ENVIRONMENT IMPACT ASSESSMENT OF KRYSTALLINE SALT WORKS GONGONI MALINDI DISTRICT KENYA

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Abstract:

Krystalline Salt Works, situated at Gongoni, Malindi District, Kenya in the latitude 4° 03' S, Longitude 39° 38' E, is taken for Environment Impact Assessment study. The objectives of the study is to suggest recommendations of the proposed expansion of salt works that will entail development, creation, construction, establishment and building activities as a result of its impact on the environment. Eight legislation acts of Kenya which are in force are considered during the study. These Acts are applied on the proposal of expansion of the salt works and the impact on the environment are assessed. These include such us: Tidal water flow, ecological impacts on flora, fauna, soil, water resources and socio- economic impacts were given due consideration. .

The terms of reference for EIA study on all aspects mentioned above were made and the study recommends that special attention have to be paid on terms of reference (TOR) before expansion of the salt works. The study forms a guide line for the future expansion of the salt works in the region within which has become mandatory as per the legal requirement.

Introduction

Urbanisation coupled with industrialization have led to play a role in global economy and therefore, environment sustainability has become mandatory and a watchword for future development. The present study is on the proposal of expansion activity of Krystalline Salt Works, Gongoni, Malindi District, Kenya and therefore EIA study was undertaken. Such study was made earlier on the eastern Africa of Coastal resources of Kenya in 1980;1998 by UNEP ;Glasson et al 1999 and Helm, 2000. Impact of salt and sand harvesting activities on Timboni Well field, Gongoni, Malindi District was studied (Opio - Aketch, Ologo, Dindi and Njue, 1998). The authors have made extensive study on the sand dune system indicating large scale mining of sand at Timboni, probably causes serious environment damage that threatens the aquifer. Such EIA study is now done in Krystalline Salt Works with a view to assess the impact on environment in case of the implementation of the expansion of proposed activity in salt works. The study reports on the impact on environment and terms of reference of such study is presented.

Materials & Methods

Krystalline Salt Works which is now functioning under the name since 2007 was earlier known as Fundisha Salt Works, 1930 and Mombasa Salt Works, 1982. The Krystalline Salt Works has systematic base of

construction of four stages of different sections.
1. Reserviors 2. Evaporation Ponds, 3. Pre-Crystallization Ponds 4. Crystallization Ponds.

The sea water is taken through the creek and it is blocked by natural tides during high tidal conditions for pumping. Through the passage of creek, mangrove species such as Avicenia marina are dense rich in nutrients and highly productive and thus this water is taken into the reservoirs. It flows from the reservoirs, evaporation ponds to pre-crystallization ponds and crystallization ponds where the salt is harvested. The EIA study was conducted in this region and the results are reported.

Results:

1. ENVIRONMENT POLICY

The Kenya Government's commitment to environment protection and sustainable use of natural resources has been stated in all development plans since independence.(Central Bureau of statistics, Vol.1 & 2 1999).The Government environment policy is at integrating environment aspects into the national development plan. It includes:

1.1 Optimal use of natural land and water resources in improving the quality of human living and environment sustainability. .
1.2 Sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations.
1.3 Integrate environment conservation and economic activities into the process of sustainable development.
1.4 Meet national goals and international obligations by conserving biodiversity, arresting desertification, mitigating effects of disasters, protecting ozone layer and maintaining ecological balance on the earth.

2. POLICY AND LEGAL FRAMEWORK

The legislation that is relevant to this project includes the:

2.1 Environment Management and Co-ordination Act (EMCA), 1999
2.2 Local Government Act
2.3 Forest Act
2.4 Water Act
2.5 Fisheries Act
2.6 Wildlife ct
2.7 Public Health Act
2.8 Education Act

2.1 Environment Management and Co-ordination Act (EMCA), 1999

The Act aims to improve the legal and administrative coordination of the diverse sector initiatives in the field of environment so as to enhance the national capacity for its effective management. It is general policy of the Government of Kenya that Environmental Impact Assessments (EIA), be conducted for planned projects or extensions of the running projects that are likely to, or will have significant impacts on the environment. This is so that the adverse impacts on the environment can be foreseen, eliminated or mitigated. The policy of the Government that the EIA process is interdisciplinary and fully transparent. The process would serve to provide a balance between environmental, economic, social and cultural values for purposes of sustainable development of the area in question. The application of EIA is to integrate environmental concerns in all development matters, at all levels with full public participation. The project is in accordance with the Environmental (Impact Assessment & Audit) Regulations, 2003 of the Kenya Gazette Supplement No. 56 that was published on 13th June 2003.

2.2 Local Government Act

2.2.1 Under the Local Government Act is empowered to license harvesting of common salt and levying royalties on it.
2.2.2 The Act has provisions that empower the Local Authority to control the discharges from factories within the area of jurisdiction.
2.2.3 Section 163 of the law stipulates that the local authority may control or prohibit activities which constitute a source of

danger, discomfort or annoyance to the neighbourhood.

2.3 Forest Act

Mangrove forests are managed under the Forest Act. It has the mandate to control exploitation and utilization of and protect the mangrove forest within the Ngomeni creek.

2.4 Water Act

It aims to make better provision for conservation, apportionment and use of Kenya's water resources. The general rule within the Act provides that any rights acquired under are the permit subject to the Public Health Act and the Malaria Prevention Act in addition to Water Act itself.

2.5 Fisheries Act

The Fisheries Act (Cap. 378 of the laws of Kenya) provides for the development, Management, exploitation, utilization and conservation of fisheries and connected purpose. The Fisheries Department has the mandate to control and protect fisheries resources within the affected water channel of Ngomeni.

2.6 Wildlife Act

Protection, management and utilization of wild life in Kenya is regulated under the Wildlife Act (Cap 376)

2.7 Public Health Act

Sections 10, 11, 12, 13, 28, 29, 30 & 115 deals on relevant area of the Public Health Aspects.

2.8 Education Act

Establishment, Management of schools is carried out under the Education Act and law is administered by the Ministry of Education.

3. EIA PROCESS

It takes into account biological, physical , social, cultural, economic and legal considerations.

Detailed EIA Study

This involves:

3.1 Collection of baseline data and information

3.2 Description of the affected environments

3.3 Public participation

3.4 Identification and assessing potential impacts (-ve and +ve) of the project to the environment

3.5 Possible mitigation, measures to curb any potential negative impacts and enhance positive impacts and

3.6 Development of an Environmental Management Plan

4. ANTICIPATED ENVIRONMENTAL IMPACTS

4.1 Impacts on tidal water flow

Tidal water from sea flows into the salt works by natural creek channel. The possible impact includes increase in the size of the area between creek and Ngomeni road that is constantly flooded. Possibility of flooding of some more areas cannot be ruled out.

Salt Water contaminates the unconfined main fresh water body of the area due to lateral flow of the salt water into the aquifer.

4.2 Ecological Impacts

4.2.1 Impacts on flora

Expansion of salt works may affect flora both inside and outside the creek. More significant impacts could occur in the mangrove forest. The roots and lower parts of the mangrove system are always covered with sea water during high tide, while muddy substrate in which they grow is devoid of such water during high tide.

The mangrove species Rhizophora mucronata has aerial roots, while Avicenia marina has knee roots. Thus tidal regime configures directly with the respiratory requirements of the former mangrove species. Development may require removal of some of the mangrove trees. As a consequence, change may occur in the floral structure and composition of the mangro ve eco system. So overall possible impact of the expansion of salt works on flora may include:

4.2.1.1 Removal of some mangrove trees along the creek

4.2.1.2 Reduction in the amount of vegetation outside the creek

4.2.1.3 Alteration of the self regulatory nutrient recycling system within the mangrove eco system.

4.2.1.4 Reduction and or depletion of some species of plants.

4.2.1.5 Introduction of plant species that are best adapted to the new conditions.

4.2.2 Impacts of Fauna

Expansion of salt works would affect both terrestrial and marine aquatic fauna including benthic fauna. The mangrove forest provides feeding and breeding, and nursery grounds for multitude of organisms both racially and individually and their food web is well known. Biodiversity on the avian fauna is evident from the fact that the birds feed on the fishery resources in the mangrove water. Further the fishery resources in the mangrove eco system needs conservation because it provides means of living for the local population. Therefore clearing some of the mangrove forest and alteration of part of the creek channel morphology could affect the fauna in the creek channel and mangrove forest.

Therefore the possible impacts of expansion of salt works may include:

4.2.2.1 Change and/or migration biodiversity of fauna

4.2.2.2 Reduction in the population of some species

4.2.2.3 Change in the fisheries breeding cycle

4.2.2.4 Reduction in the fishery population in the bar mouth due to declined population in the creek

4.2.2.5 Reduction in the fish catch from the creek for the local fishing community

4.2.2.6 Additional fish catch from the reservoirs for the local fishing community.

4.2.2.7 Increased flamingo and pelican population at the reservoirs

4.2.2.8 Introduction of animal species best adapted to new conditions

4.2.3 Impacts on Soil

The development of salt pans and aligned infrastructure is a major aspect of the expansion programme. The area is covered by clay soil. The constructed pans will carry water ranging in salinity from 3.5 to 28 °Be. Creation of fruit farm may carry chemical fertilizers, herbicides and pesticides and it may have residual effects on the soil.

Overall possible impacts on soil could include:

4.2.1.1 Salination of surrounding agricultural land due to lateral movement of salt water from salt pans.

4.2.1.2 Water logging of surroundings area due to lateral seepage across barriers and overflows from the salt pans during rains.

4.2.1.3 Bioaccumulation of chemicals used in the farm

4.2.4 Impact on Ground Water Resources (Quantity)

4.2.4.1 Over-abstraction of the water leading reduced yields

4.2.4.2 Decrease in ground water flow and availability

4.2.4.3 Change in ground water level due to abstraction

4.2.4.4 Subsurface erosion and silting of aquifer

4.2.5 Impacts on Quality of Water Resources

The increased number of salt pans and location with respect to proximal end of the fresh water aquifer changes in tidal water flow and its impact on the quality of water may include:

4.2.5.1 Salt water intrusion and contamination of the fresh water aquifer due to over-abstraction

4.2.5.2 Biological and chemical pollution.

4.2.5.3 Sub-surface erosion and silting, reducing the quality of the water

4.2.5.4 Lateral flow of salt water from highly saline ponds

4.2.5.5 Infiltration of salt water from salt ponds into sub-surface leading to contamination of underground fresh water aquifers.

4.3 Socio-Economic Impacts

4.3.1 Development of Creek

Expansion of salt works would cover areas with resources that the local community uses eg. creek within mangrove forest. The altered use of creek may have social and economic impacts on the local community that includes:

4.3.1.1 Fishing grounds

4.3.1.2 Recreational sites

4.3.1.3 Cultural sites

4.3.1.4 Sources of medicinal plants and

4.3.1.5 Sources of honey.

4.3.2 Development of piped water supply, secondary school and health centre. These are directly related to social needs of the local community. The positive impacts includes:

4.3.2.1 Improved health of the people
4.3.2.2 Reduced expenses on water
4.3.2.3 Promotion of school education at primary and secondary level with reduced drop outs
4.3.2.4 More children accessing secondary education
4.3.2.5 Better developed man power for employment at salt firms
4.3.2.6 Reduction of potential population of child labour
4.3.2.7 Improvement of health conditions of the local community
4.3.2.8 Prompt attention to occupational health conditions
4.3.2.9 Prevent of occupational health diseases

4.3.3 The overall impact due to the expansion of salt works is likely to result in socio economic aspects which includes:

4.3.3.1 More imployment opportunities to the local community
4.3.3.2 Improved relations between Krystalline Salt Works and local community
4.3.3.3. Fulfillment of current needs of the local community
4.3.3.4 Improved economic performance for salt works
4.3.3.5 Overall growth of the Gongoni village and trading centre

5. DISCUSSION AND RECOMMENDATIONS

5.1 Effect of Tidal Water flow

There will be need to determine:

5.1.1 The likely altered flow pattern of tidal water changes in morphology of the natural creek channel and location of the outward bound dyke and
5.1.2 Effects of tidal water flow on the surrounding areas

The following are taken into consideration:

5.1.1.1 The Ngomeni Salt Works location gets constantly flooded
5.1.1.2 Distance between creek and Ngomeni road will decrease

5.2 Effects on Flora

The following are considered with regard to the flora

5.2.1 Identification of rare, threatened or ecologically important plant species is on site
5.2.2 Mangroove species that needs special attention with reference to the roots due to alteration or disturbance of the natural tidal system because respiration takes place during the low tide.
5.2.3 Mangrove forest aid in nutrient recycling.
5.2.4 Mangroves are effective barriers for wind or cyclone during the high tide

5.3 Effects on Fauna

Special attention should be made with regard to the effects of expansion of salt works on the nature, structure, composition and specialized ecological requirements of the different animals living within the creek and mangrove eco system.

The following have to be considered:

5.3.1 Establish whether any RED DATA BOOK species that may be particularly be susceptible to disturbance occur on site and examine their ability to adaptability.
5.3.2 The mangroves eco system is home for mammals such as baboons, monkey, reptile, birds and insects
5.3.3 It is a vital feeding and breeding ground for multitude of organisms

5.4 Economic and Social Effects

A need to pay special attention to socio-economic roles the parcels of the land earmarked for expansion of salt works in particularly in the creek and the entire mangrove ecosystem are the effects that are concerned to the local community.

5.5 Mangrove Ecosystem

The following are considered in regard to the development with the mangrove ecosystem:

5.5.1 Local community collect building materials, firewoods,

medicinal plants and honey from the mangrove forest.

5.5.2 The Creek is a fishing ground for local community

5.5.3 Creek is used for transportation of fishery resources to market

5.5.4 There are glades within the mangrove ecosystem which are considered as grazing grounds, cultivation areas and cultural sites for the local community.

5.5.5 The mangrove forest serves as a buffer zone for the possilbilty of anthropogenic activities at the glades.

5.5.6 The creek is a passage to Ngomeni for the local people

5.5.7 The creek is a recreational site for the local people

5.5.8 The creek is a home to a bird, which alerts the local fishermen when tide is low and warns them in advance when the high tide is approaching.

5.6 Fruit Farm

The following is considered in regard to converting the area to a fruit farm

5.6.1 Establish a soil suitable for fruit farming

5.6.2 Part of the area is a company solid waste damping ground

5.6.3 Part of the community derives their lively hoods from scavenging the damped solid waste

5.6.4 Effects fruit farming may have on production of salt

5.7 Effects on the soil formation

In the development of salt pans, the following have to be considered:

5.7.1 Nature of clays such as kaoline (– hallo site or smectite that swells when wet) type

5.7.2 Stratography of clay beds

5.7.3 Depths to fresh water aquifer

5.7.4 The sea water is held at the pans where the pH is progressively increased towards more salinity. .

5.7.5 The water is retained for approximately three months before salt formation.

5.8 Effects on Ground Water Resources

In the development of water supply the following would need to be considered:

5.8.1 Size or volume of the ground water body

5.8.2 The configuration of the fresh water body

5.8.3 Depth to the fresh water aquifer

5.8.4 Quality of the ground water

5.8.5 Sustainable abstraction rates

5.8.6 Density of wells for good yield

5.8.7 Safeguard from activities of pollution

5.8.8 Chemical characteristics

5.8.9 Location of salt pans and lagoons

5.8.10 Location of nearest flood water pools

5.9 Effect of Social Amenities

The following are considered to the development of social amenities for improved community relations and fulfillment of the current community requirements:

5.9.1 The community have an ongoing plan of building secondary school. Their views will be important to give a sense of ownership to the secondary school to be built by Krystalline Salt Works.

5.9.2 There is no secondary school in the entire Gongoni location. Therefore there will be need to build a secondary school for a larger part of the community

5.9.3 Gongoni had a public piped water supply that failed

5.9.4 Currently there only four private health clinics and one small government health centre at Gongoni.

5.9.5 Effects of living organism

As a result of removal of mangrove vegetation, flora and fauna will be disturbed which could be compensated by developing mangrove vegetation along degraded areas and creek, to retain the bio-diversity. Since living resources are available, Tilapia farming, prawn farming and mud crab farming cold be one of the ways to sustain the resources besides will serve as livelihood for local community. .

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