DISTRICT SURVEY REPORT
OF MINOR MINERALS
(EXCEPT RIVER SAND)

MALAPPURAM DISTRICT

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DISTRICT SURVEY REPORT OF MINOR MINERALS
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(This report is to be submitted along with application for Environmental Clearance (EC) for mining of all minor minerals except river sand)

1 Introduction

Malappuram district forms part of Malabar region of Kerala, which is predominantly a land of hills and valleys. Malappuram literally means an elevated place on the top of hills. The district has a unique place in the geological history in view of the fact that Laterite, first identified in the area near Angadippuram by Francis Buchanan is the type area of Laterite. The district lies between North latitudes 10° 40’ and 11° 32’ and East longitude 75° 50’ and 76° 36’.

The Nilgiris of Tamil Nadu in the east and Lakshadweep Sea in the west provide natural boundaries. In the north it is bounded by Kozhikode and Wayanad districts and in the south by Palakkad and Trichur districts. The district has a geographical area of 3550 sq.km, which is 9.13 % of the total area of the State.

In 2011, Malappuram had population of 4,110,956 of which male and female were 1,961,014 and 2,149,942 respectively. There was an increase of 13.39 percent in the population compared to population as per 2001. The initial provisional data suggest a density of 1,158 in 2011 compared to 1,021 of 2001. Malappuram ranks 3rd in the area and first in the population of the State. Out of the total population 55.81% (2,294,473) is in the rural area and the rest (1,816,483) is in the urban area. Malappuram contributes 12.31% of the total population of the state.

The district is accessible by air, rail and road. The Kozhikode airport is situated near Kondotty in the district. The Kanyakumari-Mangalore-Mumbai broad gauge railway line passes through the western parts of the district. There is another branch rail line to Nilambur from Shornur (Palakkad district). The NH 17 which connects Cochin and Mangalore passes through the western portion of the district.

The Headquarters of the district is at Malappuram. The district has two Revenue Divisions with Headquarters at Perinthalmanna and Tirur. There are 6 taluks namely Ernad (Headquarters at Manjeri), Perinthalmanna, Tirur, Ponnani, Nilambur and Tirurangadi (Headquarters at Parappanangadi), 15 blocks, 100 panchayats and 150 villages. There are 7 Municipalities namely Malappuram, Kottakkal, Ponnani, Perinthalmanna, Tirur, Manjeri and Nilambur.
2 Drainage and Irrigation

Malappuram district is mainly drained by the Kadalundi River, Chaliyar River and Bharathapuzha (locally known as Ponnani River). Of these rivers, only Chaliyar and Bharathapuzha are perennial and all others get dried up in summer and hence Malappuram district is drought prone. The Kadalundi River is formed by the confluence of its two main tributaries viz; the Olipuzha and the Veliyar. The Olipuzha takes its origin from 'the Cherakkobban Mala' (1160 m amsl) and the Veliyar originates from the forest of the 'Erattakomban Mala' (1190 m amsl). The Kadalundi River is 130 km long with a drainage area of 1274 sq. km. The river joins the Lakshadweep Sea at about 5 km south of the Chaliyar river mouth.

The Chaliyar River, one of the major rivers of the State, originates from the Ilambalari Hills in Nilgiri district of Tamil Nadu (2066 m amsl). The river flows along the northern boundary of Malappuram district through Nilambur, Mambad, Edavanna, Areakode and Feroke. It joins the Lakshadweep Sea near Beypore. The river is 169 km long with a drainage area of 2535 sq. km in Kerala State.

The Bharathapuzha or the Ponnani River is the second longest river of Kerala, originating from the Anamalai Hills (1964 m amsl) in the Western Ghats. The river below the confluence of Bharathapuzha and Gayathripuzha is called the Ponnani River. It flows through the districts of Palakkad, Malappuram and Trichur and drains into the Lakshadweep Sea near Ponnani town in Malappuram district.

The drainage pattern of the three rivers in the district is generally dendritic. Tidal effects are experienced in places such as Vallikkunnu and Tirurangadi, which are 6 to 8 km away from the coast. Analysis of the drainage characteristics of the two basins reveals that Kadalundi river is a fourth order stream, the Ponnani river is fifth order stream and the Chaliyar river is a seventh order stream.

3 Rainfall and climate

The district has more or less the same climatic conditions prevalent elsewhere in the State viz. dry season from December to February and hot season from March to May, the South-West monsoon from June to September and the North-East monsoon from October to December. The normal rainfall of the district is 2793.3 mm. Out of this, major rainfall contribution is from SW monsoon followed by the NE monsoon. The South West monsoon is usually very heavy and nearly 73.5% of the rainfall is received during this season. NE monsoon contributes nearly 16.4% and March to May summer rain contributes nearly 9.9% and the balance 0.2% is accounted for during January and February months.
4 Meteorological parameters

4.1 Temperature
The climate is generally hot and humid. March and April months are the hottest and January and February months are the coldest. The maximum temperatures ranges from 28.9 to 36.2°C and the minimum temperatures range from 17.0 to 23.4°C. The temperature starts rising from January and reaches the peak in the month of March and April and then decreases during the monsoon month and again rising from September onwards.

4.2 Wind
The wind is predominant from east as well as west during morning and evening hours. The wind speed is more during December to February months. It ranges from 2.9 to 7.2 km per hour.

4.3 Humidity
The relative humidity ranges from 84 to 94 % during morning hours. The humidity is more during the peak monsoon months from June to September.

4.4 Geology
From the exposure pattern of the rock types, the district can be divided into two geological belts: (i) Charnockite group of rocks covering a major part and (ii) Migmatite Complex towards the east. Wayanad group is represented by small bodies of meta-ultramafites (tal-tremolite schist, talc-pyroxene-garnet schist, banded magnetite quartzite) and high-grade schist and gneiss (hornblende-biotite schist and gneiss+garnet with amphibolite band) which extends into Tamil Nadu where it is known as Sathyamangalam Group. The rocks of Peninsular Gneissic Complex, represented by granite gneiss and hornblende-biotite gneiss, form the next younger sequence. They have a very limited distribution near the eastern boundary. They have a very limited distribution near the eastern boundary, extending into the adjacent district where they are known as Bhawani Group. A linear band of granite gneiss NE of Perinthalmanna and a large body of hornblende-biotite gneiss east of Manjeri are prominent units. Charnockit Group includes charnockite/charnockite gneiss, having the largest areal distribution, followed in decreasing order of abundance by banded magnetite quartzite, pyroxene granulite, amphibolite/hornblende granulite and pyroxenite, which occur as concordant as well as discordant bands, lenses, layers and enclaves both within charnockite as well as within gneisses of Migmatite Complex. The Migmatite Complex is represented by biotite-hornblende gneiss (or hornblende-biotite gneiss) and quartzo-feldspathic
gneiss/garnet-biotite gneiss with enclaves of garnet-sillimanite gneiss+graphite distributed mostly in the central and northeastern part. Pegmatite and quartz veins constitute the acid intrusives, whereas gabbro and dolerite are basic intrusives. Near the coast, isolated cappings of Neogene Warkalli sediments comprising grit and clay beds are noticed. Lateritisation is widespread, at places attaining a thickness of more than 10m. Extensive plateaus with laterite ‘mesas’ are common in the area. Angadipuram (west of Perinthalmanna), the type locality of laterite falls in this district. Quaternary unconsolidated sediments are restricted to the coastal plain. They have been classified into different morpho-stratigraphic units based on their lithic content and environment of formation. Guruvayur Formation (palaeo-marine), Periyar Formation (fluvial), Viyyam Formation (fluvio-marine) and Kadappuram Formation (marine) (Figure 1). The geology of the district given above may be read with the “Geology of Kerala” which is given as Annexure 1 for better understanding of geological succession and stratigraphic sequence.
Figure 1: Geology and mineral resources of Malappuram. (Source: District Resource map, Malappuram district, Geological Survey of India)
5 Mineral Resources

5.1 Major minerals
The economic minerals reported from the district are iron ore, gold, clay limeshell etc. Good deposits of iron ore (magnetite) occur at Korattimala. Both primary and secondary (placer) gold are reported from the district. Kappil, Mankada, Kadannamanna, Valambuur and Maruda areas are known for occurrence of primary gold associated with quartz veins traversing traversing the Archaean metamorphic rocks. Placer gold (gravels) is reported from Nilambur valley along the channels and traces of Chaliyar puzha, Punnappuzha, Pandi puzha, Karakkod puzha and Maradi puzha. Both china clay and tile clay deposits occur in the district. China clay formed by insitu weathering of gneiss and charnockite and also sedimentary origin associated with the Warkalli Beds are present. These clay deposits are seen along the flood plains. The alluvium near Ponnani is rich in lime shell. The beach sands south of Ponnani show high content of ilmenite.

5.2 Minor Minerals

5.2.1 Granite Dimension Stone and Granite (building stone)
For administrative purpose the hard crystalline rocks which do not have any economic minerals are classified as granite dimension stones and granite (building stones). The definition given in the Kerala Minor Mineral Concession Rules 2015 is as follows:-

‘Granite dimension stones include all types of granites, dolerite, charnockite, leptynite and other crystalline rocks of Acid, Intermediate, basic and ultra basic groups of igneous and metamorphic origin which are suitable for cutting to pre-determined sizes, polishing, carving and amenable for making value-added products in decorative monumental and ornamental fields of industry as a high-value item. Granite (building stone) include all those group of rocks specified above which are not suitable for using as dimension stones as specified therein, but can be used as ordinary building stones, road metal, rubble and ballasts after breaking into irregular pieces by blasting or otherwise as low value item. The Rules insists that the rocks having the quality of granite dimension stone shall not be quarried for granite building stone as these two types of rocks have different values/royalties’.

The major granite dimension stone occurrence in the district forms part of Charnockite-Khondalite belt and has colour ranging from pale green with mottled red, bluish green with cordierite, deep dark green, greyish white. Charnockite is largely used as a building stone.

All Archaean and Proterozoic rocks of Kerala (refer section on Geology of Kerala) which are not listed above as granite dimension stone falls under the category of granite (building stone) and
are found below ordinary earth/laterites/and other sedimentary rocks. In some cases such rocks are exposed as hillocks without any overburden.

6 Details of minor mineral concessions
Permission for mining will be granted on case to case basis on ascertaining the availability at the site and only if conditions stipulated in the KMMC Rules 2015 are satisfied (The reader may refer the KMMC Rules 2015 available in the website www.dmg.kerala.gov.in for more details in this regard). The concession will be granted only if other statutory licenses like Environmental Clearance, Explosive Licence, consent to operate issued by State Pollution Control Board, NOC issued by Revenue Department (as the case may be), Dangerous and Offensive Trade Licence issued by Local Self Government Institutions, NOC related to Coastal Regulation Zone (as the case may be), NOC issued by Forest (as the case may be) etc. The mineral concession will not be granted in the ecologically sensitive areas, ecological fragile zones etc.
Geology of Kerala

Physiography

Physiographically the state can be divided into four domains from east to west, viz., the Western Ghats, the foothills, the midland and the coastal low-land.

Western Ghats

The hill ranges of the Western Ghats rise to an altitude of over 2500m above the MSL and the crest of the ranges marks the inter-state boundary in most of the places. A breach in the continuity of the ranges marks the Palghat Gap with a sinistral shift of 50 km between the shifted crests. The Wynad plateau and the Munnar (10 57'00": 77 31'00") upland fall within this zone.

Foothills

The foothills of the Western Ghats comprise the rocky area from 200 to 600m above MSL. It is a transitional zone between the high-ranges and midland.

Midland region

This forms an area of gently undulating topography with hillocks and mounds. Laterite capping is commonly noticeable on the top of these hillocks. The low, flat-topped hillocks forming the laterite plateau range in altitude from 30-200m and are observed between coastal low-land and the foothills.

Coastal low-land

Coastal low-land is identified with alluvial plains, sandy stretches, abraded platforms, beach ridges, raised beaches, lagoons and estuaries. The low-land and the plains are generally less than 10m above MSL.

Rivers

Kerala is drained by 44 rivers, many of which orginate from the Western Ghats. Except Kabini, Bhavani and Pambar which are east-flowing, the rest of rivers are west-flowing and join the Arabian Sea. A few of them drain into the backwaters. Most important rivers (with their length in km in paranthesis) of the state, are Chandragiri(105), Valapatnam (110), Achankovil (120) Kallada (121), Muvattupuzha (121), Chalakudy (130), Kadalundi(130), Chaliyar (169), Pampa (176),Bharathapuzha (209) and Periyar (244).

Geology
Geologically, Kerala is occupied by Precambrian crystallines, acid to ultra basic intrusives of Archaean to Proterozoic age, Tertiary (Mio-Pliocene) sedimentary rocks and Quaternary sediments of fluvial and marine origin (Fig.1). Both the crystallines and the Tertiary sediments have been extensively lateritised.

Based on the detailed studies by GSI during the last three decades, the following stratigraphic sequence has been suggested.