. Via gas wells the gas of the landfill will be collected and flared. As soon as each landfill zone reaches its final filling height, a surface sealing has to be applied on the respective filling zone.

The operation of the landfill is chronological and divided into five different landfill zones. The area will be stepwise filled from east to northwestern direction. The operation of each landfill zone is approximately 5 years, meaning the last zone will be sealed in approx. 28-30 years. As an aftercare measure in addition to the surface sealing, the surface will be rehabilitated by a soil layer.

The final surface sealing (after settlements have stopped) may consist of the following layers (bottom to top):

- Removal of the surface soil of the temporary surface sealing, lateral storage; levelling;

- Protection layer made of geotextile 1,200 g/m²;
- Mineral impermeable layer, double-ply, thickness 0.5 m, and probably also in combination with a HDPE foil, 2.5 mm;
- Protection layer made of geotextile 1,200 g/m²;
- Drainage layer made of gravel, thickness 0.5 m²;
- Surface soil made of material suitable for vegetation cover, thickness > 1.0 m

2. ENVIRONMENTAL AND SOCIAL ASSESSMENT

2.1 Baseline

The baseline study comprises environmental and social issues.

The following aspects were addressed in regard to environmental issues:

- Noise: Noise measurement, traffic counts, site visit.
- Air pollution: Air quality assessment through secondary sources and a site visit.
- Macro-climatic conditions and emission of greenhouse gases: Calculations based on Yerevan's waste composition, the EBRD Greenhouse Gas Assessment Methodology, data from Nubarashen Landfill Gas Capture and Guidelines on landfill gas from Germany.
- Micro-climatic conditions: Description based on site visit and secondary sources.
- Vibration: Factor is omitted (no impact statement).
- Odour: Verbal description of factors - gas emissions from uncovered waste and uncontrolled burning.
- Accidents: Verbal description of factors – unsafe roads, poor lighting, vehicles in poor maintenance condition.
- Landscape: Verbal description of factors – previous impacts within the context of urban periphery.
- Biodiversity: Field reconnaissance survey regarding flora and fauna; field survey and consultation of Hye Antar (Armenian Forestry Agency) regarding forest.
- Protected areas: Factor is omitted (no impact statement).
- Geology: Literature survey (maps, reports), geotechnical field survey (boreholes and pits), information on brownfields.
- Radioactivity: Literature survey, measurements (Sievert) at projected landfill site
- Mining resources: Factor is omitted (no impact statement)
- Groundwater: Geotechnical field survey and chemical water analyses
- Surface water: Field investigations, chemical water analyses
- Cultural heritage: Factor is omitted (no impact statement)

The following aspects were evaluated in regard to social issues:

- Statistical data on poverty, social situation of Yerevan and Armenia, and in particular Nubarashen districts obtained from the Statistical Service of Armenia and the Ministry of Labour and Social Affairs;
- Observations from the site visit and waste-pickers settlement at Nubarashen 2 – 4 streets, interviews with the families; (sample of 18 people)
- Data by the cadastral service and an interview with the Erebuni municipality deputy head;
- Survey with “formal” and “non-formal” landfill workers engaged in waste picking;
- Interviews with nurses and doctors working in affected communities – Nubarashen and Erebuni;
- Interview with the head of the landfill operator;

- Interview with the head of the Nubarashen Social Service;

2.2 Assessment of Environmental Impacts

In regard to **noise and vibration**, the main focus was the traffic on Nubarashen road and the vehicular movement of waste trucks with poor maintenance. The projected noise levels do not exceed the given thresholds neither from the WHO neither from Armenian Standards. The expected noise level of the equipment on the landfill is approx. 80 dB(A) and can reach peaks of up to 90 dB(A). The staff of the landfill site is exposed to this noise, even though noise peaks are expected to be temporary. Usually noise intensive compaction works are limited to a few hours. Personal protection equipment has to be used, especially ear protection. The remaining impact is insignificant.

The available **air quality** data indicates high values of air pollution are already present in the Yerevan region. The large amount of uncovered non-degraded organic compound leads to fires and strong odour. Irrigating the waste will reduce toxic compound emitting from the waste site and nuisance due to the strong odour. In order to mitigate adverse aspects during the construction period sprinkling of water on roads, tyre wash and the loads of trucks covered by canvas are planned to reduce dust emissions. Nevertheless, equipment with low noise output should be purchased. The remaining impact is insignificant.

The main **Greenhouse Gas** emitted from landfill sites is methane. Its yearly potential emission has been calculated for Yerevan Solid Waste Project in accordance with the Greenhouse Assessment Methodology by the EBRD. Considering the composition of waste and its quantity, it is calculated that about 199,000 tons of CO₂ equivalents will be emitted per year. By flaring the gas global warming potential could be reduced by 172,000 tons CO₂ equivalents. The rest of CO₂ equivalents emitted amounts to 26,000 tons CO₂ per year (caused by flaring of landfill gas). Overall, the project will reduce the predicted GHG emissions from now 171 kt/year to 26 kt/year. The remaining impact is very low. Positive effects come from the reduction of greenhouse gases compared to the current state.

The likeliness of strong emissions of **odour** is low, because the irrigation system accelerates the degradation of organic compounds. Also the open areas for insertion of new waste are kept small. Sensitive locations in the vicinity are already in a distance of about 300m. Comparing the new system with the existing operation of a landfill site it is very likely, that the new landfill site will have a positive impact.

The risk of **accidents** along the Nubarashen road is considered to be high due to poor maintenance of vehicles and excessive speed. The road features dangerous curves, no street lights and no street boundary. Speed bumps and the installation of street lights are planned to reduce the risk of accidents. The remaining impact is low.

Landscape and biodiversity including the assets flora, fauna and forest were reviewed via existing data (e.g. cadastral information), site survey and habitat mapping.

The impact on the **landscape** comprises two issues: The view towards the landfill and the at present widely visible fume cloud that results from uncontrolled burning processes. The first one is limited due to the situation within a valley, whereas the cloud is widely visible in surrounding cities and settlements. Each closure phase will recreate a natural scenery after a new area is open. Therefore this impact is considered as positive (the current operation leaves large areas open). After reaching the landfill's capacity, it is covered with natural soil. In addition, an alley will be planted. Thus, the remaining impact is low.

The **vegetation** consists mainly of dry grasslands. The total footprint of the project is 26.68 hectares. After the closure phase, the landfill's surface is rehabilitated with natural soil, so natural vegetation can develop. In addition to that an alley of trees will be planted in order to reduce to the visibility of the landfill site. The remaining impact is very low.

At the project site, no endangered species were found. Two endangered **animal** species, a tortoise (*Testudo graeca*) and a lizard (*Eremias pleskei*) may live in the vicinity of the project, in old gardens south of the landfill area. Their core habitat is well outside the project range in southern direction. To ensure that no endangered species are harmed, a fence between the potential habitats and the landfill will be built for the construction period. The remaining impact is very low.

To ensure that no vermin (e.g. rats) spreads on the landfill, pest control monitoring will be established.

The **forest** area that is actually covered with successfully grown forest is small (2.7 ha). Unsuccessful reforestation efforts were made on a total area of 17.91 ha. According to law, notwithstanding if there are trees or not, an area of 20.55 ha is labelled as forest. Compensations are needed for this. The potential compensation of forest is up to final negotiations between the Forest Agency and the Yerevan Municipality. Suitable areas for reforestation were identified in the vicinity of the project. The remaining impact is very low.

In regard to **geology and soil**, neither erosion nor other hazard endangers the proper operation of landfill site. Therefore it is unlikely that the new landfill site is affected. This impact is therefore classified as insignificant. The impact is evaluated as "very low."

To prevent **surface water** from being polluted, the current leachate stream from the extant landfill will be collected in the course of the slope sealing. The contaminated soil of this leachate stream bed has to be removed, temporarily stored and finally deposited in the new landfill when operation starts. In the unlikely case of an accident it is impossible that **groundwater** is affected, because the layers are below a massive layer of clay in a depth of > 40m. The remaining impact is considered as very low.

For the **impacts on climate change**, no significant ones are to be expected from the project.

Cultural heritage is unlikely to be found in the area. If something should be found nonetheless, the site supervision will take adequate steps to insure carefully retrieving it.

A prerequisite of the Bank's support in this project is the **closure of the operation of the extant landfill** as soon as the new landfill starts to operate. At the same time the implementation of surface sealing at the existing landfill shall start. Therefore the closure of the existing landfill site does not cause any further impact. The close will have a "positive" impact (on e.g. landscape, emission of greenhouse gases).

For the active waste pickers, the closure of the existing landfill means a significant loss of livelihood and economic displacement. The Due Diligence process therefore requires a Livelihood Restoration Framework. It gives details for mitigation measures for the waste pickers which have to be carried out in a follow-up process (see ESDD 08). The remaining impact is considered as low, at best as positive.

2.3 Assessment of Social Impacts

The social assessment refers to the social and economic situation of the waste pickers both some employees and more than 40 residential families (around 160 - 200 people) who make their living by sorting out recyclable materials and resell it to buyers. The waste pickers are regarded as vulnerable and potentially affected. These families live in settlements or scattered houses close to the landfill site under poor conditions. School drop-out rates are

high, as children are needed to look after siblings and bus fares are comparatively expensive.

For the active waste pickers, the closure of the existing landfill means a significant **loss of livelihood and economic displacement**. The Due Diligence process therefore requires a Livelihood Restoration Framework. It gives details for mitigation measures for the waste pickers which have to be carried out in a follow-up process (see ESDD 08). The remaining impact is considered as low, at best as positive.

To mitigate negative social and economic impacts, a Livelihood Restoration Plan is put into action. An entitlement based on an **entitlement cascade** for the waste pickers will be implemented to mitigate the direct effects of the shortfall of waste picking.

For the process of fixing the entitlements, see figure 4 below. The **entitlement matrix** offers within a first step **vocational trainings**, to facilitate re-integration into the normal job market. Assistance will be given to obtain personal documents, to help with job applications and to ensure access to further education. Additionally, it will be assisted to benefit from national and international **welfare programs**. As mobility is a crucial issue, it is envisaged to connect public transport to the waste picker settlement.

In case none of the aforementioned measure help the waste pickers to re-enter in the job market a transitional allowance based on an economic survey will be provided. Children and pensioners are particularly taken into account by the entitlement matrix and entitlement cascade. The matrix also defines who is eligible for compensation referring to the time of the respective person spent at the landfill site.

Concerning **gender issues**, women are considered to be especially vulnerable by the project. The project can put a burden on women's lives, because their mobility is stronger limited than men's. The project could intensify inequalities, which is considered as a relevant and significant impact. Mitigation measures are needed to compensate the impact. For this, champions of equal opportunities will be implemented both at the landfill company and the municipality to advance gender issues actively. Through this equal involvement, remuneration, creation of part time jobs and so on will be actively promoted. The remaining impact is considered as low, at best as positive.

All new created job have to be open **for men and women equally** (gender mainstreaming). Potential contractors for construction and operation of the landfill have to adopt the equality of men and women and implement flexibility in their statues, as part-time working models and child care opportunities. The consideration of gender mainstreaming refers also to the measures of the Livelihood Restoration Framework. All vocational training have to be open to everybody (also women in men's domains) and gender-related assistance (child care opportunities, women as part of the LRF conduction consultant) has to be provided.

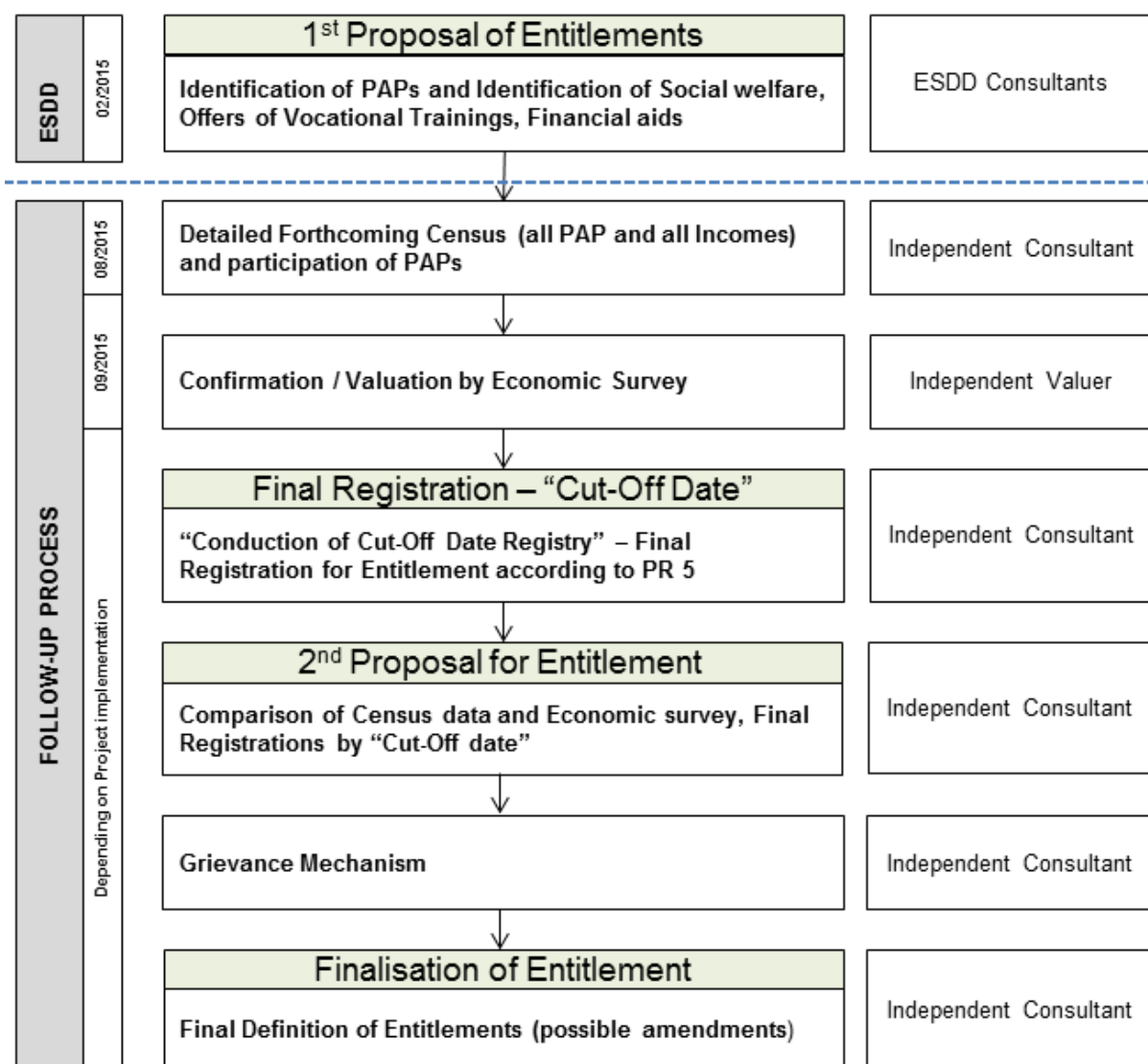


Figure 4: LRF process with compensation fixing and responsibility

Land acquisition affects the State of Armenia. The required land is actually under the purview of the State Forestry Agency.

Considering the above mentioned measures to each asset an environmentally and socially sound project that is in compliance with EBRD's policy requirements can be built and operated.

In order to avoid any third party intrusions the landfill area is projected to be fenced. This is also related to issue of safety.

2.4 ESAP and Monitoring

The Environmental and Social Action Plan takes into account the findings of the environmental and social appraisal and the result of consultation with affected stakeholders. The document sums up all mitigation and performance improvement measures and actions that address the identified social and environmental issues, impacts and opportunities. Thereby the ESAP documents formulates the steps that need to be taken to ensure compliancy with laws, technical standards, EBRD requirements and best practice requirements.

In addition, the ESAP defines the acting person, stakeholder or institution for the respective task.

Main actions that are outlined are:

- Stakeholder engagement
- Ensure state of the art management of the landfill
- Ensure working conditions in compliance with EBRD, best practice and EU standards (e.g. pollution abatement)
- Promote gender issues and equal opportunities through implementation of champions of equal opportunity
- Occupational Health and Safety
- Install Livelihood Restoration Plan
- Compensation for land use and loss of forest land
- Rehabilitation of landfill site after closure phase
- Monitoring and Reporting
- Grievance

An Environmental and Social monitoring program is provided to identify adverse effects on leachate water, surface and groundwater as well as air quality including climatological parameters. Moreover, a waste acceptance monitoring is being implemented. Social benefits are monitored also. The grievance mechanisms are implemented as well.

2.5 Environmental and Social Management Review (E+S MR)

To ensure that the operation company will be able to operate the landfill in compliance with the technical, the financial, the environmental and legal requirements, a E+S Management Review was carried out covering the following areas:

- Organizational capacities and resources
- Human resources and employment policies
- Occupational health and safety – policy and practices
- Pollution prevention – policy and practices
- Community health and safety and security – practices related to existing operations of Yerevan Municipality and operating companies
- Avoidance of third party intrusion into potentially hazardous areas
- Management of potentially hazardous waste
- Management of noise and vibration
- Land acquisition and economic displacement
- Supply Chain and identification of relevant environmental, social, labour and

reputation issues

- Public interaction

The issues identified during the E+S Management Review are addressed in the ESAP.

2.6 Public Consultations and Stakeholder Engagement (SEP)

A stakeholder engagement plan (SEP) was developed. The aim of the SEP is to ensure that adequate and timely information is provided to project-affected people (PAP) and other stakeholders so that they have an opportunity to voice their opinions and concerns, and these concerns can influence Project decisions. Moreover, it discusses various engagement medium to utilize and provides an implementation plan. This locations and pathways of disclosure are also defined by the SEP document.

The stakeholder engagement plan addresses the involvement of representation of women in the project and the consideration of equal opportunities.

A first meeting was held on 28th October 2014 at Municipality in Yerevan. All key stakeholders were invited. Upcoming objections were discussed within the following days after the meeting at the respective offices (Forestry Agency Hye Antar on 29th Oct. 2014, Water supply 30th Oct. 2014, Veolia Djur 30th Oct, Biodiversity issues 30th Oct.)

Meetings are envisaged with the waste picking community, landowners and institutions, ministries and NGOs. Moreover, a second meeting is planned after the approval of the ESDD.

The public consultations envisage public display of the documents for a period at least 120 days on the EBRD website. The project will be moreover disclosed through several information pathways, thereunder the distribution by leaflets, press, TV, social media, public display and the project website.

The SEP includes a grievance mechanism for complaints related to the project implementation.

The contact person is the head of procurement of the Yerevan Municipality is:

Mrs. Nora Martirosyan

"Investing Projects Implementation Unit
Building up of Yerevan" CNCO
Sustainable Urban Development Investment Program
Address: Byuzand 1/3, 5th floor, Yerevan
Tel. number: + 374 10 52 09 73
E-mail address: nora.martirosyan@yerevan.am

The Head of the procurement Unit is in charge of responding and acting in the grievance process. During the operation phase of the new landfill, the general management is in charge of responding and acting handling complaints (Grievance mechanism).