

Geomorphic Resources and Tourism Potentials of the Niger-Benue Confluence Area, Central Nigeria

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Abstract An aerial view of the confluence of Rivers Niger and Benue at Lokoja in Central Nigeria presents a remarkable picturesque and touristique attraction. In addition, the Campano- Maastrichtian Agbaja (375m), Patti (420m) and Aforo (510m) plateaux which have been preserved by the lateritized iron capping host the underlying oolitic and pisolitic ironstones, water springs and by their relief constitute locations of touristic attraction and ideal field laboratories for general and engineering geology studies; particularly with several road cuttings opened up by road construction activities. The plateaux slope into Precambrian, which hosts Banded Iron Formation and marble deposits to the west and the Maastrichtian coaliferous deposits of the northern Anambra Basin to the east. The ongoing dredging of the River Niger with its inland port for commercial transportation and the planned petroleum refinery in the area calls for adequate planning to achieve sustainable human activities that should lead to economic growth and the development of the tourism industry. The latter has enormous implication in attracting investment that can lead to the repositioning of the extractive industry in an area of such great potential.

Keywords: geomorphic resources, rivers Niger and Benue, tourism, sustainable development, Lokoja

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1. Introduction

The history of Nigeria is intrinsically linked to the development of Lokoja, especially its unique geomorphic features and landforms. It is located between Latitude: 070 74'N - 070 79'N and Longitude: 060 57'E - 060 63'E with a total land coverage of about 3179.7189 sq.km, and about 170 km from the Federal Capital Territory (FCT), Abuja (Dukiya, 2012). The contrasting high altitude plateaux and low-grounds of the two major Rivers Niger and Benue (Figure 1) with their natural transportation potentials must have attracted early foreign settlers like Baikie in 1857 and encouraged the subsequent activities and growth of the Royal Niger Company. Apart from the spectacular scenery and strategic central location of Lokoja which led Lord Lugard in 1914, to settle in the confluence town, the area holds promise for geotourism as a georesource that needs to be explored in detail. There are several geosites that have been identified, each with peculiar structure, geology and engineering applications (Plates 1 - 5). Further study can expand our present geosciences information in a systematic way; and lead to specific frameworks of action. It is also essential to maintain such identified natural resources which have intrinsic, aesthetic, heritage and recreational values as geological conservation for present and future generations (Plates 3 - 5). The development of the georesources along

with several government projects in the area envisages rapid development of the confluence region which is proximal to the Federal Capital Territory.

2. General Geology and Geomorphic Setting

The Niger-Benue confluence area around Lokoja is underlain by Precambrian crystalline basement unconformably overlain by gently dipping Upper Cretaceous sediments while the flood plains of the two rivers are covered by swampy organic-rich Quaternary to Recent alluvial sands. The river channel host Recent alluvium dotted with several sand bars and basement outcrops. The basement rocks consist of variously migmatized gneisses, metasediments including schists, quartzite and marble further northwest. The Pan-African granitoids, including pegmatites that intrude the above rocks constitute the younger series of the Precambrian (Abimbola, 1993) (Figure 1). The Late Cretaceous sedimentary cover rocks of Campano.

Maastrichtian age overlie the basement unconformable and the relationship has become clearer with the recent road cuttings (Plates 2 - 3). They consist mainly of basal conglomerates, sandstones, grits, ironstones, clays, shale and coals especially to the east of the confluence. The confluence area is surrounded by a number of deeply dissected Upper Cretaceous plateaux having a combined

area of over 150 square kilometers (Figure 1), with the Agbaja table-land situated to the northwest and better known, but much smaller Mount Patti south of the former situated north of the closest to Lokoja (Plate 5). Much further to the south (30km) of the confluence is a range of SW–NE trending plateaux that rise above 500m (Plate 5). North – eastwards, the series defines the easterly dipping ironstone beds of the Bassange Escarpment while the much lower Kotonkarfi plateaux series (<300m) (Plate 1) to the north are helmed between the two arms of Rivers Niger and Benue. The prominent series of plateaux belongs to the essentially flat-lying Campano-Maastrichtian

sediments that have been preserved by a thick bed of lateritic, oolitic and pisolitic ironstone capping (Jones, 1958; Adeleye, 1973) (Plate 1). They are devoid of any luxuriant vegetation at the top and they drop with steep scarps to the crystalline Precambrian basement where they form dotted outliers in form of mesas in widely scattered locations (e.g Plate 2). The confluence water area is underlain by Recent alluvial sands and low-lying basement outcrop; while organic-rich fine flood-plain Quaternary sand has given rise to luxuriant vegetation away from the rivers banks (Plate 3).

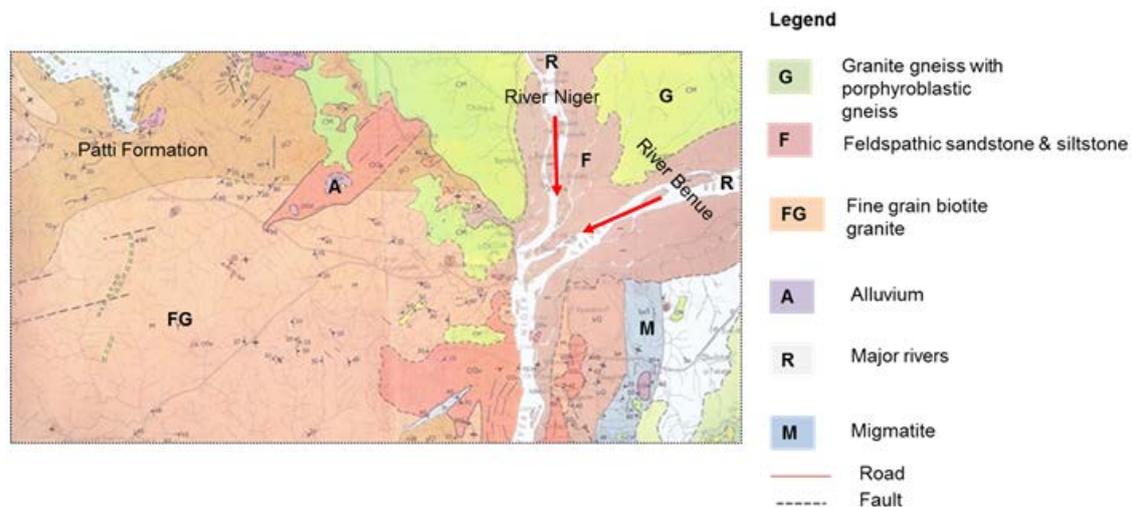


Figure 1. Geological map of the Niger-Benue confluence area (after Hockey *et al.* 1958)



Plate 1. Oolitic Ironstone band of Agbaja Plateau underlain by Jakura marble

3. Mineral Resources

Several resources abound in the Niger-Benue confluence area such as several solid minerals, perennial water supply for both domestic, industrial, commerce in fishing and waterway transportation, micro-climates of the wide alluvial plains for agriculture and high table lands in form of plateau for scenic picturesque tourism and telecommunications etc (Plates 1 – 5). The area has been prospected by the Mineral Survey of Northern Nigeria

(Dustan, 1911; Falconer, 1911). The minerals of economic interest include ironstones, coal, marble, precious metals (gold, cassiterite and tantalite), feldspar, kaolinitic clay and various construction materials such as stone aggregates, abundant laterite and alluvial sands.

3.1. Ironstones

Geological mapping and reserve estimation of the Agbaja ironstones during the Geological Survey prospecting of 1952 and 1953 (Jones, 1958). An area of less than 1 square kilometer prospected indicated 30 million tons of

continuous bed of oolitic ironstone of approximate thickness of 10 metres with an assay value of 50% Fe.

Reserves of coal deposits in Ogboyega (Casey *et al.* 1958) and Okaba (Richards & Buchanan, 1958) with more than 1 metre minimum workable thickness and 39 to 43% fixed carbon are in excess of 80 and 50 million tons respectively.

Swardt and Hazell (1958), first described in detail by the continuous prospecting by Obajana Cement Company of the best quality marble in the Jakura-Obajana axis have increased the reserves substantially. Apart from the current use in cement production at the Obajana factory and decorative works by the Jakura Marble Company in Lokoja (Plate 1), its potential in the production of agricultural lime, glass, tiles, mortars and paint whitewash is equally very promising (Braide, 1992).

Further west of Agbaja plateau, alluvial, alluvial and vein occurrences of gold, cassiterite and tantalite occur in the Sanford workings along Taki-Guruguji-Abugi; the easternmost extension of the Isanlu-Egbe schist belt (Dada,

1983). Large reserves of feldspar in Late Pan-African pegmatites notably southwest of the confluence have been prospected by the defunct Nigerian Mining Corporation. Clays, including kaolin, occur both in the Precambrian basement (Hazell, 1958) as well as in the Upper Cretaceous sediments, especially the Lokoja and Patti Formations (Adeleye, 1973; Ojo and Akande, 2003) Plate 5.

3.2. Construction Materials

Stone aggregates from the basement and sandstones (Plate 2) are available in unlimited supply for various civil engineering works. In addition, alluvial sands of various shades, sizes and forms are available for appropriate civil constructions, which have led to the rapid growth of the town since it became the capital of Kogi State. It has, however, given rise to enormous environmental problems, principal among which are plainness of the new settlements and uncontrolled quarrying in a region of such undulating topography.



Plate 2. Contact between the sedimentary rock (sandstones) and the basement



Plate 3. River flow from the confluence rivers

4. Hydrological Resources

Rivers Niger and Benue are perennial and overflow their banks at the peak of the rainy season between mid-July and September, thereby sustaining large volumes of water for the greater part of the year (Figure 1) (Plate 3).

4.1. Water transportation

The Lower Niger is currently being dredged northwards to Baro, north of Lokoja where the construction of an inland port has reached an advanced stage (Figure 1). This is bound to open up the country for greater commercial activity, particularly when the railway system is resuscitated. The impact on the Federal Capital Territory

and northwards from the central location of the confluence seaport and the Baro railway station are obvious (Figure 1).

4.2. Water Supply

The River Niger is currently being harnessed for the Greater Lokoja Water project to cater for the fast growing metropolis and environ. Abundant groundwater is concentrated in the aquiferous conglomerate and sandstone horizons of the Lokoja and Patti Formations where spring water emanates all year round in many locations (Plate 4). The yield from the boreholes is more prolific at the contact between the basement and the cover sediments as well as within the palaeo-alluvial of the River Niger flood-plains (Omada et al., 2009).



Plate 4. Natural spring flow from the Patti Formation and basement down the slope

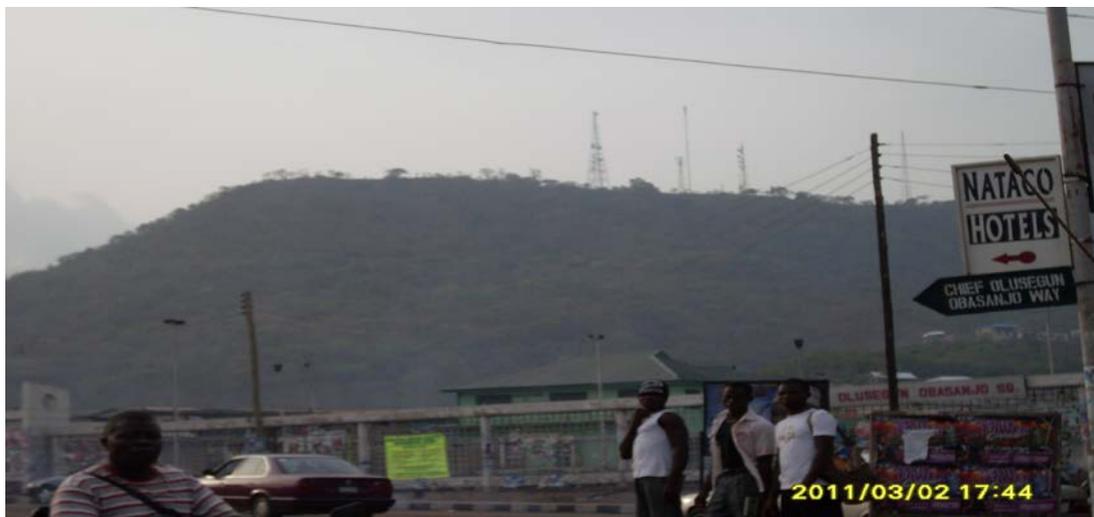


Plate 5. Mount Patti Formation with erected poles and telecommunication masts

The age-long trade in fishing has witnessed an increasing boom due to the growing population of Lokoja and other confluence towns, its central passage on the highway to the Federal Capital Territory. This is likely to continue with the dredging of the River Niger and the dualisation of the Abuja-Lokoja highway.

5. Sustainable development and tourism initiatives

The current expansion of the 5-star Confluence Beach Hotel along Ajaokuta road which, among other things,

will give a more impressive aerial view of the confluence and its environ is just one testimony of the growing industrialisation and great potential of Geotourism in the area. Other attractions include several monuments and relics of the colonial history of the ancient city such as the Royal Niger Company flag stand, the World War Cenotaph, Lord Lugard's first residence in Nigeria, the Iron of Liberty (where slaves were freed in late 19th century), European colonial cemeteries, tombs of deposed Northern Emirs, etc (Plate 5). However, of more geoscientific interest are the natural geomorphic feature of expansive plateau of Mount Patti, Agbaja, Ate and Aforo

as well as the Koton Karfe cave and the Eganaja Warm Spring. On the other hand, there are obvious environmental concerns that militate against the development of the potentials, some of which will be elaborated upon below, in catering for the present interests without compromising the capability of future generations to meet their own needs. These include the evident of the new housing developments compared to the old Lokoja layout of the colonial era and the pollution and environmentally devastating stench of the western bank of River Niger, adjoining the old city (Plate 1). Specific areas of interest in tourism include:

5.1. Transportation

There is a range of products and services that can bolster the financial viability of individuals, groups, communities and the region, thereby attain a balance of economic sustainability alongside environmental sustainability.

5.2. River Niger

The dredging of River Niger upwards of the river port in Lokoja, under the supervision of the Nigeria Inland Waterways Agency (NIWA), will result in economic viability, especially if the water routes are regularly maintained. This will lead to diversification of services offered. These will include commercial transportation, the provision of luxury river trips including classic and traditional regattas, rafting and canoeing. Adventure hubs can be developed into a formalized river industry between road points of entry; thus encouraging the establishment of luxury river safari camps with concomitant economic growth both on land and along the river.

5.3. Plateaux Telepheric Cable Car

Connections between plateaux table lands which themselves offer cool micro-climates and Telecommunication services, but have their development hindered due to poor accessibility (e.g. Mount Patti, Agbaja Township), can be more easily connected with the development of Telepheric Cable Cars (TCC) (Plate 5). This means of telecommunication are common in areas of high relief and rugged topographies such as in the Alps, covering relatively short distances not only solve transportation problems but serve as tourist attractions. A phased development from SE Agbaja plateau of Mt. Patti and the latter across River Niger Kogi East can be considered (Plate 1 and Plate 2).

5.4. Geotourism and Education

The scenery, geologic, geomorphic and telecommunications developments on the plateaux around the confluence constitute attractive, practical education and field laboratories for teaching and learning, especially in the enhancement of technical competency outside of the classroom environment – Geology, geomorphology, ecology, Information Technology and Telecommunication Management to mention a few. Excursions by all categories of educational institutions and particularly visits to geologic sites and industries (Okaba and Ogboyega coal, Obajana Cement, Itakpe Iron smelting, Ajaokuta Iron and Steel Complex, etc.) (Plates 1, 2 and 5). One can therefore advance the great potentials of the

confluence area in terms of its georesources and geomorphic peculiarities for tourism, recreational, leisure or business purposes. However, there are certain factors to be taken into consideration in order to achieve sustainable development, notable among which is the need to mitigate against environmental degradation that is unfolding in Lokoja and its environ. Environmental problems being addressed, and that should continue to receive attention from all stakeholders are re-emphasized hereunder:

1. Access to improved drinking water supply. The Greater Lokoja Water Supply Scheme, which is at an advanced stage should be completed.
2. The need for the Urban Waste and Sanitation Board to ensure environmentally healthy alluvial area along the banks of the Niger River by monitoring and enforcing safe sanitation practices and controlling the discharge of wastes into the area along the Niger River.
3. The development of a comprehensive master plan of the growing city, and establish/control physical development.

The world over, tourism is recognized as the engine of growth and a huge foreign exchange earner, accounting for over 10 per cent of Gross Domestic Product (GDP) in many countries. Most countries make a huge investment in the tourism industry because of its potential to create job opportunities, improve local livelihoods, encourage economic growth and alleviate poverty. Tourism is most advantageous because it is a renewable source of revenue, and is capable of generating incentives for conservation of natural and cultural assets.

6. Conclusions and Recommendations

The Niger-Benue confluence area is just one example of several areas in Nigeria with tremendous potential for integrated resource development and geotourism is waiting to be tapped. Sectorial responsibility on the part of government and all stakeholders can ensure long-term prosperity and quality of life without placing future generations at risk; i.e. in a sustainable manner. When the on-going power resuscitation and security issues are addressed, both local and foreign investments would be more easily tapped. This should enhance regional capabilities in the country that would be economically viable, socio-culturally acceptable and environmentally sustainable; thereby bringing benefits to wide segments of the society and alleviating poverty nationwide through the private partnership program (PPP) initiative.

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