An audit of environmental impact assessments for mining projects in Kenya

F. Mwaura[1]

Affiliation:
[1]Department of Geography and Environmental Studies, University of Nairobi, Kenya.

Correspondence to:
F. Mwaura

Email:
mwauraf@uonbi.ac.ke

Dates:
Received: 29 May 2018
Revised: 12 Sep. 2018
Accepted: 29 Sep. 2018
Published: May 2019

How to cite:
Mwaura, F.
An audit of environmental impact assessments for mining projects in Kenya.
The Southern African Insitute of Mining and Metallurgy

DOI ID:
http://dx.doi.org/10.17159/2411-9717/143/2019

ORCiD ID:
F. Mwaura
https://orchid.org/0000-0002-4054-0218

Synopsis

The aim of the audit was to determine whether the mining project environmental impact assessments (EIAs) in Kenya are undertaken according to international best practice. A sample of 50 EIA reports for the 2007–2016 period was evaluated using 18 criteria in the Environmental Law Alliance Worldwide (ELAW) guidelines. The findings showed that only two criteria were considered 'excellent' according to the ELAW guidelines, namely baseline environmental assessment and prediction of physical impacts. Six criteria were found to be 'satisfactory', including prediction of social impacts, analysis of alternative options, and impact mitigation. The reports were quite weak in terms of: consideration of all phases in the mining cycle, environmental regulatory framework, prediction of biological impacts, stakeholder consultation and engagement, integration of human right issues, and integration of climate change and cost-benefit analysis. It is therefore recommended that the Kenyan National Environment Management Authority (NEMA) should consider tightening the EIA terms and conditions in the approval of statutory terms of reference (ToR) for full-scale mining EIAs to ensure improved performance of EIA as a tool for environmental protection.

Keywords
mining projects; environmental sustainability; EIA reports, best practice.

Introduction

The nexus between society and the environment has continued to generate interest because the environment is the source of goods and services that sustain the various needs of human beings as outlined in the UN sustainable development goals (SDGs) (Armstrong and Peart, 2000; Sutton 2004; Chakrabarti 2007; Strange and Bayley 2008). All the five generic categories of societal needs, namely physiological needs (food, water, clothing, medicines, *etc.*), residential and occupational needs (shelter, transport, energy, *etc.*), economic needs (tradeable goods and services), leisure and recreational needs (tourism), and cultural and spiritual needs (*e.g.* sacred resources and ecosystems) (Mwaura *et al.* 2016) are addressed by the environment. Consequently, a wide range of development sectors have been established around the world in order to address the above needs (Lederer, Galtung, and Antal, 1980; Rammelsberg *et al.*, 2006; Noonan, 2014). All these development sectors rely entirely on the environment for their proper functioning, as shown in Table I.

Development activities such as large-scale farming, irrigation, fishing, forestry, mining, manufacturing, tourism, transport, and communication, among many others usually take place within or very close to sensitive environments such as forests, rivers, lakes, wetlands, and wildlife breeding zones. The interface between society, environment, and development always poses a risk of environmental damage to the terrestrial, aquatic, and atmospheric spheres of the world environment. This risk continues to grow as the demands by society on the environment increases due to population growth (Tisdell, 2005; Schaltegger and Wagner 2006). The United Nations estimates the current world population at approximately 7.6 billion, which is expected to increase to 11.2 billion in the year 2100 (UN-DESA 2017).

Most development sectors pose a significant potential risk of negative impact on the environment. However, some economic sectors such as mining pose a higher risk in comparison to other sectors such as pastoralism (Patnaik and Das, 1990; Ripley, Redmann, and Crowder, 1996; Azcue, 1999; Ozkan and Ipekoglu 2002). The mining sector is associated with a wide range of environmental risks due to activities such excavation and earthworks, tailings disposal, and gaseous emissions, which are likely to negatively affect terrestrial, aquatic, and atmospheric environments leading to serious impacts on biodiversity, ecosystems, and society (Dold and Friese 2007; UNDP 2014; Sivi *et al.*, 2015). Generally,

Table I

The linkages between society, development, and environment

Society	Development sector	Environmental requirements
Physiological needs – food, water, clothing, medicines *etc.*	Agriculture, irrigation, dam construction, industries	Suitable landscapes, arable soils, rivers, lakes, biodiversity, *etc.*
Residential and occupational needs – shelter, homes, vehicles, trains, aircraft, ships, energy, *etc.*	Construction, urbanization, transport communication, power stations	Land, forests, rivers, lakes, oceans, airspace, minerals, *etc.*
Economic needs – goods and services for revenue generation	Agriculture, forestry, mining, fisheries, livestock husbandry, tourism	Terrestrial ecosystems, aquatic ecosystems, biodiversity
Leisure and recreation needs – human relaxation and entertainment	Tourism	Natural and cultural heritage
Cultural and spiritual needs – prayer, sacrifice, circumcisions, weddings *etc.*	National heritage	Sacred mountains, rivers, lakes, wetlands, forests, rangelands, sacred species *etc.*

mining activities lead to extensive vegetation clearing which affects flora and fauna. Mining areas also become vulnerable to degradation through soil erosion and environmental pollution. The management of waste arising from different stages of mining processes is usually a major environmental challenge around the world. Depending on the degree of pollution, this can lead to serious health risks to the public, livestock, and wildlife (Černe *et al.*, 2012). On the social front, the mining sector is also known to cause a wide range of adverse impacts including land acquisitions, displacements, resettlements, as well as illegal engagement of child labour (Jha-Thakur and Fischer, 2008; Salgado 2013).

The environmental risks associated with mining activities therefore demand a very careful interrogation of projects before their commissioning to ensure proper mitigation of potential negative impacts so as to ensure sustainable development. Such projects must also be subjected to regular monitoring to ensure that they are conducted in a sustainable manner. Environmental impact assessment (EIA) has been identified as a suitable management tool that aims at ensuring that all new development projects, including mining, are implemented in a sustainable way, and that their possible negative impacts are identified early and adequately mitigated at the project design stage. Consequently, EIA is considered as a valuable tool for ensuring environmental protection and sustainability (Muttamara, 1996; Zhao, 2009; Morrison-Saunders and Retief, 2012; Safont, Vegas-Vilarrúbia, and Rull, 2012; Arts *et al.*, 2012). Consequently, up to 190 of the 193 member states of the United Nations have adopted and regulated EIA as a systematic process for identifying and mitigating the potential environmental impacts of development projects (Harris, Viliani, and Spickett, 2015). EIA is a useful instrument for ensuring sustainability in the society-environment-development nexus by identifying suitable mitigation strategies for dealing with environmental damages.

The effectiveness of EIA as an environmental protection tool requires the complementary engagement of the processes of strategic environmental assessment (SEA) and environmental audits. A number of studies have considered the linkages between SEA, EIA, and environmental audits (Marshall and Fischer, 2006; Fischer, 2006). EIA is closely related with SEA but the latter is usually undertaken ahead of the former during the development cycle. The SEA interrogates the sustainability of development policies, plans, and programmes from which many types of development projects usually emerge. Projects are usually initially subjected to the EIA process and subsequently undergo environmental audits as shown in Figure 1. Regular environmental audits are necessary to ensure that the EIA recommendations are implemented and fulfilled throughout the project life-cycle. Consequently, SEAs are usually undertaken ahead of EIAs, which makes them capable of informing the implementation of EIAs and environmental audits.

A wide range of studies have been done on the effectiveness of EIA as an instrument for sustainable environmental governance throughout the world (Biswas and Agarwal, 1994; Churie, 1997; Loots, 1997; Staeck and Heinelt 2001; Arts *et al.*, 2012). Numerous EIA evaluation studies on mining projects have been undertaken around the world. Audits of the EIAs for the Ok Tedi mine in Papua New Guinea and Century Mine in northern Australia by Mckillop and Brown (1999), for example, identified a failure to adequately safeguard the biophysical and social environment. The evaluation showed that the EIA process was poorly timed and not well integrated within the early phases of the mining activities because most EIA efforts are concentrated on the mining phase and do not address impacts resulting from the exploration, prospecting, and pre-feasibility phases. Various environmental studies are associated with these phases, after which a decision is made whether to proceed with the project or not. The EIA describes the environmental measures the proponent has committed to and on which the relevant authority approves or disapproves projects. The findings showed that EIA considerations were not integrated in the approval and issuance of mineral exploration and prospecting permits and licenses, and yet these activities also had certain negative impacts on the environment.

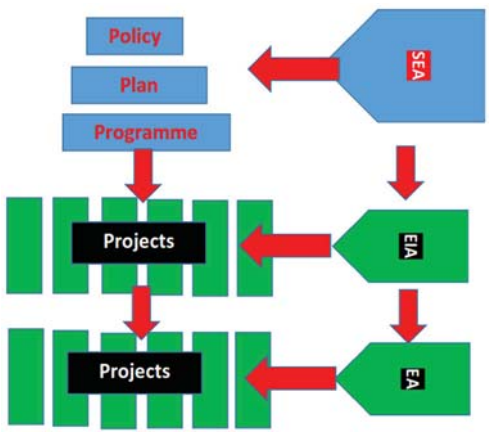

Figure 1—Linkages between EIA, SEA, and environmental audit (EA)

Morrison-Saunders *et al.* (2016) evaluated the integration of mine closure and decommissioning in the EIA by comparing the practice in eight African and Australian jurisdictions, including Western Australia, Ghana, Kenya, Nigeria, Mozambique, South Africa, Tanzania, and Zambia. The findings showed that although all eight jurisdictions have appropriate regulatory provisions in place, the implementation capacity is still a challenge which affects the environmental outcomes. Similarly, Kruger *et al.* (1997) noted the inability of the EIA to accurately predict the magnitude of expected impact from mining activities in St Lucia, South Africa. However, Sandham, Hoffmann, and Retief (2008) evaluated the quality of mining EIA reports in South Africa and concluded that 85% were of satisfactory quality. In Ghana, Kuma, Younger, and Bowell (2002) established a weakness in mining EIAs in terms of hydrogeological impact analysis due to inability to clearly determine the pre-mining groundwater status. In Nigeria, Ingelson and Nwapi (2014) evaluated the EIA process for oil and gas projects in the world's twelfth largest producer of crude oil and highlighted a range of reasons why the impacts of such projects are not properly managed despite the application of EIAs.

In 1999, the Republic of Kenya joined the rest of the world as a nation with a clear legal framework on environmental management. The enactment of the Environmental Management and Coordination Act (EMCA, Cap 387) paved the way for EIA and regular environmental audit practice in development activities with a potential for adverse environmental impact. A number of studies have evaluated the effectiveness of EMCA (Cap 387) in environmental protection in Kenya, including the effective application of EIAs and environmental audits. Kibutu and Mwenda (2010), for example, reviewed the provision for EIA in the environmental legislation while Okello *et al.* (2009) and Mwenda *et al.* (2012) evaluated the role of public participation in Kenyan EIAs. Kamau and Mwaura (2013) assessed the level of climate change adaptation and EIA studies in Kenya. To date, there have not been many evaluation studies considering the effectiveness of EIA in mining projects in Kenya.

Kenya is endowed with over 120 different types of mineral deposits, but the exploitation of these assets is yet to reach peak level (Republic of Kenya, 2015). Accordingly, the government of Kenya has recognized the mining sector as a key player for the realization of the UN SDGs as well as the goals for the Africa Mining Vision (2009) and Kenya Vision 2030 (Mutua, 2014; Republic of Kenya, 2015). The government has recently added oil, gas, coal, titanium, and other minerals as priority assets for spurring economic growth through Vision 2030 (Mutua, 2014; Republic of Kenya, 2015). Although the mining industry has an unprecedented opportunity to mobilize significant human, physical, technological, and financial resources to advance the SDGs, its impacts can jeopardize the realization of some environmental SDGs. The development of large-scale mining (LSM) in Kenya will consume vast quantities of land and water resources and is likely to cause land degradation and water pollution which must be mitigated or avoided through good governance with the support of effective application of EIA. The mining sector is also capable of disturbing national biological capital through the loss and degradation of ecosystems such as forests, wetlands, and coastal areas, which can affect the status of the country as a major wildlife tourism destination. It is therefore urgently necessary to evaluate the quality of mining project EIA reports to determine whether the process is undertaken according to international best practice through the approving authorities and financing agencies.

The key research question for the study was – which types of mining EIAs have been undertaken in Kenya during the last decade and do they measure up to the expected standards according to international best practice? The aim of the evaluation of mining projects EIAs in Kenya was therefore to:

(a) Analyse the typology and distribution of mining project EIAs in the country
(b) Determine whether the quality of mining project EIA reports is a reflection of international best practice with regard to the consideration of all the expected issues.

Study area

Kenya is endowed with over 120 different types of mineral resources, as shown in Figure 2 and Table II. Accordingly, the government of Kenya has recognized the mining sector as a key player in the journey towards Vision 2030, and has recently included oil, gas, and other minerals as the seventh priority economic sector for the country's Vision 2030 (Republic of Kenya, 2015). In the past, both soda ash (trona) and fluorspar contributed significantly to the gross domestic product (GDP). Overall, the country earned more than $232 million from the mining sector in 2015 which was an increase from $203 million in 2014. In 2012, the sector employed approximately 8400 people (Mutua, 2014; Republic of Kenya, 2015). With further exploration and development, it is estimated that Kenya could soon have the capacity to position itself as a regional mining sector hub for East Africa.

The environmental law in Kenya, like most other countries in the world. requires that a full and comprehensive EIA, and not a general project study, be undertaken and an EIA license issued before any mining-related activities, including exploration, prospecting, extraction, and processing, can proceed. However, the final approval may be based on different EIAs carried out for the exploration and prospecting stages in the mining cycle. According to the Environmental Management and Coordination Act (EMCA, Cap 387), all mining projects are listed under the category of 'high-risk projects' that must be screened through

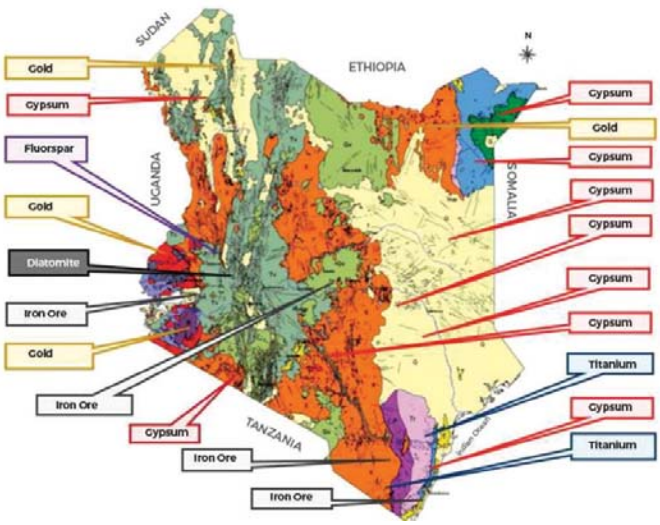

Figure 2—Distribution of selected minerals in Kenya (Republic of Kenya, 2015)

Table II

Distribution of mineral in Kenya by county

County		Minerals
1.	Kwale	Gemstones, heavy mineral sands (titanium minerals), silica sand, rare earth elements, niobium
2.	Kilifi	Titanium minerals, manganese, barytes, gypsum, gemstones
3.	Taita Taveta	Iron ore, gemstones, manganese, granites
4.	Tana River	Gypsum
5.	Makueni	Vermiculite, gemstones
6.	Kitui	Coal, iron ore, copper, gemstones, limestone, magnetite, alumina clay, marble
7.	Machakos	Gypsum and pozzolana
8.	Kiambu	Carbon dioxide and diatomite
9.	Tharaka Nithi	Iron ore, gemstones, copper
10.	Isiolo	Gemstones
11.	Garissa	Gypsum
12.	Mandera	Gypsum
13.	Isiolo	Gemstones
14.	Marsabit	Gold, manganese, chromite, gemstones
15.	Elgeyo Marakwet	Fluorspar
16.	Baringo	Gemstones (Baringo ruby), diatomite
17.	Nakuru	Diatomite
18.	Kajiado	Soda ash, feldspar, limestone, gypsum, gemstones, marble and granite (dimension stones)
19.	Uasin Gishu	Carbon dioxide gas
20.	Turkana	Gypsum, oil, gold, gemstones
21.	West Pokot	Gold, gemstones, chromite
22.	Samburu	Gold, manganese, chromite, gemstones, and vermiculite
23.	Narok Transmara)	Gold
24.	Nandi (Kibigoni)	Gold
25.	Kakamega	Gold, dimension stone
26.	Siaya	Gold, iron ore
27.	Migori	Gold, copper
28.	Homa Bay	Iron ore and gold

(Source: Republic of Kenya, 2015)

pre-project EIAs and thereafter through regular environmental audits to ensure environmental sustainability throughout the mining cycle from exploration, through prospecting, extraction, and processing, to mine closure and rehabilitation. The EIA framework in Kenya requires that adequate consultation be undertaken with and among all the relevant stakeholders, especially the mining host communities. EMCA Cap 387 requires the EIA report to be circulated throughout the country by the National Environment Management Authority (NEMA) to allow wider peer review and comprehensive stakeholder consultation, which eventually informs final decision-making regarding the licensing of mining-related projects.

Methods

The audit was undertaken through an interrogation of a sample of the mining EIA reports in the national database at the NEMA office in Nairobi. The audit was undertaken using standard criteria provided in the Guidebook for Evaluating Mining Project EIAs (Environmental Law Alliance Worldwide, 2010). The approach and methodology for the audit are detailed below.

Audit period

The audit was undertaken for the 2007–2016 period as the decade during which the mining sector was identified as one of the key drivers for economic growth and transformation. The sector is expected to contribute 10% to the GDP by 2030, up from the current 0.9%. Mining activities in the country increased remarkably during this period, hence the need to assess the mining project EIAs during this period.

Sampling strategy

A total of 50 mining project EIA reports were considered in the audit, representing 30.7% of the 163 EIAs undertaken during the study period as shown in Table III.

Evaluation criteria

The audit was undertaken using the standard criteria described in the Guidebook for Evaluating Mining Project EIAs by Environmental Law Alliance Worldwide (ELAW, 2010). Similar standard criteria have been used to evaluate EIAs for proposed mining projects around the world. Each report was evaluated using a standard checklist of 18 parameters used in the evaluation (Table IV). This is an EIA report evaluation checklist and not an EIA implementation checklist as provided in the performance standards for various international agencies such as the World Bank/IFC (World Bank, 2008).

The evaluation was based on four judgements prescribed in the Guidebook (ELAW 2010), namely: (a) 'yes to all' if all the attributes in an evaluation criterion were fully considered in the EIA process, (b) 'yes to most' if 80% of the attributes were considered, (c) 'yes to a few' if less than 50% of the attributes were considered, and (d) 'no to all' if none of the attributed were considered. The overall quality of the EIA process was based on four quality categories as follows: (a) 'excellent' if the 'yes to all' judgment for a given parameter was dominant, (b) satisfactory' if the 'yes to most' grading was dominant, (c) 'poor' if the 'yes to a few' grading was dominant, or (d) 'very poor' if the 'no to all' grading was dominant. Quantification of attributes in percentages was based on the actual counting of the total number of criteria out of the 18 which were considered in an EIA report.

Results and analysis

The evaluation of the 50 mining project EIA reports in the 2007–2016 period showed that 50% of the EIAs were associated with mining activities, 22% with both prospecting and mining, 18% with exploration and prospecting, 8% with mineral processing, and 2% with both mining and processing. Table V shows the

Table III

Summary of mining project EIAs in 2007–2016

Year	Total no. of EIA reports	Audit sample EIA reports
2007	6	2
2008	6	2
2009	7	3
2010	17	5
2011	16	4
2012	21	6
2013	18	6
2014	22	7
2015	21	6
2016	29	9
Total	163	50

Table IV

Summary of the parameters used for evaluation of mining project EIAs

EIA quality evaluation parameter	Specific attributes
1. Consideration of key EIA stages of the assessment process	Screening, scoping, description of mining project, baseline environmental description, comprehensive environmental regulatory framework, analysis of alternative options, stakeholder engagement, impact analysis, impact mitigation, decommissioning strategy, EMP and environmental monitoring strategy
2. Consideration of all the phases of mining project	Exploration and prospecting, construction of access roads, site preparation and clearing, mining installations, mining activities, disposal of overburden and waste rock, ore extraction, tailings disposal
3. Comprehensive environmental regulatory framework	Policies, laws (Acts of Parliament), regulations, standards, national strategies and action plans, multilateral environmental agreements (MEAs) and other relevant international agreements
4. Consideration of potential physical impacts	Land environment, landscapes, hydrology, groundwater and water resources, water quality, air quality, noise and vibrations, climate change
5. Consideration of potential biological impacts	Flora, fauna, endangered species, sensitive habitats and ecosystems, protected areas, biodiversity hotspots
6. Consideration of potential social impacts	Displacement and resettlement, livelihoods impacts, traffic interruption, solid wastes, public safety and health, employment, CSR, emergency response and contingency plans, conflict resolution
7. Human rights considerations	Right to fair administrative action, right to access public information, right to security and peace, right to proper physical and mental health, prevention of child labour
8. Evidence of actual baseline environmental studies	Characterization of proposed mined materials, soil, water, noise, air quality, flora, fauna, climate, population characteristics, land use, social services
9. Stakeholder engagement and consultation	Stakeholder mapping, identification of stakeholders, directly affected stakeholders (DAS) and indirectly affected stakeholders (IAS), gender balance, youth and vulnerable groups
10. Adequate EIA consultation meetings	Number of meetings, convenient meeting venues, listing of stakeholder consultation meeting (SCM) participants, listing of SCM contacts, stakeholder communication strategy, evidence of full project information disclosure, listing of stakeholder concerns, clear details of project approval or disapproval by stakeholders, adequacy of consideration of stakeholder inputs, identification of issues and concerns and where dealt with in the reports
11. Characterization of potential impacts for all mining stages	Pre-construction, construction, operation, decommissioning, and rehabilitation
12. Climate change considerations	Loss of CO_2 uptake through vegetation clearance, CO_2 emission by mining machines, CO_2 emission through mineral processing, considerations on climate change-proof mining infrastructure, climate change mitigation and adaptation, considerations on climate change-related natural disaster risk reduction in the EMP
13. Consideration of trans-boundary impacts	Inter-village, inter-county, regional, and international
14. Analysis of alternative options	Preferred option, no-action zero option, other options
15. Cost-benefit analysis	Estimated cost of project economic benefits and environmental losses
16. Impact mitigation	Positive impacts, negative impacts, recommendations for mitigation of negative impacts, rehabilitation cost and funding allocation at decommissioning phase, enhancing positive impacts
17. Environmental management and monitoring plan (EMP)	Land environment, soil environment, water resources, air quality, noise and vibration, flora and fauna, public safety and health, decommissioning and rehabilitation, long-term monitoring protocol, responsible persons and agencies, timelines, guidelines
18. Overall quality of EIA report	Comprehensive non-technical summary, illustrative maps, diagrams, and photos, clear conclusion and recommendations, clear and easy to understand

Table V

Types of minerals covered in the 2006–2016 mining project EIAs

Mineral	% of EIA reports in 2006–2016
Gypsum	32
Gold	12
Manganese	12
Copper	10
Iron ore	8
Diatomite	2
Graphite	2
Barytes	2
Limestone	2
Precious and non-precious stones and minerals	2
Kyanite crystals	2
Rock material	2
Copper and non-precious minerals	2
Carbon dioxide	2
Pumice	2
Sodium silicate	2
Magnetite	2
Silica sand	2
Total	**100**

key types of minerals for which mining EIAs were undertaken. These were dominated by gypsum, followed by gold, manganese, copper, and iron ore. Gypsum deposits are common in a number of areas in Kenya such as Kitui, Machakos, Tana River, and Kilifi counties. The mineral is commonly used in the manufacturing of gypsum boards, binders, and plasters for house ceilings and interior partitioning. The demand for gypsum is high as a result of a vibrant construction sector in the urban areas. The geographic distribution of mining project EIAs showed that most of the mining project EIAs were undertaken in Tana River County, followed by Kilifi, Kitui, Migori, and Garissa counties (Table VI). The overall audit showed that 38% of the mining project EIAs were undertaken in the coast region, followed by the Rift Valley (20%), Eastern region (18%), and Nyanza (12.5%).

Table VII shows the findings on the audit of the 50 mining project EIA reports. The 2006–2016 reports were 'excellent' only with regard to prediction of potential physical impacts and baseline environmental assessment. They were satisfactory with regard to the consideration of key EIA stages, prediction of social impacts, analysis of alternative options, impact mitigation, and environmental management and monitoring plan (EMP). The

Table VI

Geographic distribution of mining project EIAs per county

County	% of EIA reports in 2006–2016
Tana River	20.4
Kilifi	16.3
Kitui	10.2
Migori	10.2
Garissa	6.1
Samburu	4.1
Machakos	4.1
Kajiado	4.1
West Pokot	4.1
Embu	2
Baringo	2
Makueni	2
Homa Bay	2
Tharaka Nithi	2
Kwale	2
Uasin Gishu	2
Transmara	2
Nakuru	2
Taita Taveta	2
Total	**100**

findings showed that the quality of the EIA reports was weak in terms of comprehensive consideration of potential impacts across all stages in the mining cycle, adequacy of the environmental regulatory frameworks, prediction of potential biological impacts, and human rights. The quality was very weak in terms of the overall quality of stakeholder engagement and consultations, integration of mining-related climate change, consideration of trans-boundary impacts, and cost-benefit analysis (CBA). The evaluation established that only a mere 7% (3 out of 50 reports) of the approved mining projects in the 2006–2016 period had undertaken third-party post-EIA environmental audits in order to ensure that the EIA recommendations are fulfilled. This means that consistent follow-up of the EIA recommendations, including EMP compliance monitoring by the regulatory authority through environmental audits, is not effectively undertaken.

Discussion

The high concentration of mining project EIAs in the south-eastern and coastal regions of Kenya is consistent with the geographic distribution of mineral-rich areas in the country. The south-eastern region of Kenya is a source of limestone, gypsum, clays, manganese, and coal plus other (unproven) hydrocarbons. Base metal mineralization, lead-zinc-barite, and copper are also known to occur in the sedimentary basin along the coastal belt. Heavy mineral sands occur along the coast, such as the approximate 3.2 Gt billion tons deposits Kwale County. Exploration around the Mrima Hill in Kwale County have also confirmed up to 105 Mt Inferred Mineral Resource in the area with an average grade of 0.65% niobium pentoxide (Nb_2O_5) and up to 12 Mt at 1.21% Nb_2O_5.

The findings showed that only two out of the eighteen quality evaluation criteria were considered 'excellent' in the EIA process, namely the baseline environmental assessment and prediction of potential physical impacts, both of which only accounted for 11% of the well-considered issues in the audited reports. On the other hand, six out of the eighteen EIA quality evaluation parameters were considered 'satisfactory' in the EIA process, accounting for 33.3% of the issues in the audited reports. The parameters considered to be satisfactory included (a) consideration of all the key EIA stages, (b) prediction of potential social impacts, (c) analysis of alternative options, (d) impact mitigation, and (e) provision of a reliable environmental management and monitoring plan (EMP). Consequently, only approximately 44% of the environmental sustainability considerations expected in the EIA process were adequately addressed in the audited mining project EIA reports for mining projects undertaken in 2007–2016, while the consideration of 56% of the parameters was below expectation.

The issues that were inadequately considered in the EIAs included (a) consideration of all stages in the mining cycle, (b) description of the environmental regulatory framework, (c) prediction of potential biological impacts, and (d) human rights considerations. Those considered in a very poor and inadequate manner included (a) stakeholder engagement and consultation, (b) integration of climate change considerations, (c) trans-boundary impacts, and (d) application of cost-benefit analysis (CBA). These weaknesses can significantly dilute the impact of EIA in influencing more environmentally sustainable mining project decisions, as has been experienced in other countries (*e.g.* Phylip-Jones and Fischer, 2013). Given that full-scale EIAs cannot be conducted in Kenya unless the Terms of Reference (ToR) are approved by the National Environment Management Authority (NEMA), the above weaknesses in the EIA reports can only be due to negligence and casual regard of critical issues of consideration at the EIA study design and implementation stage. This might signify the inability of the authority to demand and obtain the correct procedure due to certain systemic challenges.

The findings in the audit were found to closely resemble those of similar studies such as the one by Kamijo and Huang (2017), which evaluated the 30-year history of EIA implementation in developing countries. The evaluation identified weak enforcement of EIA obligations and requirements as a common problem in many developing countries, and the lack of serious post-EIA follow-up audits in Kenya could be associated with this challenge. Kamijo and Huang (2017) also recognized the problem of inadequate government capacity to ensure public participation, especially in sub-Saharan Africa, and recommended the use of a standard communications strategy for EIA public consultations. Such a strategy does not exist in most countries, including Kenya, although various financial institutions, including the IFC/World Bank, usually insist on this, which if followed is adequate for most projects. The findings in this study differ from those of Wood (1999), who evaluated the quality of mining project EIA practice in South Africa and considered the practice to be satisfactory. This was echoed by Sandham, Hoffmann, and Retief (2008) who considered up to 85% of the EIA reports in South Africa to be of satisfactory quality but with weaknesses in terms of prediction of impact magnitude and analysis of project alternatives options. The finding by Sandham, Hoffmann, and Retief (2005) on inadequate EIA compliance monitoring in South Africa is in agreement with the findings in the Kenya study.

It is important to note that the above weaknesses in EIA reports are not restricted to the mining sector. Phylip-Jones and Fischer (2013), in an evaluation of EIAs for wind farms in the UK and Germany, for example, established that in the past the process had minor to moderate impact in terms of influencing more environmentally sustainable project decisions.

Table VII

Summary of audit findings for mining project EIA reports in Kenya

Audit criteria		Percentage (%) level of compliance in 50 EIA reports				
		Yes to all	Yes to most	Yes to a few	No to all	Overall status
1.	**Consideration of key EIA stages** - Description of mining project, screening, scoping, baseline environmental assessment, comprehensive environmental regulatory framework, analysis of alternative options, stakeholder engagement, impact analysis, impact mitigation, decommissioning strategy, ESMP and environmental monitoring strategy	8	80	12	0	**Satisfactory**
2.	**Consideration of all the phases of mining project** - Exploration and prospecting, construction of access roads, site preparation and clearing, mining installations, mining activities, disposal of overburden and waste rock, ore extraction, tailings disposal	2.1	29.2	37.5	31.2	**Poor**
3.	**Comprehensive environmental regulatory framework** - Policies, laws (Acts of Parliament), regulations, standards, national strategies and action plans, MEAs and other agreements	2	20.4	73.5	4.1	**Poor**
4.	**Consideration of potential physical impacts** - Land environment, landscapes, hydrology and water resources, water quality, air quality, noise and vibrations, climate change	85.4	0	14.6	0	**Excellent**
5.	**Consideration of potential biological impacts** - Flora, fauna, endangered species, sensitive habitats and ecosystems, protected areas, biodiversity hotspots	2.1	25	68.8	4.2	**Poor**
6.	**Consideration of potential social impacts** - Displacement and resettlement, livelihoods impacts, traffic interruption, solid wastes, public safety and health, employment, CSR, emergency response and contingency plans, conflict resolution	2.1	56.2	41.7	0	**Satisfactory**
7.	**Human rights considerations** - Right to fair administrative action, right to access public information, right to security and peace, right to proper physical and mental health, prevention of child labour	16.7	0	79.2	4.2	**Poor**
8.	**Evidence of actual baseline environmental assessment** - Characterization of proposed mined materials, soil, water, noise, air quality, flora, fauna, climate, population characteristics, land use, social services	76	0	20	4	**Excellent**
9.	**Stakeholder engagement and consultation** - Stakeholder mapping, identification of stakeholders, directly affected stakeholders (DAS) and indirectly affected stakeholders (IAS), gender balance, youth and vulnerable groups	20	0	32	48	**Very poor**
10.	**Adequate EIA consultation meetings** - Number of meetings, convenient meeting venues, listing of SCM participants, listing of SCM contacts, stakeholder communication strategy, evidence of full project information disclosure, listing of stakeholder concerns, clear details of project approval or disapproval by stakeholders, adequate of consideration of stakeholder inputs	2	24	40	34	**Poor**
11.	**Characterization of potential impacts for all mining stages** - Pre-construction, construction, operation, decommissioning and rehabilitation	24.5	26.5	26.5	22.4	**Satisfactory**
12.	**Climate change considerations** - Loss of CO_2 uptake through vegetation clearance, CO_2 emission by mining machines, CO_2 emission through mineral processing, considerations on climate change-proof mining infrastructure, climate change mitigation amd adaptation, considerations on climate change related natural disaster risk reduction in the EMP	2	0	0	98	**Very poor**
13.	**Consideration of transboundary impacts** - Inter-village, inter-county, regional and international	8.2	0	2	89.8	**Very poor**
14.	**Analysis of alternative options** - Preferred option, no-action zero option, other options	2	63.3	10.2	24.5	**Satisfactory**
15.	**Cost-benefit analysis**	4	0	0	96	**Very poor**
16.	**Impact mitigation** - Positive impacts, negative impacts, recommendations for mitigation of negative impacts, rehabilitation cost and funding allocation at decommissioning phase	32.7	61.2	6.1	0	**Satisfactory**
17.	**Environmental management and monitoring plan (EMP)** - Land environment, soil environment, water resources, air quality, noise & vibration, flora and fauna, public safety and health, decommissioning and rehabilitation, long-term monitoring protocol, responsible persons and agencies, timelines, guidelines	6	70	16	8	**Satisfactory**
18.	**Overall quality of EIA report** - Comprehensive non-technical summary, illustrative maps, diagrams and photos, clear conclusion and recommendations, clear and easy to understand	24.4	59.2	18.4	2	**Satisfactory**

Mining project EIA practice in Kenya shows major similarities to that in other countries within the East African Community. Kahangirwe (2011) evaluated the EIA process in western Uganda and concluded that poor stakeholder engagement, negative perception of EIA by developers, lack of capacity for post-EIA follow-up, and enforcement as key challenges. Many of these factors were also identified in the Kenya study. Kahangirwe (2011) emphasized the need for stakeholder involvement in the analysis of project alternative options. In Tanzania, an evaluation of general EIA practice by Sosovele (2013) indicated that the country is also grappling with certain challenges, especially with regard to inadequate stakeholder participation.

Conclusion and recommendations

The overall quality of EIA reports was found to be weak in terms of comprehensive consideration of all the phases of mining projects, adequacy of description of the environmental regulatory framework, prediction of potential biological impacts, quality of stakeholder consultation meetings, and dealing with human right issues. The quality was also quite weak in terms of the overall stakeholder engagement and consultation, mining-related climate change considerations, and cost-benefit analysis. Potential risks that are not adequately mitigated because of poor EIAs practices include:

(a) Violation of environmental laws and regulations leading to frequent court cases, expensive fines and penalties
(b) Inadequate mitigation of biological impacts leading to negative impacts on sensitive biodiversity and ecosystems
(c) Widespread public protests due to inadequate involvement and participation in mining operations
(d) Widespread violation of human rights, including public health problems and child labour
(e) Inadequate mitigation and adaptation for climate change leading to mining-related disasters such as flood-related shaft collapses, mine cave-ins, mine flooding and mine suffocations.

The EIA process is considered to be a useful tool for overcoming a wide range of challenges which can face the mining sector. One of the challenges associated with the expected growth in the mining sector in Kenya is the need to ensure good sectoral governance in order to avoid the problems which other countries, especially in Africa, have encountered, such as:

- Inequitable sharing of mineral resource benefits, which are skewed in favor of those in power
- Neglect of local host communities and economies where such resources are located
- Mineral-related conflicts across inter-county and international boundaries
- Conflicts between existing land uses such as agriculture and livestock husbandry and mining activities
- Environmental degradation due to mining activities
- Violation of human rights by mining activities.

The EIA provides an opportunity for avoiding the paradoxical resource curse in Kenya, which has affected many other mineral-endowed countries in Africa (African Development Bank, 2007; Appiah and Zhang, 2013; Demissie and Naghshpour, 2014). The resource curse (also known as the paradox of plenty) refers to the failure of many resource-rich countries to benefit fully from their natural resource wealth and instead suffer from widespread environmental degradation and social conflicts that stem from such assets.

The African Mining Vision (AMV), adopted in February 2009, recognizes that Africa is the world's top producer of numerous mineral commodities. The continent is a global leader in the production of several key commodities such as gold, diamonds, aluminum, cobalt, platinum, chromium, manganese, vanadium, and phosphate. Consequently, the AMV is a policy tool used to help African governments to better harness their natural resource wealth for socio-economic development. The key goals of the AMV include safeguarding transparency and good governance as well as enforcing internationally acceptable safety and health standards, environmental and material stewardship, and corporate social responsibility. These objectives can be realized through the undertaking of high-quality mining project EIAs which are devoid of the weaknesses identified in the audit.

Based on the above conclusions it is recommended that NEMA should tighten the terms and conditions considered in the approval of the statutory terms of reference (ToR) for full-scale mining project EIAs to ensure the following:

(a) Inclusion of a competent mining engineer or geologist in the EIA team
(b) Comprehensive consideration of all the phases of mining projects
(c) Adequacy of the environmental regulatory framework for the EIAs both in terms of Kenyan and international instruments, including those of the IFC/World Bank
(d) Adequate consideration of potential biological impacts
(e) Adequate consideration of human right issues
(f) Adequate consideration of mining-related climate change implications, especially the minimization of greenhouse gas (GHG) emissions
(g) Convincing and effective stakeholder engagement plans
(h) Adequate strategies for cost-benefit analysis.

Acknowledgements

The author is grateful to NEMA Director-General Professor Geoffrey Wahungu for authorizing access to the national EIA database for use in this study. Many thanks to Paul Nguru and Reagan Owino for their kind assistance in the EIA information retrieval. The assistance provided by Tiffany Mwake and Sharon Mwende in terms of data analysis is highly appreciated. The comments by two anonymous reviewers as part of the SAIMM editorial process are highly appreciated.

References

African Development Bank. 2007. African development report 2007: Natural resources for sustainable development in Africa. Oxford University Press, Oxford, UK.

Appiah, M. and Zhang, T. 2013. Escaping the resource curse in sub-Saharan Africa. The Hague Institute for Global Justice, The Hague.

Arts, J., Runhaar, H.A.C., Fischer, T.B., Jha-Thakur, U., Laerhoven, F.S.J. van, Driessen, P.P.J., and Onyango, V. 2012. The effectiveness of EIA as an instrument for environmental governance – a comparison of 25 years of EIA practice in the Netherlands and the UK. Imperial College Press.

Armstrong, W. and Peart, R. 2000. Marrying planning, economics and environment: Is South Africa ahead of the curve? *Development*, vol. 43, no. 4. pp. 75–78.

Azcue, J.M. 1999. Environmental Impacts of Mining Activities: Emphasis on Mitigation and Remedial Measures. Springer, Berlin.

Biswas, A.K. and Agarwala, S.B.C. 1994. Environmental impact assessment for developing countries. Butterworths, Oxford.

Černe, M., Smodiš, B., Štrok, M., and Benedik, L. 2012. Radiation impact assessment on wildlife from a uranium mine area. *Nuclear Engineering and Design*, vol. 246. pp. 203–209.

Chakrabarti, S.B. 2007. Man and environment: Evolving dimensions. *Journal of the Indian Anthropological Society*, vol. 42, no. 2. pp. 103–110.

Churie, A. 1997. An overview for the EIA process in Zimbabwe. *Proceedings of the International Environmental Impact Assessment: European and Comparative Law and Practical Experience Conference*, Milan, October 1996. Environmental Law Network International.

Clark, J. and Scottish Natural Heritage. 1996. Rivers and their catchments: Impacts of opencast coal mining on water quality. Scottish Natural Heritage, Edinburgh.

Demissie, M.Z. 2014. The natural resource curse in Sub-Saharan Africa: Transparency and international initiatives. PhD thesis, University of Southern Mississippi.

Dold, B. and Friese, K. 2007. Biogeochemical studies about the environmental impacts of mining on ground and surface water. *Journal of Geochemical Exploration*, vol. 92, no. 2. pp. v–vi.

Environmental Law Alliance Worldwide. 2010. Guidebook for evaluating mining project EIAs. Eugene, OR.

Fischer, T.B. 2010. Reviewing the quality of strategic environmental assessment reports for English spatial plan core strategies. *Environmental Impact Assessment Review*, vol. 30, no. 1. pp. 62–69.

Fischer, T.B. 2006. SEA and transport planning: towards a generic framework for evaluating practice and developing guidance. *Impact Assessment and Project Appraisal*, vol. 24, no. 3. pp. 183–197.

Freeman, J. 1999. All of Us - Births and Better Life: Population, Development and Environment in a Globalized World. Earth Times Books, New York.

Harris, P., Viliani, F., and Spickett, J. 2015. Assessing health impacts within environmental impact assessments: An opportunity for public health globally which must not remain missed. *International Journal of Environmental Research and Public Health*, vol. 12, no. 1. pp. 1044–1049.

Ingelson, A. and Chilenye, N. 2014. Environmental impact assessment process for oil, gas and mining projects in Nigeria: A critical analysis. *Law, Environment and Development Journal*, vol. 10, no. 1. pp. 35–56.

Jha-Thakur, U. and Fischer, T. 2008. Are open-cast coal mines casting a shadow on the Indian environment? *International Development Planning Review*, vol. 30, no. 4. pp. 441–459.

Kahangirwe, P. 2011. Evaluation of environmental impact assessment (EIA) practice in Western Uganda. *Impact Assessment and Project Appraisal*, vol. 29, no. 1. pp. 79–83.

Kamau, J.W. and Mwaura, F. 2013. Climate change adaptation and EIA studies in Kenya. *International Journal of Climate Change Strategies and Managemen*t, vol. 5, no. 2. pp. 152–165.

Kamijo, T. and Huang, G. 2017. Focusing on the quality of EIS to solve the constraints on EIA systems in developing countries: A literature review. *JICA-RI working paper* no. 144. JICA Research Institute, Tokyo Japan.

Kibutu, T.N. and Mwenda, A.N. 2010. Provision for environmental impact assessment (EIA) in Kenya's legislation: A review of the environmental management and coordination act (EMCA) and environmental (impact assessment and audit) regulations (EIAAR). *Eastern Africa Journal of Humanities and Sciences*, vol. 10, no. 2. pp. 1–13.

Kruger, F.J., Van, W.B.W., Weaver, A.V.B., and Greyling, T. 1997. Sustainable development and the environment: lessons from the St Lucia Environmental Impact Assessment. *South African Journal of Science*, vol. 93, no. 1. pp. 23–33.

Kuma, J.S., Younger, P.L., and Bowell, R.J. 2002. Expanding the hydrogeological base in mining EIA studies: A focus on Ghana. *Environmental Impact Assessment Review*, vol. 22, no. 4. pp. 273–287.

Lederer, K., Galtung, J., and Antal, D. 1980. Human Needs: A Contribution to the Current Debate. Oelgeschlager, Gunn and Hain, Cambridge, MA.

Loots, C. 1997. EIA in South Africa. *Proceedings of the International Conference on International Environmental Impact Assessment: European and Comparative Law and Practical Experience*, Milan, October 1996. Environmental Law Network International.

Marshall, R. and Fischer, T.B. 2006. Regional electricity transmission planning and tiered SEA in the UK – the case of Scottish Power. *Journal of Environmental Planning and Management*, vol. 49, no. 2. pp. 279–299.

McKillop, J. and Brown, A.L. 1999. Linking project appraisal and development: the performance of EIA in large-scale mining projects. *Journal of Environmental Assessment Policy and Management*, vol. 1, no. 4. pp. 407–428.

Morrison-Saunders, A. and Retief, F. 2012. Walking the sustainability assessment talk – Progressing the practice of environmental impact assessment (EIA). *Environmental Impact Assessment Review*, vol. 36. pp. 34–41.

Morrison-Saunders, A., McHenry, M.P., Rita, S.A., Gorey, P., Mtegha, H., and Doepel, D. 2016. Integrating mine closure planning with environmental impact assessment: challenges and opportunities drawn from African and Australian practice. *Impact Assessment and Project Appraisal*, vol. 34, no. 2. pp. 117–128.

Muttamara, S. 1996. Environmental impact assessment (EIA). *Resources, Conservation, and Recycling*, vol. 16. pp. 335–349.

Mwaura, F., Kiringe, J.W., Warinwa, F., and Wandera, P. 2016. Estimation of the economic value for the consumptive water use ecosystem service benefits of the Chyulu Hills watershed, Kenya. *International Journal of Agriculture Forestry and Fisheries,* vol. 4, no. 4. pp. 36–48.

Mwenda, A.N., Bregt, A.K., Ligtenberg, A., and Kibutu, T.N. 2012. Trends in consultation and public participation within environmental impact assessment in Kenya. *Impact Assessment and Project Appraisal*, vol. 30, no. 2. pp. 130–135.

Mutua, E. 2014. Report on the policy, legal and regulatory framework in the extractive industry of Kenya. Law Society of Kenya, Nairobi.

Noonan, J. 2014. Democratic Society and Human Needs. McGill-Queen's University Press, Montreal.

Okello, N., Beevers, L., Douven, W., and Leentvaar, J. 2009. The doing and un-doing of public participation during environmental impact assessments in Kenya. *Impact Assessment and Project Appraisal*, vol. 27, no. 3. pp. 217–226.

Ozkan, S. and Ipekoglu, B. 2002. Investigation of environmental impacts of tailings dams. *Environmental Management and Health*, vol. 13, no. 3. pp. 242–248.

Patnaik, L. N. 1990. Environmental Impacts of Industrial and Mining Activities. Ashish, New Dehli.

Phylip-Jones, J. and Fischer, T.B. 2013. EIA for wind farms in the United Kingdom and Germany. *Journal of Environmental Assessment Policy and Management*, vol. 15, no. 2. pp. 1–30. doi: 10.1142/S1464333213400085

Rammelsberg, L.S., Markus, L., Kerns, S., Richardson, A.V., Howard, B., and Accame, G. 2006. Environment and Society. Schlessinger Media, Wynnewood, PA

Republic of Kenya. 2015. Investment handbook. Ministry of Mining. Government Printer, Nairobi.

Retief, F. 2012. Walking the sustainability assessment talk - Progressing the practice of environmental impact assessment (EIA). *Environmental Impact Assessment Review*. vol. 36. pp, 34–41.

Ripley, A.E., Redmann, E.R., and Crowder, A.A. 1996. Environmental effects of mining. St. Lucie Press, Delray Beach, FL.

Safont, E., Vegas-Vilarrúbia, T., and Rull, V. 2012. Use of Environmental Impact Assessment (EIA) tools to set priorities and optimize strategies in biodiversity conservation. *Biological Conservation*, vol. 149, no. 1. pp. 113–121.

Salgado, I. 2013. The nexus of African growth, environment and conflict: Africa-wide – monitoring economies. *Africa Conflict Monthly Monitor*. February 2013. pp. 20–23.

Sandham, L.A., Hoffmann, A.R., and Retief, F.P. 2008. Reflections on the quality of mining EIA reports in South Africa. *Journal of the Southern African Institute of Mining and Metallurgy*, vol. 108, no. 11. pp. 701–706.

Schaltegger, S. and Wagner, M. 2006. Managing the Business Case for Sustainability: The Integration of Social, Environmental and Economic Performance. Greenleaf Publishing, Sheffield.

Sivi, K., Odari, E., Ataka, V., and Wasunna, M. 2015. Local communities in Kenya's extractive sector: From paternalism to partnership. Norwegian Church Aid (NCA).

Sosovele, H. 2013. Governance challenges in Tanzania's environmental impact assessment practice. *African Journal of Environmental and Waste Management*, vol. 1, no. 5. pp. 81–84.

Staeck, N. and Heinelt, H. 2001. The implementation of EIA in Germany. *European Union Environment Policy and New Forms of Governance: A Study of the Implementation of the Environmental Impact Assessment Directive and the Eco-Management and Audit Scheme Regulation in the Three Member States*. Heinelt, H., Malek, T., Smith, R., and Töller, A.E. (eds). Routledge, Abington, UK. pp. 61–70.

Strange, T. and Bayley, A. 2008. Sustainable development: Linking economy, society, environment. OECD, Paris.

Sutton, P.W. 2004. Nature, Environment, and Society. Palgrave Macmillan, Basingstoke, UK.

Tisdell, C.A. 2005. Economics of Environmental Conservation. Edward Elgar, Cheltenham, UK.

Tuberfield, D. 1994. The quality of environmental impact assessment (EIA) reports. *Industry and Environment*, vol. 17, no. 2. pp. 44–47.

United Nations. Department of Economic and Social Affairs, Population Division. 2017. World Population Prospects: The 2017 Revision, Key Findings and Advance Tables. Working Paper no. ESA/P/WP/248.

United Nations Development Programme (Kenya). 2014. Extractive industries for sustainable development in Kenya: Final assessment report.

Wilson, L. 1998. A practical method for environmental impact assessment audits. *Environmental Impact Assessment Review*, vol. 18, no. 1. pp. 59–72.

World Bank. 2008. Environmental sustainability: An evaluation of World Bank Group support. Washington, DC.

Zhao, Y. 2009. Assessing the environmental impact of projects: A critique of the EIA legal regime in China. *Natural Resources Journal*, vol. 49, no. 2. pp. 485–524. ◆