USING ESIA TO OPTIMISE DESIGN OF MINING PROJECTS - OLC CASE STUDY EXAMPLE

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ABSTRACT

This article aims to demonstrate how mining projects can be planned in a biologically diverse and socially challenging environment by designing out potentially negative impacts and enhancing positive impacts early in the project development process. This article also discusses the growing importance of avoiding impacts in the earliest stage of planning.

SRK was commissioned to conduct an Environmental and Social Impact Assessment (ESIA) for the Kola Potash Mine Project in the Republic of Congo in parallel with the pre-feasibility study and feasibility study design phases. A particularly challenging component of the design was a 35 km overland conveyor (OLC) linking the proposed mine with the potash processing facilities, and its location between a national park and a nature reserve.

As part of this scope of work, SRK worked iteratively with the project engineers, NGOs and local communities to assess and suggest possible design alternatives, which would have ecological, social and economic benefits. As a result of this iterative process, the feasibility stage design was optimised to include more inherent design measures and reduce the significance of negative impacts. The article explores the benefits of early and continuous collaboration of disciplines and the close interaction between the project development and ESIA processes, ultimately leading to a more sustainable project.

Key words: Mitigation hierarchy, ESIA, Congo, Conveyor belt, Sustainability, Mining

1 INTRODUCTION

The approach to conducting activities during a mining exploration programme in terms of building relationships with stakeholders and managing key potential environmental and social risks can profoundly influence the success of the programme and future project development potential for the site. In addition, there is a clear global drive for sustainability and a low carbon future. This is resulting in a rising recognition by the mining industry, and financial institutions involved in funding mining projects, of the importance of effectively managing environmental, social and governance (ESG) factors from exploration through to closure.

The Environmental and Social Impact Assessment (ESIA) process is critical to ensuring the mine has mutually beneficial gains for the environment, host communities and the mining company. The ESIA process is often the first opportunity for a company to demonstrate to the public and investors how the project has been designed with ESG matters in mind, and how it will be managed sustainably going forward.

1.1 The Kola Potash Mine

SRK was commissioned to conduct an ESIA process for Kore Potash on the Kola Potash Mine (the project) in the Republic of Congo. The project is located 70 km north west of Pointe Noire.

The project consists of an underground potash mine, a 35 km ore transport corridor from the mine site to the coast, a processing facility and ship loading facility. The life of mine is 25+ years to produce approximately 2 Mt per annum of muriate of potash (MoP). The project location, communities and important protected areas are shown in Figure 1.

Figure 1: Kola project overview

Major components of the project were subject to alternative assessments as part of the ESIA process and project development studies. For the ore transport corridor, an overland conveyor (OLC) was selected over truck hauling along a dedicated haul road.

The OLC was the preferred choice based on improved operability (lower fuel costs), better environmental and social performance (reduced noise, dust and light pollution and lower carbon footprint) and improved health and safety for employees and communities (Kluge et al., 2017). In terms of design, the OLC will be steel clad and slightly elevated from the ground to allow culverts for water drainage. The OLC corridor is 200 m wide and includes the conveyor, a service road and fence.

1.2 Environmental and Social Setting

Habitat in the area comprises of forest and savanna. The savanna habitat represents degraded, previously forested land that contains fewer species and less diversity than the forests. The two protected areas in proximity of the project are the Conkouati-Douli National Park (CDNP) to the west of the project and the Tchimpounga Natural Reserve (TNR) to the southeast. The OLC is located within the eco-development zone (eastern edge) of the CDNP and approximately 20 km west of the TNR (Figure 1).

Two biodiversity connectivity corridors used by fauna were identified along the OLC route. One of these connectivity corridors is used by forest elephants and is located in the middle of the proposed OLC route. The two protected areas and biodiversity connectivity corridors were identified as critical habitat and are particularly sensitive to development (IFC, 2019).

The population of the project area was 8,472 (excluding Pointe Noire) in 2017, residing in 21 communities between Nkola and Quartier Loango 1. The majority of people lack formal employment and have mixed livelihoods based on natural resources, consisting of agriculture (cassava is the main crop grown), fishing, hunting and making charcoal. Communities are generally located on the east side of the OLC and their natural resources are predominately based on the west side of the OLC in the CDNP.

The project is in a landscape that is gradually degrading over time (SRK, 2018) due to increased pressure on natural resources, climate change and the absence of feasible alternatives for food or income generating activities in the area. The results of the extensive biodiversity baseline studies conducted for the project between 2011 and 2016 showed charcoal production, farming and logging have had significant impacts on the amount of intact forested habitat (SRK, 2018).

2 APPROACH TO OPTIMISING DESIGN

During the ESIA process, SRK collaborated with Kore Potash, design engineers, local and international non-government organisations (NGO), to identify feasible and effective management measures for the project. The team used the mitigation hierarchy to avoid and then minimise potentially negative impacts on habitats and protected fauna using a host of innovative approaches and world first examples.

The process (see Figure 2) for optimising design relied on constant communication between various parties and helped to identify and avoid potentially negative impacts early in the process.

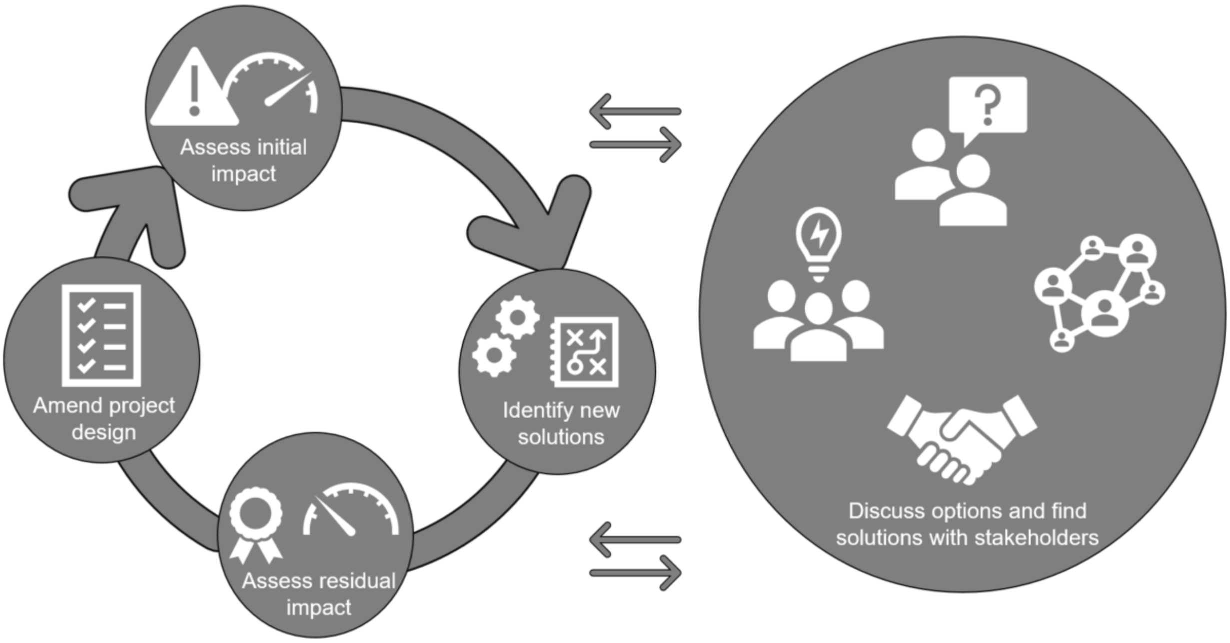

Figure 2: Iterative process undertaken by SRK for the Kola ESIA

2.1 Potential impacts of the OLC

The initial impact of the OLC was assessed to be high magnitude, with potentially regional scale impacts to humans and biodiversity for an extended period (25+ years) resulting in a major negative impact of the project. The main impacts were defined as:

- **Impact 1: Direct loss of habitat** - The OLC route crosses forest, savanna, eucalyptus plantations and coastal swamp forest. There will be a direct loss of these habitats within the OLC footprint totalling 700 ha.

- **Impact 2: Habitat fragmentation** - The OLC corridor presents a physical barrier to east-west movement of many terrestrial species. The OLC could also cause a functional barrier due to higher noise levels associated with the OLC. Additionally, if species are restricted to the east side of the conveyor, away from the CDNP, this increases the risk of conflict between fauna and local communities as they compete for the same resources.

- **Impact 3: Land take and reduced access to resources** – The OLC may restrict access to habitats harvested for their natural resources. Constrained access to natural resources may also result in reduced income for individuals who sell natural resource products. Lower income may contribute to a reduced standard of living and increased poverty.

- **Impact 4: Continued environmental degradation due to natural resource use** – The OLC has potential to accelerate environmental degradation through creating a physical barrier to the CDNP and accelerating resource use in more readably accessible areas. This is linked with potential speculative influx to the area as people may settle along the OLC in search of work at the mine.

2.2 Identified measures to reduce or enhance impacts

SRK undertook extensive research on successful animal crossing designs in operation throughout the world. There were no examples of forest elephants in rainforest environments crossing OLC type structures. Underpasses were identified as a feasible option to minimise the impacts on habitat fragmentation. The location, number and size of the underpasses were discussed with NGOs and communities and their design optimised to reduce the distances travelled by communities to access natural resources.

In total, 68 crossing points were designed along the OLC for pedestrians, cars and fauna. The elephant underpass was designed with a 50 m span and 7 m hight clearance in a known elephant migration corridor. The design of the large open span bridge underpass for elephants is illustrated in Figure 3.

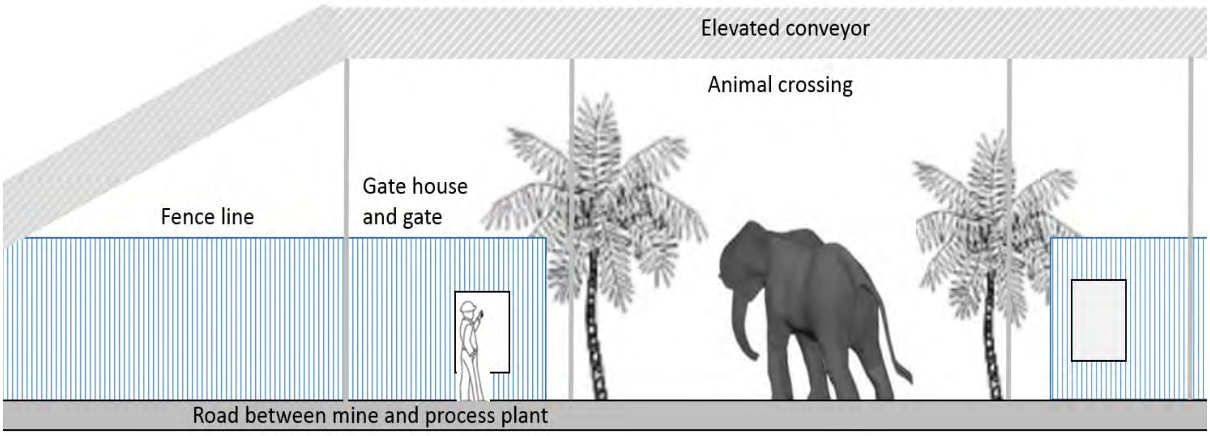

Figure 3: Illustration of large animal crossing

The results of the optimisation of OLC design based on the iterative approach and using the mitigation hierarchy are shown in Table 1. Assuming successful implementation of these measures, particularly the use of the underpasses by humans and fauna, the residual impact rating of the OLC was assessed to be a medium impact.

Table 1: Innovative measures developed during the iterative design process to minimise impacts of the OLC

<table>
<tr><th rowspan="2">Impact</th><th colspan="4">Top preference → Lowest preference</th></tr>
<tr><th>Avoid</th><th>Minimise / Enhance</th><th>Manage</th><th>Offset</th></tr>
<tr><td>Direct loss of habitat and disturbance to fauna</td><td>• Optimise OLC route to avoid forest habitat as they are important oases for birds and other wildlife in the savanna dominated landscape</td><td>• Insulating hooding to reduce conveyor noise along the biodiversity connectivity corridors
• Reduce conveyor speed to further reduce noise levels
• Restrict vegetation clearance during construction to minimise disturbance</td><td>• Use staff meetings to inform project employees and contractors of the conservation significance of the CDNP</td><td rowspan="4">• Plant a forest-like habitat corridor along the western edge of the OLC bordering the CDNP to re-connect isolated habitat patches & mitigate noise
• Plant a fruit tree-based forest corridor along the community side of the OLC to improve food security for communities
• Diversify livelihoods with beekeeping initiative to secure food, provide alternative income sources and deter elephants from crop raiding around villages (King et al., 2017)</td></tr>
<tr><td>Habitat fragmentation</td><td>• The OLC route cannot realistically be optimised to avoid the biodiversity connectivity corridors</td><td>• Construct underpasses for fauna to minimise the fragmentation of habitat from functional and physical barriers</td><td rowspan="2">• Monitor the use of human and animal underpasses to ensure they are being used effectively and not used for logging, hunting or poaching activities
• Implement corrective measures if required</td></tr>
<tr><td>Land take and reduced access to resources</td><td>• Optimise OLC route to avoid key natural resources and locate as far from villages as possible
• Undertake land acquisition according to national and international standards</td><td>• Construct underpasses for humans, motorbikes and small vehicles along OLC to secure community use of natural resources but deter poachers and illegal loggers entering CDNP</td></tr>
<tr><td>Continued environmental degradation due to natural resource use</td><td>• Avoid placement of mine infrastructure around CDNP to reduce speculative influx to the mine area and limit population growth in surrounding communities</td><td>• Preferential employment of project affected communities
• Encourage a switch from subsistence to employment-based livelihoods
• Partner with NGOs to improve crop practices in the area and introduce disease resistant cassava</td><td>• Monitor local employment statistics
• Establish vocational training centers to upskill communities</td></tr>
</table>

3 CONCLUSION

Effective ESIA management played a key role in resolving difficult challenges with innovative and often mutually beneficial outcomes. The iterative approach resulted in Kore Potash being able to demonstrate incorporation of ESG into early project design by reducing the magnitude of negative impacts. The process also fostered a productive and supportive relationship between Kore Potash and their stakeholders by engaging regularly and involving them in the decision-making process.

Ultimately, as a result of the process, the ESIA report was submitted to authorities with fewer 'highly significant' negative impacts meaning the development is more likely to obtain the required permits and project financing to proceed.

This article demonstrates how mining projects can be planned in a biologically diverse and socially challenging environment by designing out potential negative impacts and enhancing positive impacts early in the project development process.

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