

REVIEWER'S REPORT

Manuscript No.: IJAR-57383

Title: AT THE CROSSROADS OF NATURAL AND HUMAN SCIENCES: THE EVALUATION AND PROSPECTS FOR THE DEVELOPMENT OF THE GEOSITES OF BAKEL CITY (TAMBACOUNDA REGION, SENEGAL)

Recommendation:

Accept as it is

Rating	Excel.	Good	Fair	Poor
Originality		√		
Techn. Quality		√		
Clarity		√		
Significance			√	

Reviewer's ID: JPR- 006

Detailed Reviewer's Report

Main Objective of the Study

The main objective of this work is to identify and evaluate the geosites present in the municipality of Bakel in order to better understand their scientific, cultural, ecological, aesthetic, and economic importance. The study aims to highlight the richness of the region's geodiversity and its close relationship with biodiversity and local heritage. Another key goal is to assess the current condition of these sites and determine their potential for conservation and sustainable use. By doing so, the research seeks to propose practical strategies for protecting and enhancing these geosites. It also emphasizes the role of geoheritage in supporting local development and education. Ultimately, the study aspires to contribute to the creation of a geopark and promote geotourism as a driver of socio-economic growth in Bakel.

Geographical Location of Bakel

Bakel is situated in the eastern part of Senegal, within the Tambacounda region, near the border with Mauritania and Mali. Its position on the left bank of the Senegal River gives it both geographical and strategic importance. The river acts as a natural boundary and has historically influenced settlement patterns. Being far from the capital Dakar, Bakel remains relatively remote but connected through national roads. Its location enhances its potential as a cross-border cultural and economic hub.

Historical Settlement Patterns

Human settlement in Bakel dates back to the Late Pleistocene, largely due to the presence of water resources. The Ndiaye aristocrats migrated from the Djolof Empire and established early communities in the region. Their settlement reflects historical movements linked to political changes in West Africa. Over time, different ethnic and political groups interacted in this area. These layers of history contribute to Bakel's rich cultural identity.

Influence of the Senegal River

The Senegal River has played a crucial role in shaping Bakel's development. It supported agriculture, transportation, and trade for centuries. The river also facilitated early colonial navigation and settlement.

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Seasonal flooding contributes to soil fertility but also creates environmental challenges. Overall, it remains central to both the ecological and socio-economic life of the region.

Climate Characteristics

Bakel experiences a Sudano-Sahelian climate with distinct dry and wet seasons. The dry season lasts from November to June, while rains occur between July and October. Temperatures are generally high, averaging around 27°C annually. Rainfall is moderate but irregular, affecting agriculture and water availability. These climatic conditions influence vegetation, livelihoods, and settlement patterns.

Geological Diversity

The geological formations in Bakel range from the Paleoproterozoic to the Pliocene epochs. This diversity reflects a long and complex Earth history. The region contains quartzites, schists, and other metamorphic rocks. These formations are part of the Mauritanides Supergroup. Such geological richness provides valuable insights into tectonic and sedimentary processes.

Geomorphological Features

The landscape of Bakel is mostly flat, with scattered hills and depressions. These features are shaped by erosion, river activity, and tectonic processes. Hills like Grimpalé and Ndiayega stand out in the terrain. Depressions often form seasonal ponds or wetlands. This varied relief adds both scientific and aesthetic value to the region.

Biodiversity and Ecosystems

The region supports a mix of savanna vegetation and aquatic ecosystems. Riverbanks and wetlands host diverse plant and animal species. Crops like rice thrive in water-rich areas. Fauna includes fish, amphibians, and birds adapted to humid conditions. The link between geodiversity and biodiversity is clearly visible here.

Cultural and Ethnic Diversity

Bakel is home to multiple ethnic groups, including Soninke, Toucouleur, Wolof, and Fulani. Each group contributes to the cultural richness of the town. Traditions, languages, and social practices coexist harmoniously. Cultural ceremonies and heritage sites reflect this diversity. It strengthens Bakel's identity as a multicultural community.

Economic Activities

Agriculture and livestock farming are the main economic activities in Bakel. Many households depend on farming for their livelihood. Crops include millet, corn, and vegetables. Livestock farming is widespread and includes cattle and poultry. Despite this, economic development remains limited due to infrastructure challenges.

Role of Migration

Migration plays a significant role in Bakel's socio-economic structure. Many residents, especially men, migrate to Europe for work. Remittances sent back home support families and local development. These funds contribute to housing and urban growth. Migration has reshaped both the economy and social fabric of the town.

Concept of Geosites

Geosites are specific locations that hold geological, cultural, or aesthetic significance. In Bakel, they include both natural and human-made features. These sites help explain Earth's history and human

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interaction with the environment. They are essential for education and tourism. Identifying them is the first step toward conservation.

Importance of Geoheritage

Geoheritage refers to valuable geological features that need protection. In Bakel, it includes hills, rocks, and historical structures. Preserving these sites helps maintain natural diversity. It also supports education and scientific research. Geoheritage can be a foundation for sustainable tourism.

Evaluation Methodology

The study used both qualitative and quantitative methods to assess geosites. Criteria included scientific, cultural, ecological, aesthetic, and economic values. Each criterion was scored from 0 to 1. Scientific value was given more weight. This systematic approach ensures objective evaluation of each site.

Types of Geosites Identified

Nine geosites were identified in Bakel. Eight are anthropogenic (human-made), and one is hydrological. Anthropogenic sites include forts, towers, and cemeteries. The hydrological site is the large marsh. This classification highlights the dominance of historical structures in the region.

Pavillon René Cailé

This site is located on a hill overlooking the town and river. It has historical significance linked to colonial times. The pavilion served multiple purposes, including a sanatorium and training center. Despite its value, it is currently neglected. Its aesthetic and scientific importance remains high.

Fort of Bakel

The fort is one of the most significant geosites in the region. Built during the colonial era, it served military and administrative purposes. It offers panoramic views of the surroundings. The fort is still functional as a prefecture. It holds high scientific and ecological value.

Tour Brue (Pigeon Hill Tower)

This tower was built for surveillance and defense purposes. Located on a hill, it provides excellent visibility of the area. It reflects colonial military strategy. Although historically important, it is now deteriorating. Its aesthetic appeal remains strong.

Tour Descennet (Monkey Hill Tower)

This tower controlled access routes and protected the region from attacks. It is strategically located on elevated terrain. Like Tour Brue, it has both historical and geological significance. The site is currently underutilized. Conservation efforts are needed.

French Military Cemetery

This cemetery contains remains of colonial soldiers. It reflects the historical conflicts and diseases of the era. The site holds cultural and historical value. However, it lacks proper maintenance. Preservation is essential to protect this heritage.

Telegraph Tower

The telegraph tower served as a communication hub during colonial times. It played a role in administrative coordination. Today, it exists in ruins. Despite this, it remains historically significant. Restoration could enhance its value.

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Cemetery of the Circumcised

This site has strong cultural and social significance. It is linked to traditional rites of passage. The cemetery symbolizes important community beliefs. Unfortunately, it has become a waste disposal area. Its preservation is crucial for cultural continuity.

Grimpalé Hill

Grimpalé is a sacred site with panoramic views. It holds both cultural and geological importance. However, it is currently used as a dumping ground. This misuse threatens its value. Protection measures are urgently needed.

Large Marsh of Bakel

This hydrological site is a seasonal wetland. It supports biodiversity and agriculture. However, pollution and safety risks are major concerns. The marsh has potential for ecological tourism. Proper management could enhance its benefits.

Tourism Potential

Bakel has strong potential for cultural and geotourism. Historical sites, landscapes, and traditions attract interest. However, lack of infrastructure limits tourism growth. Better promotion and facilities are needed. Tourism could boost the local economy.

Challenges in Development

Major challenges include poor infrastructure and lack of maintenance. Many geosites are neglected or misused. Transportation and accommodation facilities are limited. Environmental degradation also poses risks. Addressing these issues is essential for progress.

Future Prospects and Recommendations

Developing Bakel as a geopark could transform the region. Conservation of geosites should be prioritized. Investments in tourism infrastructure are necessary. Community involvement is key to sustainable development. With proper planning, Bakel can become a major geotourism destination.