American Journal of
Environment Studies
(AJES)

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American Journal of Environment Studies
ISSN 4520-4738 (Online)
Vol.7, Issue 4, pp 50 - 58, 2024

www.ajpojournals.org

Assessment of the Environmental Impact of Clay Extraction in the Assumane Neighborhood

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Article history
Submitted 02.07.2024 Revised Version Received 10.08.2024 Accepted 17.09.2024

Abstract

Environmental Impact Assessment can be understood as an environmental management instrument of a preventive nature that consists of the identification and prior qualitative and quantitative analysis of the harmful and beneficial environmental effects of an activity. Decree 54/2015 of December 31, describes as Environmental Impact any change in the physical, biological and chemical properties of the environment, caused by any form of matter or energy resulting from human activities that directly or indirectly affect health, safety, the well-being of the population, social and economic activities, the biota, the aesthetic and sanitary conditions of the environment and the quality of environmental resources. The environmental impact can also be any change in the physical, biological and chemical properties of the environment, caused by any form of matter or energy resulting from human activities. However, this article has the general objective of evaluating the environmental impacts of clay extraction in the neighborhood of assuming. Specifically, it will: i) describe the process of clay extraction and brick production; ii) identify the impacts arising from clay mining activities; ii) classify impacts according to characteristics and finally, mention the destination of production and to Brick producers are recommended to seek advice from an environmental specialist with a view to developing a recovery and environmental education plan in order to inculcate aspects inherent to the preservation of nature as a common good.

Keywords: *Environmental, Clay Extraction, Assumane, Neighborhood*

Q5; Q51; Q53.

1.0 INTRODUCTION

This article aims to evaluate the environmental impacts caused by the activity of extracting clay for the production of bricks in Assumane, somewhere in the city of Lichinga, where clay is extracted for the production of bricks for commercial purposes; as such activity harms the environment. . In Assumane, brick production is a traditional activity practiced by the community. Young people in particular turn to this activity as a way of combating unemployment and ensuring the survival of their families. Therefore, the activity described above allows the occurrence of the erosive phenomenon. However, clay extraction caused severe damage to the environment such as deforestation, loss of native species, removal of the fertile layer, and alteration of the landscape.

This article has the general objective of evaluating the environmental impacts of clay extraction in the neighborhood of Assumane in 2022. Specifically, it will: i) describe the process of clay extraction and brick production; ii) identify the impacts that arise from the activity of clay mining; ii) classify the impacts according to characteristics and finally, mention the destination of production.

However, this study aims to minimize the impacts of this activity in order to guarantee environmental sustainability in the area in question, as it was noted the absence of one organizational structure that would guarantee supervision and establishment of standards so that the activity complies with environmentally accepted parameters, therefore, it is necessary to organize local producers and associations so that the activity is sustainable.

Characterization and Location of the Area under Study

The Assumane neighborhood is located in the northern region of the Municipality of Lichinga. It has a total surface of 3,053 Ha and a population density of 162 inhabitants per km2 and is located between the neighborhoods of Massenger, Aeroporto, Namacula and Micoco. According to the 2017 census, the Assumane neighborhood has a population of 5,390 inhabitants.

Temperature - The average annual temperature varies between 18 and 25 oC, but does not exceed 30 o C in summer, the hot and rainy season, which lasts from October to April, and in winter it varies from 15 to 25 o C, the cool and dry season. . The average value of annual precipitation is 1200 mm. The average annual relative humidity is 74%.

Wind Speed - The average annual variation range is relatively low, 11 km/h with the highest values recorded in October and the lowest in February and the dominant winds are from the East (E). In general, the Assumane neighborhood is characterized by high altitude, measuring 1400 m above the average sea level.

Hydrography - The hydrographic extension is considerable, expected to accumulate over 1 million cubic meters per year, fed by the Rovuma Basin (Lugenda, Luchiringo, Luchimua, Luambala, Luculumezi and Lualessi Rivers). These rivers have water quality for consumption, irrigation and construction of mini-hydro plants.

The neighborhood's 3,053 areas are segmented into housing, agricultural, special equipment, services, green and industrial areas.

Agriculture and Livestock - Agriculture constitutes the basis for the development of the neighborhood, although on a small scale, with potential for grain legumes, cereals, roots and tubers and fruit plants. However, fruit tree production is incipient due to financial limitations.

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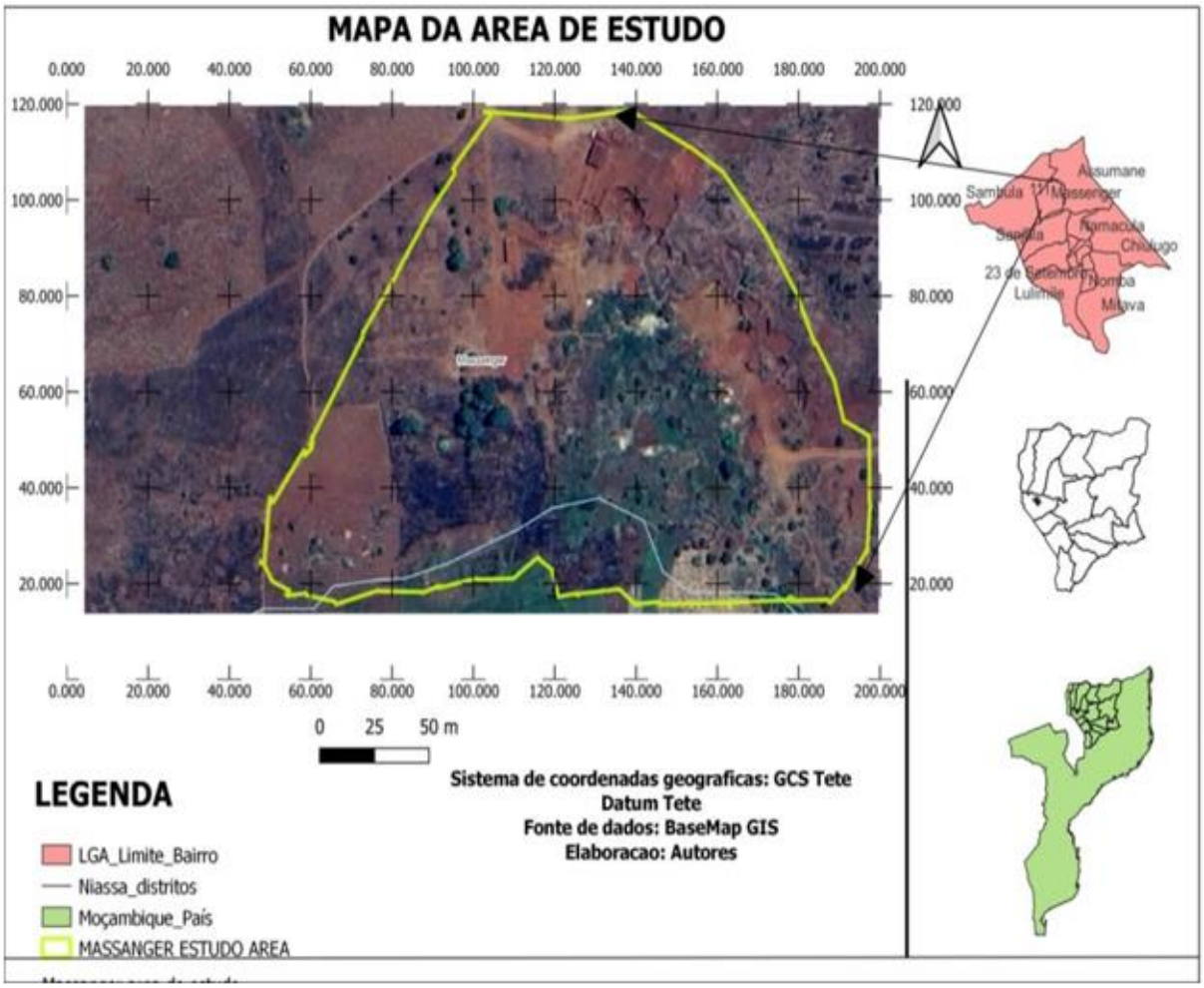
The climate, temperature, precipitation and soil characteristics give the Assumane neighborhood potential for agriculture and livestock farming, especially for small birds and large ruminants (CMCL, 2022/2027).



Theoretical Foundation

This chapter addresses a theoretical basis to support research on the assessment of the impacts of clay extraction for the production of bricks in the Assumane neighborhood in the city of Lichinga. Environmental Impact Assessment can be understood as an environmental management instrument of a preventive nature that consists of the identification and prior qualitative and quantitative analysis of the harmful and beneficial environmental effects of an activity (Adams, J. 1995).

Decree 54/2015 31 December describes as Environmental Impact any change in the physical, Chemical and biological properties of the environment, caused by any form of matter or energy resulting from human activities that, directly or indirectly, affect:

1. The health, safety and well-being of the population;
2. Social and economic activities, biota;
3. The aesthetic and sanitary conditions of the environment;
4. The quality of environmental resources.

Environmental impacts have two main attributes: Magnitude, which is the magnitude of an impact in absolute terms, and can be defined as the measure of the change in value of an environmental factor or parameter, in quantitative or qualitative terms, caused by an action (Bella, 1987).

Cutter (2001) states that the magnitude of an impact can be defined as the difference between the values that a given parameter would probably assume after a given action, and the values that would be observed if this action had not occurred..

The values of a parameter, whether physical, biotic or anthropic, rarely remain the same over time.

Importance: weighting the degree of significance of an impact in relation to the affected environmental factor and other impacts.

It may occur that a given impact, although of high magnitude, is not important when compared with others in the context of a given environmental impact assessment, either because the affected environmental component is not significant or due to its distinct characteristics (Egler, 1996).

According to Feriri (1991), Environmental Impact is any change in the physical, chemical and biological properties of the environment caused by any form of matter or energy resulting from human activities and can be positive or beneficial, and negative or adverse.

Environmental impacts have two main attributes: magnitude, which is the measure of the change in value of an environmental factor or parameter caused by an action, and importance, which is the weighting of the degree of significance of an impact in relation to the affected environmental factor.

For Zuquette & Nakazawa (1998), the environment is the set of conditions, laws, influences and interactions of a physical, chemical and biological order, which allow, shelter and govern life in all its forms, while environmental impact is the adverse change the characteristics of the environment.

Hirsch (1972) states that clay is a granular rock with grains of reduced dimensions. It is a product of the alteration of silicate rocks, being a mixture of various minerals such as kaolinite, illite and montmorillonite. Its main characteristics are its coherence, dryness and its plastic state when it comes into contact with water.

The mineralogical composition favors the development of reactions with water and dissolved salts, thus generating surface forces that end up controlling the behavior of the aggregate of particles, surpassing the effect of the forces of their own weight, called colloid particles (Mandarino, 2008).

Common clays are generally made up of smectite and illite, their use has been in the form of bricks, tiles, vases, among others. They are also used as a source of alumina and in the manufacture of cement and light aggregates or expanded clays (white, 2008).

In this approach perspective, the extraction of clay with a view to producing bricks proves to be extremely important for the local community as they use this activity as a source of income, that is, through the sale of production they can obtain monetary values which in turn acquire severalgoods, thus improving their social and economic conditions. Despite the activity providing income in return, it appears to be environmentally unsustainable due to the fact that it leads to the devastation of vegetation as well as the opening of huge portfolios that gradually

become increasingly large under the effect of erosion, in addition to removal of soil, burning bricks requires large quantities of firewood, which is removed by thinning large areas and also degrades the ecosystem.

As a result of analyzes carried out in similar studies, some gaps in the management of natural resources and the environment in the Assumane neighborhood were identified, such as: Lack of a community organization designed to coordinate brick production and environmental restoration actions, weak community involvement in environmental management and lack of knowledge of environmental law on the part of community residents,

The following phenomena were identified as threats: Soil erosion, air pollution, deforestation and ineffective application of environmental protection law.

In this sense, the absence of a community-based organization dedicated exclusively to protecting the environment is a weakness that prevents the involvement of neighborhood residents in environmental management.

The existence of an organization presupposes awareness and coordination between the actors involved. The environmental preservation activities carried out by some associations barely involve the local population, thus limiting the population's contribution to the protection and management of the environment.

What remains is the occurrence of erosion that gradually takes over the craters and residential areas, putting homes at risk. It should be noted that this phenomenon is driven by the clay extraction process.

However, urbanization, deforestation and the ineffective application of environmental legislation are among the main threats.

2.0 MATERIALS AND METHODS

The research was carried out in 2022, using a qualitative approach. It is a case study as it is an appropriate procedure for the concise analysis of a given situation. Information from the Municipal Council was used as a methodological procedure for data collection from the city of Lichinga.

The centrality of the objectives of the article occurred in the year 2022 for reasons of carrying out fieldwork for the Environmental Impact Assessment (AIA) module of the Environmental Management course at Unirovuma Niassa delegation.

Other resources and assumptions that supported this article were bibliographical research, semi-structured interviews and direct observation of the place under study.

Data interpretation was in accordance with content analysis, based on the theoretical foundation and research questions.

3.0 FINDINGS

The presentation of the results will be described around the analysis of the following aspects: i) clay extraction and brick production in Assumane; ii) Destination of bricks;ii) Main impacts observed in the study area; iv)

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Extraction and Production

The extraction of clay is done using short-handled hoes, while the brick manufacturing process uses pre-defined frames, following specific criteria. The extracted clay is mixed with water and clamped with feet, thus forming the ideal "trace" for the production of bricks, then it is molded and left to dry. After drying, the pieces are sent to the ovens, at temperatures always between 750 and 900ºC. The burning process provides the brick with an increase in specific mass, hardness and mechanical resistance.

Source: Author (2022)

Destination

Bricks are produced and used by the population in the construction of houses without neglecting the primary objective based on commercialization.

Source: Author (2023)

Main Environmental Impacts Observed in the Study Area

In general, at the study site, the main environmental impacts found are the deforestation of extraction areas, the occurrence of ravines and air pollution resulting from the burning of bricks, as well as the following aspects:

1. Loss of native fauna and flora;
2. Soil erosion;
3. Soil degradation (removal of the fertile bed);
4. Destruction of agricultural production areas and atmospheric pollution;
5. Modification of the relief (Change of the landscape);
6. Production of disease vectors in water-mosquito containment ponds.

Classification of Impacts

Regarding value characteristics: Negative and Positive;

Order characteristics: Direct and indirect;

Spatial characteristics: Local Impact;

Temporal Characteristics: Immediate impact;

Reversibility characteristics: Reversible.

Table 1: **Abiotic, Biotic and Socio-Economic Characteristics of the Area under Study**

ENVIRONMENT	ASPECTS SAVED	CHARACTERISTICS
Abiotic	Physical-geographical characterization	Sandy clayey soils; Poorly permeable soils; Reddish soils
	Climatic	Dry season – (April –October).
	Geomorphological and pedological	Soil erosion; Soil degradation (removal of the fertile layer).
	Water	wells in swampy areas and turbid water
Biotic	Organisms	Rabbits, Rats,snakes, amphibians
	Vegetation	Chanfuta, Massuqueiro, and Mbanga
Socioeconomics	Population	5390 in habitants
	Physical infrastructures	Houses built from precarious materials with grass roofs and adobe bricks.. Houses built with conventional material, block, burnt brick, zinc plate.
	Economic activities	Agriculture, small industries Milling, ceremonial, livestock farming and commerce.

4.0 CONCLUSION AND RECOMMENDATIONS

Conclusion

The study evaluated the clay extraction process and its impacts, where the degradation of extensive areas whose soil was removed due to the practice of manufacturing bricks intended for housing construction as well as for commercial purposes was notable.

It is worth noting that in the clay extraction area there are huge craters that encourage the occurrence of erosion, which puts at risk the physical integrity of the houses located on the slopes of the ravines. During the rainy season, they are filled with water that serves as a source of multiplication of disease vectors such as waterborne malaria.

Another fact noted was that the craters pose a great danger to residents since, during the rainy season, they become authentic rivers where children use them as a place to relax and on some

occasions bathers have drowned. Using interviews, residents reported that in the explored areas it is not possible to practice agriculture as the soils have become unsuitable for the activity due to soil impoverishment.

Observing the images mentioned above, one can see the severity of the losses and accentuated levels of soil degradation mainly due to clay extraction and the consequent loss of vegetation on the site.

Reports from clay extractors state that there is no inspection action by the Municipality in order to regulate and put an end to abuses in that district. However, it is common knowledge that the production of bricks using clay generates employment and income for practitioners, which is why the activity is considered profitable and profitable.

In the area under study, it is noted the occurrence of a clay with good plasticity, reddish-brown in color, which, according to Pedrassani (2009), this type of clay is made up of groups of minerals called montmorillonite, illite, chlorite, kaolinite, as they are rich in oxides. of iron.

In general, the activity is characterized as unsustainable as it does not observe any mining standards, much less prevent actions to replace soils or species that became extinct as a result of the practice of the activity.

In short, the study concludes that in Assumane the impacts resulting from clay extraction are negative due to there being huge open craters, removal of native forest and soil compaction due to the brick burning process and positive due to generating jobs and income.

Recommendations

Brick producers are recommended to seek advice from an environmental specialist with a view to developing a recovery and environmental education plan in order to inculcate aspects inherent to the preservation of nature as a common good.

REFERENCES

Adams, J. (1995). Risk: the policy implications of risk compensation and plural rationalities. London, UCL Press.

Bella, D. A. (1987). Engineering and Erosion of Trust. Journal of Professional Issues in Engineering.

Branco, P. (2008).Dicionario de Mineralogia e Gemologia.São Paulo.

CMCL - Municipal Council of the City of Lichinga. Integrated Solid Waste Management Plan for the City of Lichinga (2022/2027).

Cutter, S. (2001). The Changing Nature of Risks and Hazards. American Hazards capes. The regionalization of Hazards and Disasters. Washington, D.C. Joseph Henry Press.

Egler, C. A. G. (1996). Environmental Risk as Territory Management Criteria.

Feriri, G. (1991). Regions of Risk. A Geographical Introduction to Disasters. Essex. Longman.

Hirsch, H (1972). Applied mineralogy.

Mandarino, A (2008). Mineralogical record

Pedrassani, J. (2009). Biografia das Argilas.Unpublished

Republic of Mozambique. (2015).Bolentim da República.Decreto n.54/2015 of 31 December.

Zuquette, L. V. & Nakazawa, V. A. (1998). Engineering Geology Letters. (Ed) Engineering Geology. São Paulo, ABGE.

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