

# **ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY REPORT**

*For*

---

**THE PROPOSED SAVANNAH CEMENT LTD CAPACITY  
INCREASE PROJECT ON PARCELS L.R. NO. 184747/227  
ALONG NAIROBI-NAMANGA, IN ATHI RIVER, MACHAKOS  
COUNTY**

---

*Proponent:* **SAVANNAH CEMENT LIMITED**



P.O. Box 27910 - 00100  
Nairobi

*Prepared By:* **PURIFIED CONSULTANTS LTD**



NEMA REG. No.: **2866**  
P.O. Box 106-00204  
Athi-River

**2016**

**Report Title:** Environment and Social Impact Assessment (ESIA) Study Report for Savannah Cement Capacity Increase Project.

**Firm of Experts:**

Purified Consultants Ltd (Reg. 2866)

P. O. Box 106 - 00204

Athi-River, KENYA

+254 722 580 237

Signed:



Douglas M. Mwangi

Lead ESIA Expert 2278

**Proponent:**

Savannah Cement Limited

P.O. Box 27910 – 00100

Nairobi, Kenya

Signed:



Ronald Ndegwa  
**Managing Director**

**Disclaimer:**

*This Environmental and Social Impact Assessment Study Report is strictly confidential to Savannah Cement Ltd (the Proponent) and any use of the materials thereof should be strictly in accordance with the agreement between the Proponent and Purified Consultants Ltd (the firm of expert). It is, however, subject to conditions in Legal Notice No. 101 section 4 of the Environmental (Impact Assessment and Audit) Regulation 2003.*

## **ACKNOWLEDGEMENTS**

---

The successful completion of this ESIA Study Report was made possible by several individuals, establishments and institutions. The Expert acknowledges the input of the proponent in terms of providing resources, documentation and logistical support that was necessary for data collection as well as compilation of this ESIA Study Report.

To obtain baseline information on the project site, the firm of experts relied on site visits, literature review of information available from government offices and previous EIA studies undertaken by lead consultants.

The firm of experts thanks the neighbors for their input during the public consultation process for accepting to participate in informal meetings and interviews as well as responding to the questionnaires on the possible impacts associated with the proposed project development.

The Lead Expert (Reg. No. 2278) facilitated the preparation of this report through the administration of questionnaires, collection of data and information; and in printing and binding of this report.

**LIST OF ACRONYMS**

---

<b>AP</b>	Affected Persons
<b>CO</b>	Carbon Monoxide
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>CSR</b>	Community Social Responsibility
<b>DOSH</b>	Department of Safety and Health
<b>EA</b>	Environmental Audit
<b>EHS</b>	Environment Health and Safety
<b>EIA</b>	Environmental Impact Assessment
<b>EMCA 2015</b>	Environmental Management and Coordination Act
<b>EMP</b>	Environmental Management Plan
<b>EMS</b>	Environment Management Systems
<b>ESIA</b>	Environmental and Social Impact Assessment
<b>GoK</b>	Government of Kenya
<b>H<sub>2</sub>S</b>	Hydrogen Sulfide
<b>HIV/AIDS</b>	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
<b>ISO</b>	International Standards Organization
<b>KeNHA</b>	Kenya National Highway Authority
<b>KSHs.</b>	Kenyan Shillings
<b>MAVWASCO</b>	Mavoko Water and Sewerage Company
<b>NEAP</b>	National Environment Action Plan
<b>NEMA</b>	National Environment Management Authority
<b>NO<sub>x</sub></b>	Nitrogen Oxides
<b>OHS</b>	Occupational Health and Safety
<b>PAHs</b>	Polycyclic Aromatic Hydrocarbons
<b>PIN</b>	Personal Identification Number
<b>PPE</b>	Personal Protective Equipment
<b>PUCO Ltd</b>	Purified Consultants Limited
<b>SO<sub>x</sub></b>	Sulphur Oxides
<b>TOR</b>	Terms of References

## **EXECUTIVE SUMMARY**

---

### **Introduction and Study Objectives**

**Purified Consultants Ltd**, herein referred to as a firm of experts registered by NEMA (NEMA Reg. No. 2866), was contracted by **Savannah Cement Limited**, a limited company which was first incorporated under the Companies Act (Cap 486) laws of Kenya on the 7<sup>th</sup> day of August Two Thousand and Seven as CATIC Cement (Kenya) Company Limited. On the 25<sup>th</sup> day of September Two Thousand and Eight, this name was changed to CATIC Cement (Kenya) EPZ Limited. This was later changed to the current name, Savannah Cement (Kenya) Company Limited on the 22<sup>nd</sup> day of June Two thousand and ten. The current name, **SAVANNAH CEMENT LIMITED**, was due to the change of name that was made on the 13<sup>th</sup> day of January Two thousand and thirteen. This Company is herein thereafter referred to as the proponent intends to carry out an Environmental and Social Impact Assessment for the proposed **Capacity Increase Project**. The firm of experts relied on qualified and competent staff to conduct the environmental assessment and write this ESIA Study report. The proponent is required to present this ESIA Study Report to NEMA in order to comply with the Environment Management Co-ordination Act 2015(1999 amended) and in particular part II of the Environmental (Impact Assessment and Audit) Regulations, 2003. This ESIA Study was deemed relevant after the Proponent had submitted an EIA Project Report (**NEMA/PR/5/2/16,605**) to NEMA for review. After the Project Report review, a full study was recommended as per the Second Schedule of EMCA 2015 to allow for in-depth analysis of Environmental and Social impacts of the proposed project. This Study Report has provided a summary statement of the likely environmental and social effects of the proposed project.

The investigation examined the potential impact of the project on the immediate surroundings with due regard to all the phases of the project. The investigation encompassed all aspects relating to the physical, ecological, socio-cultural, health and safety conditions at the site and its environs; during and after the project operations. The assessment strictly adhered to the relevant legislative frameworks and regulations. Reference was made to past ESIA reports dealing with similar projects. Where possible, this ESIA Study Report has provided annexes such as the Land Title Deeds, Project Layout Plan, company's tax PIN, Certificate of incorporation, etc. to support the

findings and show the depth of its investigations. The Study Report has also provided photos of the proposed site. The proponent of the proposed project has proposed to follow the laid down regulations, standards and laws as put out and as proposed by the relevant authorities and professionals respectively. This assessment's conclusion is that the project is important for the economy of the country and it has minimal negative impacts to the environment since it is just a grinding plant. The Study Report has suggested measures to mitigate the negative impacts and has also proposed an Environmental Management Plan (EMP), which the proponent should adhere to in the entire life cycle of the project to ensure its sustainability.

An Environmental Impact Assessment is a tool for environmental protection & conservation and is considered as a key component in new project implementation. According to section 58 of the Environmental Management and Coordination Act (EMCA) of 2015 second schedule 9 (1), and Environmental (Impact Assessment and Audit) Regulation, 2003, such projects as the proposed project must be subjected to an EIA process. The report of the same must be submitted to National Environment Management Authority (NEMA) for review and issuance of EIA Licence. This is necessary as many forms of developmental activities cause damage to the environment and hence the greatest challenge today is to maintain sustainable development with due consideration to the environment.

### **Impacts and Mitigation Measures**

There are both positive and negative impacts associated with the proposed **Grinding Capacity Increase Project**. In general the following positive impacts are associated with the proposed development;

- a) Several job opportunities shall be created during the construction/installation and Operational phases;
- b) Much needed building and construction materials (cement) and raw materials (clinker) for cement manufacture shall be availed to several individuals/companies within and without Kenya;
- c) Gains in the local and national economy;
- d) Optimal use of land;
- e) Permanent investment opportunity for the project proponents.

- f) The same site zoned for Industrial development being used for expansion
- g) Use of same proven/tested mitigation measures for negative impacts

The negative Impacts associated with the proposed project are:

- a) Increased Energy consumption;
- b) Dust (mainly fugitive) and emissions associated with mobile and stationery vehicles and machines;
- c) Solid waste generation;
- d) Workers accidents and hazards during construction and/or installation of equipment;
- e) Increased pressure on the existing infrastructure such as roads;
- f) Noise pollution during construction/installation and operational phases of the project;
- g) Increased traffic during construction and operation

In order to mitigate on the negative impacts associated with the project, the proponents shall put in place the following measures suggested in the table below:

**Table 1: Summary of Environmental Management/Monitoring Plan**

<b>ACTIVITY/ISSUE</b>	<b>PROPOSED MITIGATION MEASURES</b>
<i>Dust (Fugitive and Cement dust)</i>	<ul style="list-style-type: none"> <li>• Paving of the Project Site and roads;</li> <li>• Sprinkling of water;</li> <li>• Workers to use dust/nose masks;</li> <li>• Sufficient ventilation at workplace;</li> <li>• Ensure de-dusting system (bag filters) is always efficient;</li> <li>• Workers to use appropriate PPE;</li> <li>• Strict enforcement on PPE use;</li> <li>• Ensure packed cement is carefully handled</li> </ul>
<i>Release of Sulphur gases SOx</i>	<ul style="list-style-type: none"> <li>• Use fuels with low Sulphur content</li> </ul>
<i>NOx Emissions</i>	<ul style="list-style-type: none"> <li>• Maintenance and servicing of vehicles and machine/equipment. Switch off engines when not in use</li> </ul>
<i>CO2 Emission</i>	<ul style="list-style-type: none"> <li>• Planting trees onsite and offsite</li> </ul>
<i>CO emission</i>	<ul style="list-style-type: none"> <li>• Maintenance and servicing of vehicles and machine/equipment;</li> <li>• Switch off engines within the site when not in use</li> </ul>

<b>High Noise Levels at workplace</b>	<ul style="list-style-type: none"> <li>• Develop and implement an effective noise control and hearing conservation programme;</li> <li>• Carry out periodic noise measurements;</li> <li>• Fit noisy machines with noise reduction devices;</li> <li>• Provide suitable hearing protection to all workers exposed to noise levels above 85dB(A);</li> <li>• Post notices and signs in noisy areas;</li> <li>• Carry out audiometric test by a designated medical practitioner to all workers exposed to noise levels above 85dB(A);</li> <li>• Educate all workers on importance of marking correct use of PPE provided.</li> </ul>
<b>Process Solid waste management and disposal</b>	<ul style="list-style-type: none"> <li>• Recycle and Re-use where applicable;</li> <li>• Segregate for appropriate disposal;</li> <li>• Process improvement to minimize waste generations;</li> <li>• Material substitution to minimize waste generation;</li> <li>• Technological improvements to minimize waste generation.</li> </ul>
<b>Domestic waste management and disposal</b>	<ul style="list-style-type: none"> <li>• Sorting of waste at source;</li> <li>• Waste disposal as provided for in the Environmental Management and Coordination (Waste Management) Regulations, 2006;</li> <li>• Provide appropriate waste handling receptacles.</li> </ul>
<b>Office waste management and disposal</b>	<ul style="list-style-type: none"> <li>• Obsolete electronic equipment and other electronic waste to be returned to manufacturers for safe disposal</li> </ul>
<b>Utilities operations wastewater</b>	<ul style="list-style-type: none"> <li>• Adaption of water conservation methods</li> </ul>
<b>Sanitary Wastewater</b>	<ul style="list-style-type: none"> <li>• Segregation of wastewater streams;</li> </ul> <p>Treatment to meet national standards for sanitary wastewater discharge</p>
<b>Storm Water</b>	<ul style="list-style-type: none"> <li>• Storm water should be separated from process and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge;</li> <li>• Runoff from areas without potential sources of contamination should be minimized (e.g. by minimizing the area of impermeable surfaces) and the peak discharge rate should be reduced (e.g. by using vegetated swales and retention ponds);</li> </ul> <p>Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage and containment areas.</p>
<b>Physical Hazards</b>	<ul style="list-style-type: none"> <li>• Good housekeeping;</li> <li>• Ensure surfaces are not slippery;</li> </ul>



	<ul style="list-style-type: none"> <li>• Clearly mark all uneven surfaces;</li> <li>• Guarding of machine moving parts;</li> <li>• Provide and mark safe passages and exits;</li> <li>• Spills to be promptly cleaned.</li> </ul>
<b><i>Parking within the factory</i></b>	<ul style="list-style-type: none"> <li>• The space for parking is already available, however, proper planning will be necessary to accommodate the increased numbers of trucks that will be parked awaiting to deliver materials and collect cement from the facility</li> </ul>
<b><i>Occupational Health and Safety</i></b>	<ul style="list-style-type: none"> <li>• PPE use;</li> <li>• Appropriate handling as per material safety data sheets;</li> <li>• Training and sensitizations;</li> <li>• Medical examination of exposed workers</li> </ul>
<b><i>Vehicular Traffic along Nairobi-Namanga Roads</i></b>	<ul style="list-style-type: none"> <li>• Liaise with the Kenya KeNHA to find out whether the existing acceleration and deceleration lanes are enough for safe entry and exit of the highway;</li> <li>• Drivers to strictly observe the Highway Code;</li> <li>• Speed limits to be strictly observed</li> </ul>
<b><i>Demolition waste (wash rooms)</i></b>	<ul style="list-style-type: none"> <li>• Use of an integrated solid waste management system</li> <li>• Recycle/reuse recyclable solid waste where possible</li> <li>• All foundations must be removed and recycled, reused or disposed of at a licensed disposal site</li> <li>• Where recycling/reuse is not possible, waste should be taken to a licensed waste disposal site</li> </ul>
<b><i>Site Restoration(Decommissioning)</i></b>	<ul style="list-style-type: none"> <li>• Implement a re-vegetation programme to restore the site to its original status</li> <li>• Use indigenous plant species in re-vegetation</li> </ul>

## Conclusion

It is quite evident that the construction, installation and operation of the proposed **Capacity Increase Project** will have more positive than the negative impacts at the project site including creation of employment, economic growth, optimum utilization of the land, etc., hence maximum returns, availing building and construction materials for various individuals/companies/developers, improved economy, improved security, and increase in revenue base to the project proponent, tax to County and National Governments . However, although the project is highly regarded in terms of positive impacts, it is anticipated that there will

be negative impacts such as those listed in the above table. Since the impacts associated with the Capacity Increase have been identified, it is our recommendation that the project be allowed to go on provided the mitigation measures outlined in this ESIA Report are adhered to and the EMP is implemented.

---

**TABLE OF CONTENTS**


---

<b>ACKNOWLEDGEMENTS</b>	<b>iii</b>
<b>LIST OF ACRONYMS</b>	<b>iv</b>
<b>EXECUTIVE SUMMARY</b>	<b>v</b>
<b>TABLE OF CONTENTS</b>	<b>xi</b>
<b>LIST OF FIGURES</b>	<b>xv</b>
<b>LIST OF TABLES</b>	<b>xv</b>
<b>CHAPTER 1: BACKGROUND INFORMATION</b>	<b>1</b>
<b>1.1 Introduction</b>	<b>1</b>
<b>1.2 General Cement Production Process</b>	<b>1</b>
<b>1.3 Need for the Project</b>	<b>2</b>
<b>1.4 Scope, Objective and Criteria of the Environmental and Social Impact Assessment Study</b>	<b>2</b>
1.4.1 Scope	2
1.4.2 Objective of the Environmental and Social Impact Assessment	3
<b>1.5 Terms of Reference (TOR) for the ESIA Study Process</b>	<b>3</b>
<b>1.6 Data Collection Procedures</b>	<b>4</b>
<b>1.7 ESIA Organization and Structure</b>	<b>4</b>
<b>1.8 Reporting and Documentation</b>	<b>4</b>
<b>1.9 Responsibilities and Undertaking</b>	<b>5</b>
<b>1.10 Methodology Outline</b>	<b>5</b>
1.10.1 Environmental Screening	5
1.10.2 Environmental Scoping	5
1.10.3 Desktop Study	5
1.10.4 Site Assessment	6
1.10.5 ESIA Public Participation	6
1.10.6 Reporting	6
<b>CHAPTER 2: DESCRIPTION OF THE PROJECT</b>	<b>7</b>
<b>2.1 Introduction</b>	<b>7</b>
<b>2.2 Location and size of the project</b>	<b>7</b>
2.1.1 <i>Neighbourhood</i>	8
2.1.2 <i>Roads</i>	10
<b>2.2 Current status of the Project Site</b>	<b>10</b>

<b>2.3</b>	<b>Objectives of the Project</b>	<b>11</b>
<b>2.4</b>	<b>Design of the Proposed Project</b>	<b>11</b>
<b>2.5</b>	<b>Description of the project's Construction and Installation activities</b>	<b>11</b>
2.5.1	<i>Pre-construction investigations and Demolition Works</i>	11
2.5.2	<i>Construction Materials and Equipment</i>	12
2.5.3	<i>Storage of Materials</i>	12
2.5.4	<i>Excavation and Foundation Works</i>	13
2.5.5	<i>Masonry, Concrete works and related activities</i>	13
2.5.6	<i>Electrical work</i>	13
2.5.7	<i>Landscaping</i>	13
2.5.8	<i>Project Budget</i>	13
<b>2.6</b>	<b>Description of the Project's Operational Activities</b>	<b>14</b>
2.6.1	<i>Savannah Cement Ltd.'s Capacity Increase project</i>	14
2.6.2	<i>Emissions and Controls</i>	14
2.6.3	Noise and Vibrations	14
2.6.4	Solid Waste	14
2.6.5	Sewage and Waste Water	15
2.6.6	<i>Cleaning</i>	15
2.6.7	<i>General repairs and maintenance</i>	16
<b>2.7</b>	<b>Description of the project's decommissioning activities</b>	<b>16</b>
2.7.1	<i>Demolition works</i>	16
2.7.2	<i>Dismantling of equipment and fixtures</i>	16
2.7.3	<i>Site restoration</i>	16
<b>CHAPTER 3:</b>	<b>BASELINE INFORMATION</b>	<b>17</b>
<b>3.1</b>	<b>Introduction</b>	<b>17</b>
<b>3.2</b>	<b>Description of the Project Environment</b>	<b>17</b>
3.2.1	Bio-physical	17
<b>3.3</b>	<b>Climate</b>	<b>17</b>
<b>3.4</b>	<b>Infrastructure</b>	<b>17</b>
3.4.1	Road	17
3.4.2	Energy	18
3.4.3	Geology and Soils	18
3.4.3.1	Geology	18
3.4.3.2	Soils	18
3.4.4	Climate	18
3.4.5	Rainfall	18
3.4.6	Temperatures	19
3.4.7	Winds	20
3.4.8	Vegetation/Flora	20
<b>3.5</b>	<b>Infrastructural Services</b>	<b>20</b>

3.5.1	Storm Water Drainage and Effluents Management	20
3.5.2	Electricity and Telephone Services	20
3.5.3	Archaeological and Cultural Heritage	20
3.5.4	Noise levels	20
3.5.5	<i>Air Quality</i>	22
<b>CHAPTER 4: RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORKS</b>		<b>26</b>
<b>4.1</b>	<b>Policy Framework</b>	<b>26</b>
4.1.1	The National Environmental Action Plan (NEAP)	26
<b>4.2</b>	<b>Legislative Framework</b>	<b>27</b>
4.2.1	Environmental management and coordination Act (EMCA) 2015	27
4.2.2	Physical Planning Act 2010	28
4.2.3	Land planning Act cap 303	28
4.2.4	Public Health Act (Cap 242)	28
4.2.5	The Kenya Mining Act 2016	29
4.2.6	Building code 2000	30
4.2.7	The Water Act, 2016	30
4.2.8	Occupational Safety and Health Act, 2007	30
<b>4.3</b>	<b>Administrative Framework</b>	<b>31</b>
4.3.1	The National Environment Management Authority (NEMA)	31
<b>4.4</b>	<b>Regulatory Framework</b>	<b>31</b>
4.4.1	Environmental Impact Assessment and Audit Regulations 2003	31
4.4.2	The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009	32
4.4.3	Solid Waste Management Legal Notice No. 121	32
4.4.4	The Environmental Management and Co-Ordination (Air Quality) Regulations, 2014	33
<b>CHAPTER 5: PUBLIC PARTICIPATION</b>		<b>34</b>
<b>5.1</b>	<b>Public Consultation Findings</b>	<b>35</b>
<b>5.2</b>	<b>Analysis of the Public Consultation findings</b>	<b>35</b>
5.2.1	Noise and Vibrations	35
5.2.2	Air Pollution	36
5.2.3	Water demand and Waste water management	36
5.2.4	Waste Management	36
5.2.5	Soil and Water pollution	36
5.2.6	Quarrying and Clinker Production Increase	37
5.2.7	Other Concerns	37
<b>5.3</b>	<b>Positive impacts</b>	<b>37</b>
5.3.1	Increased exploitation of common minerals used in cement production	37
5.3.2	Increase in cement production in Kenya	38
5.3.3	Reduction in cement imports	38
5.3.4	Increase in Cement exports	38

5.3.5	Employment and Internship opportunities-----	38
5.3.6	Support of local businesses-----	38
5.3.7	Increased revenue to National and County government-----	38
<b>CHAPTER 6:</b>	<b>POTENTIAL ENVIRONMENTAL IMPACTS-----</b>	<b>40</b>
<b>6.1</b>	<b>Introduction-----</b>	<b>40</b>
<b>6.2</b>	<b>Potential Negative Impacts of the Project-----</b>	<b>40</b>
6.2.1	Gaseous Emissions-----	40
6.2.2	Dust Emissions-----	40
6.2.3	Increased Noise and Vibration disturbances-----	41
6.2.3.1	Introduction-----	41
6.2.3.2	Potential Noise and Vibration sources-----	41
6.2.3.3	Health Effects of noise-----	41
6.2.4	Occupational injuries and/or accidents-----	42
6.2.5	Waste Generation-----	42
6.2.5.1	Solid waste-----	42
6.2.5.2	Liquid waste-----	42
6.2.6	Increased Energy Demands-----	43
6.2.7	Negative impacts on local flora-----	43
6.2.8	Negative impacts on local fauna-----	43
6.2.8.1	Mammals and Herpetofauna-----	43
6.2.9	Negative Impacts on Avifauna-----	43
6.2.9.1	Loss of avifauna habitats-----	44
6.2.9.2	Habitat Modification from associated project activities-----	45
<b>6.3</b>	<b>Proposed Mitigation Measures-----</b>	<b>45</b>
6.3.1	Proposed mitigation measures of gaseous emissions-----	45
6.3.1.1	Mitigation of Sulfur Dioxide Emissions-----	45
6.3.1.2	Mitigation measures of Nitrogen Oxides Emissions-----	45
6.3.1.3	Mitigation measures of Carbon Monoxide Emission-----	45
6.3.1.4	Proposed mitigation of Carbon Dioxide Emission-----	45
6.3.2	Proposed mitigation measures of dust-----	45
6.3.3	Proposed mitigation measures for increased noise-----	46
6.3.3.1	Management of noise effects-----	46
6.3.4	Proposed measures to mitigate against solid waste generation-----	46
6.3.4.1	Management practices-----	46
6.3.4.2	Waste generation prevention-----	47
6.3.5	Proposed measures to mitigate waste-----	48
6.3.5.1	Sanitary Wastewater management-----	48
6.3.5.2	Storm water management-----	48
6.3.6	Proposed mitigation measures for increased energy demands-----	49
6.3.7	Proposed mitigation measures for occupational injuries and accidents-----	50
<b>CHAPTER 7:</b>	<b>ANALYSIS OF PROJECT ALTERNATIVES-----</b>	<b>51</b>
<b>7.1</b>	<b>'No Project' Alternative-----</b>	<b>51</b>

7.2	The Proposed Development	51
7.3	The Proposed Development with modifications	52
7.4	The proposed development in another location	52
<b>CHAPTER 8: IMPACTS MITIGATION AND MONITORING PLAN</b>		<b>53</b>
8.1	Introduction	53
<b>CHAPTER 9: DECOMMISSIONING PHASE</b>		<b>60</b>
<b>CHAPTER 10: CONCLUSIONS AND RECOMMENDATIONS</b>		<b>62</b>
<b>CHAPTER 11: AUXILLIARY INFORMATION</b>		<b>63</b>
11.1	The Project Cost	63
11.2	Monitoring Guidelines	63
11.3	Reporting	63
11.4	Conclusion and recommendations	63
11.5	APPENDICES	64
11.6	REFERENCES	65

## LIST OF FIGURES

Figure 1: Cement Production Flow Chart	2
Figure 2: Directional Map to the Project Site	7
Figure 3: Neighbourhood (Photo of East Africa Portland Cement)	8
Figure 4: Map of the project neighbourhood	9
Figure 5: Current State of the site	10
Figure 6: Current worker's washrooms (Likely to be affected)	12

## LIST OF TABLES

Table 1: Summary of Environmental Management/Monitoring Plan	vii
Table 2: Average Monthly Rainfall	19
Table 3: Average Monthly Temperatures	19
Table 4: Measured Noise Levels in Technical Offices and Laboratories	21
Table 5: Levels Production Line and Related Processes	22
Table 6: Ambient Air Quality of Property boundary for general pollutants	23
Table 7: Emission limits for controlled facilities (Cement Plants)	23
Table 8: IFC air emission levels for cement manufacturing	23
Table 9: Emission Results from the drier	24
Table 10: Dust measurements and concentrations in mg/m <sup>3</sup>	24

*Table 11: List of Stakeholders consulted ----- 34*

*Table 12: Pre-Construction, Construction & Operation Phases Environmental Management/Monitoring Plan (EMP)*  
*----- 54*

*Table 13: Decommissioning Phase EMP for the Proposed ----- 60*



## **CHAPTER 1: BACKGROUND INFORMATION**

---

### **1.1 Introduction**

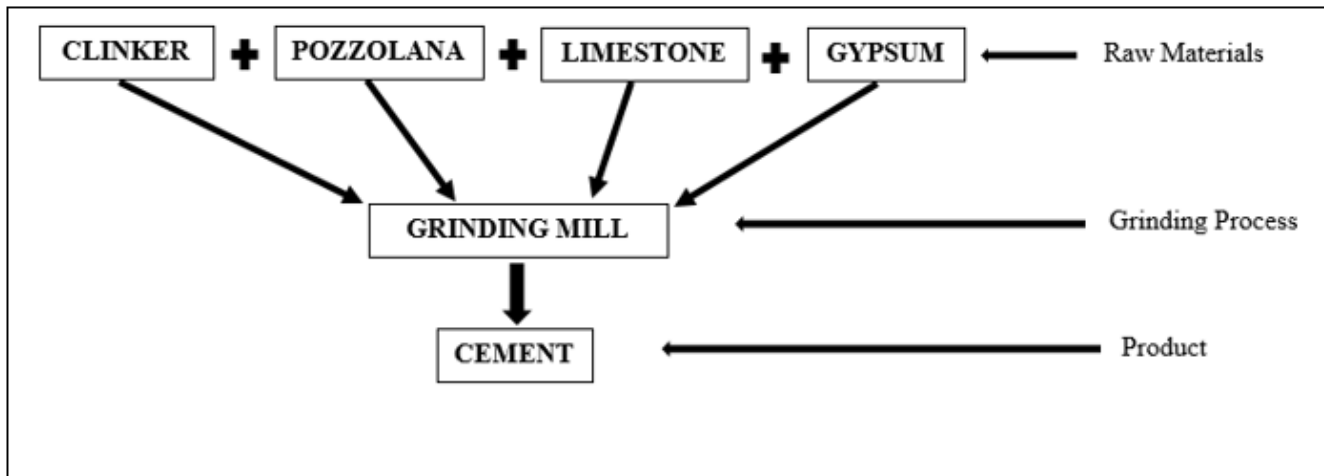
The proponent, **Savannah Cement Ltd**, has proposed to undertake a **Capacity Increase Project** along Nairobi-Namanga Road in Athi River, Machakos County. This Project is to be undertaken on plots **LR No. 18474/227**; whose coordinates are **1° 27'37.693"S 36° 57' 45.989"E** and at an altitude of about **1544 meters** above sea level. The site of the project is along Nairobi-Namanga road and borders Nairobi-Namanga road to the East. The immediate project neighbors are East African Portland Cement which is on the north of the project site, EPZ Athi River to the south-east and both Technology Development Center and Kitengela police post to the south of the project site. The site of the proposed project is on a parcel of land owned by the **Savannah Cement Ltd**. The ESIA Study Report for proposed development has been compiled by **Purified Consultants (PUCO) Ltd**.

Environmental concerns need to be part of the planning and development process and not an afterthought. Cement Industry is generally categorized as a heavy industry with a lot waste in form of heat energy, emissions, dust and other product materials and requires project affected (PA) persons to be consulted through the EIA process. The participation of the project neighbors is critical to avoid any future concerns which could be sorted out during the ESIA study process. It's having this in mind that the proponent undertook this ESIA Study report and incorporated environmental concerns as advised by the experts. Finally, a comprehensive Environmental Management/Monitoring Plan (EMP) is mandatory for a project of this magnitude and nature to guide during construction, operation and Decommissioning phases.

### **1.2 General Cement Production Process**

The main ingredient in cement production is Clinker which is produced by thermal process in a kiln at elevated temperatures. During the process gaseous emissions and particulate matter are produced. Pollution control systems are normally installed for cleaning the emission before being discharged into the air through a stalk. Once clinker is produced, it is then mixed with Pozzolana, limestone and gypsum before grinding to produce cement.

The proposed project of Capacity Increase only involves grinding of clinker with pozzolana, limestone and gypsum to produce cement. It does not involve thermal process of manufacturing clinker and therefore the pollution associated with clinker production will not be there.



**Figure 1: Cement Production Flow Chart**

### 1.3 Need for the Project

It is a well-known fact that the rate of development keeps growing as is evidenced by the multi-billion shillings projects being undertaken in Kenya such as infrastructural and housing developments. The construction of such humongous developments needs readily available construction materials in large quantities. Such materials include cement and cement products. It is against this backdrop and the proponent's need to increase cement grinding capacity from the current 1,200,000 tons per year by approximately the same margin, 1,200,000 tons per year on the existing site in Athi-River, Machakos County. The project involves adding a second grinding line to the existing one. The conceived project is designed to satisfy the current and future development trends' demands of Cement in the country which is critical for Industrial development and attainment of flagship projects under the vision 2030.

### 1.4 Scope, Objective and Criteria of the Environmental and Social Impact Assessment Study

#### 1.4.1 Scope

The scope of this Savannah Capacity Increase Project will comprise the installation of a vertical Cement Grinding mill, Belt Conveyors, a parking plant and Dust arrestors with all the supporting accessories to guarantee safe and environmental friendly operations. The storage, infrastructure (roads, utility lines for water and electricity) that will be used during the project construction and operational phases are already in place and operating currently on the facility.

The existing workers washroom facility is to be demolished to create room for the proposed cement grinding line. Also likely to be affected by the proposed project are the nine trees and the grass that are present on site and are likely to be cleared to create space for the new project.

#### **1.4.2 Objective of the Environmental and Social Impact Assessment**

The objective of the proposed Capacity Increase project for Savannah Cement's plant is to increase the cement grinding capacity from the current 1,200,000 tons per year to 2,400,000 tons per year on the existing site in Athi River, Machakos County.

#### **1.5 Terms of Reference (TOR) for the ESIA Study Process**

The scope of the assessment covered implementation works of the proposed Capacity Increase project which included demolition of the existing workers washrooms, , ground preparation, and construction and/or installations of a vertical cement grinding mill, Belt conveyors, a parking plant and dust arrestors with all the supporting accessories. The output of this work was a comprehensive Environmental and Social Impact Assessment Study report for the purposes of applying for an EIA licence. The main objective of the assignment was to assist the project proponent to prepare an ESIA Study report for the proposed project and take into consideration appropriate measures to mitigate any adverse impacts to the environment. The assessment identified existing and potential environmental impacts and possible concerns that interested and/or affected persons (AP) have with the development, as well as the associated prevention and mitigation measures for the negative impacts as stipulated in the Environmental Management Plan (EMP) proposed.

The consultant on behalf of the project proponent conducted the assessment by incorporating but not limited to the following terms of reference:-

- Location of the proposed project site;
- A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project;
- The objectives of the proposed project;
- The technology, procedures and processes to be used, in the implementation of the project;
- The materials to be used in the construction, installations and implementation of the project;
- The products, by-products and waste to be generated by the project;
- A description of the potentially affected environment;
- The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated;
- Provide alternative technologies and processes available and reasons for preferring the chosen technology and processes;

- Analysis of alternatives including project site, design and technologies;
- An environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures;
- Provide an action plan for the prevention and management of the foreseeable accidents and hazardous activities in the cause of carrying out development activities;
- Propose measures to prevent health hazards and to ensure security in the working environment for the employees, residents and for the management in case of emergencies;
- An identification of gaps in knowledge and uncertainties which were encountered in compiling the information;
- An economic and social analysis of the project;
- Such other matters as the Authority may require.

### **1.6 Data Collection Procedures**

First, the Consultant undertook environmental screening and scoping to avoid unnecessary data. The data collection was carried out through consultations with the proponent representatives, administration of questionnaires, observations and photography, site visits, desktop environmental studies and scientific tests, where necessary in the manner specified in Part V (section 31-41) of the Environmental (Impact Assessment and Audit) Regulations, 2003.

### **1.7 ESIA Organization and Structure**

The ESIA study was carried out to full completion under the guidance of the lead expert who coordinated the day-to-day functions and any related institutional support matters. Otherwise, all requirements by NEMA with regard to the assessment were formally communicated to the project proponent.

### **1.8 Reporting and Documentation**

An Environmental Impact Assessment Project report from the findings was compiled in accordance with the guidelines issued by NEMA for such works and was prepared and submitted by the project proponent for consideration and approval. The consultant ensured constant briefing of the client during the exercise. Drawing plans and relevant documentations are part of the appendices.

## **1.9 Responsibilities and Undertaking**

The team undertook to meet all logistical costs relating to the assignment, including those of production of the report and any other relevant material. The consultant arranged for own transport and travels during the exercise. On the site of the proposed commercial development, the proponent provided a contact person(s) to provide information required by the team. The proponent also provided site plans layout and the actual sizes of the site, future development plans, operation permits, baseline data, land-ownership documents and estimated project cost.

The output from the consultants includes the following: An Environmental and Social Impact Assessment Study Report comprising of an executive summary, study approach, baseline conditions, anticipated impacts and proposed mitigation measures. An Environmental Management Plan outlines which also forms part of the report recommendations.

## **1.10 Methodology Outline**

Since the proposed site is located within an Industrial zone, with no rich natural resources whose total effect to the surroundings could not be adverse and noting that the intended development and use of the facility will be in line with what exists in the surrounding areas, an environmental Study report would be seen to be adequate. The general steps followed during the assessment were as follows:

### ***1.10.1 Environmental Screening***

This step was applied to determine whether an environmental impact assessment study was required and what level of assessment was necessary. This was done in reference to requirements of the EMCA 2015, and specifically the second schedule. Issues considered included the physical location, sensitive issues and nature of anticipated impacts.

### ***1.10.2 Environmental Scoping***

The scoping process helped narrow down onto the most critical issues requiring attention during the assessment. Environmental issues were categorized into physical, natural/ecological and social, economic and cultural aspects.

### ***1.10.3 Desktop Study***

This included documentary review on the nature of the proposed activities, project documents, designs policy and legislative framework, as well as the environmental setting of the area among others. It also

included discussions with the proponent's representatives and design engineers as well as interviews with neighboring communities.

***1.10.4 Site Assessment***

Field visits were meant for physical inspections of the site characteristics and the environmental status of the surrounding areas to determine the anticipated impacts. It also included further interviews with random members of the surrounding.

***1.10.5 ESIA Public Participation***

To ensure adequate public participation in the ESIA process, questionnaires were administered as well as face-to-face interviews were carried out to seek public views towards the proposed project and any anticipated effects of the project to the surrounding. The information gathered was subsequently synthesized and incorporated in the ESIA Study report.

***1.10.6 Reporting***

In addition to constant briefing of the client, this Environmental and Social Impact Assessment Study report was prepared. The contents were presented for submission to NEMA as required by law.

---

## CHAPTER 2: DESCRIPTION OF THE PROJECT

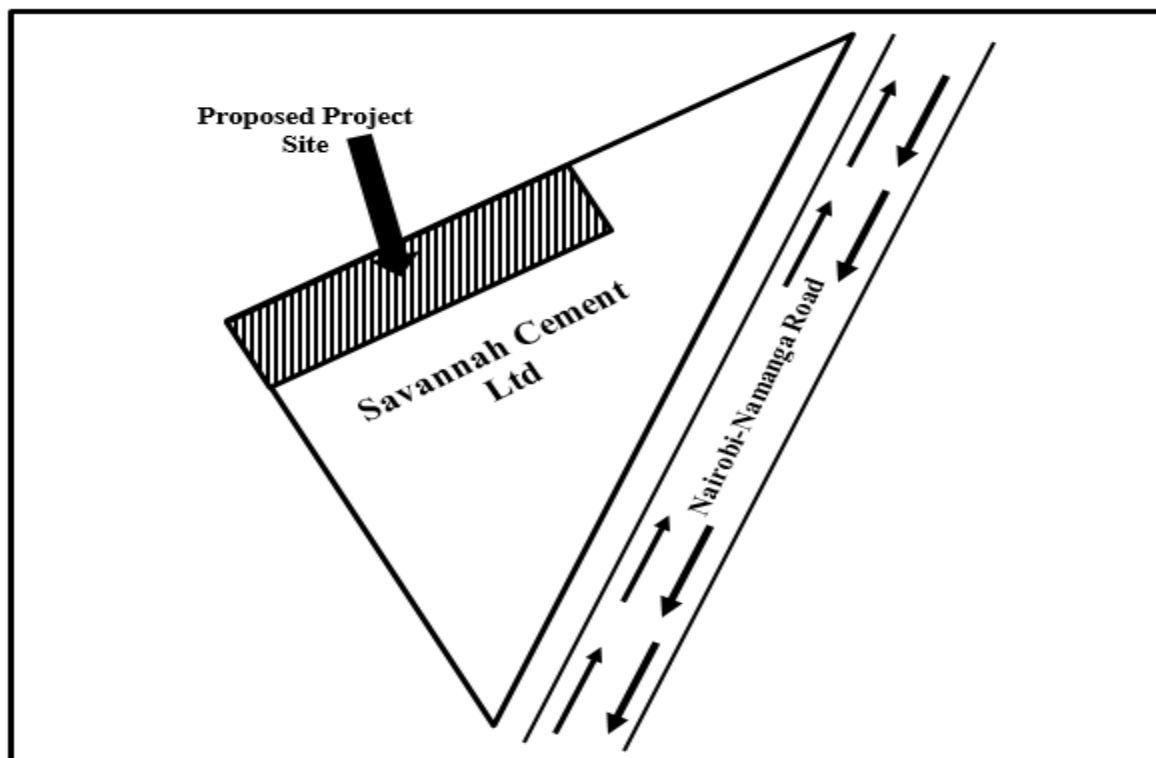
---

### 2.1 Introduction

Savannah Cement Ltd, a cement manufacturing company based along Nairobi-Namanga Road in Athi River, Machakos County has been manufacturing cement for the last four (4) years since 2012 and makes two brands of cement, the 32.5R and 42.5N. The Company proposes a Capacity Increase Project to increase its cement grinding capacity from the current 1.2 Million tons per year by approximately **1.2 Million tons** per year on the existing site.

### 2.2 Location and size of the project

The proposed **Savannah Cement Ltd.'s Capacity Increase Project** site is along Nairobi-Namanga Road in Athi River, Machakos County on plot **LR No. 18474/227** whose coordinates are **1° 27' 37.693" S 36° 57' 45.989" E** and at an altitude of about **1544 metres** above sea level. The site of the project is accessible via Nairobi-Namanga Road. The site of the proposed project is on a parcel of land owned by the Savannah Cement Ltd.



**Figure 2: Directional Map to the Project Site**

**2.1.1 Neighbourhood**

The proposed project is located in an area zoned majorly for industrial purposes. The immediate project site neighbors are: The East African Portland Cement which is to the north of the site, EPZ Athi River to the south-east, and both Technology Development Centre, and Kitengela Police Post to the South of the Project site.



**Figure 3: Neighbourhood (Photo of East Africa Portland Cement)**





Figure 4: Map of the project neighbourhood

### **2.1.2 Roads**

Nairobi-Namanga Road is the main road that bisects the immediate Project Area. This road is tarmacked and in good condition.

### **2.2 Current status of the Project Site**

The EIA expert found that no construction or installation works have commenced on the project site. The site had no structures that will need to be demolished to create room for the proposed project except the worker's washrooms that are likely to be demolished to create room for the proposed development. The site was found to be hosting some grass and nine planted trees all of which are likely to be affected by the proposed project being undertaken at the proposed site.



**Figure 5: Current State of the site**

The following activities are expected to be carried out at the site:

- Demolition of the existing workers' washrooms;
- Delivery of construction material (sand, ballast and cement), machines and equipment to the site,
- Site excavation and digging of trenches for foundations laying,
- Foundation laying for the proposed Grinding Mill and the accompanying structures,
- Hoarding of the site by using iron sheets or any other means deemed fit and appropriate,
- Construction and installation of the Plant and associated facilities;

### **2.3 Objectives of the Project**

The Objective for the proposed project is to construct and install the Proposed Savannah Cement Ltd.'s Capacity Increase project to increase the cement production capacity by approximately 1.2 Million tons per that will allow Savannah Cement Ltd the opportunity to manufacture enough cement that will satisfy the demand for cement by the Company's consumer base that keeps growing.

### **2.4 Design of the Proposed Project**

The Savannah Cement Ltd.'s Capacity Increase project is a Brownfield project that aims to increase cement grinding capacity from the current 1.2 Million tons per year by approximately 1.2 Million tons per annum on the existing site in Athi-River. The proposed project will be constructed on the vacant parcel behind the current grinding plant. Savannah Cement Ltd intends to use the most modern technology, The Vertical Roller Mill that is extremely environmentally friendly with least emissions, least noise and has extremely low carbon footprint because of its low electricity consumption. The project will involve the installation of a Vertical Cement Grinding Mill, Belt Conveyors, a Parking Plant and Dust Arrestors with all the supporting accessories to guarantee safe and environmental friendly operations. The infrastructure (roads, utility lines for water and electricity) that will be used during the project construction and operational phases are already in place in the current facility. The existing workers' washroom is, however, likely to be demolished to create room for the proposed development and its auxiliary facilities.

In general, the design of the project will tend to essentially optimize the use of best available technology to prevent or minimize potentially significant environmental impacts associated with the project and to incorporate efficient operational controls together with trained staff, to ensure high level business and environmental performances.

The proposed project is designed to be undertaken within a period of 12-15 months (December 2016 to March 2018).

### **2.5 Description of the project's Construction and Installation activities**

#### ***2.5.1 Pre-construction investigations and Demolition Works***

The implementation of the project's design and construction phase will start with thorough investigation of the site, soil, chemical and physical properties and water table level determination.

To accommodate the new equipment, the existing external workers' washroom will be demolished to create room for the proposed project's development.



**Figure 6: Current worker's washrooms (Likely to be affected)**

### ***2.5.2 Construction Materials and Equipment***

Greater emphasis will be laid on procurement of construction materials and equipment from within the local area, which will make both economic and environmental sense as it will reduce negative impacts of transportation of the materials and equipment to the project site through reduced distance of travel by the materials transport vehicles. These materials and equipment will be transported to the project site from their extraction, manufacture, and/or storage sites using trucks. The construction materials to be used in construction of the project will be sourced from Nairobi and its environs. Some of the specialized equipment will be imported from outside Kenya.

### ***2.5.3 Storage of Materials***

Provision for storage of construction materials and equipment will be provided on site. Bulky materials such as rough stones, ballast, sand and steel will be carefully piled on site. To avoid piling large quantities of materials on site, the project proponent will order bulky materials such as sand, gravel and stones in quotas. Materials such as cement, paints and glasses; and equipment will be stored in storage structures which are already within the project site for this purpose.

#### ***2.5.4 Excavation and Foundation Works***

At the proposed project site, excavation works will be carried out to set up foundation for the silos and equipment. This will involve the use of heavy earthmoving machinery such as tractors and bulldozers.

#### ***2.5.5 Masonry, Concrete works and related activities***

The construction of the foundations, structural frames, pavements, drainage systems, perimeter fence, among other components of the project will involve a lot of masonry work and related activities. General masonry and related activities will include concrete mixing, plastering, slab construction, construction of foundations, and erection of structural frames and curing of fresh concrete surfaces. These activities are known to be labour intensive and will be supplemented by machinery such as concrete mixers.

#### ***2.5.6 Electrical work***

Electrical work during construction of the proposed development will include installation of electrical gadgets and appliances including electrical cables, lighting apparatus, sockets among others. In addition, there will be other activities involving the use of electricity such as welding and metal cutting.

#### ***2.5.7 Landscaping***

To improve the aesthetic value or visual quality of the site once construction ceases, the proponent will carry out landscaping. This will include establishment of flower gardens and flourishing grass lawns and will involve replenishment of the topsoil. It is noteworthy that the proponent will use plant species that are available locally preferably indigenous ones for landscaping. The proponent has already over 5000 tree seedlings that will be planted around the facility once the project construction phase is completed.

#### ***2.5.8 Project Budget***

The total cost of the proposed project is estimated to cost approximately One Billion Kenya Shillings (KShs. 1,000,000,000). This amount will be distributed to various project activities that include; builders work, electrical services installations, mechanical service installations, external works, water reticulation and drainage services, site installations, preliminaries and contingencies.

## **2.6 Description of the Project's Operational Activities**

### **2.6.1 Savannah Cement Ltd.'s Capacity Increase project**

The new expansion project will use the same materials used by the current manufacturing facility to produce cement, i.e. Clinker, Pozzolana, Limestone and Gypsum. Imported clinker will be used. Local Pozzolana will be obtained from Ngurunga and supplied by 3<sup>rd</sup> party contractors whereas Gypsum will be sourced from Garissa and supplied by 3<sup>rd</sup> Party Contractors. See *figure 1* above on the process of Cement production.

### **2.6.2 Emissions and Controls**

The emissions of concern from the proposed project is fugitive dust as a result of movement of heavy trucks over unpaved roads, SO<sub>x</sub> from the use of Sulphur containing fuels and NO<sub>x</sub> from diesel-propelled engines within the project site.

*To mitigate on the above, paving site/roads and use of water sprays will be used for fugitive dust, use of low Sulphur fuels and proper vehicle servicing and machine maintenance will be done.*

### **2.6.3 Noise and Vibrations**

Noise and Vibrations will be as a result of the cement production activities such as the running of cement grinding mill, conveyance of raw materials and the movement of heavy trucks and mobile equipment within the site.

*The following should be applied in mitigating noise and vibrations: Assessment of noise risks hazards at the work place and developing the appropriate action plans. Employee protection by elimination or controlling noise risks to acceptable legal limits by applying good practices and appropriate engineering controls; appropriate use of all noise control equipment and appropriate use of hearing protection; Training and sensitization of workers on noise risks, control measures and hearing protection; Health surveillance checks for exposed workers and using result to improve on protection of the workers; and constant review of work practice, changes in noise exposure and new ways to reduce risks.*

### **2.6.4 Solid Waste**

During the construction and operational phases of the proposed project, solid waste is likely to be produced. This solid waste is likely to be of three categories namely process waste, domestic waste

and office waste. Process waste which includes cement production waste is generated from plant maintenance (e.g. used oil and scrap metal) and waste associated with packaging cement. Domestic waste include waste from canteen and other eating places within the plant and include food left overs, wastepaper. Office waste includes wastepaper, electronic waste and sweepings. Potential negative impacts of solid waste include: Skin irritation when in contact with cement dust; Water pollution; Production loss; Chocking of plants; Odor from decomposing food leftovers from the canteen; Blockage of drainage system by scrap and other non-decomposing solid wastes; Some electronic office waste such as used toner cartridges and obsolete office electronic equipment contain hazardous substances.

*Measures to mitigate solid waste generation will include appropriate management practices and deliberate innervations aimed at minimization of waste generation.*

#### **2.6.5 Sewage and Waste Water**

Liquid waste is likely to be generated during the construction, operational and decommissioning phases of the proposed project. This waste includes sanitary wastewater, storm water and waste oil. Wastewater is likely to be generated mainly from sanitary facilities from the plant, from cleaning of floors and other surfaces and from tools and equipment cleaning such as motor vehicles.

Sewage and waste water will be mitigated on by use of the existing sewerage system in the project area. Waste oil is generated from servicing of machines and equipment will be handled through water-oil separation for reuse, selling to recyclers and burning in incinerators. Potential negative impacts may be ground water contamination.

#### **2.6.6 Cleaning**

The proponent will be responsible cleaning of the plant, the parking areas and the compound among other areas. Cleaning operations will involve the use of substantial amounts of water, disinfectants and detergents.

### ***2.6.7 General repairs and maintenance***

The proposed Capacity Increase project and associated facilities will be repaired and maintained regularly during the operational phase of the project. Such activities will include repairs of silos and machinery, repairs and maintenance of electrical gadgets and equipment repairs.

## **2.7 Description of the project's decommissioning activities**

### ***2.7.1 Demolition works***

Upon decommissioning, the project components including equipment, silos, pavements, drainage systems, parking areas and perimeter fence will be demolished. This will produce a lot of solid waste, which will be reused for other construction works, and those not reusable will be disposed of appropriately by a licensed waste disposal company.

### ***2.7.2 Dismantling of equipment and fixtures***

All equipment including electrical installations, furniture, finishing fixtures partitions, pipe-work and sinks among others will be dismantled and removed from the site on decommissioning of the project. Priority will be given to reuse of these equipment in other projects. This will be achieved through resale of the equipment to other contractors.

### ***2.7.3 Site restoration***

Once all the waste resulting from demolition and dismantling works is cleared from the site, the site will be restored through replenishment of the topsoil and re-vegetation using indigenous plant species.



## **CHAPTER 3: BASELINE INFORMATION**

---

### **3.1 Introduction**

This section describes the major elements of the project area's environment, encompassing the physical, biological and social environment as well as the condition of the proposed project site. The information presented in this section is based on observation of the project area by the consultants as well as information from secondary literature.

### **3.2 Description of the Project Environment**

#### **3.2.1 Bio-physical**

The proposed **Savannah Cement Ltd.'s Capacity Increase Project** site is along Nairobi-Namanga Road in Athi River, Machakos County on plot **LR No. 18474/227** whose coordinates are **1° 27' 37.693" S 36° 57' 45.989" E** and at an altitude of about **1544 metres** above sea level. The site of the project is accessible via Nairobi-Namanga Road. The site of the proposed project is on a parcel of land owned by the Savannah Cement Ltd.

### **3.3 Climate**

Athi River, just like many parts in Machakos County experiences a bimodal rainfall pattern. The short rains fall between October and December while the long rains fall between mid-March and May. Annual rainfall is influenced by altitude with a mean annual rainfall of 800 mm. The climate is humid highland subtropical in character with seasonal dry and wet periods. Temperatures vary with altitude rising from the lowest 10<sup>0</sup>C in to the highest are 27<sup>0</sup>C

### **3.4 Infrastructure**

The area of the Project has both tarmac and all-weather road networks connecting it to major towns like Nairobi, Kitengela and Machakos Town. The roads in the immediate neighbourhood are in good conditions.

#### **3.4.1 Road**

The major roads in the district follow the north-south axis and are connected to the Nairobi-Mombasa Road.

### **3.4.2 Energy**

Energy in its various forms is used to varying degrees, but by far the most important is electricity the national grid supplemented a generator that runs on need basis and heavy fuel oil (HFO). Majority of the project area is occupied by industries/Factories which use electricity as a major source of energy to run their processes.

### **3.4.3 Geology and Soils**

#### **3.4.3.1 Geology**

Athi River area predominantly comprises of tertiary rocks (Ngong volcanic) overlaying pre-Cambrian basement rocks, which is exposed in small area in upper reaches of the Kitengela River. In the north, from Nairobi national park and eastwards are the Nairobi phonolites, in the west are the Mbagathi Phonolite Trachytes and to the East are Athi tuffs. These rocky basements are usually very important for providing strong foundations for buildings.

#### **3.4.3.2 Soils**

The soils covering the area have greatly been influenced by the underlying basement rock system. Most parts of the area are covered by thin black cotton soils which is a great impediment to urban development and construction in particular. On the site of the proposed project, the soil is sandy to clay soils. This can comfortably support the proposed project development.

### **3.4.4 Climate**

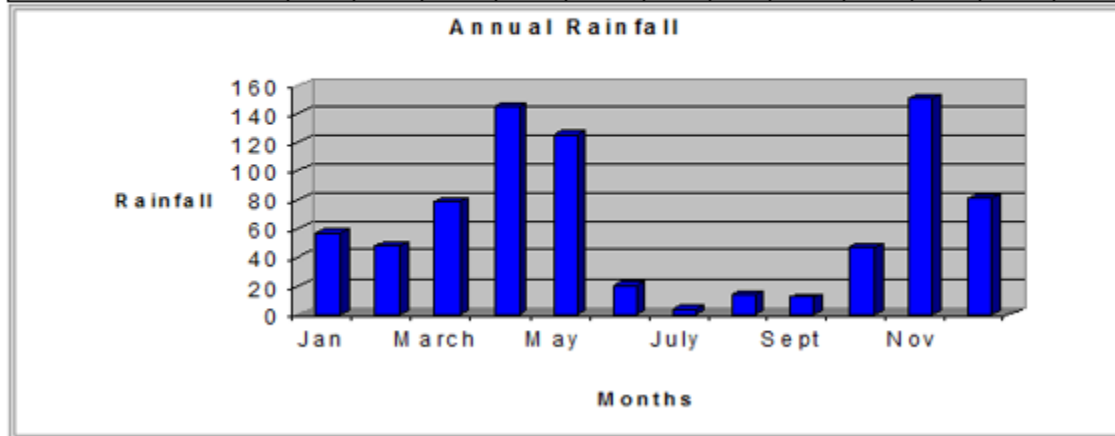
The various elements of climate include rainfall, temperatures, winds and even sunshine.

### **3.4.5 Rainfall**

Statistics from the meteorological department of Kenya indicates that Athi River has two rainfall maximums: long rains fall between February to May and short spells occur between the months of October to December. The rain is preceded by two dry spells. The table below shows the amount of rainfall per month for Machakos

**Table 2: Average Monthly Rainfall**

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	57	48	79	145	125	20	4	4	2	47	150	81

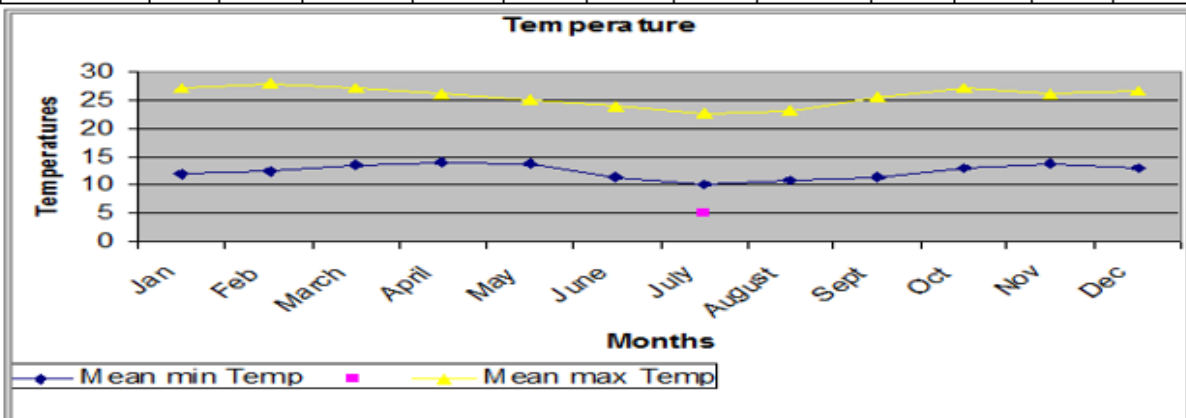


### 3.4.6 Temperatures

The temperatures of Athi River are very high between the month of January March. The mean maximum temperatures ranges between 23<sup>0</sup>C – 28<sup>0</sup>C while the mean monthly minimum temperatures range between 11<sup>0</sup>C – 15<sup>0</sup>C. The table below indicates the temperature records of Athi River town in Mavoko Municipality in 1983.

**Table 3: Average Monthly Temperatures**

Months	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Mean min Temp	12	12.5	13.5	14.2	13.8	11.5	10.5	11	11.3	13	13.8	13
Mean max Temp	27	28	27	26	25	24	22.5	23	25.5	27	26	26.5



Source: Meteorology Department of Kenya Temperature records (1983)

### **3.4.7 Winds**

The area experiences very strong winds during the months of August to October and of January to March. The winds flow from the Indian Ocean and are usually dry. The wind direction is in the southwest direction from November to May particularly across the area.

### **3.4.8 Vegetation/Flora**

The site is devoid of major physical developments or structures. The uncultivated land has short grass and bushes. The property is open and not fenced. Since the parcel has already been surveyed, there exist beacons at the four corners of the parcel. The owners intend to fence off the property to discourage encroachment. Very little animal activity is noted within the site. The wildlife that may occasionally be found within the site includes birds, insects, rodents and butterflies.

## **3.5 Infrastructural Services**

The status in respect of various services is as outlined herein under:-

### **3.5.1 Storm Water Drainage and Effluents Management**

The topography of the site is such that there is a gentle slope southwards towards a seasonal storm drain flowing towards River Athi. The storm water therefore drains naturally into the stream on the southern side of the factory. The area is therefore not prone to floods making it habitable. The site is connected to functional bio digester which treats waste water. The other neighboring facilities are connected to the Mavoko water and sewerage company public sewer.

### **3.5.2 Electricity and Telephone Services**

The area is served with electricity power line serving the area. The area is also well served by the Telkom, Safaricom and Celtel telephone providers. The site is closer to Kenya power and Company national grind.

### **3.5.3 Archaeological and Cultural Heritage**

The project site, being completely established in an industrial area it has no major archaeological and cultural complications.

### **3.5.4 Noise levels**

The noise assessment was undertaken at Savannah Cement Ltd plant in February 2016 to fulfil rules 610 (I) of the legal requirements and to establish noise exposure levels and patterns in the

workplace due to factory operations and to obtain data that can be used to form basis for planning the control measures to eliminate or control noise exposure to the workers. Measurements were performed at various locations within the factory including some offices. The workplace was divided into two i.e. (i) Technical Offices and Laboratories; and (ii) Production Line and Related Processes. The  $L_{Aeq,T}$  for the offices and laboratories did not exceed the first action level of 85 dB(A). The table below shows the measurements taken from the technical offices and the laboratories. The number of workers exposed to noise at these sites is also indicated in the table.

**Table 4: Measured Noise Levels in Technical Offices and Laboratories**

Work Stations Measurement Point	NOISE MEASUREMENT (dB(A))				Workers exposed
	Noise Measurements $L_{Aeq,T}$	Noise daily exposure $L_{EP,d}$ ( $L_{Aeq,8h}$ )	International TLVs	Peak Level (C) $L_{peak}$	
Tech Boardroom	68.2	65.7	50	98.1	2
SHE Manager's Office	72.0	69.8	50	103.6	1
Technical Pool Office	70.3	68.1	50	99.4	5
CCR Room	72.9	71.1	50	98.2	3
Shift Lab Analyzer Room	69.8	66.1	55	97.3	2
Chemical Lab Room	71.7	68.7	55	100.9	4

The table below shows the measured noise levels when various machines and operations are functioning simultaneously. It was discovered that some of the locations were bordering the action level of  $L_{Aeq,T}$  85 dB(A) and others were above the  $L_{Aeq,T}$  90 dB(A) which would require provision of ear protection appliances or doing something to reduce the noise levels in these areas.

Table 5: Levels Production Line and Related Processes

NOISE MEASUREMENT (dB(A))				
Measurement Point	Noise Measurements $L_{Aeq,T}$	Noise daily exposure $L_{EP,d} (L_{Aeq,8h})$	Peak Level (C) $L_{peak}$	Workers exposed
Physical Lab	74.7	73.4	99.9	2
Quality Manager Office	76.9	73.8	107.3	1
Ball Mill Lab	96.2	94.4	112.3	1
Clinker Hall	85.3	83.7	97.6	4
Wheel Loader	80.4	78.2	112.8	1
Roller Press Chute	91.4	89.8	110.2	2
Grinding Shop	94.8	92.7	111.3	2
Mill Area Chute	94.1	92.5	116.1	3
Pozzallana Hall	77.8	75.9	102.9	7
Drier Area	94.1	91.6	103.4	2
Cement Silo Extractor Area	75.2	75.4	109.0	3
Paper Bags Store	68.4	65.1	99.2	4
Rotor Packing Area	86.7	83.3	111.9	6
Loading Plant	75.3	80.7	100.5	6
Packing Office	68.7	65.7	96.6	5

It is worth noting that the proposed project is likely to compound the noise levels hence the need for proper noise control and minimization measures in place to secure the wellbeing of the workers exposed to high noise levels.

### 3.5.5 Air Quality

Air quality assessment for Savannah Cement Ltd was conducted on five factory locations in 2015 for determination of air pollutants in ambient air using a gas monitor to measure O<sub>2</sub>, CO<sub>x</sub>, NO<sub>x</sub>, H<sub>2</sub>S, SO<sub>x</sub>, and Dust using the ambient air quality standards shown below. The air quality assessment was undertaken against the limits set in the Environmental Management and Coordination (Air Quality) Regulation, 2014.

**Table 6: Ambient Air Quality of Property boundary for general pollutants**

Pollutant	Property boundary
Sulphur oxides, Sox	50 µg/m <sup>3</sup>
Oxides of Nitrogen, NOx	80 µg/m <sup>3</sup>
Particulate Matter (PM <sub>10</sub> )	50 µg/m <sup>3</sup>

Source: EMC (air quality) regulations, 2014

**Table 7: Emission limits for controlled facilities (Cement Plants)**

Pollutant	Limits
Sulphur oxides, Sox	400 mg/Nm <sup>3</sup>
Oxides of Nitrogen, NOx	1500 mg/Nm <sup>3</sup>
Particulate Matter (PM <sub>10</sub> )	50 mg/Nm <sup>3</sup>

IFC's guidelines on environment, health and safety for cement and lime manufacturing were also considered. The table below is a guideline for point sources for cement manufacturing plants:

**Table 8: IFC air emission levels for cement manufacturing**

Pollutant	Limits
Sulphur dioxide, So <sub>2</sub>	400 mg/Nm <sup>3</sup>
Oxides of Nitrogen, NOx	600 mg/Nm <sup>3</sup>
Particulate Matter (PM <sub>10</sub> )	50 mg/Nm <sup>3</sup>

The table below shows the emission results from the drier.

The results below for air quality analysis are within the stipulated standard limits for air quality set out in the EMC (Air Quality) regulations, 2014 for cement plants. The proponent is therefore required to maintain and/or employ better air quality monitoring standards when the proposed project gets operational.

Table 9: Emission Results from the drier

SGS						
Name of Client:	SAVANNA CEMENT					
Name of Site:	Drier					
Sampling Date/time:						
<b>Gases</b>	<b>Actual Dry</b>	<b>Units</b>	<b>Actual Dry</b>	<b>Units</b>	<b>10% O2 Ref.</b>	<b>Units</b>
Oxygen	18.92	%				
Carbon Dioxide	1.54	%				
Carbon Monoxide	502.25	ppm	627.81	mg/Nm3	3316.18	mg/Nm3
Sulphur Dioxide	22.25	ppm	63.64	mg/Nm3	336.13	mg/Nm3
Nitrogen Oxide	66.75	ppm	136.84	mg/Nm3	722.79	mg/Nm3
Nitrogen Dioxide	0.23	ppm	0.46	mg/Nm3	2.44	mg/Nm3
Nox	66.75	ppm	136.84	mg/Nm3	722.79	mg/Nm3
Nox as NO2	101.20	ppm	207.46	mg/Nm3	1095.83	mg/Nm3
Flue Temperature	62.40	oC	335.40	K		
<b>Gases</b>	<b>Reading 1</b>	<b>Reading 2</b>	<b>Reading 3</b>	<b>Reading 4</b>	<b>Average</b>	
Oxygen	18.92	18.95	18.95	18.85	18.92	
Carbon Dioxide	1.53	1.51	1.51	1.59	1.54	
Carbon Monoxide	505.00	507.00	507.00	490.00	502.25	
Sulphur Dioxide	16.00	23.00	23.00	27.00	22.25	
Nitrogen Oxide	66.00	66.00	66.00	69.00	66.75	
Nitrogen Dioxide	0.00	0.00	0.00	0.90	0.23	
Nox	66.00	66.00	66.00	69.00	66.75	
Flue Temperature	62.40	62.30	62.30	62.60	62.40	

Dust measurements were also performed at Savannah Cement Ltd factory at various locations within the working area within the factory following raw materials from clinker to dispatch brush area. Five dust level measurements were taken from different locations in the work area. Below are the measurements and concentrations in mg/m<sup>3</sup>.

Table 10: Dust measurements and concentrations in mg/m<sup>3</sup>

DUST MEASUREMENTS (mg)				
Measurement Samples	Empty Filters (mg)	Load Filters (mg)	Calculated 8 Hour Dust Concentration mg/m <sup>3</sup>	Workers exposed
Clinker Hall	46.8	51.6	26.89	4
Pozzolana Hall	47.2	47.9	3.28	4
Packaging Hall	48.6	51.1	7.93	6
Silos Area	47.8	49.3	7.76	3
Loading Area	47.2	48.3	5.23	6

The level of inhalable and respirable fraction of cement dust in the Clinker Hall, Packaging Hall, Loading Area and Silos Area were found to be above the Threshold Limit Value of 5.0 mg/m<sup>3</sup>. Only the Pozzolana hall was found to below this limit. However, the high wind velocity during the time of measurement was an influencing factor since the four workplaces that recorded results



above the threshold limit value are open to wind movements. The proponent is therefore advised to consider designing a good control strategy so as to be able to capture dust as close as possible to its source.

## **CHAPTER 4: RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORKS**

---

This chapter of the ESIA Study Report highlights the relevant legal provisions which govern the process of ESIA under which this proposed project falls. These provisions are broadly categorized as policies, legislations, regulations and administrative frameworks.

### **4.1 Policy Framework**

This sub-section highlights the relevant environmental policies established by the Government of Kenya (GOK) for purposes of environmental protection towards the process of sustainable development. The GOK, through the ministry of environment, has established environmental policies which broadly aim at:

- Encouraging respect for the environment by all and being mindful and taking care of the same;
- Ensuring environmental issues are integrated with economic matters to attain sustainable development;
- Reviewing and evaluating development plans to ensure they follow the set environmental guidelines/policies;
- Encouraging the public to take part in environmental matters so as to enlighten them on the same hence improve on environmental performance.

The following are the environmental policies set by the GOK through the Ministry of Environment and Natural Resources to ensure the environment is safeguarded in all development aspects:-

#### ***4.1.1 The National Environmental Action Plan (NEAP)***

Established in 1990, this policy addresses the issue of social, economic and industrial activities and their impacts on the ecosystem as opposed to environmental sustainability. This policy also emphasizes environmental concerns to be accounted for in socio-economic developments. The EIA process was established in line with this policy and the key players in this were local authorities and other development partners.

## **4.2 Legislative Framework**

This sub-section explains the various legal provisions which govern the processes of EIA and EA. Some environment related acts that have been created deal with specific areas of the environment such as water pollution, soil erosion, air pollution, resettlement among others. Before the establishment of Environmental Management and Coordination Act (EMCA) of 1999 and Environmental Impact Assessment and Environmental Audit regulations of 2003, environmental strategies were implemented through local authorities' acts and policy statements. The EMCA Act led to establishment of NEMA which coordinates all environmental issues in the country and enforces environmental laws. The following is a highlight of some legal frameworks that govern this project. In the revised EMCA, Environmental Council and Standards Enforcement and Review Council (SERC) were abolished and the Policy issues that were being handled by these two institutions are now vested in the Cabinet Secretary for the Ministry of Environment and Natural Resources in Kenya.

### ***4.2.1 Environmental management and coordination Act (EMCA) 2015***

Established in 1999, this Act is the most comprehensive Act of parliament pertaining to environmental protection, conservation and management. This Act states that each and every individual is entitled to a clean environment and should therefore safeguard the same. This Act goes ahead to stipulate that, all development activities and projects must undergo an EIA so as to achieve the target of a clean environment for all. The EMCA of 1999 was amended to EMCA 2015.

An ESIA report provides information on how to manage the environment better by identifying the significant impacts that emanate from a given project and proposing appropriate mitigation/management and monitoring measures. The ESIA study report also includes an environmental management plan which provides an action plan for impact management and monitoring. Therefore, the EIA process is very essential since it ensures proper environmental management towards the process of sustainable development. The proponent will have to adhere to all impact management and mitigation measures highlighted and thereon implement the environmental management and monitoring plan and all other relevant measures as required in this Act while undertaking the project to ensure proper and effective environmental management.

#### **4.2.2 Physical Planning Act 2010**

This Act provides for the preparation and implementation of physical development plans for connected purposes. It establishes the responsibility for the physical planning at various levels of Government in order to remove uncertainty regarding the responsibility for regional planning. It provides for a hierarchy of plans in which guidelines are laid down for the future physical development of areas referred to in specific plan. The ostensible intention is that the three tier order plans, the national development plan, regional development plan, and the local physical development plan should concentrate on broad policy issues.

The Act also promotes public participation in the preparation of plans and requires that in preparation of plans, proper consideration be given to the potential for economic development, socio-economic development needs of the population, the existing planning and future transport needs, the physical factors which may influence orderly development in general and urbanization in particular, and the possible influence of future development upon natural environment. The innovation in the Act is the requirement for Environmental Impact Assessment (EIA). Any change of use of the actual development without authority constitutes an offence.

#### **4.2.3 Land planning Act cap 303**

This Act addresses such issues as land allocation and development procedures and it is administered by the Ministry of Lands. This Act also advocates for efficient utilization and management of the land resources available. The department of lands is mandated to keep records of all lands, collect revenues emanating from lands, demarcation of boundaries, solving any arising land disputes, issuing land ownership title deeds and monitoring on development undertakings on the land. Under this Act, the local authority before submitting any plans to the Minister at the time for approval, the owners of such land affected should be incorporated into the process. The land owner's opinions should be forwarded so as to minimize conflict. The proponent should obtain a legal land title deed from the ministry of lands. In the case of this project the land where the project is undertaken belongs to the project proponent.

#### **4.2.4 Public Health Act (Cap 242)**

The Public Health Act (Cap 242) aims at protecting and promotes human health and the prevention, limitation or suppression of infectious, communicable or preventable diseases within Kenya. It also aims to advise and direct local authorities in regard to matters affecting public health and to

promote or carry out researches and investigations in connection with the prevention and treatment of human diseases. This Act provides the impetus for a healthy environment and gives regulations to waste management, pollution and human health.

Section 119 states that a medical officer may require the owner of dwelling causing nuisance to remove the nuisance in the dwelling failure to which legal proceedings may be taken against the owner of the dwelling and penalties. Under section 126 the act includes The Public Health (Drainage and Latrine) Rules which in section 63 deals with sewerage and prohibits the disposal of solid or liquid sewage or sewage effluent in such a manner or in such a position as to cause or be likely to cause dampness in any building or part thereof, or to endanger the purity of any water supply, or to create any nuisance.

*The main contractor will be required to provide sanitary facilities and solid waste containers for use by the construction workers on site during construction phase. A licensed solid waste transporter will also be contracted to collect all solid waste from the site for dumping at approved sites. Waste water from the proposed project during its operational phase will be discharged into the sewer system in the serving the project area.*

#### **4.2.5 The Kenya Mining Act 2016**

The Kenya Mining Act of 2016 was gazetted on Friday 20th May 2016. The new law attends to Articles 60, 62(1)(f), 66(2), 69 and 71 of the constitution of the Republic of Kenya in so far as they apply to minerals, providing for; prospecting, mining, processing, refining, treatment, transport and any dealings in minerals.

The Kenya Mining Act came into effect on 27 May 2016 and is an overhaul of the country's previous legislation on Mining. The Mining Act 2016 replaced the following acts: (a) The Mining Act; Cap. 306 (b) the Trading in Unwrought Precious Metals Act; and Cap. 309; and (c) the Diamond Industry Protection Act. This is an Act of parliament that consolidates the law relating to mining. The Act spells out licensing conditions set by the government and duties of the licencees. This Act will specifically apply to the cement plant because of mining the raw materials.

**4.2.6 Building code 2000**

Sewers and waste management are addressed in this Code. It directs that applications to the local authority before connecting to a sewer line whenever it exists must be made. All waste water is required to be discharged into public sewers. This code as well prohibits any constructions on sewer lines.

**4.2.7 The Water Act, 2016**

This Act provides the guidelines for proper management of water, conservation and control of water resources to ensure the water resources are sustainable. Under this Act waste water, storm water, sewage systems and drainages are supposed to be put in design drawings in the building plan; This Act also prohibits water pollution by a developer in his/her area of jurisdiction.

*Though the site has no stream or river, the proponent will ensure that appropriate measures to prevent pollution of underground and surface water resources are implemented throughout the project cycle. The proponent shall also seek the necessary approvals from Mavoko Water and Sewerage Company before seeking other alternative sources of water supply to the proposed project site throughout the project cycle.*

**4.2.8 Occupational Safety and Health Act, 2007**

This is an Act of parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. According to Section 3 (1), this legislation shall apply to all workplaces where any person is employed, whether permanently or temporarily. Under Section 3 (2), the purpose of this Act is to: -

- a) Secure the safety, health and welfare of persons at work; and
- b) Protect persons other than persons at work against risks to safety and health arising out of, or in connection with, the activities of persons at work.

Under Section 6 (1), every occupier shall ensure the safety, health and welfare at work of all persons working in his workplace. Under section 6 (3), every occupier shall carry out appropriate risk assessments in relation to the safety and health of persons employed, and on the basis of these results, adopt preventive and protective measures to ensure that under all conditions of their intended use, all chemicals, machinery, equipment, tools, and process under the control of the

occupier are safe and without risk to health and comply with the requirements of the safety and health provisions in this Act.

Under Section 47 (1), every workplace shall be kept in a clean state, and free from effluvia arising from any drain, sanitary convenience or nuisance. In accordance with section 52 (1), sufficient and suitable sanitary conveniences for the persons employed in the workplace shall be provided, maintained and kept clean, and effective provision shall be made for lighting the conveniences; and where persons of both sexes are or are intended to be employed (except in the case of workplaces where the only persons employed are members of the same family dwelling there), such conveniences shall afford proper separate accommodation for persons of each sex.

### **4.3 Administrative Framework**

In 2001 various administrative structures were established for purposes of monitoring and evaluation of the various environmental laws and regulations existing. These administrative frameworks enforce environmental rules, laws, regulations and policies that exist with an aim of protecting and managing the environment effectively. They include;

#### ***4.3.1 The National Environment Management Authority (NEMA)***

NEMA was established after the EMCA Act of 1999 and its main role is to coordinate and supervise all environmental matters in the country. All set environmental policies and goals are implemented by the Ministry of Environment through NEMA.

### **4.4 Regulatory Framework**

This sub-section outlines the various rules and regulations which have been established to safeguard the environment. Some of these regulations are as follows:-

#### ***4.4.1 Environmental Impact Assessment and Audit Regulations 2003***

Established in 2003 these regulations provide the objectives and guidelines for carrying out an EIA and an EA. These regulations which apply hand in hand with the EMCA Act of 1999 requires any project proponent before commencement of the project activities to have an EIA done on the same and a license awarded by NEMA so as to ensure sound and effective environmental management. Under the same regulations, regulation 4(1) prohibits project proponents implementing projects with negative environmental impacts. The Environmental Impact Assessment and Audit

Regulations state in Regulation 3 that ‘the regulation shall apply to all policies, plans, programmes, and activities specified in Part IV, V and the Second schedule of the Act.

#### ***4.4.2 The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009***

Part II of the general prohibition of this regulation state that except as otherwise provided for in this regulations, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. Part (2) of the general prohibitions stated that in determining whether noise is loud, unreasonable, unnecessary or unusual the following factors may be considered:-

- Time of the day;
- Proximity to residential area;
- Whether the noise is recurrent, intermitted or constant;
- The level and intensity of the noise;
- Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and
- Whether the noise can be controlled without much effort or expense to the person making the noise.

Part 2 of section III states that any person wishing to operate or repair any machinery, motor vehicle, construction equipment or other equipment, pump, fan, air-conditioning apparatus or similar mechanical device or engage in any maisonettes or industrial activity which is likely to emit noise or excessive vibrations shall carry out the activity or activities within relevant levels prescribed in the first schedule to these regulations. Part III section 13 (1) states that except for the purpose specified in sub-Regulation (2)... no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the second schedule of the regulations.

#### ***4.4.3 Solid Waste Management Legal Notice No. 121***

The Environmental Management and Coordination Legal Notice No 121 on (waste management) provides for the responsibility of waste generator, cleaner production methods, segregation of



waste by generator, waste transportation license, responsibility of a waste transporters, transportation of waste by licensed transporters, license for disposal facility, waste treatment by operators of disposal sites, requirement for environmental audit and re-use and recycling plants. The legal notice further provides mitigation measures to industrial wastes and their treatment. The hazardous and toxic wastes have been specified by the legal notice that also provides for various requirements of EIA.

The proponent will use private companies to collect and dump all the solid waste generated from the proposed development. Temporal solid waste handling containers will be provided on site and protected from rain and animals where residents will collect their solid waste before it is dumped to the city's designated dumpsite once or twice a week.

#### ***4.4.4 The Environmental Management and Co-Ordination (Air Quality) Regulations, 2014***

These regulations apply to:-

- a) all internal combustion engines,
- b) all premises, places, processes, operations, or works to which the provisions of the Act and Regulations made thereunder apply, and
- c) Any other appliance or activity that the Minister may by order in the Gazette, specify.

The fourteenth schedule to the regulations lists Cement plants (clinker plants included) among controlled facilities where these regulations apply. Part VIII of the Fifth schedule to these regulations gives Guidelines on sources of fugitive emission air pollutants. The following are listed as the sources of fugitive emissions: construction activities; storage and handling, including loading and unloading, of materials such as bauxite, alumina, gypsum, or Portland cement or the raw materials therefore; mining and quarrying activities; haul roads; haul trucks; tailings piles and ponds; demolition activities; blasting activities; sandblasting operations; wind breaks; the paving of roads and conveyor belts. The fourth schedule to these regulations gives a table of guidelines on air pollution monitoring parameters from stationary sources.

## CHAPTER 5: PUBLIC PARTICIPATION

There are no clear and comprehensive national regulations on Public Participation in Kenya. However, as per EMCA 2015 and EIA Regulations 2003, Public Participation is done through interviews and questionnaires, advertisements in the print media and Kenya gazette and finally for controversial projects, a public hearing is done.

The broad objective of the Public Consultation Process was to provide the local population, statutory bodies, local organizations and interested parties with the opportunity to identify issues, concerns and opportunities regarding the proposed development. This allowed the EIA Study team to explain to the public and others how the project might affect them and receive feedback on particular concerns that they might have in order that subsequent studies undertaken and actions could reflect those concerns.

In conforming to the environmental legislation, public consultations were conducted using interviews, questionnaire survey and consultative meetings to inform project AP that the project is being undertaken, to record and understand any concerns, and to allow the project to be designed and the ESIA scoped so as to reduce any adverse impacts to an acceptable level; and on completion of ESIA, to inform people of the outcome of the ESIA to communicate how issues/concerns have been addressed; and to record, and where necessary act upon any further issues/concerns. Neighboring the site are developments of the same character as the proposed development project. (See Annexes for Questionnaire Feedback). The table below shows details of some of the stakeholders consulted during the public consultation process:

**Table 11: List of Stakeholders consulted**

NAME	POSITION	ORGANIZATION	ID NO.	PHONE
Johnstone Mutava	Environment Officer/Department Head	Department of Environment, Natural Resource & Solid Waste - Mavoko County Government	22217570	0722592339
Mutonga Z. Mwirigi	Head Administrator	Technology Development Centre – Athi River	9215256	0723874300
Jessy Ambundo	Section Head	Mavoko Water and Sewerage Company Ltd (MAWASCO)	21637114	0721256925
Godfrey Mutuku	Public Health Officer	Sub-County Health Office – Mavoko Sub-County	-	0716890040
Mr. Shankar	Managing Director	Triumph Power Ltd		0732523415 info@triamph power.co.ke

## **5.1 Public Consultation Findings**

During the Public Participation process, a majority of those consulted did not object to the proposed project being undertaken as proposed (**See Annex**). The general feeling was that the proposed project would have positive impacts such:

- Creation of employment opportunities;
- Creation of business opportunities;
- Provision of attachment and internship opportunities;
- Availing cement for constructions in the neighbourhood;
- Provision of revenue to the governments (National and County) through taxes levied on the factory's activities;
- Improvement of the infrastructure;

However, there were a number of concerns that were raised by the respondents. They included:

- Noise and pollution;
- Waste Management issues;
- Health and Safety aspects of the project;
- Dust emissions from the factory and as a result of trucks' movement on the roads;
- Demand for water and sewerage services;
- Water and Soil pollution;
- Concern that the locals are not given priority for jobs at the factory;
- Concern of HIV/AIDS prevalence due to the proposed project;
- Concern that the company is not doing much as far as Community Social Responsibility (CSR) is concerned;
- Concern that there was no catchment protection provided by the company;
- Concern of road congestion due to trucks;

## **5.2 Analysis of the Public Consultation findings**

### **5.2.1 Noise and Vibrations**

There was agreement from all the respondents that were engaged during the public stakeholder participation that there will be the possibility of high noise levels and vibrations. According to the respondents, the sources of noise pollution and vibrations are likely to be transport vehicles,

construction machinery, and from cement production activities such as cement grinding. The respondents suggested that high levels of noise and vibrations are likely to be experienced during the construction and operational phases of the proposed project.

### ***5.2.2 Air Pollution***

There was a general concern from the respondents that dust emissions due to project activities is likely to cause air pollution. Even though the company had undertaken an Air quality analysis and emission testing on five factory locations in 2015 for determination of air pollutants in ambient air using a gas monitor to measure O<sub>2</sub>, CO<sub>x</sub>, NO<sub>x</sub>, H<sub>2</sub>S, SO<sub>x</sub> and Dust using the ambient air quality standards; and that the results indicated that the air quality analysis were within the stipulated National Standards, the proposed project is likely to heighten air pollution due to vehicles and machines that will be used during the construction and operational phases of the project.

### ***5.2.3 Water demand and Waste water management***

Issues of increased water demand were raised in the public participation exercise. One of the stakeholders was concerned that there would be high demand for water and sewerage services in the area due to the proposed project. However, this being a grinding plant (Dry Process), increase of water demand will be very minimal and therefore not a major concern. The same applies to wastewater; the factory has a functional bio-digester with capacity to handle extra waste water from the increased capacity.

### ***5.2.4 Waste Management***

Waste management was a concern to some of the respondents. It was intimated that the proposed project would lead to increase in both solid and liquid waste that if not well taken care of would be detrimental to the environment and the human health.

### ***5.2.5 Soil and Water pollution***

From the stakeholder interviews, there were concerns that some of the project activities may lead to soil and water pollution. Some of the waste such as waste oil, chemical waste and cement dust may negatively impact on the soil and water. These, however, may not be a problem if the correct measures are put in place as outlined in the EMP.

### ***5.2.6 Quarrying and Clinker Production Increase***

One of the respondents indicated that there is going to be increased quarrying activities for Pozzolana, Gypsum and Limestone which may lead to increased negative impacts associated with the raw materials extraction. Increased production of cement also means more clinker will be required and this again will lead to increased negative impacts associated with clinker production.

### ***5.2.7 Other Concerns***

Other concerns that were raised by the public include: the concern that the locals are not given priority for jobs at the factory; the concern that the project would lead to more people coming to the area of the project hence the chances of HIV/AIDS prevalence being increasing in the area; the concern that the company has not done much in the Community Social Responsibility (CSR) sector; there was also the concern that the company had not provided catchment protection; and that the company's activities would lead to road congestion due to truck movements.

## **5.3 Positive impacts**

According to the Economic Survey of the Kenya Bureau of statistics of 2014, cement production registered an accelerated growth of 7.8 per cent in 2013 compared to a growth of 4.8 per cent in 2012. This translated into 5,059.1 thousand tons in 2013. Cement consumption and stocks also increased from 3,991.2 thousand tons in 2012 to 4,266.5 thousand tons in 2013 as a result of increased construction activities. For a second consecutive year, imports of cement declined to stand at 34.4 thousand tons in 2013. Total exports of cement to Uganda and Tanzania, which had decreased in 2012, reversed to record 594.0 thousand tons in 2013.

Implementation of the proposed Capacity Increase Project for Savannah Cement in Athi River will result in positive impacts. Potential positive impacts likely to result from the proposed project may include:

### ***5.3.1 Increased exploitation of common minerals used in cement production***

The proposed capacity increase project at Athi River will likely result in increased mining and exploitation of common minerals used in cement production. Such common minerals include limestone which is the bulk raw material used in cement production. Other minerals whose exploitation is likely to increase as a result of the expansion may include pozzolana and gypsum.

**5.3.2 Increase in cement production in Kenya**

The proposed capacity increase project of Savannah Cement at Athi River seeks to increase the cement grinding capacity from the 1,200,000 tons per year to 2,400,000 tons per year. This if achieved will effectively contribute to significant increase in cement production in Kenya.

**5.3.3 Reduction in cement imports**

The proposed capacity increase project of Savannah Cement at Athi River will mean there will be more cement in Kenya than before. This will mean previous cement deficit will be farther narrowed. There will thus be less need for cement importation. Reduced cement importation will translate to reduced spending of foreign currencies; this will mean there will be more foreign currency reserves due to reduced cement importation and consumers may benefit from cheap cement.

**5.3.4 Increase in Cement exports**

The proposed capacity increase project at Athi River will result in production of more cement. This will translate to increased tonnage of sales of cement for export and hence increase in foreign currency in the Country.

**5.3.5 Employment and Internship opportunities**

The proposed capacity increase project of Savannah Cement will provide opportunities for employment and internship for more people to work in the expanded factory. It is envisaged that the workforce may double to cater for the expansion needs.

**5.3.6 Support of local businesses**

Services of local businesses such as transporters will be required to cater for the expanded factory. This will contribute to growth and development of such businesses. Other businesses may start or be farther developed to cater for the needs of the expanded factory such businesses likely to grow may include housing to cater for the increased workforce, hospitals, schools, shops among others.

**5.3.7 Increased revenue to National and County government**

The proposed capacity increase project of Savannah Cement will translate to increased tonnage of cement and clinker that will be produced. This will translate to increased tonnage of sales of clinker and cement translating to increased profits to the company. Increased profits will translate to increased taxes hence increased revenue to government. The expansion will translate to increased

use of raw materials this will result to increased taxes to Machakos County Government and the National Government.

---

**CHAPTER 6: POTENTIAL ENVIRONMENTAL IMPACTS**

---

**6.1 Introduction**

This chapter outlines the potential negative and positive impacts that will be associated with the proposed Capacity Increase project. The impacts will be related to activities to be carried out during construction/installation phase of the project; the operational phase impacts of the project will be associated with the grinding activities carried out by the proponent. In addition, closure and decommissioning phase impacts of the project are also highlighted. The impacts of the project during each of its life cycle phases (construction/installation, operation and decommissioning) can be categorized into: impacts on the biophysical environment; health and safety impacts; and socio-economic impacts.

**6.2 Potential Negative Impacts of the Project**

Potential negative impacts that may result from the implementation of the proposed Capacity Increase Project of the Savannah Cement Limited Athi River factory may include: -

- Increased gaseous emissions (SO<sub>x</sub> and NO<sub>x</sub>)
- Increased dust emissions
- Increased noise disturbance
- Occupational injuries and or accidents
- Waste (liquid and solid) related pollution
- Increased Energy demands
- Negative impacts on local fauna
- Negative impacts on local flora
- Negative impacts on avifauna

**6.2.1 Gaseous Emissions**

The main gaseous emissions will be associated with vehicular and machine/equipment within the proposed project site. The emissions are SO<sub>x</sub>, NO<sub>x</sub>, CO and CO<sub>2</sub>. These gaseous emissions have the effect of causing upper respiratory ailments to human beings apart from the impact of climate change.

**6.2.2 Dust Emissions**

This will mainly be fugitive dust due to unpaved roads and within the project site. Dust, like other



emissions, causes upper respiratory illnesses in human beings apart from aesthetic impacts. Health effects of Cement dust may include occupational lung diseases, skin irritation, stomach ache, headache, fatigue and carcinoma of lung, stomach and colon.

### **6.2.3 Increased Noise and Vibration disturbances**

#### **6.2.3.1 Introduction**

Noise can be defined as any undesirable sound that is intrinsically objectionable or that may cause adverse effects on human health or the environment {EMC (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009}. Noise can be either intermitted or intrusive. Intermitted noise is noise whose level suddenly drops to several times the level of background noise, on the other hand; intrusive noise is external or noise from another part of the building which penetrates the structural defenses of a room or building. Noise can also be defined as unwanted or undesirable sound derived from sources such as industrial set up and operations, road traffic or construction works that interferes with normal activities such as conversation, sleep or recreation.

#### **6.2.3.2 Potential Noise and Vibration sources**

Industrial machinery and processes are composed of various noise sources such as rotors, stators, gears, fans, vibrating panels, turbulent fluid flow, impact processes, electrical machines, and internal combustion engines among others. The basic mechanism of noise generation can be due to mechanical noise, fluid noise and/or electromagnetic noise. Sound fields in the workplace are usually complex, due to the participation of many sources which may include propagation through air (air-borne noise), propagation through solids (structure-borne noise), diffraction at the machinery boundaries, reflection from the floor, wall, ceiling and machinery surface, absorption on the surfaces among others. The mechanisms of noise generation depend particularly on the noisy operations and equipment including grinding, shake out (foundries), punch presses, drop forges, drilling, lathes, pneumatic equipment, tumbling barrels, plasma jets, cutting torches, machine tools for forming, dividing and metal cutting, such as punching, pressing and shearing, milling machines and grinders, pumps and compressors, drive units, hand-guided machines, self-propelled working machines, in-plant conveying systems and transport vehicles.

#### **6.2.3.3 Health Effects of noise**

Elevated noise levels can cause health effects such as hearing loss, hypertension, ischemic heart disease, annoyance, bowel movements and sleep disturbance. Noise exposure has also been known

to induce tinnitus, hypertension, vasoconstriction and other cardiovascular impacts. Elevated noise levels can create stress, increase workplace accident rates, and stimulate aggression.

#### **6.2.4 Occupational injuries and/or accidents**

The most significant occupational health and safety impacts occurring during the construction and operational phase of the grinding plant include dust, noise and vibrations, physical hazards, chemical hazards and other industrial hygiene issues.

#### **6.2.5 Waste Generation**

##### **6.2.5.1 Solid waste**

Sources of solid waste in the proposed Grinding plant will consist of production waste, domestic waste and office waste. Production waste consists of mainly of rejected and damaged packaging materials and used oil; domestic waste will include waste from canteen and other eating places within the plant, while office waste will include wastepaper, electronic waste and sweepings. Potential negative impacts associated with the above will be water pollution, odor, blockage of drainage system and impacts associated with E-Waste disposal.

##### **6.2.5.2 Liquid waste**

Liquid waste generated from the proposed project includes, sanitary wastewater, storm water and waste oil. Wastewater is likely to be generated mainly from sanitary facilities from the plant, from cleaning of floors and other surfaces and from tools and equipment cleaning such as motor vehicles. Potential negative impacts of wastewater generation include:

- Water shortage due to high use;
- Water contamination due to high dissolved solids and other contaminants;
- Contamination of ground water if untreated contaminated wastewater is discharged into the environment;
- Odor from untreated contaminated wastewater;
- Degradation of the quality of water of the receiving water body if contaminated wastewater is discharged into aquatic environment prior to treatment;
- Contamination of soils if contaminated wastewater is discharged into the ground prior to treatment.

### **6.2.6 Increased Energy Demands**

There will be increased use of energy due to increased energy uses during construction and operational phases of the proposed project and potential wastage. Construction machineries will require fuels (petroleum or electricity) during construction phase. Energy, mainly electricity will also be needed during operational phase of the proposed project.

### **6.2.7 Negative impacts on local flora**

Implementation of the proposed Capacity Increase will not have a direct negative impact on a few local vegetation at the proposed site. This is because the vegetation on site that will have to be cleared to pave way for the grinding plant and other associated components. The result impact of vegetation clearance will include the following:

- Overall reduction of flora in the area and overall loss and/or reduction of ecological and economic services derived from the lost vegetation to the environment;
- Reduced scenic and aesthetic value.

### **6.2.8 Negative impacts on local fauna**

#### **6.2.8.1 Mammals and Herpetofauna**

Based on the knowledge on hazards, ecological hazards in terrestrial ecosystem can be coined to be any biological, chemical, mechanical, environmental or physical agent that is likely to cause harm to other organisms and damage to habitats and ecological processes in the environment in the absence of their control. Potential risks that would likely occur when project is implemented.

Ecological risk/impact assessment focused on the sensitive issues within the project footprint. The total area of the project footprint and the potential new project area. Fauna diversity and population at the project site is low or absent. However, the raw materials such as limestone, gypsum and pozzolana which are being supplied by third parties will have negative impacts, these will be mitigated at those sites and will not directly relate to the grinding plant site.

### **6.2.9 Negative Impacts on Avifauna**

The implementation of the proposed project will lead to negative impacts to avifauna in the area. The project has the potential to affect the avifauna of the project area from the associated activities. This is mainly through ecological disturbance leading to displacement or exclusion of birds. For some of the species, there will be complete annihilation of their habitats. This is because the project

activities are likely to cause site-specific negative impacts on the biophysical environment of the project area which will affect avifauna in various ways including increased pressure and/or loss of habitat and essential resources for food and nesting for birds.

The following are the potential impacts on avifauna at the proposed site

- The impacts of direct habitat loss due to annihilation of the species habitats.
- The impacts of habitat modification due to changes in land management.
- The impacts of indirect habitat loss due to the displacement of birds as a result of construction, and maintenance activities,

As a wintering/feeding ground for some of the migrants, it is also possible that the species will have to find alternative sites. The effects of the proposed project on birds are highly variable and will depend on a wide range of factors including:

- Specification of the development – how expansive and level of the transformation,
- Topography of the surrounding land,
- Habitats affected
- Number and species of birds present.
- Land uses within the surrounding matrix and availability of alternative sites for these species

#### ***6.2.9.1 Loss of avifauna habitats***

Potential negative impacts on avifauna population were quantitatively assessed against the set criteria. Activities associated with the project during construction will involve; movement of works of project components. Bird habitats are expected to be affected through various processes and activities including:-

- Construction activities will result in destruction of bird habitats at the construction sites;
- Equipment activity at the proposed project site may result in trampling on habitats of ground dwelling birds, including bird nests;
- Project implementation may result in bird habitat fragmentation making the habitat less attractive to bird;
- Disturbance of birds may occur during all phases of the project as a result of increased on-site human activities during site preparation, and plant operation activities.

### **6.2.9.2 Habitat Modification from associated project activities**

Implementation of the proposed project may result in modification of habitats for avifauna at the proposed project site and its environs. Vegetation clearance to pave way for project implementation will destroy bird feeding grounds, bird nesting ground and complete interfere with the daily routine of the birds. The results of habitat modification to local avifauna will include:

- Disruption on breeding patterns which will results on diminished bird population;
- Migration and relocation of the affected bird species from the area which will affect the local food chain;
- Loss of ecological services associated with birds such as pollination;
- Destruction of migration route for migrant bird species;
- Destruction of foraging grounds of local resident species.

## **6.3 Proposed Mitigation Measures**

### **6.3.1 Proposed mitigation measures of gaseous emissions**

#### **6.3.1.1 Mitigation of Sulfur Dioxide Emissions**

Use of low Sulphur fuels in vehicle and machines and/or equipment.

#### **6.3.1.2 Mitigation measures of Nitrogen Oxides Emissions**

Maintenance and regular servicing of diesel engines. Switching off engines when for stationary trucks will also be done

#### **6.3.1.3 Mitigation measures of Carbon Monoxide Emission**

Avoid engine idling mode by switching of engines when not in use and carry out regular maintenance and servicing of engines for vehicles and machines.

#### **6.3.1.4 Proposed mitigation of Carbon Dioxide Emission**

Planting of trees either on-site or offsite mitigation.

### **6.3.2 Proposed mitigation measures of dust**

Dust can be mitigated in the following ways among others:

- Paving of roads and project site;
- Water sprinkling on dusty roads and surfaces;
- Use of appropriate Personal Protective Equipment (Dust Masks);

- Proper storage of clinker, pozzolana, gypsum and limestone-devoid of wind blowing;
- The mill is designed to meet minimum threshold of dust levels
- Covering conveyors
- Use of covered trucks to deliver materials

### ***6.3.3 Proposed mitigation measures for increased noise***

#### ***6.3.3.1 Management of noise effects***

Management of the noise risks can be done in six steps namely:-

- Assessing the risks;
- Protecting employees;
- Maintaining and equipment use;
- Training and sensitizing of workers;
- Health surveillance;
- Work reviews
- Use of appropriate technology

Assessing of noise risks involves identification of noise hazards at the work place and developing the appropriate action plans. Employee protection should involve elimination or controlling noise risks to acceptable legal limits by use good practice, appropriate engineering controls and employee protection. Equipment use and maintenance involves appropriate use of all noise control equipment and appropriate use of hearing protection. Training and sensitization of workers involves employee accessing information and training on noise risks, control measures and hearing protection. Health surveillance involves hearing checks for exposed workers and using result to improve on protection of the workers. Work reviews involve constant review of work practice, changes in noise exposure and new ways to reduce risks.

### ***6.3.4 Proposed measures to mitigate against solid waste generation***

Measures that can be put in place to mitigate solid waste generation may include appropriate management practices and deliberate innervations aimed at minimization of waste generation.

#### ***6.3.4.1 Management practices***

Some of the management practices that can be put in pace to mitigate waste generation include:-

- Environmental management policy, ISO certification and Energy management policy

- Establishing waste management priorities at the outset of activities based on an understanding of potential Environmental, Health, and Safety (EHS) risks and impacts and considering waste generation and its consequences;
- Establishing a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes;
- Avoiding or minimizing the generation waste materials, as far as practicable;
- Where waste generation cannot be avoided but has been minimized, recovering and reusing waste;
- Where waste cannot be recovered or reused, treating, destroying, and disposing of it in an environmentally sound manner;
- Collection of data and information about the process and waste streams in existing facilities, including characterization of waste streams by type, quantities, and potential use/disposition;
- Establishment of priorities based on a risk analysis that takes into account the potential EHS risks during the waste cycle and the availability of infrastructure to manage the waste in an environmentally sound manner;
- Definition of opportunities for source reduction, as well as reuse and recycling;
- Definition of procedures and operational controls for onsite storage;
- Definition of options / procedures / operational controls for treatment and final disposal.

#### **6.3.4.2 Waste generation prevention**

The cement grinding processes should be designed and operated to prevent, or minimize, the quantities of wastes generated and hazards associated with the wastes generated in accordance with the following strategy:

- Substituting raw materials or inputs with less hazardous or toxic materials, or with those where processing generates lower waste volumes;
- Applying manufacturing process that convert materials efficiently, providing higher product output yields, including modification of design of the production process, operating conditions, and process controls;

Instituting good housekeeping and operating practices, including inventory control to reduce the amount of waste resulting from materials that are out-of-date, off specification, contaminated, damaged, or excess to plant needs.

### **6.3.5 Proposed measures to mitigate waste**

#### **6.3.5.1 Sanitary Wastewater management**

Sanitary wastewater includes effluents from domestic sewage, food service, and laundry facilities serving site employees. Recommended sanitary wastewater management strategies include:

- Segregation of wastewater streams to ensure compatibility with selected treatment option (e.g. sewerage system which only accepts domestic sewage);
- Segregation and pretreatment of oil and grease containing effluents (e.g. use of a grease trap) prior to discharge into the environment;
- Treatment to meet Kenyan standards for sanitary wastewater discharges;
- Sewage from the industrial facility is to be discharged to either a septic system, or where land is used as part of the treatment system, treatment to meet Environmental Management and Coordination (Water Quality) Regulations, 2006, standards for sanitary wastewater discharges;
- Sludge from sanitary wastewater treatment systems should be disposed in compliance with Environmental Management and Coordination (Water Quality) Regulations, 2006.

#### **6.3.5.2 Storm water management**

Storm water includes any surface runoff and flows resulting from precipitation, drainage or other sources. Typically storm water runoff contains suspended sediments, metals, petroleum hydrocarbons, Polycyclic Aromatic Hydrocarbons (PAHs), coliform, etc. Rapid runoff, even of uncontaminated storm water, also degrades the quality of the receiving water by eroding stream beds and banks. In order to reduce the need for storm water treatment, the following principles should be applied:

- Storm water should be separated from process and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge;
- Surface runoff from process areas or potential sources of contamination should be prevented;



- Where this approach is not practical, runoff from process and storage areas should be segregated from potentially less contaminated runoff;
- Runoff from areas without potential sources of contamination should be minimized (e.g. by minimizing the area of impermeable surfaces) and the peak discharge rate should be reduced (e.g. by using vegetated swales and retention ponds);
- Where storm water treatment is deemed necessary to protect the quality of receiving water bodies, priority should be given to managing and treating the first flush of storm water runoff where the majority of potential contaminants tend to be present;
- When water quality criteria allow, storm water should be managed as a resource, either for groundwater recharge or for meeting water needs at the facility;
- Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage and containment areas;
- Sludge from storm water catchments or collection and treatment systems may contain elevated levels of pollutants and should be disposed in compliance with the Environmental Management and Coordination (Water Quality) Regulations, 2006.

### ***6.3.6 Proposed mitigation measures for increased energy demands***

Since the proposed Capacity Increase project will require colossal amounts of energy during its construction/installation phase and operational phase and the fact that there is likelihood of energy being wasted during these phases of the project, there is need for proper planning and use of energy so as to conserve energy. Energy conservation involves:

- Optimum use of petroleum products (diesel and gasoline), electrical appliances (equipment), lighting systems and other electric machinery as used for different purposes;
- Switching off electrical appliances when not in use and optimize operations of electrical equipment or energized machinery to enhance energy conservation;
- Installation or use of energy conserving electric lamps for general lighting and putting off all lights immediately when not in use or are not needed;
- Making use of or installing alternative sources of energy such as solar power, which is renewable. The proponent should include solar power systems, which can be used for lighting purposes;
- Use of high quality fuels; and

- Switching of engines and equipment when not in use

### ***6.3.7 Proposed mitigation measures for occupational injuries and accidents***

- Use of OHS Standards and regulations
- Use of safety policy
- Control of dust through implementation of good housekeeping and maintenance;
- Use of air-conditioned, closed cabins;
- Use of dust extraction and recycling systems to remove dust from work areas, especially in grinding mills;
- Use of air ventilation (suction) in cement-bagging areas;
- Use of PPE, as appropriate (e.g. masks and respirators) to address residual exposures following adoption of the above-referenced process and engineering controls;
- Use of mobile vacuum cleaning systems to prevent dust buildup on paved areas.

Control of noise emissions may include the following:

- Use of silencers for fans.
- Room enclosures for mill operators.
- Noise barriers and attenuators.
- Personal hearing protection.

The potential accidental contact with chemicals on skin/eyes/mucous membranes is a specific hazard in cement production that needs to be assessed, prevented, and mitigated through emergency procedures and equipment. The presence of moisture may result in burns. Facilities for immediate washing of the affected body surface should be available, including eyewash facilities. The handling areas should be covered and enclosed, if possible, to avoid generation of a dust hazard.

## **CHAPTER 7: ANALYSIS OF PROJECT ALTERNATIVES**

---

In considering the development options, four alternatives can be considered. These are:

- The ‘No Project Alternative’
- The proposed development
- The proposed development with modifications
- The proposed development in another location

### **7.1 ‘No Project’ Alternative**

The selection of the ‘No Project option’ would mean the discontinuation of the proposed project’s implementation and this would result in the existing form. There are physical, biological and socio-economic implications of this alternative. This option is likely to have the greatest negative implication on the socio-economic environment of the area and its environs. Due to the proposed scope of the project, it is anticipated that it would provide a major opportunity for employment, revenue, benefits associated with the mining industry and cement manufacturing in Kenya. In addition, a project of this magnitude will add to the community’s ability to develop. Increased community conflicts which would promote insecurity and a negative image of the area would repel potential investors. If this alternative is adopted, the proponent would need to find an alternative site for the development. This is likely to hinder development and slow Industrial Development in the Country.

### **7.2 The Proposed Development**

This proposal would see the construction/installation of the proposed Capacity Increase Project as proposed by the proponent and as outlined in this ESIA Study report. This option has good support from the key stakeholders who would be most affected by its implementation. Therefore, community support is anticipated for the development

Generally, it is believed that this alternative will provide positive benefits to the proponent, Kenyans (business entities, contractors and developers) and the Government through generation of revenue. These include benefits such as employment opportunities, cement and cement-based products’ availability, source of income. The proposed development is being designed and undertaken to meet and/or exceed the national and international environmental standards and

regulations.

### **7.3 The Proposed Development with modifications**

If there are issues concerning the project that may be enhanced, changed or modified to increase the acceptability of the project, then these issues should be considered. At this time based on public views in the project area, it appears that there are no major issues and once these minor issues are solved amicably through modification or compromise; the support for the development would further increase. These include, but are not limited to: Damage to the road network, Solid waste generation, Noise pollution and vibrations, Air pollution, and Waste water management. These issues and others are easily resolvable through either modification or compromise and we do not foresee these issues resulting in disapproval of the development by interested groups and regulatory agencies. The proponent has resolved to operate an efficiently run project that will be the pride of all involved. This alternative retains the same positive benefits as with maintaining the proposed development option.

### **7.4 The proposed development in another location**

Setting up the proposed project in an alternative site such as in a neighbouring country was also considered. However, this alternative was found not to be the best option because it would mean loss of investment in Kenya.

**CHAPTER 8: IMPACTS MITIGATION AND MONITORING PLAN**

---

**8.1 Introduction**

The proponent will incorporate mitigation measures into the activities of the Proposed Capacity Increase Project and will ensure that mitigation measures highlighted in this report are implemented during construction phase with the assistance of ESIA firm of experts (PURIFIED CONSULTANTS LTD) until the submission of the initial Audit report to NEMA. Once the project becomes operational, the Health and Safety issues as well as environmental considerations will be handled by the proponent. The proposed project should be implemented in such a way that will include issues of environmental considerations and issues affecting the project, implementation of environmental management plan, project management, health risks and their prevention. Others include the following:

- Organizational practices.
- Project management.
- Socio-economic issues relating to access and use of road and natural resource.
- Financial management.

Table 12: Pre-Construction, Construction &amp; Operation Phases Environmental Management/Monitoring Plan (EMP)

ACTIVITY/ ISSUE	POTENTIAL ENVIRONMENTAL & HEALTH IMPACT	PROPOSED MEASURES	MITIGATION	MONITORING	RESPONSIBLE PERSON	TIME FRAME	COST ESTIMATE S(KShs)
<b>Dust (Fugitive and Cement dust)</b>	<ul style="list-style-type: none"> <li>Occupational illness (lung infection, itching skin, eye irritation, coughing, to workers and other people exposed to the cement dust;</li> <li>Reduced visibility;</li> <li>Chocking of plants</li> </ul>	<ul style="list-style-type: none"> <li>Paving of the Project Site and roads;</li> <li>Sprinkling of water;</li> <li>Workers to use dust/nose masks;</li> <li>Sufficient ventilation at workplace;</li> <li>Ensure de-dusting system (bag filters) is always efficient;</li> <li>Workers to use appropriate PPE;</li> <li>Strict enforcement on PPE use;</li> <li>Spilled Cement to be recovered</li> <li>Covering conveyors</li> <li>Use of covered trucks to deliver materials</li> <li>High standard design for mill</li> </ul>		<ul style="list-style-type: none"> <li>Monitoring ambient air and workplace;</li> <li>Medical examination of workers exposed to dust</li> </ul>	<ul style="list-style-type: none"> <li>Plant Head of Manufacturing</li> <li>Occupational Safety and Health Officer;</li> </ul>	<ul style="list-style-type: none"> <li>Every six months (twice each year);</li> <li>Once annually for medical examination</li> </ul>	<p>800,000</p> <p>6,000,000</p>
<b>Release of Sulphur gases SOx</b>	<ul style="list-style-type: none"> <li>Pollution of upper atmosphere that result in the formation of smog, Acid rain effect on plant, wildlife and property;</li> <li>Respiratory illness, alterations in the lungs' defences and aggravation of existing cardiovascular disease.</li> </ul>	<ul style="list-style-type: none"> <li>Use fuels with low Sulphur content</li> </ul>		<ul style="list-style-type: none"> <li>Ambient Air Monitoring during operations;</li> <li>Measurement of emission levels;</li> <li>Continuous checking and maintenance of both mobile and stationary engines within the factory.</li> </ul>	Plant Head of Manufacturing	Every six months (twice per year).	800,000

<b>NOx Emissions</b>	<ul style="list-style-type: none"> <li>• Pollution of upper atmosphere that result in the formation of smog, Acid rain effect on plant, wildlife and property;</li> <li>• Respiratory illness, alterations in the lungs' defences and aggravation of existing cardiovascular disease;</li> <li>• Contributes to global warming;</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance and servicing of vehicles and machine/equipment.</li> <li>• Switching off engines when not in use(avoid idling mode)</li> </ul>	<ul style="list-style-type: none"> <li>• Ambient Air Monitoring during operations;</li> <li>• Measurement of emission levels;</li> <li>• Continuous checking and maintenance of both mobile and stationary engines within the factory.</li> <li>•</li> </ul>	Plant Head of Manufacturing	Every six months (twice per year).	800,000
<b>CO2 Emission</b>	<ul style="list-style-type: none"> <li>• Formation of acid rain, weak carbonic acid;</li> <li>• Major source of greenhouse gas;</li> <li>• Causes climate change related issues (Global Warming);</li> </ul>	<ul style="list-style-type: none"> <li>• Planting trees onsite and offsite</li> </ul>	<ul style="list-style-type: none"> <li>• Continuous checking and maintenance of both mobile and stationary engines within the factory.</li> </ul>	Plant Head of Manufacturing	Every six months (twice per year).	150,000
<b>CO emission</b>	<ul style="list-style-type: none"> <li>• CO contributes to the formation of smog, ground-level ozone, which can trigger serious respiratory problems;</li> <li>• Greenhouse gas hence contribution to global warming;</li> <li>• Formation of acid rain potentially damaging to plants, animals and property;</li> <li>• Harmful health effects by reducing oxygen delivery to the body's</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance and servicing of vehicles and machine/equipment;</li> <li>• Switch off engines within the site when not in use(avoid idling mode)</li> </ul>	<ul style="list-style-type: none"> <li>• Ambient Air Quality monitoring during operational phase and within the workplace;</li> </ul>	Plant Head of Manufacturing	Every six months (twice per year).	150,000

	organs (like the heart and brain) and tissues; <ul style="list-style-type: none"> <li>• Central Nervous System Effects</li> </ul>					
<b>High Noise Levels at workplace</b>	<ul style="list-style-type: none"> <li>• Noise induced hearing loss;</li> <li>• Poor concentration at the workplace;</li> <li>• Reduced productivity</li> </ul>	<ul style="list-style-type: none"> <li>• Develop and implement an effective noise control and hearing conservation programme;</li> <li>• Carry out periodic noise measurements;</li> <li>• Fit noisy machines with noise reduction devices;</li> <li>• Provide suitable hearing protection to all workers exposed to noise levels above 85dB(A);</li> <li>• Post notices and signs in noisy areas;</li> <li>• Carry out audiometric test by a designated medical practitioner to all workers exposed to noise levels above 85dB(A);</li> <li>• Educate all workers on importance of marking correct use of PPE provided.</li> </ul>	<ul style="list-style-type: none"> <li>• Noise survey at the workplace every twelve months;</li> <li>• Audiometric test for workers exposed to high noise levels</li> </ul>	<ul style="list-style-type: none"> <li>• Plant Head of Manufacturing</li> <li>• Staff of Savannah cement Ltd</li> </ul>	The proposed mitigation measures to be implemented from the beginning of the implementation of the proposed project, be sustained throughout the project cycle ensuring continuous improvement	1,000,000 per year
<b>Process Solid waste management and disposal</b>	<ul style="list-style-type: none"> <li>• Accumulation of cement dust in the factory;</li> <li>• Water pollution;</li> <li>• Production loss;</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Recycle and Re-use where applicable;</li> <li>• Segregate for appropriate disposal;</li> <li>• Process improvement to minimize waste generations;</li> <li>• Material substitution to minimize waste generation;</li> <li>• Technological improvements to minimize waste generation.</li> </ul>	<ul style="list-style-type: none"> <li>• Quantity of process waste generated</li> </ul>	<ul style="list-style-type: none"> <li>• Plant Head of Manufacturing</li> </ul>	From the onset of the production process and then throughout the operational life of the plant	450,000 per year
<b>Domestic waste management and disposal</b>	<ul style="list-style-type: none"> <li>• Odor from decomposing food leftovers;</li> <li>• Blockage of drainage system</li> </ul>	<ul style="list-style-type: none"> <li>• Sorting of waste at source;</li> <li>• Waste disposal as provided for in the Environmental Management and Coordination (Waste Management) Regulations, 2006;</li> </ul>	<ul style="list-style-type: none"> <li>• Regular checking of handling areas;</li> <li>• Waste disposal records.</li> </ul>	<ul style="list-style-type: none"> <li>• Plant Head of Manufacturing</li> </ul>	From the onset of the production process and then throughout the	250,000 per year



	•	• Provide appropriate waste handling receptacles.			operational life of the plant	
<b>Office waste management and disposal</b>	• Some electronic office waste such as used toner cartridges and obsolete office electronic equipment contain hazardous substances	• Obsolete electronic equipment and other electronic waste to be returned to manufacturers for safe disposal	• Records of disposal	• Plant Head of Manufacturing • Staff of Savannah Cement Ltd	From starting of operation of the plant and then be sustained throughout the operational life of the plant	200,000 per year
<b>Utilities operations wastewater</b>	• Water shortage due to high usage; Water contamination due to high dissolved solids and other contaminants	• Adaption of water conservation methods; •	• Sampling and testing for conformity with Water quality standards before discharge	• Plant Head of Manufacturing • Staff of Savannah Cement Ltd	The proposed mitigation measures to be implemented from the beginning of the implementation of the proposed project, be sustained throughout the project cycle ensuring continuous improvement	1,000,000 per year
<b>Sanitary Wastewater</b>	• Contamination of ground water; Odor	• Segregation of wastewater streams; Treatment to meet national standards for sanitary wastewater discharge	Sampling and testing for conformity with Water quality standards before discharge •	• Plant Head of Manufacturing • Employees of Savannah , NEMA, Public Health	The proposed mitigation measures to be implemented from the beginning of the implementation of the proposed project, be sustained throughout the project cycle ensuring continuous improvement	1,000,000 per year

<p><b>Storm Water</b></p>	<ul style="list-style-type: none"> <li>• Degradation of the quality of water of the receiving water body;</li> <li>• Contamination of soils;</li> <li>• Erosion</li> </ul>	<ul style="list-style-type: none"> <li>• Storm water should be separated from process and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge;</li> <li>• Runoff from areas without potential sources of contamination should be minimized (e.g. by minimizing the area of impermeable surfaces) and the peak discharge rate should be reduced (e.g. by using vegetated swales and retention ponds); Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage and containment areas.</li> </ul>	<p>Sampling and testing for conformity with Water quality standards before discharge</p>	<p>Plant Head of Manufacturing NEMA, WRMA, Public Health</p>	<p>The proposed mitigation measures to be implemented from the beginning of the implementation of the proposed project, be sustained throughout the project cycle ensuring continuous improvement.</p>	<p>1,800,000 per year</p>
<p><b>Physical Hazards</b></p>	<ul style="list-style-type: none"> <li>• Slip;</li> <li>• Trips;</li> <li>• Falls;</li> <li>• Contact with falling/moving parts</li> </ul>	<ul style="list-style-type: none"> <li>• Good housekeeping;</li> <li>• Ensure surfaces are not slippery;</li> <li>• Clearly mark all uneven surfaces;</li> <li>• Guarding of machine moving parts;</li> <li>• Provide and mark safe passages and exits;</li> <li>• Spills to be promptly cleaned.</li> </ul>	<p>Physical checking/inspections of all workplaces at short intervals</p>	<ul style="list-style-type: none"> <li>• Plant Head of Manufacturing</li> <li>• Workers of Savannah Cement Ltd</li> </ul>	<p>Proposed mitigation measures to be employed before start of plant operations and be sustained and improved on throughout the functional Proposed mitigation measures to be employed before start of plant operations and be sustained and improved on throughout the functional</p>	<p>500,000 per year</p>

<b>Occupational Health and Safety</b>	<ul style="list-style-type: none"> <li>Physical burns;</li> <li>Sickness;</li> <li>Disease/ill health</li> </ul>	<ul style="list-style-type: none"> <li>PPE use;</li> <li>Appropriate handling as per material safety data sheets;</li> <li>Training and sensitizations;</li> <li>Medical examination of exposed workers</li> </ul>	Spot checks at workplaces on appropriate handling	<ul style="list-style-type: none"> <li>Plant Head of Manufacturing</li> <li>DOSH, NEMA, workers,</li> </ul>	Proposed mitigation measures to employed before start of plant operations and be sustained and improved on throughout the functional life of the plant	6,000,000
<b>Increased vehicular traffic along Nairobi-Namanga Road</b>	<ul style="list-style-type: none"> <li>Potential delays at the junction as traffic enters and exits the highway;</li> <li>More traffic on the said road may translate to increased use of the road and hence increased wear and tear;</li> <li>Likelihood of accidents, incidents and mere misses at the said turnoff from the highway</li> </ul>	<ul style="list-style-type: none"> <li>Liaise with the Kenya KeNHA to find out whether the existing acceleration and deceleration lanes are enough for safe entry and exit of the highway;</li> <li>Drivers to strictly observe the Highway Code;</li> <li>Speed limits to be strictly observed</li> </ul>	<ul style="list-style-type: none"> <li>Records of traffic number in and out of the project site;</li> <li>Flow of traffic in and out of the plant during construction phase;</li> <li>Record of vehicular accidents and incidents</li> </ul>	Plant Head of Manufacturing	Implementation of the measures proposed by KeNHA and to be sustained and improved on throughout the lifecycle of the project	According to the recommendations by KeNHA

## CHAPTER 9: DECOMMISSIONING PHASE

It is necessary to outline some basic mitigation measures that will be required once all operational activities of the Proposed Capacity Increase project have ceased. The following will be necessary during this phase of the project:

- Appropriate vegetation and crops re-planted on open spaces (landscaping).
- All solid waste to be collected and disposed of appropriately by licenced garbage handlers.
- All efforts should be made to ensure that all excavated sites are restored to as near as possible to the state in which they were before the project was undertaken. This is according to EMCA's section 108.

The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project are outlined in table below.

**Table 13: Decommissioning Phase EMP for the Proposed**

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (KShs)
<b>1. Demolition waste management</b>				
<b>Demolition waste</b>	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Composting and reuse 4. Combustion 5. Sanitary land filling.	Project Manager & Contractor	Once-off	850,000
	All buildings, machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible	Project Manager & Contractor	Once-off	
	All foundations must be removed and recycled, reused or disposed of at a licensed disposal site	Project Manager & Contractor	Once-off	
	Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site	Project Manager & Contractor	Once-off	
	Donate reusable demolition waste to charitable organizations, individuals and institutions	Project	Once-off	

<b>2. Rehabilitation of project site</b>				
<b>Site degradation</b>	Implement an appropriate re-vegetation programme to restore the site to its original status	Project Manager & Contractor	Once-off	350,000
	Consider use of indigenous plant species in re-vegetation	Project Manager	Once-off	
	Trees should be planted at suitable locations so as to interrupt slight lines (Screen planting), between the adjacent area and the development.	Project Manager	Once-off	

**CHAPTER 10: CONCLUSIONS AND RECOMMENDATIONS**

---

If the proposed mitigation measures are incorporated during construction and operation stage, the proposed Capacity Increase project is good for the industrial development of Machakos County and Kenya at large as Cement importation will not be necessary.

## **CHAPTER 11: AUXILLIARY INFORMATION**

---

### **11.1 The Project Cost**

The project cost has been estimated at **KShs. 1000,000,000.00** (Kenya Shillings Nine Hundred and Two Million only). **NEMA fee 0.1% of the cost of the project is KShs. 1,000,000**

### **11.2 Monitoring Guidelines**

Continuous observations and assessment is essential so that if foreseen safety dangers are noticed, alternatives must be sort for. Risk assessment of fire outbreaks, and others should be ignored in the construction plan. Waste management on the project site should be strictly followed. Mitigation measures of storm water management are essential. Safety standards should constantly be maintained, in brief, monitoring guidelines could be based on the following parameters;

- Flora and Fauna life including the species of either that is in the surrounding
- Health and safety measures using such standards as ISO 14000 and EMS and the laid down regulatory framework.
- Waste management
- Examine the changing land use patterns including those of residential, ecological and economic purposes
- Accidents and risk assessment arising from the use of water, roads, electricity and or any other amenity.

### **11.3 Reporting**

Constant reporting by the site contractor to the architect is necessary to ensure the project is executed as per the architectural drawings. The safety officer should always remain on site to report any safety concerns for urgent mitigation measures. He should also at all times enforce safety requirements as per the relevant legislations. The contractor must consult the architect to maintain a clear understanding of all the aspects of the project.

### **11.4 Conclusion and recommendations**

During the preparation of this report for the development of the proposed Capacity Increase project it was observed and established that most of the negative impacts on the environment are rated low and short term with no significant effect. The positive impacts are highly rated and will

benefit all stakeholders of this project. The project proponent has proposed to adhere to prudent implementation of the environmental management plan and is obtaining all the necessary permits and licenses from the relevant authorities, has qualified and adequate personnel and has proposed adequate safety and health mitigation measures as part of the relevant statutory requirements.

*The proponent should therefore be licensed to implement this project subject to adherence to the Environmental Management Plan proposed in this report and the statutory requirements.*

## **11.5 APPENDICES**

- a. Certificate of Incorporation;
- b. Company PIN Document;
- c. Land Ownership documents;
  - Title Deeds
- d. Firm of Experts' NEMA Practicing Licence
- e. Terms of Reference;
- f. Respirable Dust Survey Report;
- g. Respirable Dust Survey Report;
- h. Air Quality Measurement Report;
- i. Sound Level Inspection Report;
- j. Water Consumption (January-August 2016) report;
- k. Power consumption and production report, 2015;
- l. NEMA Letter directive letter for undertaking EIA Study;
- m. Introductory letter for public consultation;
- n. Public interview questionnaires;



**11.6 REFERENCES**

1. Kenya gazette supplement Acts 2015, Environmental Management and Coordination Act 2015. Government printer, Nairobi
2. Kenya gazette supplement Acts Physical Planning Act 2016 by government printer, Nairobi
3. Kenya gazette supplement Acts Land Planning Act (cap 303) government printer, Nairobi
4. Kenya gazette supplement Acts Local Authority Act (Cap 265) government printer, Nairobi
5. Kenya gazette supplement Acts number 56. Environmental Impact Assessment and Audit Regulations, 2003. Government printer, Nairobi
6. Kenya gazette supplement Acts Physical Planning Act, 2010 government printer, Nairobi
7. Kenya gazette supplement Acts Public Health Act (Cap 242) government printer, Nairobi

# APPENDICES

---

## **1.0 TERMS OF REFERENCE**

## **2.0 DOCUMENTATIONS**

## **3.0 REPORTS**

## **4.0 NEMA STUDY LETTER AND PUBLIC CONSULTATION INTRODUCTORY LETTER**

## **5.0 SAMPLE QUESTIONNAIRES**