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THE GEOLOGY OF THE NYIKA AREA

by

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Lakeshore Plain and the Vwaza Marsh, flow ceases in some cases during the latter part of the dry season.

On the Nyika Plateau, streams and rivers follow meandering swamp-fringed courses along gently sloping valleys. Beyond the Plateau they occupy steep sided valleys with gorge sections, rapids and waterfalls.

The North Rukuru and its major right-bank tributary the Chipome drain the northwest part of the Nyika Plateau. The northeast and east parts of the highland areas are drained by the consequent rivers Mwesia, Ruasho, Wayi, Remero, Sawi, Bumba, Wovwe and North Rumphi. The southern part of the Plateau is drained by the South Rukuru tributaries Mwazisi, Luviri, Runyina and Chelinda-Rumphi. The Vwaza Marsh is drained by the Hewe/Luwewe tributary of the same system and the East Nyika Escarpment by several other tributaries of the South Rukuru, mainly the Luviri and Muhuju.

(c) Geomorphology

As appraised by Lister (1967) the rolling uplands on the Nyika Plateau represent the Gondwana (Jurassic) surface (King 1963) dissected by shallow valleys belonging to the post-Gondwana (early- and mid-Cretaceous) cycle of erosion. Similar relics (Fig. 3) are preserved north of the Plateau in the area of the Mpanda-Kawozya, Musisi and Pirewombe Hills and also south of the Plateau in the Nkhonjera Hill area.

The most extensively developed erosion surface in the area is the African or mid-Tertiary (late-Cretaceous to early-Miocene) surface. Its characteristic form, a mature peneplanation (locally with scattered inselbergs) is seen in the Vwaza Marsh, Nkamanga Plain, Henga Valley and Lufilya Valley areas.

The hills of the northwest and the hilly areas to the north and south of the Plateau are considered to be the result of advanced African erosion of the post-Gondwana surface, numerous residuals of which persist in isolated summits and on the crests of interfluves. As in the Vwaza and Henga areas, post-African erosion is evident in the Lufilya and North Rukuru Valleys and along the South Karonga Scarp Zone.

Tertiary faulting, associated with the development of the Lake Malawi rift trough, including renewed movement along lines of weakness established in late Precambrian or Karroo times, is responsible for the escarpment zones in the northeast and southeast extremities of the area. In the former, several sub-parallel step-faults have broken down the post-Gondwana surface promoting its deep dissection. In the southeast, faulting along the west side of the Henga Valley, the northward continuation of the Kasitu Fault (Hopkins 1973), defined the margin of the Nyika Plateau. The faults bounding the various Karroo basins in the northern part of the area probably also experienced renewed movement during Tertiary times, promoting the development of the associated valley features, particularly those of the Lufilya, North Rukuru and Mwesia Rivers.

The Quaternary erosion cycle is represented by the lakeshore alluvium and by the various *dambo** accumulations along the major river courses.

(d) Climate

The Nyika area, in common with the rest of Malawi, experiences a tropical continental climate with a single rainy season lasting from December to March or April. There is a cold season from May to August and a hot season from September to December. The wide variety of relief gives rise to corresponding variations in the local climate. The six 'climatic regions' (Young and Brown 1962) which can be distinguished in the area are listed in Table I.

* Chichewa: broad, grass-covered, swampy valley(s).

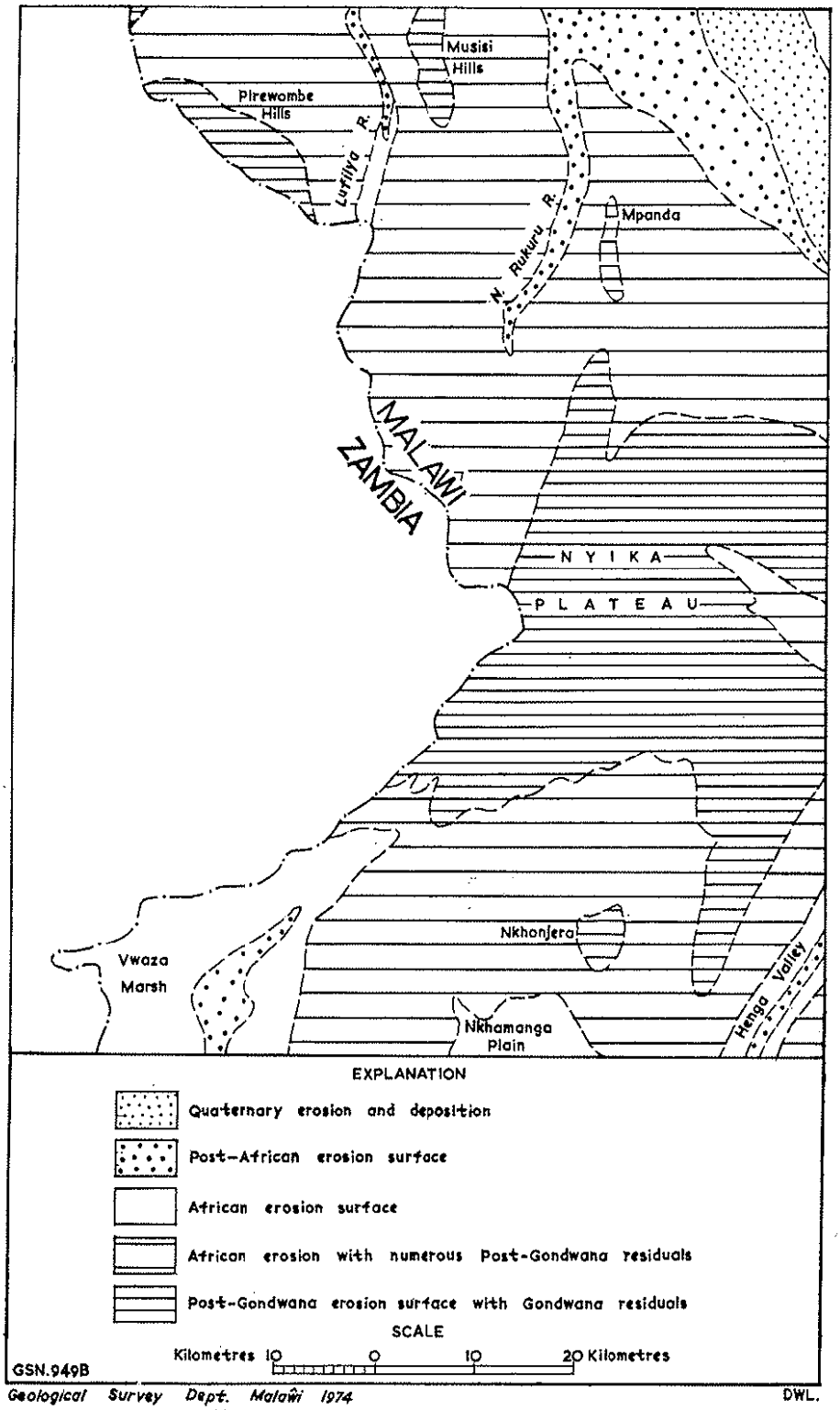

FIG. 3. Erosion surfaces in the Nyika area.

(g) Construction materials

(i) *Sand*

Large deposits of fairly pure sand occur on the shores of Lake Malawi near Mwenilondo and along the South Rukuru River in the Henga Valley. Elsewhere in the Nyika area only small pockets of sand are found along the courses of the major rivers, particularly in the Nthalire area and along the South Karonga Rift Scarp Zone.

(ii) *Brick-clay*

Only limited deposits of clays suitable for brick-making are known in the Nyika area. Good quality bricks have been manufactured from the clay soils of the Nyika Plateau at Chelinda, and also from clays near Ng'onga and Muhuju on the Rumphi-Livingstonia road.

(iii) *Gravel*

Large supplies of gravel are usually available close to the present main roads. During construction of the Karonga to Chilumba lakeshore highway, gravel was readily obtained from the Dwangwa Gravels and reworked Chitimwe Beds.

Elsewhere gravel deposits are usually plentiful where the road passes through hilly country, particularly at the foot of escarpments or where phyllonite zones with associated quartz reefs occur close to the road, for example on the Rumphi-Katumbi road between Katumbi and the turn-off to the Nyika Plateau.

On the Nyika Plateau gravels suitable for road making are locally available where the surface of the ground is strewn with quartz pebbles. The underlying mixture of soil and quartz fragments is usually adequate for local use.

(iv) *Stone*

Stone suitable for construction purposes is available close to main roads in most parts of the area. The high-grade sillimanite-biotite-cordierite gneisses which cross the central part of the Nyika map area are considered suitable for concrete aggregate. Sites for small quarries in this rock type are available in the Mwenewenya area, the eastern parts of the Nyika Plateau, along the Nyika road near Tazima Hill, on the northern edge of the Nkamanga Plain near Rumphi, and in small hills close to the Rumphi-Livingstonia road between Ng'onga and Muhuju. In the Katumbi area the steep rocky hillsides on the south side of Makuli Village are mainly in this rock type.

The broad dolerite dykes which are crossed by the tracks between Nthalire and Mwenewenya and between Nthalire and Muyombe would be an excellent source of hard durable stone for concrete aggregates or roadstone if suitable quarry sites could be found.

The nepheline syenite at Telelele Hill and at a small hill west of Lokali School would produce a stone suitable for construction purposes if suitable quarry sites were available. Microgranite and microsyenite dykes at the northern end of the Njakwa Granite near Ng'onga are also suitable for concrete aggregate.

The biotite-gneisses at the western edge of the Nkamanga Plain are suitable for quarrying where free from shear zones and other cataclastic effects. Suitable sites include a large outcrop on the western side of the track south from Mwachanda Village, and various outcrops near the Bowe turn-off on the main road east of Mwazisi Agricultural Station.

(h) Water supplies

In many parts of the Nyika map area surface waters are adequate to supply the local population, particularly on the margins of the high level plateau areas

TABLE XV

BOREHOLES DRILLED FOR WATER SUPPLY IN THE NYIKA AREA UP TO MARCH 1974

Ref. No.	Locality	Grid reference	Depth (m)	Depth (ft)	Yield (g.p.h.)	Year drilled
A141	Nelehle	XD 033929	25	82	not recorded	1963
A227	Nyungwe	XD 082842	30	100	not recorded	1963
E180	Mkombezi	XC 088917	47	153	540	1958
E182	Katowo Court	WD 570050	30	98	540	1958
E183	Kabulufa School	WD 548028	38	124	900	1958
E184	Bolero Court	WC 810872	45	147	900	1958
E185	Mwasizi School	WC 630905	28	92	540	1958
E273	Kalindamawe	WC 345855	30	98	540	1958
E274	Church of Christ Mission	XC 083955	27	89	754	1959
DP170	Mthenga	XD 013937	72	235	480	1972
GK43	Mugwela	WC 609859	45	148	635	1973
GK44	Chelinda Game Camp	WD 885302	61	200	400	1973
GK45	Mwasizi Road Camp	WC 625940	41	136	800	1973
GK47	Nthenje Mission	XC 083921	52	170	300	1973
GK51	Lupembe Scheme	XD 078884	38	125	600	1973
H83	Mjuma 1	WC 831897	44	143	360	1966
H84	Mjuma 2	WC 833893	45	145	360	1966
H85	Rupoka	WC 861856	57	186	2400	1966
H88	Bolero 2	WC 805853	92	302	200	1966
H89	Chakoma	WC 808924	47	155	450	1966
H91	Kampulikanga	WC 791926	64	210	514	1966
H92	Zindawera	WC 811908	51	168	514	1966
H93	Katakoli 1	WC 805891	47	155	514	1966
H94	Katokoli 2	WC 801892	47	156	600	1966
H97	Muwa 1	WC 762913	59	195	300	1966
H98	Muwa 2	WC 746906	45	146	610	1966
H101	Rohono	WC 688867	62	205	1200	1966
H121	Chilambo 1	WC 779859	62	205	300	1966
H122	Chilambo 2	WC 789859	58	191	160	1966
H140	Bolera Agric. School	WC 809869	50	164	450	1966
Q130	Mkupa	XC 020880	43	140	480	1968
Q134	Chalanga	WC 560958	49	160	720	1968
Q135	Chatumbwa	WD 532008	67	220	240	1968
Q144	Hewe M.Y.P. Camp	WD 581072	24	79	300	1968
Q390	Ng'onga Agric. Station	XC 027906	52	170	800	1970
Q392	Nkombedzi School	XC 066896	30	100	800	1970
R192	Luzi	XC 043861	55	180	450	1970
R195	Thulwe Settlement	WC 775929	50	165	250	1970
R198	Khutamasi	WC 514984	46	152	642	1970
R199	Chilulu	XC 061941	40	130	650	1970
R205	Lupembe	XD 082842	46	152	947	1970
R212	Bugulira Customs Post	WD 411905	38	125	500	1970
R213	Thulwe Settlement	WC 768934	69	225	353	1970
RB88	Luvire School	WC 710889	38	126	635	1973
RB90	Cheranya	WC 558962	61	200	450	1972
RB91	Mpandachuka	WD 457026	49	162	480	1972
W68	Nthalire Court	WD 703563	49	162	1056	1961
W72	Mwangolera	XD 021942	36	118	900	1959
W73	Samuel Ngosi	XD 042933	31	103	900	1959
W74	Mwenelupembe	XD 064876	50	164	480	1960
W158	Mwalughali	XD 051900	39	127	340	1960
W159	Monga	WC 557986	38	125	540	1960
W162	Chiwaya	XC 039913	43	140	900	1960
W238	Buwira	WC 886847	25	83	540	1960

Depth in metres calculated to nearest whole metre.

and along the major rivers. On the plainlands however the minor streams and *dambo* may dry up for long periods between May and December so that wells have had to be sunk in the past to supplement surface supplies.

In recent years boreholes have been drilled to tap groundwater on the plainlands surrounding the Nyika Plateau and its foothills in order to make permanent habitation possible in cultivable areas remote from perennial sources of surface water. These boreholes are listed in Table XV and their locations are shown on the accompanying geological maps. Aquifers are usually to be found in the lower part of the soil profile above bedrock. In the southern part of the area some holes have tapped aquifers in sandstone, presumably of Karroo age, overlain by clayey residual soil.

(i) Airborne geophysical survey

During 1971 a combined magnetic and radiometric airborne survey was carried out in the south-eastern part of the area. The block surveyed extended into the Rumphi-Nkhata Bay area to the south and the Uzumara area to the east, its approximate limits being longitudes 33°45′E and 34°07′E and latitudes 10°50′S and 11°10′S. The main objective of the survey was the investigation of the Rumphi Igneous Complex.

The magnetic contour pattern obtained reflects the main structural features of the area, notably the fault following the west side of the Henga Valley and the west-north-westerly trend of the gneiss belts west of it, interrupted by the intrusive rocks.

The radiometric survey revealed a few small areas and strips of anomalous response, the radiation from which is provisionally attributed in some cases to a thorium source and in others to uranium.

Follow-up investigation of selected magnetic and radiometric indications is in progress at the time of going to press.