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6 POTENTIAL IMPACTS AND MITIGATION MEASURES

This Chapter sets out the potential environmental and social impacts of the Project in all its phases (construction, operation and closure). It identifies the sources of impact associated with the Project's infrastructure and activities as set out in Chapter 3. It also considers impacts induced with social changes associated with the Project, including accommodation, direct employment and economic inputs and demographic changes. Impacts are assessed with regards to the regulatory framework in Section 2.1 to 2.2, the Lydian Policy Framework in Section 2.3, and Project-specific criteria presented in Section 2.4 of Chapter 2.

The assessment has been organised into the following main subject areas:

Environmental

- Greenhouse Gas Emissions and Climate Change;
- Landscape and Visual Impact;
- Air Quality;
- Noise and Vibration;
- Soils and Land Cover;
- Groundwater;
- Surface Water; and
- Biodiversity and Ecosystems.

Social

- Socio-economic
 - Demographics;
 - Economics;
 - Labour and Working Conditions
- Land Use, Agriculture and Natural Resources;
- Livelihoods
- Community Health and Safety;
- Cultural Heritage;
- Transport;
- Ecosystem Services; and
- Worker accommodation impact assessment

Note: the worker accommodation impact assessment (see Chapter 6.21), draws on earlier

chapters in the ESIA, in particular socio-economic, community, health and safety and transport. This assessment has been submitted as a separate chapter, as the requirements for a bespoke study on worker accommodation has been identified in Chapter 5 and Section 5.9.

Within the ESIA, the methodology for assessing environmental impacts is distinct from that used in the social impact assessment. This is due to the qualitative nature of the analysis required for the social studies combined with the potential for significant positive change to take place, in social terms, subject to appropriate Lydian policies and implementation of the social plans. In contrast, environmental impacts have generally been derived using quantitative assessment techniques related to aspects of the mine design and operation. In addition, the mitigation measures are generally focussed on reducing the effect of predicted impacts that, without the intervention of the appropriate mitigation, would result in a significant adverse effect. On this basis, the impact summary sections have been provided using a different format for environmental and social aspects. A summary of mitigation measures has also been provided for each of the main subject areas as well as a recapitulative table at the end of Chapter 6.

6.1 General Approach for Environmental Impact Assessment

The discussion for each subject area generally follows a format that identifies and addresses:

- **Project Activities** – Describes the Project activities and/or sources of potential impact for that particular aspect;
- **Potential Impacts** – Describes the method used within each subject area to assess potential impacts, and explains any assumptions or modification to the general impact assessment methodology described here;
- **Mitigation Measures** – Describes the engineering design that has been incorporated to reduce impacts to acceptable levels;
- **Residual Impacts** – Re-assesses significance of impacts after mitigation is applied (assuming effective implementation of mitigation measures); and
- **Monitoring and audit** - Identifying the level of monitoring that will be necessary, over a defined period, to ensure that mitigation measures remain appropriate and maintain actual impacts within acceptable limits is considered in Chapter 8.

Environmental aspects have been summarised assessing significance from a combination of direction, duration, receptor sensitivity and magnitude. Significance is given over the short and long term with mitigation during construction and operation phases, providing a summary of mitigation measures.

6.1.1 Defining Terms

The terms *impact* and *effect* are often used interchangeably but, within the context of the environmental studies considered in this chapter, these terms have specific meanings.

Impact is used with reference to changes in a particular aspect of the environment (e.g. air or water) which can be considered attributable to the Project. Where possible the degree of change is quantified.

Effect relates to the implication of changes in the baseline conditions which have been established for a particular receptor. The assessment of the significance of these changes to the baseline is based on the magnitude of the impact and the sensitivity of the receptor to that change.

Thus *impacts* are a measurement of the change upon aspects of the environment, from the baseline condition, as a consequence of the Project. The *effect* is how significant the change will be considering the sensitivity of the receptor.

The Project-affected area includes the Project footprint (see Figure 1.2) together with the surrounding areas that would potentially be affected by impacts associated with the construction, operation and closure of the mine.

6.1.2 Project Activities and Identification of Potential Impacts

The nature of the assessment and the methodology adopted to define significance is specified for each environmental aspect, within a general framework set out below.

Where quantitative techniques can be used, the approach adopted has been to model the natural environment and calculate the magnitude of the potential impact as a consequence of the Project activities.

- For example: the dispersal patterns and dilution of emissions to air. Where a numeric model has been used to define the magnitude of change, the significance of the impact has been assessed by reference to the criteria established in Chapter 2.

For a number of environmental aspects, qualitative techniques have been used to define the magnitude of the potential impact.

- For example: the use of photomontage in the landscape and visual impact assessment (Section 6.5) relies on previous experience and knowledge about the consequences of a given action; expert judgement is critical to the evaluation of significance.

Where appropriate, the details of the methodologies used for the impact assessment have been considered within individual sections.

The predictions derived in the impact assessment chapters are subject to a degree of uncertainty, and this uncertainty is explained within each topic together with any assumptions on which they are based.

6.1.3 General Methodology

Four attributes that have been applied to determine the degree of significance have been defined as:

Direction

- Positive Impact – An impact that is considered to provide a net benefit to the receptor;
- Adverse Impact – An impact that is considered to negatively affect the receptor, and may require management activities to mitigate its effects.

Duration

The duration of potential impacts associated with the Project is categorised as short-term or long-term, as defined in the context of each environmental aspect to take account of the receptor. However, for the majority of the environmental aspects, short term has been defined as the construction and / or operational life of the Project (i.e. up to 12 years) and long term effects are those that remain and continue after the post-closure phase of the Project.

Receptor sensitivity

Receptor sensitivity has been defined in Table 6.1-1.

Table 6.1-1: Receptor Sensitivity Scale		
	Sensitivity of receptor	Description of receptor
1	Minor	Low importance/receptor with low sensitivity; Abundant; Local importance or scale; Resilient to change; Potential for substitution within the local area.
2	Medium	Low to medium importance/receptor with low to medium sensitivity; Relatively abundant; Regional important or scale; Reasonably resilient to change; Potential for substitution.
3	High	Medium to high importance/receptor with medium to high sensitivity; Relatively rare; National importance or scale; Fragile and susceptible to change; Limited potential for substitution.
4	Very High	Very high importance/receptor with very high sensitivity; Extremely rare; International importance or scale; Very fragile; Highly susceptible to change; Very limited potential for substitution.
Note: the scale combines the description of the receptor together with its geographic extent. The general descriptions used in Table 6.1-1 have been developed for each environmental aspect, taking into account the relevant performance standards that are applicable.		

Magnitude

The magnitude of change has been defined in Table 6.1-2.

Table 6.1-2: Magnitude of Change Scale		
	Magnitude of change	Description of change
1	Negligible	Minimal detectable changes in baseline resource. Changes are either of short duration or infrequent periodicity, such that direct control is not required to manage potential impact.
2	Low	Detectable change to the baseline conditions or resource. During construction and operations there would be ongoing change in the underlying characteristics or quality of the baseline conditions.
3	Moderate	Degree of change is such that loss of, or adverse alteration to, the baseline conditions of a specific environmental resource would occur. Post development characteristics or quality would be partially changed during construction and operational phases.
4	High	Degree of change is such that total loss of, or adverse alteration to, the baseline conditions of a specific resource would occur. Post-development characteristics or quality would be fundamentally and irreversibly changed.

Defining significance

Using the qualitative descriptions from the Receptor Sensitivity (Table 6.1-1) and Magnitude of Change (Table 6.1-2), scales have been mapped to produce an Impact Significance Matrix (Table 6.1-3).

Table 6.1-3: Impact Significance Matrix				
Receptor Sensitivity	Magnitude of Change			
	Negligible	Low	Moderate	High
Minor	Negligible	Negligible	Minor	Moderate
Medium	Negligible	Minor	Moderate	Moderate
High	Minor	Moderate	Major	Major
Very High	Minor	Moderate	Major	Very High

More detailed definitions of the levels of significance are shown in Table 6.1-4, outlining when effects can be considered to be ‘significant’.

Table 6.1-4: Impact Significance Scale			
	Significance	Description of impact (sensitivity and magnitude)	Effect
0	Positive	Provide a net benefit to the receptor	Positive
1	Negligible	Receptor not concerned or altered by a particular activity; Nearly indistinguishable from natural background variations	Not significant
2	Minor	Well within accepted limit or standard; Noticeable impact on receptor, but sufficiently small so as not to be of concern	Not significant
3	Moderate	Within accepted limit or standard, but close to reaching the threshold; High magnitude changes on relatively insensitive receptors; Low magnitude changes on highly to very highly sensitive receptors	Significant
4	Major	Accepted limit or standard is exceeded; High to moderate magnitude changes affecting highly to very highly sensitive receptors	Significant
5	Very High	Total loss or adverse alteration to extremely rare or unique receptor. No mitigation possible	Significant

6.1.4 Mitigation Measures and Residual Impacts

Adverse effects rated as Significant must be mitigated in order to reduce the level of significance of the residual impact. Monitoring measures must also be defined to assess the efficacy of the mitigation measures.

The potential impacts, with mitigation imposed, have then been reassessed to derive residual effects as a result of Project activities. This assessment is based on the same methodology and Impact Significance Matrix as used to assess unmitigated impacts. The residual effect is determined as a result of the impact and implemented through appropriate risk analysis based on the monitoring programme targeted to audit the effectiveness of the mitigation measure targeted on the potential impact.

6.2 General Approach for Social Impact Assessment

Unlike the environmental impact assessment, social impacts will not make a distinction between the use of the terms impact and effect and the methodology that has been adopted, in light of this, has been defined below. Socio-economic aspects have been summarised describing direction of the change, magnitude, extent, duration and impact prior and post-mitigation.

6.2.1 General Methodology

The four attributes applied to the determination of socio-economic impact significance are:

- **Direction:** indicates whether the impact is positive, negative or neutral. Some impacts may have mixed positive and negative dimensions, which will generate a “neutral” prediction prior to mitigation.
- **Magnitude:** indicates the degree of change in a social parameter and is generally a qualitative assessment.
- **Geographic extent:** indicates the geographic and administrative units that will be impacted. Some impacts may affect only individual households, whereas others may affect the local area of influence, regional area of influence, the entire country, or have a trans-boundary impact.
- **Duration:** indicates the length of time over which an impact may occur. Duration is usually related to the project description; short-term refers to the pre-construction and construction phase; medium-term refers to construction, operations and closure; and long-term refers to elements beyond the life of the Project.

6.2.2 Classification of social impacts

The classification of social impacts is considered in Table 6.2-1.

Table 6.2-1: Classification of social impacts	
Criteria	Definition
Direction	Positive – Impact provides a net benefit to the affected person(s). Negative – Impact results in a net loss to the affected persons(s). Mixed – Impact may be positive or negative, but requires an intervention to demonstrate net benefit. Neutral – No net benefit or loss to the affect person(s).
Magnitude	Negligible – No noticeable change anticipated. Low – Result predicted to be different from baseline conditions, but not to impair or change quality of life of the affected person(s). Moderate – Result predicted to impair or benefit quality of life of the affected persons(s). High – Result predicted to seriously impair or substantially improve quality of life.
Geographic Extent	Individual – Confined to individuals or individual households. Local – Confined to the local area of influence. Regional – Confined to the regional area of influence. National – Extends to national level. Trans-boundary – Results impact neighbouring countries in the region.
Duration	Short-term – Construction and prior to operations. Medium-term – Construction and operations. Long-term – Through decommissioning and closure.

Each social impact category and sub-category will be assessed against the four criteria. The assessment will be made prior to the consideration of mitigation or benefit enhancement measures. The assessment will consider all four criteria to assign a significance level similar to that employed for the environmental impact assessment: “Negligible” to “Very High”. The impact category and sub-category will be re-assessed after a description of mitigation or benefit enhancement with the goal of showing the anticipated change resulting from management of the impact. While all classification of the social impacts is largely qualitative, the narrative should make the rationale for the prediction transparent to stakeholders and other reviewers.

6.2.3 Monitoring and Evaluation

It is important to include a process whereby mitigation actions are monitored regularly and formally evaluated at regular intervals. Results of monitoring will be disclosed and allowance made for stakeholder feedback on a periodic basis, usually at least annually. Monitoring requirements are identified as a distinct part of each impact category. Key mitigations, and the accompanying monitoring commitments, form the basis for the socio-economic sections

of the Environmental and Social Management system.

6.3 Application of the methodology for specific environmental and social aspects

Within each section of the impact assessment, the application of the approach and methodology has been considered with specific reference to the relevant Armenia regulatory requirements, IFC Performance Standard, EBRD Performance Requirement, and other relevant criteria and/or targets that relate to the discipline such as GIIP. In addition to the general environmental and social impact methodologies outlined above, specific methodologies or modifications have been applied for landscape and visual, biodiversity, community health and safety, transport and cultural heritage impact assessment, and these are described in detail in the relevant sections.

Defining the significance of effects has been used as the basis for determining the appropriate mitigation strategies in combination with identifying the need and scope of management plans. The structure and approach to the Environmental and Social Management Plan (ESMP) has been considered in Chapter 8. The management of these effects/impacts and mitigation strategies throughout the life of the Project are embedded in the Environment and Social (E&S) Management System and Occupational Health and Safety (OHS) Management System developed by Lydian for its Amulsar Gold Project. The two systems collectively support effective health, safety, environment and community (HSEC) performance, i.e., protecting the environment, continuously improving the efficiency of natural resource use, positively impacting the quality of life of nearby communities and preventing injuries and occupational illnesses.

6.3.1 Worker accommodation impact assessment

The methodology adopted for the worker accommodation relies broadly on the principles adopted for other chapters of the ESIA, however and for consistency, because this was a bespoke study, the methodology used in the assessment has been identified in full within the chapter.