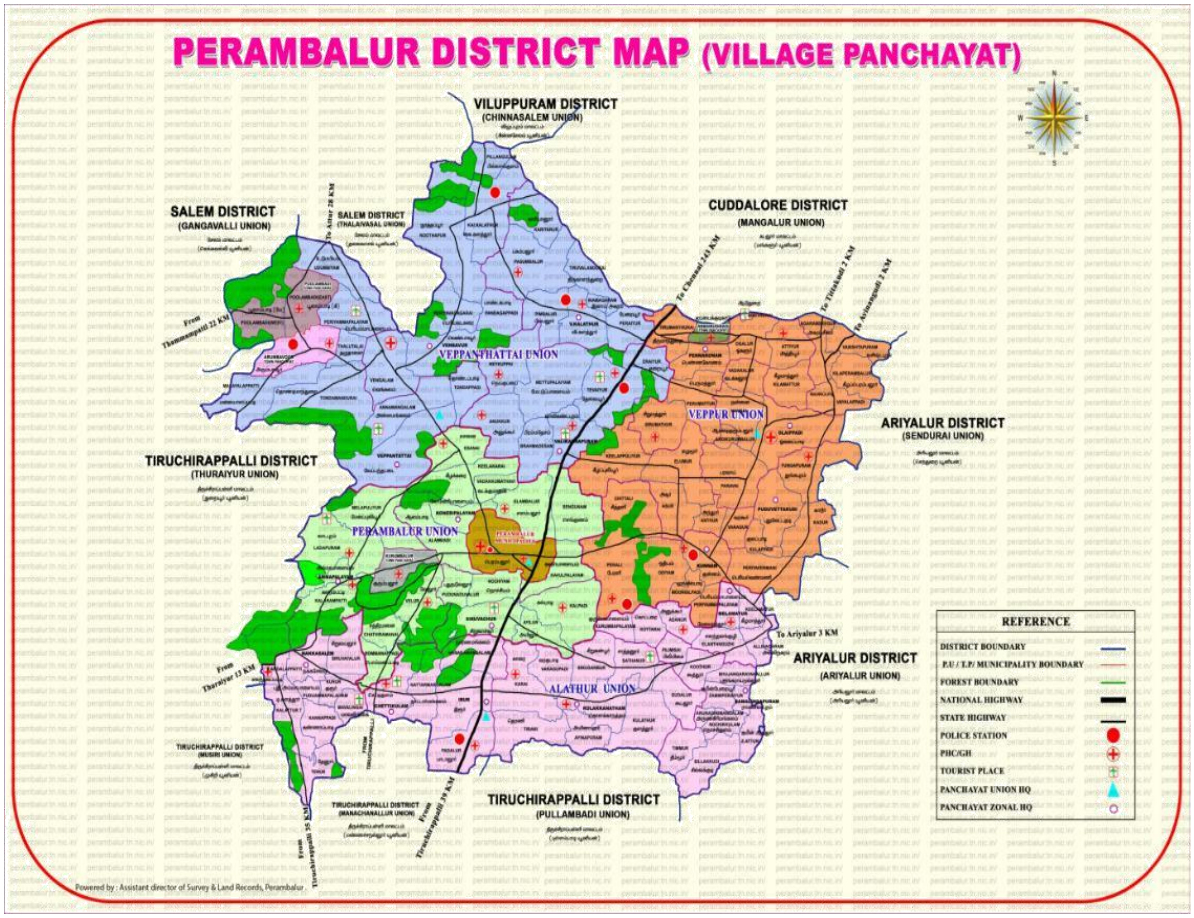
DISTRICT SURVEY REPORT FOR SAND

PERAMBALUR DISTRICT

TAMIL NADU STATE



2019

DISTRICT SURVEY REPORT FOR SAND MINING, PERAMBALUR

1. INTRODUCTION:

In pursuance to the Gazette Notification, Ministry of Environment, Forest and Climate Change, the **Government of India Notification No. S.O.3611 (E) dated 25.07.2018** laidprocedure for preparation of District Survey Report for Mining or River Bed Mining. The main purpose of preparation of District Survey Report is to identify the mineral resources and developing the mining activities along with other relevant data of the District.

2. OVERVIEW OF MINING ACTIVITIES IN THE DISTRICT

Minerals of Economic importance found in Perambalur District are mainly Gypsum, Kankar, varieties of black granites (Dimensional stones), Rough stone(aggregates), limestone, fireclay and gravel/earth. Mining activities based on these minerals are very less. However, numerous Rough Stone quarries are under operation for production of construction materials in Esanai, Kalpadi, Nattarmangalam, Naranamangalam, Padalur in the district. In addition to above, 'Dimensional Stones' (Granite) is also available in Neikuppai, V.Kalathur and Kilapuliyur villages.

Limestone mines are located in the eastern part of the district over the Cretaceous Fomration. Limestone mines are located around Varagupadi, Olaipadi, Perali, Paravoi, Vayalapadi, Kalpadi and Azur villages. Fire clay mines are located mainly around Karai village, Kunnam Taluk. Gypsum mines are not active.

A total of eleven black granite mines (working/non-working) were visited those are located around Naikuppai, Venbavur, V. Kalathur, Chittaly and Keelapuliyur villages.

Sand Quarrying in TamilNadu State

The Government of TamilNadu have inserted rule 38-A into the TamilNadu Minor Mineral Concession Rules, 1959 vide G.O.Ms.No.95 Industries (MMC.1) Department dated 01.10.2003 to the effect that the right to exploit sand in the State shall vest with the State Government ie., Public Works Department. Hence, the Public Works Department alone has been granted quarrying sand in TamilNadu and the Public Works Department is operating the sand quarry from 01.10.2003.

3.List of Mining Leases in the District with location, area and period of validity

Presently no sand mining is active in Perambalur district.

4. Details of production of sand / Bajari / minor minerals in the last Three years

(2016-17 to 2018-19)

Presently no sand mining is active in Perambalur district. However, a study has to be carried out to understand the rate of replenishment of sand along the major rivers (i.e. Vellar) in order to identify the locality for sand excavation.

5. Details of royalty or revenue received in last three years (2016-17 to 2018-19)

--NIL--

6. Process of deposition of sediments in the rivers of the district Vellar of Perambalur District

Peninsular Gneissic Complex– I

A group of gneisses in the central part of Tamil Nadu show a roughly east-west trend and extend from Kerala in the west through parts of Coimbatore, Erode, Salem, Namakkal, Tiruchirapalli and Perambalur districts, to the east coast. The typical exposures of this gneissic group are seen around the Bhavani town and hence these gneisses have been named as 'Bhavani Group' (GSI, 1998). The different constituents of Bhavani Group of gneisses are fissile and banded mica gneiss, quartzo-feldspathic gneiss, augen gneiss, hornblende gneiss, hornblende biotite gneiss, biotite gneiss, etc. They vary in composition and texture. While part of them may represent 'para' and 'ortho' gneisses, part of them are their migmatitic equivalents. Gopalakrishnan et al (1975), who coined the term Bhavani gneiss, considers that these gneisses are comparable to the Peninsular Gneisses of Karnataka and these may be linked geologically and geographically.

Though the Bhavani gneisses have been equated with the peninsular gneisses of Karnataka and kept stratigraphically in between the high-grade schists and greenstone belts, some ambiguity still exists. The distribution of the Bhavani gneisses along and in proximity to prominent shear zones, their

interrelationship with charnockite and the limited geochronological data available indicate that gneisses may, in part or full, represent the retrograded/ migmatised part of charnockite. Some of the workers who mapped the Kollimalai charnockite and the gneisses in the Cauvery valley immediate to the south of Kollimalai and Pachchamalai have considered the gneisses younger to the charnockites (Natarajan and Singanenjam, 1987).

Charnockite Group

The Charnockite Group, comprising of charnockite, pyroxene granulite, banded magnetite quartzite and thin pink quartzo-feldspathic granulite are extensively developed in the north-eastern sector of the state and are well exposed in many prominent hill ranges such as Pallavaram – Chengleput, Javadi, Shevroy, Chitteri and Kalrayan. In central Tamil Nadu Kollimalai and Pachchaimalai hills and Nilgiri hills in west central Tamil Nadu represent Charnockite Group of rocks. The pyroxene granulite of Charnockite Group are considered to represent mafic volcanics, the banded magnetite quartzite indicates a volcanic exhalative origin, while the pink granulite is interpreted to represent the associated acid volcanics (Gopalakrishnan et. Al., 1976, Suganvanam et.al., 1978). In contrast to the essentially.

sedimentary parentage of the Khondalite Group, the Charnockite Group appears to be of igneous / volcanic parentage derivatives.

Charnockite which occur in different provinces of Tamil Nadu are different not only in age and space but also in the geological mileu. The charnockites falling to the north of Bhavani shear zone and west of Mettur

shear zone, (Dimbam-Talawadi and Tattakarai-Tamarakkarai areas) enclose linear bands of fuchsite quartzite, kyanite-sillimatite-garnet schist/gneiss, magnetite quartzite and meta ultra mafics. These charnockites are considered to have been derived from the prograde metamorphism of the Peninsular gneiss and the associated Sargur type supracrustals of Dharwar craton (Srivastava and Kanishkan, 1977). This association is seen in the Nilgiri hills also.

Marine Cretaceous Sediments

The exposures of the marine Cretaceous formation are limited to detached outcropping patches, namely, Thanjavur, Tiruchchirappalli, Vriddachalam in Tamil Nadu and in the Union Territory of Puducherri. The areal extent of the Thanjavur exposure (Vredenberg 1910) is perhaps the smallest (exposures are only from well sections) and poorly known; and the one in the erstwhile Tiruchchirappalli district is the largest and best developed (70 km by 45 km).

Marine Cretaceous rocks distributed in 1) Tiruchirapalli, 2) Vriddhachalam and 3) Pondicherry sub basins have been lithostratigraphically divided into different groups. In Tiruchirappalli sub basin these are divided into three groups viz. 1) Uttattur, 2) Trichinopoly and 3) Ariyalur .In the three sub-basins, these groups are variously classified into different formations lithostrartigraphically and are shown separately in the legend. The different formations in the three sub-basins are not mutually correlated.

In the Tiruchirapalli sub-basin, the Uttattur Group is divisible into Lower Arogyapuram Formation(Albian), middle Maruvattur Formation (Late Albian) made up of limestone, mud and clay and Upper Karai Formation (Late Albian – early Turonian) consisting of gypseous clay and sandstone with lenses of limestone. The Maruvattur Formation is also termed as Dalmiapuram Formation (Sundaram et. al. 2001). The limestone is fossiliferous with abundant lamellibranchs, gastropods and lesser association of corals. Sastry et. Al, 1968) delineated the Uttatur Group into three zones viz., Scholenbachia inflate zone, Calycoceras newboldi zone and Mammites conciliatum zone based on the study ofammonites and suggested an age range form Albian to Lower Turonian. Lower and middle parts of Karai Formation contain rich Late Albian and Cenomanian fossils respectively (Sastry et al., 1968, Ayyasami 1990). Its upper beds contain ammonites of Early Turonian age. Venkatachalapathy and Ragothaman (1995) suggested Late Aptian or Early Albian to Late Turonian.

Trichinopoly Group is divided into Kulakkalnattam Formation (Turonian) made up of sandstone and clay with shell limestone and calcareous limestone, overlain (late Turonian to Conacian) by Anaipadi Foramtion comprising shale, silt, limestone and sandstone with bands of calcareous grit. The famous 26 m long fossil tree in Sattanur village discovered by Dr. M.S. Krishnan in 1940 preserved in the lower beds of Kulakkkalnattam Formation and the giant ammonites preserved in Anaipadi Formation are characteristic features of this group. The coquinite which is

popularly known as Trichinopoly marble is light to dark grey and carries lamellibraches and gastropods of varied sizes in abundance; occasional ammonites are also found. Anaipadi Formation is richly fossiliferous with plenty of molluscan fauna and ammonites, particularly Lewiceras and Eutrephoceras. One of the best fossil localities is the nala section east of Anaipadi village. The lower member of the Anaipadi Formation more or less corresponds with Lewessiceras vaju zone and Kossmaticeras theobaldianum zone (dated upper Turonian) and Conacian by Sastry et al (1968)). The upper member contains a less diverse ammonite fauna, assigned to the Plaenticeras tamulicum zone and placed at Santonian.

The Ariyalur Group (Ka) rest over the Trichinopoly Group with an unconformity and is essentially made up of sandstone, limestone and shale. This group is divided into Sillakkudi (Santonian to Campanian) Kallankurichci (early Maastrichtion) and Kallamedu Formations (Mid and late Maastrichtian) in the ascending order (Sundaram, 1976, 1977 and Sundaram and Rao, 1981, Sundaram e et. al. 2001). The Sillakudi sandstone is fossiliferous; giant sized inoceramus fossils are preserved besides ammonites like Hauericeras. Biostratigraphically the Sillakkudi Formation is recognised as Karapadites Karapadense Zone by Sastry et al (1972) and was assigned Campanian age. Fossils commonly noticed in Kallankurichi Formation are gryphea, inoceramus, pycnodonte and bryozoans. Ammonites (Hauericeras rembda) indicate a Maastrichtian age (Ayyasami 1990, Sastry et al 1968). In Kallamedu Formation, fossils (lamellibranches, rudistids, echinoids and bryozoans) are commonly found around Ootakkovil village. In the higher

horizons fossils are very rare. Dinosaurian remains are reported from the sandstone beds in the vicinity of Kallameduvillage. Fossils ammonites and rudistids indicate Maestrichtian age (Ayyamsami 1990). Planktic foraminifera indicate a late Maastrichtian age. In this basin, the beds in general are sub horizontal to low dipping (5-15) towards ESE.

MINERAL WEALTH OF THE DISTRICT

In Perambalur District Minerals of Economic importance are mainly Gypsum, Kankar, varieties of black granites (Dimensional stones), rough stone (aggregates), limestone, fireclay and gravel/earth.

Sedimentary Limestone:

In Tiruchirapalli and Perambalur the non-crystalline limestone deposits occur over an area of 400 sq km in Cretaceous and Paleocene sediments between River Coleroon in the south and Vellar in the north. All along the western contact with the Archaeans there are a number of small but scattered deposits of reefoidal limestone of Cretaceous age starting from Olaippadi in the north to Tirupattur in south, at Kallai, Paravay, Pudur, Andur, Maruvattur, Kalpadi, Varugapadi, Karai, Terani, Neykulam and Tirupattur. Along the southern boundary of the Cretaceous rocks reefoidal limestone and other clastic limestones are found near Dalmiapuram in the villages of Pullambadi and Kallakudi. Further northeast of Dalmiapuram, limestone is found around Kilpaluvur in the Sillakkudi Formation of Ariyalur Group occurring in juxtaposition with the crystalline rocks of Archaean age. The limestone extends over a strike length of 6 km. with an outcrop width of

200 to 700 m. Potential reserves are likely to be above 6-8 million tonnes. Analyitcal data indicate CaO content of the order of 40-45% and R2O3 content of 4-6%.

Black granite:

The basic dykes intruded in the Bhavani Group of rocks forms the major source for the black granite resource in the district. The basic dykes are mainly Dolerite in composition and trendes along the NE-SW direction the width of the individual dyke's ranges from 10-15 m with limited exposure of length along the strike.

Rough stone quarry:

The chornockite covers significant aerial extent of the district and becomes major production for gravel and building material. The Chornockite is mainly bluish grey in colour fine to coarse grained and occasionally contains visible garnets at places. The Chornockite forms small hillocks/mounts in the western part of the District.

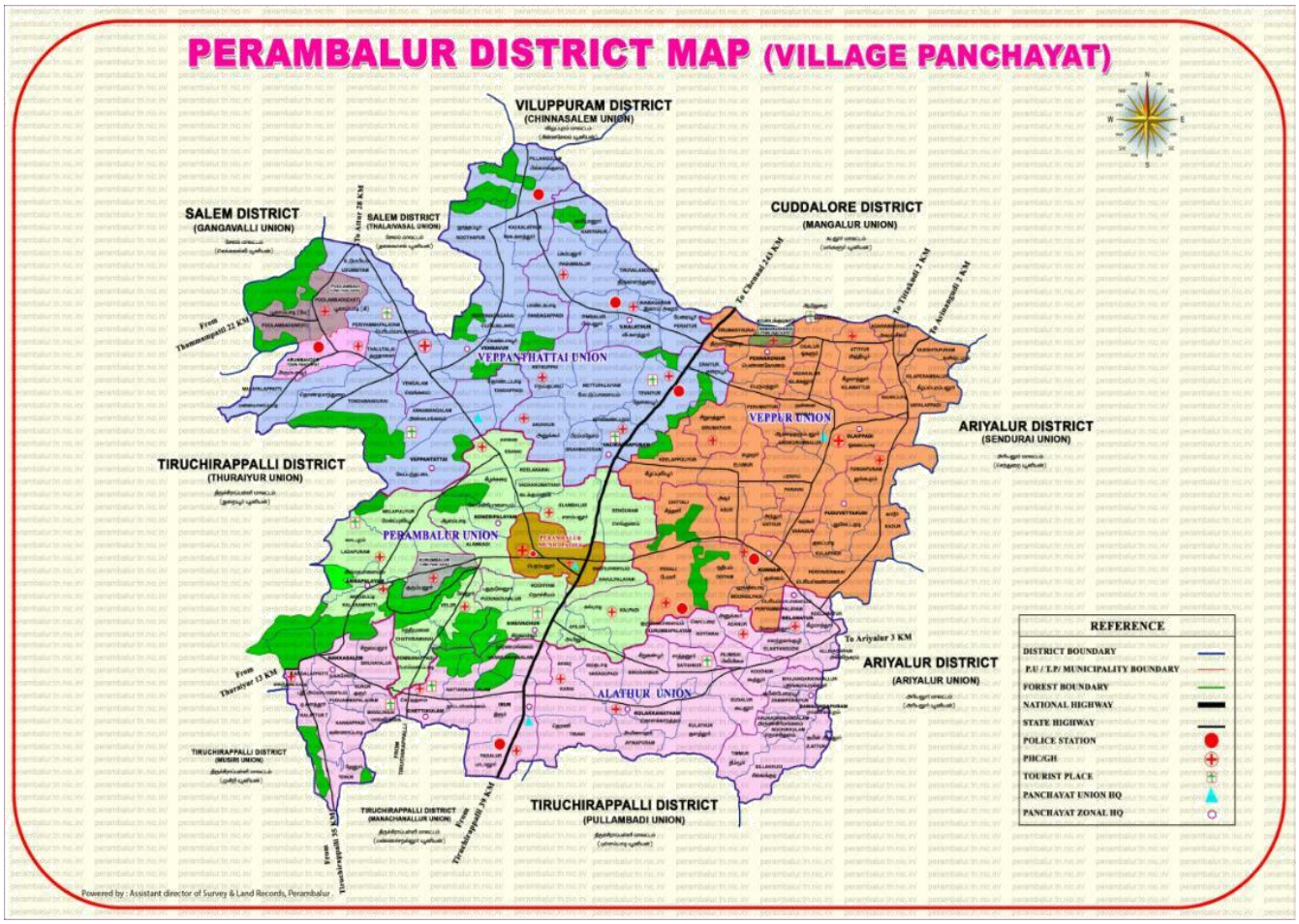
Gypsum

The most important deposits of gypsum in Tamil Nadu occur in Perambalur and Lalgudi taluks in the 'bad land' between Chittali (11°15' : 78°59') in the north and Tappay (10°50' : 78°55') and Periakurukkai (11°02': 79°50') in the south in an area of 56 sq. km. Gypsum occurs in the clays as disseminated crystals and in undulating layers, rarely exceeding 3.04 to 4.58 m. in length with thickness varying from 0.6 to 12.5 cm.

Analyses of samples show CaSO4, 2H2O content from 81.44 to 87.14%. It generally varies from 1.25 to 3.1% by volume of the strata in which it is enclosed. The reserves estimated are of the order of 15.60 million tonnes within a depth of 16 m. The State Geology Department, Govt. of Tamil Nadu, carried out investigation of the gypsum bearing Cretaceous strata of Lalgudi and Perambalur taluks and assessed reserves of the order of 13.90 million tonnes for a depth of 15 m.

7. General Profile of the district

The composite Tiruchirappalli District was trifurcated into three districts with effect from1.10.1995 (G.O.Ms.No.913 Revenue (Y3) Department, dated 30.9.95) as follows:-ThiruchirappalliPerumbiduguMuthirayar District with headquarters at Tiruchirappalli.-KarurDheeranChinnamalai district with headquarters at Karur.-Perambalur Thiruvalluvar District with headquarters at Perambalur. Again, the Government of Tamil Nadu, asper the G.O. Ms .No. 657, Revenue RA I(1)Department, dated 29.12.2000, the Perambalur Thiruvalluvar District was bifurcated into two Districts with effect from 1.12.2001; Perambalur District with headquarters at Perambalur and Ariyalur District with headquarters at Ariyalur. Perambalur consists of one Revenue Division of Perambalur and four Taluks of Perambalur, Kunnam,Veppanthattai and Alathur.



LOCATION

With an geographical area of 1757 sqkms, Perambalur district is centrally located in the State, 267 kms away from Chennai on the southern direction. The district lies between 10° 54" and 11° 30" degree northern latitude and 78° 40" and 79° 30"degree eastern longitude. The district is boundedon the north by Cuddalore and Salem districts, southand west by Tiruchirappalli district and east by Ariyalur district (Fig. 1).It is an inland district without coastal line. The District has Vellar River in the North and it has well marked natural divisions. The Pachamalai hill situated on the North boundary of Perambalur is the most important hill in the district.

Area and Population

According to 2011 census, Perambalur district had a population of 565,223 with a sex-ratio of 1,003 females for every 1,000 males, much above the national average of 929. A total of 59,567 were under the age of six, constituting 31,135 males and 28,432 females. Scheduled Castes and Scheduled Tribes accounted for 33.01% and .46% of the population respectively. The average literacy of the district was 66.49%, compared to the national average of 72.99%. The district had a total of 149,243 households. There were a total of 299,726 workers, comprising 107,542 cultivators, 91,135 main agricultural labourers, 4,365 in house hold industries, 52,055 other workers, 44,629 marginal workers, 9,762 marginal cultivators, 27,143 marginal agricultural labourers, 978 marginal workers in household industries and 6,746 other marginal workers.

Administrative set - up

Perambalur District consists of one Revenue Divisions viz., Perambalur, Four Taluks viz., Kunnam,Perambalur, Veppanthattai and Alathurcomprising of 152 Revenue Villages. The District has four blocks viz. Veppur, Perambalur, Veppanthattai and Alathurcomprising of 121 Village Panchayats. There are One Municipality viz. Perambalur and Four Town Panchayats viz. Arumbavur, Kurumbalur, Labbaikudikadu and Poolambadi.

The District is fairly rich in mineral deposits. Lime Stone, Shale, Sand Stone, Kankar and Phosphate nodules occur at various places in the district.

A good deal of building stone (rough stone) is quarried in Perambalur, Kunnam and Veppanthattai and Alathur Taluks.

Sugarcane is grown as a major commercial crop. The Public Sector factory Perambalur Sugar Mills at Eraiyur is functioning in the district with a crushing capacity of 3000 Tonnes per Day. The pre-dominate soil in the district is red sanding with scattered pockets of black soil . The soil in the district is best suited for raising dry crops. The district has a high means of temperature and low degree of humidity.

Perambalur is an important road junction on the Chennai –Madurai National Highways (NH-45). The District has well knit road system connecting various important centres in the region.

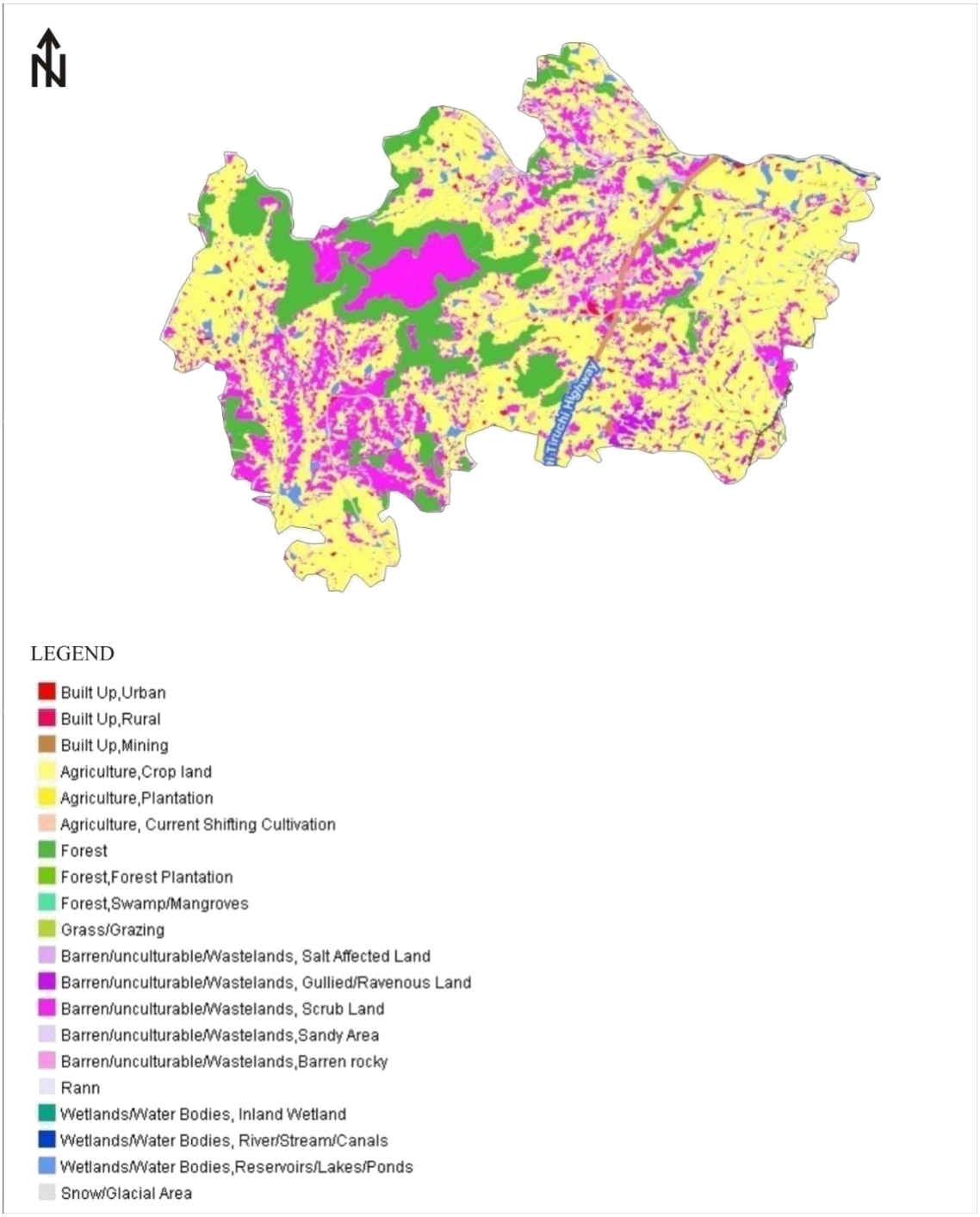
8. LAND UTILISATION PATTERN

According to the village record data provided by the revenue authorities, the total geographical area of the district is 175736 hectares. Out of this, only89127 hectares (50.72%) were Net area sown. 26268hectares (14.94%) were kept as fallow lands. The lands put to non-agricultural purposes occupy 26890(15.30 %) hectares (Table 1 and Fig. 3). The cultivable wastelands of 2687 (1.53%) hectares can be brought in to agricultural uses by suitable measures.

Details of land use pattern in Perambalur district.

Categories	Area (in Hectares)
Forests	16506.94
Area under Non-agricultural Uses	26889.97
Barren and Un-cultivable land	2686.74
Permanent Pastures and Other Grazing Lands	152.25
Land Under Miscellaneous Tree Crops etc.	1290.69
Culturable Waste Land	4930.03
Fallow lands other than current fallows	10198.75
Current Fallows	16069.10
Net Area Sown (Rural)	89126.26
Total (Rural)	167850.73
Total Irrigated Land Area sown	24727.74
Total Un-irrigated Land Area sown	64398.52

Source : District Census Handbook, Perambalur, 2011



Land utilisation pattern of Perambalur district.

Objective:

To function as an advisory to the farmers in their day to day agricultural activities, supply of quality seeds, monitoring and making available quality chemical fertilizers, bio fertilizers, bio pesticides besides making available

the latest technologies from research institutions with a view to increase the food production and raw material production to cater to the growing needs of the food for the population and raw materials for the industries.

Aim:

1. To sustain the Agricultural cropping Area.
2. To increase the Production and Productivity
3. Double the production and triple the income of the farming community.

8.a. Flora and Fauna :

The Flora and Fauna of the district are fairly rich and varied. As regards Fauna, big animals like Elephants and Bisons are not found in the district whereas spotted deer wild boars, Peacocks, Common monkeys, Jackals, Poisonous and non poisonous snakes etc.

8.b. Tourist Interest:

Ranjankudi Fort is located about 17 Kms north of Perambalur . The Fort was built by Jaginthar under Nawab of Carnatic in the 17th century AD. The Fort was the scene of battle of Valikondah between the British and Mohamed Ali on one side and Chandha Sahib and the French on the other side in 1751 AD. This Fort is under protection of Archaeological Survey of India.

The ancient Arulmigu Ekambareswarar and Thandayudhapani Swamy Temples are situated in Chettikulam village and was built by King Kulasekara Pandiyan 800 years ago. Thai Poosam festival and Panguni

Uthiram festivals are celeberated in a grand manner.Mathura Kali Amman at Siruvachur is one of the most popular shrine in the district. The presiding deity of the temple is known as Sri. Madura Kali Amman. She is one of the forms of Kali.

8.c. Fossil tree at Sathanur :

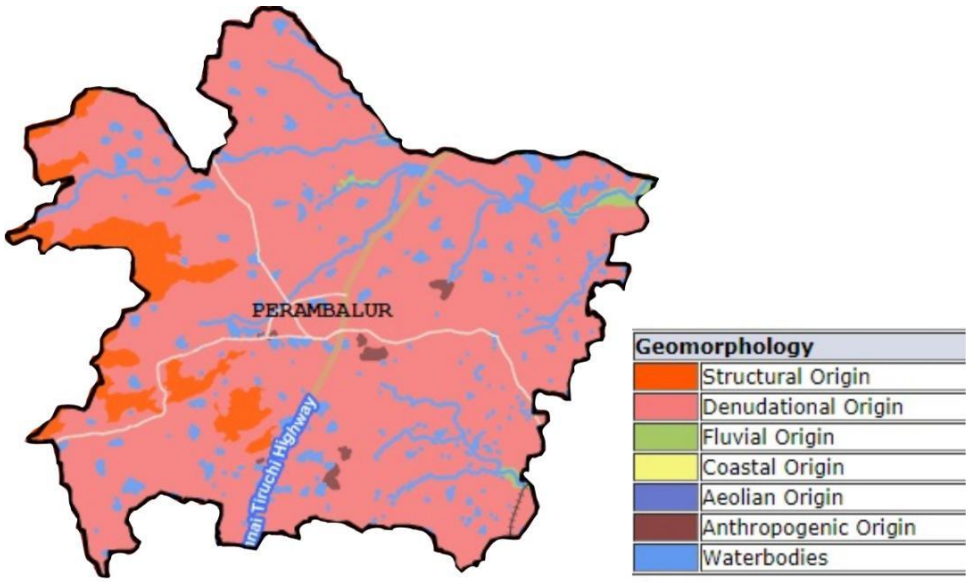
Geological study shows that more than 120 million years ago, the sea (which lies today about 100 km. East of Sathanur) had transgressed as far as 8 to 10 Km West of Sathanur. During this period which is Geologically known as the cretaceous, the sea abounded in a variety of marine animals similar to those found in the present day sea. These animals, after death, sank to the bottom and were buried by sands and clays brought down by the rivers. Along with them some of the trees which flourished on the seacoast or near shore were also buried after transport by flooded streams and were petrified in course of time. The large trunk of a petrified tree, which can be seen here, lies within the Trichinopoly group of rocks of about 100,000,000 years ago. This tree shows the presence of Conifers (The non flowering plants) that dominated the land vegetation prior to the advent of Angiosperms (the flowering plants of the present of day).

The petrified tree trunk at Sathanur measures over 18 metres in length. Similar fossil trees measuring a few meters in length are found along the stream sections near Varagur, Anaipadi, Alundalipur and Saradamangalam. Dr.M.S.Krishnan of the Geological Survey of India first

reported this fossil tree in 1940.This Fossil Tree is an important tourist site of the District.

9. PHYSIOGRAPHY OF THE DISTRICT

The district has no coastline. The Vellar river flow in the north and has no well-marked natural divisions. The Pachamalai hill situated on the north of Perambalur is the most important hill in the district. The average height of the hill is 610 metres though a few of its peaks rise to about 1036 meters above the mean sea level. Mostly, the district is dry. Pachamalai (hill) which spread over with a few places on high ranges is a haven for the tribals of this region. Pachai means 'green' and malai means 'mountainor hill'. Myluthu falls is located on the foot hills of Pachamalai, a place of scenic beauty. It is about 15kms away from Perambalur. The major part of the district is an undulating pediplain with 'inselbergs' and residual hills (Fig. 4).



Geomorphological map of the Perambalur district.

10. RAINFALL DATA MONTH-WISE

Perambalur district experience mostly hot weather although the year. The mean maximum actural temperature varies from month to month, the highest was recorded during May 2011 with 38.9degree celsius. The district has a high mean temperature and low degree of humidity. Even though the region does not have an extreme climate, the summer months are quite hot and the difference between maximum and minimum temperature is moderate. With little moisture during the early months of the year, the atmosphere is dry. The winter season is pleasant and enjoyable. By March, the Mercury acquires an uptrend and the temperature increase during the course of time. This trend of the barometer indicates the ushering of summer with its hot days. The hot season continue until the southwest monsoon sets in. With the effect of northeast monsoon during Oct-Dec, the district receives the highest rainfall.

The average rainfall in the district reported high compared to the State average. The average normal rainfall in the State during 2010-11 was 911.6mm, less than the average normal rainfall of Perambalur district (1019.4 mm) during the same period. In 2010-11, the district had received 815.4mm of actual rainfall. The precipitation level during northeast monsoon, southwest monsoon and remaining winter and hot weather periods account for 47%, 37% and 16% respectively. The table (Table 2) below gives the actual and normal rainfall (mm) in the district during the south-west, north-east monsoon, winter and hot weather seasons during 2009-10.Rainfall in the district, month wise is given table-3.

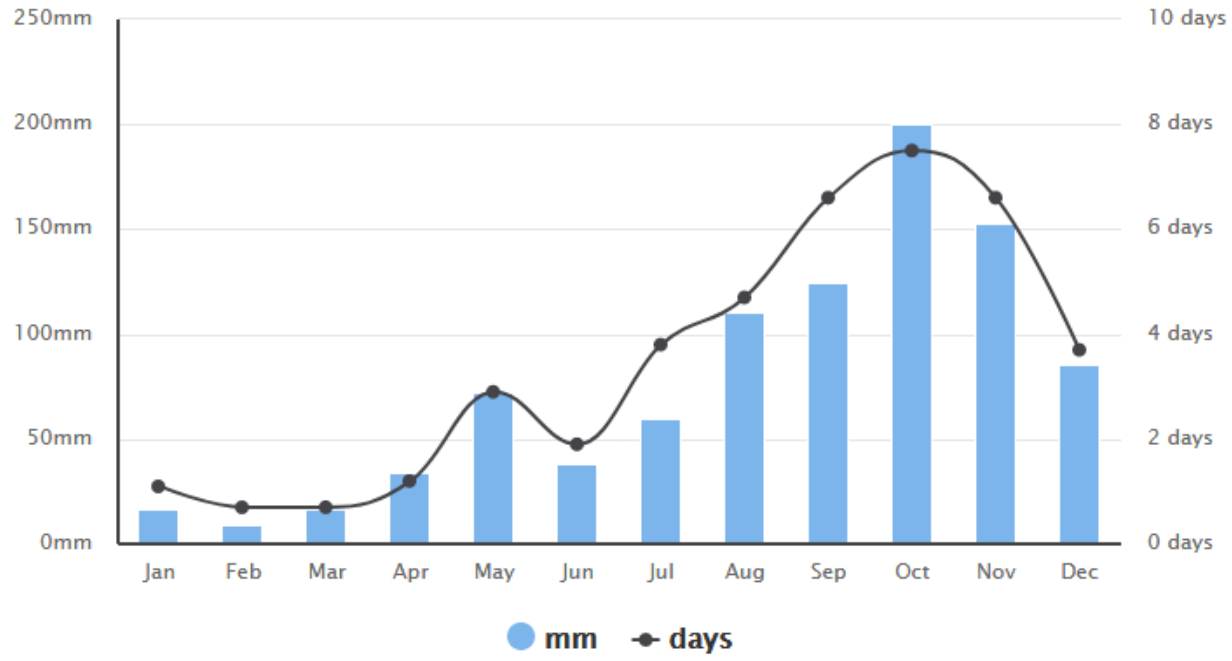
The actual and normal rainfall (mm) in the district.

Seasons	Actual	Normal
SW Monsoon (Jun '09 - Sep '09)	210.4	349.6
NE Monsoon (Oct '09 - Dec '09)	435.3	449.6
Winter Season (Jan '10 - Feb '10)	32.5	34.5
Hot Season (Mar '10 - May '10)	82.0	120.6

Rainfall data of t

YEAR		2012	2013	2014	2016
JAN	R/F	0	0.8	0	0
	%DEP	-100	-94	-100	-100
FEB	R/F	0	12.3	0.3	0
	%DEP	-100	48	-96	-100
MAR	R/F	0	10.3	0	0
	%DEP	-100	-19	-100	-100
APR	R/F	44	16.4	0	0
	%DEP	43	-47	-100	-100
MAY	R/F	34.4	33.9	182.7	168.5
	%DEP	-47	-48	179	158
JUN	R/F	3.1	20.8	23.6	42.5
	%DEP	-90	-36	-28	30
JUL	R/F	64.5	5.5	47.5	96.8
	%DEP	28	-89	-6	92
AUG	R/F	31.5	160	167	47.3
	%DEP	-62	95	104	-42
SEPT	R/F	50.5	153.8	44.8	84.3
	%DEP	-60	22	-64	-33
OCT	R/F	198.1	125.3	241.7	63.6
	%DEP	4	-34	27	-67
NOV	R/F	68.5	146.5	58.9	29.3
	%DEP	-56	-5	-62	-81
DEC	R/F	3.5	40.3	45.3	34.3
	%DEP	-96	-58	-52	-64

Perambalur district during 2012-2016.

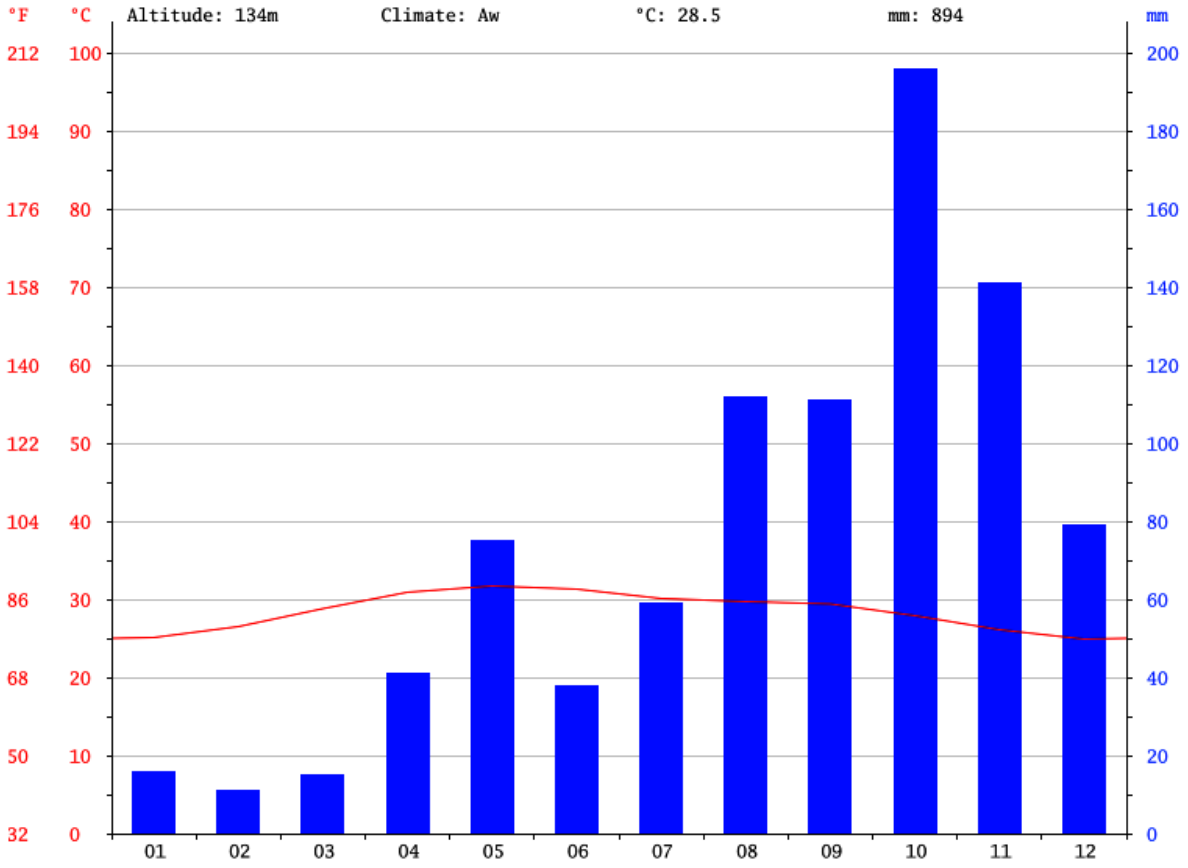


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
inches	0.6	0.4	0.6	1.3	2.8	1.5	2.4	4.4	4.9	7.9	6	3.4
Rainy days	1	1	1	1	3	2	4	5	7	8	7	4

11. Climatic Characteristics: Humidity and Wind of Perambalur District

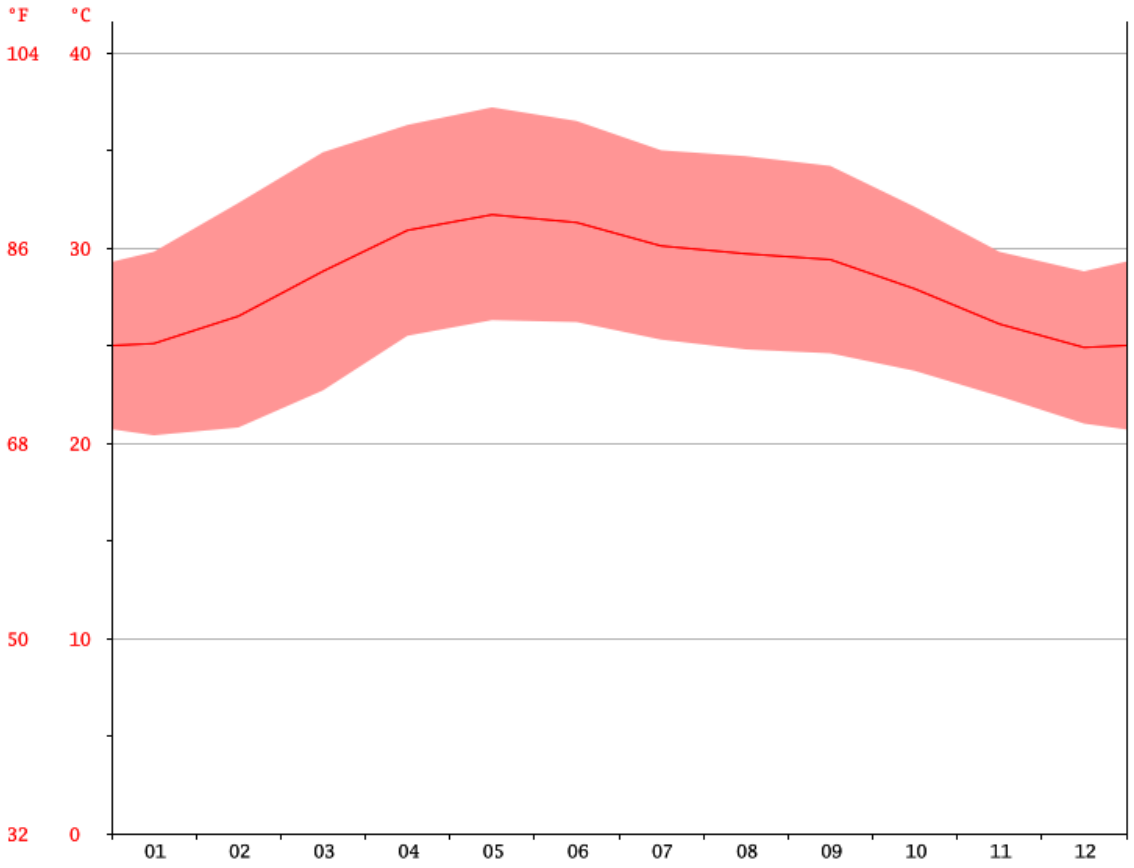
This city has a tropical climate. In winter, there is much less rainfall in Perambalur than in summer. This climate is considered to be Aw according to the Köppen-Geiger climate classification. The temperature here averages 28.5 °C. About 894 mm of precipitation falls annually.

11.a.Climograph of Perambalur District



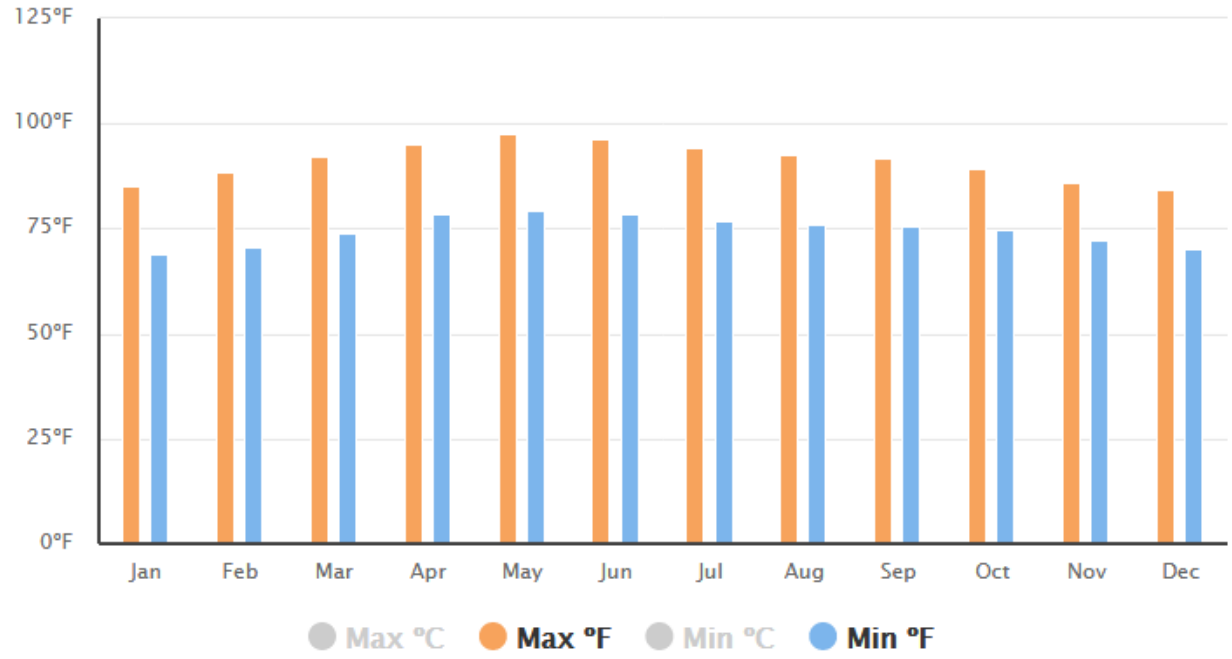
The least amount of rainfall occurs in February. The average in this month is 11 mm. With an average of 196 mm, the most precipitation falls in October.

11.b.Temperature graph Perambalur



The temperatures are highest on average in May, at around 31.7 °C. December has the lowest average temperature of the year. It is 24.9 °C.

The graph below shows the daily range of temperatures for each month.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min °F	69	70.7	74	78.5	79.2	78.3	77	75.9	75.6	74.7	72.1	70.3
Max °F	77	79.5	83.1	86.9	88.3	87.3	85.6	84.4	83.7	81.9	79	77.2

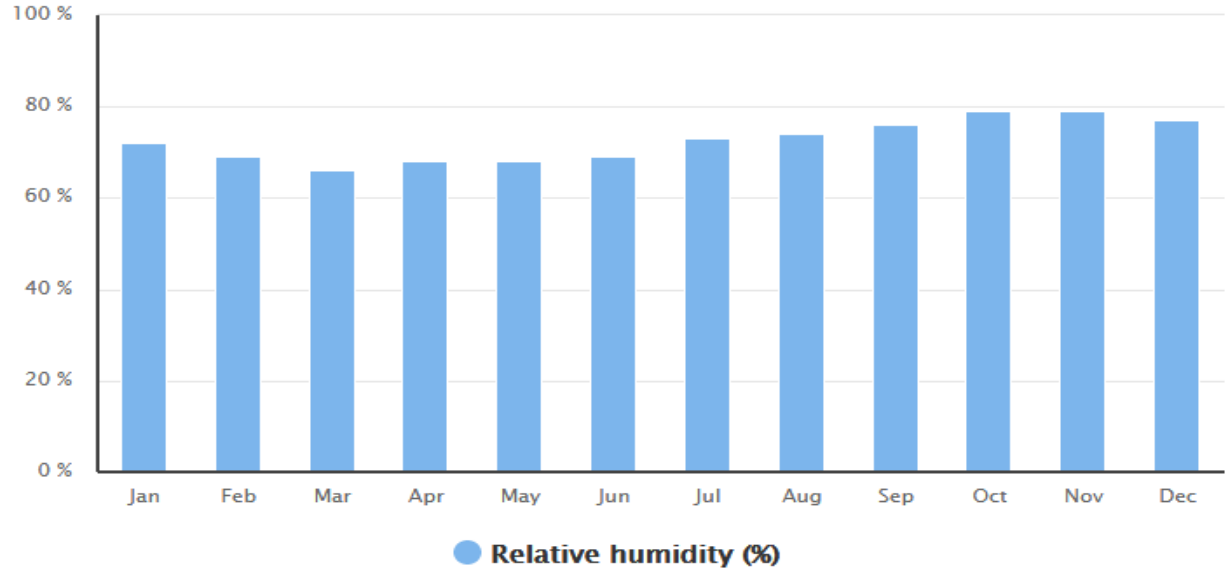
11.c.Perambalur Weather by month // weather averages

	January	February	March	April	May	June	July	August	Septem-ber	October	Novem-ber	Decem-ber
Avg. Temperature (°C)	25.1	26.5	28.8	30.9	31.7	31.3	30.1	29.7	29.4	27.9	26.1	24.9
Min. Temperature (°C)	20.4	20.8	22.7	25.5	26.3	26.2	25.3	24.8	24.6	23.7	22.4	21
Max. Temperature (°C)	29.8	32.3	34.9	36.3	37.2	36.5	35	34.7	34.2	32.1	29.8	28.8
Avg. Temperature (°F)	77.2	79.7	83.8	87.6	89.1	88.3	86.2	85.5	84.9	82.2	79.0	76.8
Min. Temperature (°F)	68.7	69.4	72.9	77.9	79.3	79.2	77.5	76.6	76.3	74.7	72.3	69.8
Max. Temperature (°F)	85.6	90.1	94.8	97.3	99.0	97.7	95.0	94.5	93.6	89.8	85.6	83.8
Precipitation / Rainfall (mm)	16	11	15	41	75	38	59	112	111	196	141	79

The variation in the precipitation between the driest and wettest months is 185 mm. During the year, the average temperatures vary by 6.8 °C.

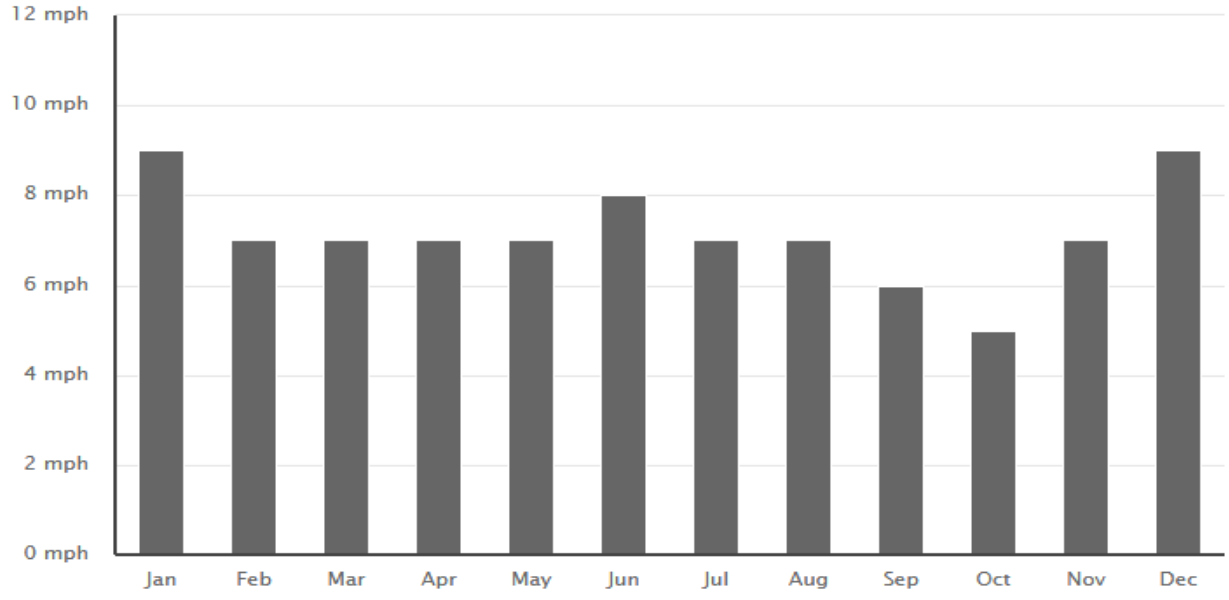
11.d.Humidity

The graph below shows the average relative humidity.



Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
72%	69%	66%	68%	68%	69%	73%	74%	76%	79%	79%	77%

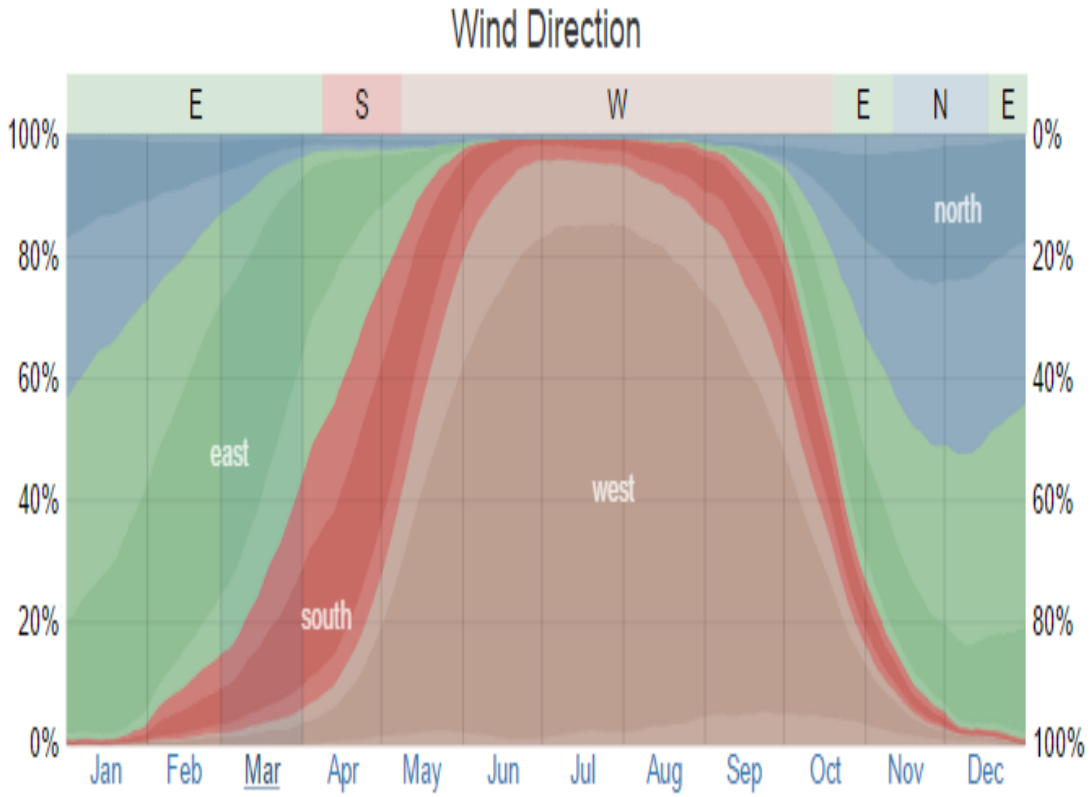
11.e.Wind:-



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
mph	9	7	7	7	7	8	7	7	6	5	7	9

A monthly average windspeed of over 16km/h or 10mph suggests a location is fairly windy.

11.f.Wind direction diagram



The percentage of hours in which the mean wind direction is from each of the four cardinal wind directions (north, east, south, and west), excluding hours in which the mean wind speed is less than 1 mph. The lightly tinted areas at the boundaries are the percentage of hours spent in the implied intermediate directions (northeast, southeast, southwest, and northwest).

12. Methodology And Guiding Principles

The trace of each and every river/ stream was covered and studied on the following principles of Geology/River bed mining:

- The general geology of the area;
- The presence of any major geological structure;
- Origin of river;
- Pattern of primary / secondary/ tertiary streams;

- Total catchments;
- General profile of river/streams;
- Meandering Pattern;
- Bank stability;
- Total potential of river bed in reference to minor mineral;
- General slope of the river / stream;
- Morphogenetic regions.

In Addition to above, presence of the following objects were also studied:-

- The presence of any WSS Schemes
- Bridges
- Agriculture fields
- Bank protection works
- Plantation etc.

Following are the important guiding principles considered while recommending the river / stream bed or part of the river / stream bed for collection for minor minerals:-

- The production of aggregate area is a function of the availability of natural resources, the size of population, the economy of the area and various developmental and infrastructural works being undertaken in the area like road construction, hydro-electric projects etc. Further, being a low- value, high-volume mineral commodity, the prices are dramatically affected by transportation distances. If the distance

increases, the transportation cost may increase much more than the cost of the aggregates.

- A stable river is able to consistently transport the flow of sediments produced by watershed such that its dimension (width and depth) pattern and vertical profile are maintained without aggrading (building up) or degrading (scouring down)
- The amount of boulders, cobbles, pebbles and sand deposited in riverbed equals to the amount delivered to the river from watershed and from bank erosion minus amount transported downstream each year.
    - It is compulsive nature for river to meander in their belts and therefore they will have to be provided with adequate corridor for meandering without hindrance. Any attempt to diminish the width of this corridor (floodway) and curb their freedom to meander would prove counterproductive.
    - Erosion and deposition is law of nature. The river/stream has to complete its geomorphological cycle from youth, mature to old age.
    - River capturing is unavoidable.
    - Erosion in upstream and deposition in downstream.
    - Tendency of the river / stream toward grade.
    - Fundamentally, the lowest point of any stream is fixed by Sea Level.
    - The ratio between the width of meander belt and width of the stream decreases as the width of the stream increases.

- Formation, Bank erosion and Replenishment of any specific riverbed depends **Primarily** upon:
  - The Geology of the area;
  - River Profile;
  - Nature of source;
  - Rainfall in catchments;
  - Morphogenetic region;
  - Catchments geomorphology;
  - Efficiency of River / Stream (i.e erosive power);
  - The competency of the river / Stream (i.e transport heaviest stone);
  - The capacity of the River/Stream (i.e volume of transportation);
  - Hydraulic radius of the River / Stream (ratio between cross sectional area and length of wetted perimeter)

  Secondarily upon:
  - Geological structures;
  - Porosity of formation;
  - Run off in the catchments;
  - Forest cover;

In addition to the above following man made factors are also involved.

- Type of agriculture;
- Encroachment on flood plain leaving least space for meandering;
- Any barrier on river / stream bed i.e banks , dams and bridge foundations etc;

- Throwing of debris into the river/stream course;
- Drying up of river courses due to construction of dams, thereby reducing the efficiency and capacity of the river / stream.

The total potential of the river / stream bed is calculated up to the depth of one meter and in the workable span. Total potential or annual replenishment is not necessarily mineable. Mine ability depends upon the availability of approachable roads, distance from the general conditions of policy viz distances from WSS Schemes, bridges etc and overall on the market demand etc. Thus keeping these factors into consideration 60% of the total potential has been taken for the purpose of exploitation of minor minerals.

13.a.Method For calculation of Reserves:

For the calculation of total reserves of minor minerals available in the river bed, length, average width and depth of the river bed for which the exploitation is to be carried out / allowed under rule / prevailing instructions of the Govt. was taken into consideration. The volume thus obtained is multiplied with the bulk density which has been assumed as 1.65 for all types of minor minerals.

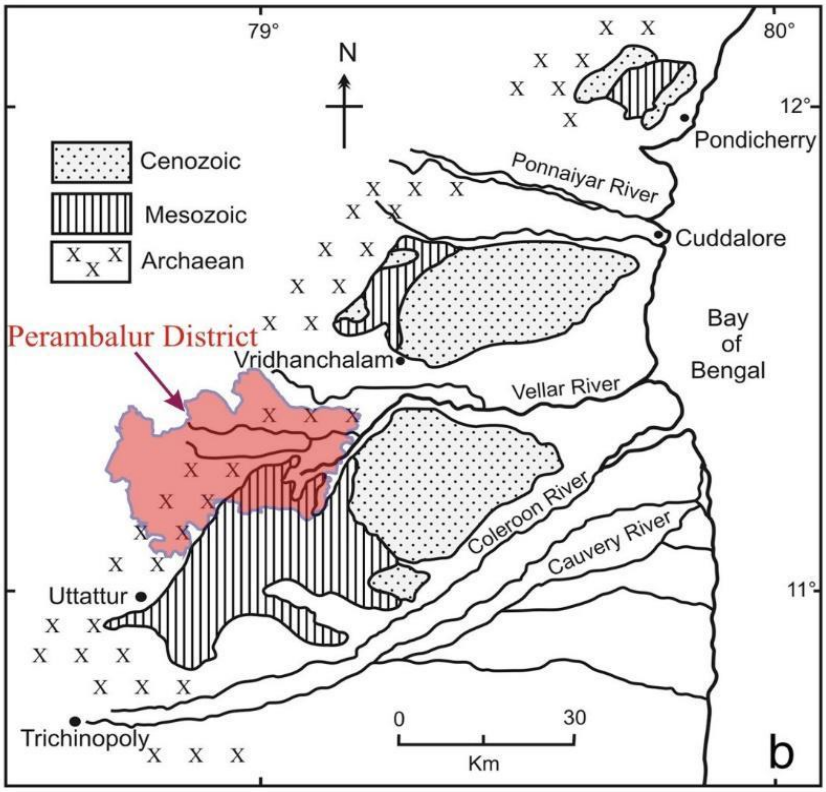
Thus reserves up to particular datum line i.e one meter below the surface have been calculated.

Total reserves of minor minerals (M.T.)= Length x Width x Height i.e Depth x Density.

For the annual replenishment of minor mineral reserves, the average annual mean depth up to which the replenishment of minor mineral takes place annually, has been taken into consideration which depends upon the annual rainfall factor and geology of the catchments area.

13. GEOLOGY AND MINERAL WEALTH OF THE DISTRICT:

The north and western part of the district is mainly covered (> 80 %) with Archaean rocks and is mainly comprises of Hornblende Gneiss and Chaornockite and the eastern part is covered with cretaceous sediments (Fig. 5). The Sathyamangalam rocks are distributed along the east-west tract in central Tamil Nadu confined between Bhavani – Attur lineament in the north and Noyil – Cauvery lineament in the south (Subramanian and Selvan, 2001). Similar rocks are also known in the northwestern part of the state in Dharmapuri district. The equivalents of Sakarsanahalli (Sargur) supracrustals are described in Dimbam–Tattakarai areas of Kollegal – Krishnagiri terrane (GSI, 1998).Though the Sathyamangalam Group of rocks are said to be exposed within the Bhavani gneiss in the E-W trending belt in central Tamil Nadu in parts of Coimbatore, Salem, Namakkal, Perambalur and Tiruchirapalli districts.



Geological map with location of the Perambalur district.

(a). DISTRICT WISE DETAIL OF RIVER OR STREAM AND OTHER SAND SOURCES

1) Vellar River

Vellar is a river which originates in the Shevaroy Hills and runs through the districts of Salem, Perambalur and Cuddalore in the northern part of the Indian state of Tamil Nadu before draining into the Bay of Bengal near Parangipettai.The total length of the Vellar River is about 150 kilometres (93 mile). The total area of the basin is 7,520.87 square kilometres (2,903.82 sq mile). The Vellar river basin is in the northern part of Tamil Nadu State in South India. This basin is between the Ponnaiar, Paravanar and Cauvery river basins. The terrain lying in the Kalrayan hills, Attur Taluk of Salem District is drained by river upper

velar, Vasis ta Nadhi known as Upper Vellar joined with to form the Vellar in the Perambalur Taluk of Permabalur District.The river Vellar has six named tributaries. They are Anaimaduvu, Swethanadhi, Kallar, Chinnar, Manimukthanadhi, and Gomukhi.

A portion of Dharmapuri, Salem, Namakkal, Perambalur, Trichy, Villupuram and Cuddalore districts fall within the Vellar river basin. Manimukthanadhi, which is the major tributary, also originates from Kalrayan hills in Villupuram district, traverses about 111 kilometres (69 mile) and joins Vellar near Srimushnam in Chidambararm taluk of Cuddalore District. Upper Vellar drains the water from the southern slopes of the Kalrayan hills on the northern boundary of Attur Taluk of Salem district. It originates at an elevation of 1,266 metres (4,154 ft) above mean sea level. At its starting point, it is known as Anaimaduvu River and flows southwards for 23 kilometres (14 mile) and then south-east.

One reservoir constructed across Anaimaduvu River is called Anaimaduvu reservoir. Just 3 kilometres (1.9 mile) below this point another tributary known as Thumbal River, formed by two drainages viz., Karyakoil river and Ammapalayam river flowing southwards from Kottaipatti pass on the Kalrayan hills, joins on the left flank. Another stream called Periyar originating in Jalluthu Reserve forest just 8 kilometres (5 mile) east of Salem taluk joins this stream. As Periyar River approaches Salem - Attur road it bends eastwards and receives on the south, the Singipuram River. Vasistanadi then flows towards southeast for about 26 kilometres (16 mile) along with boundary between Attur and

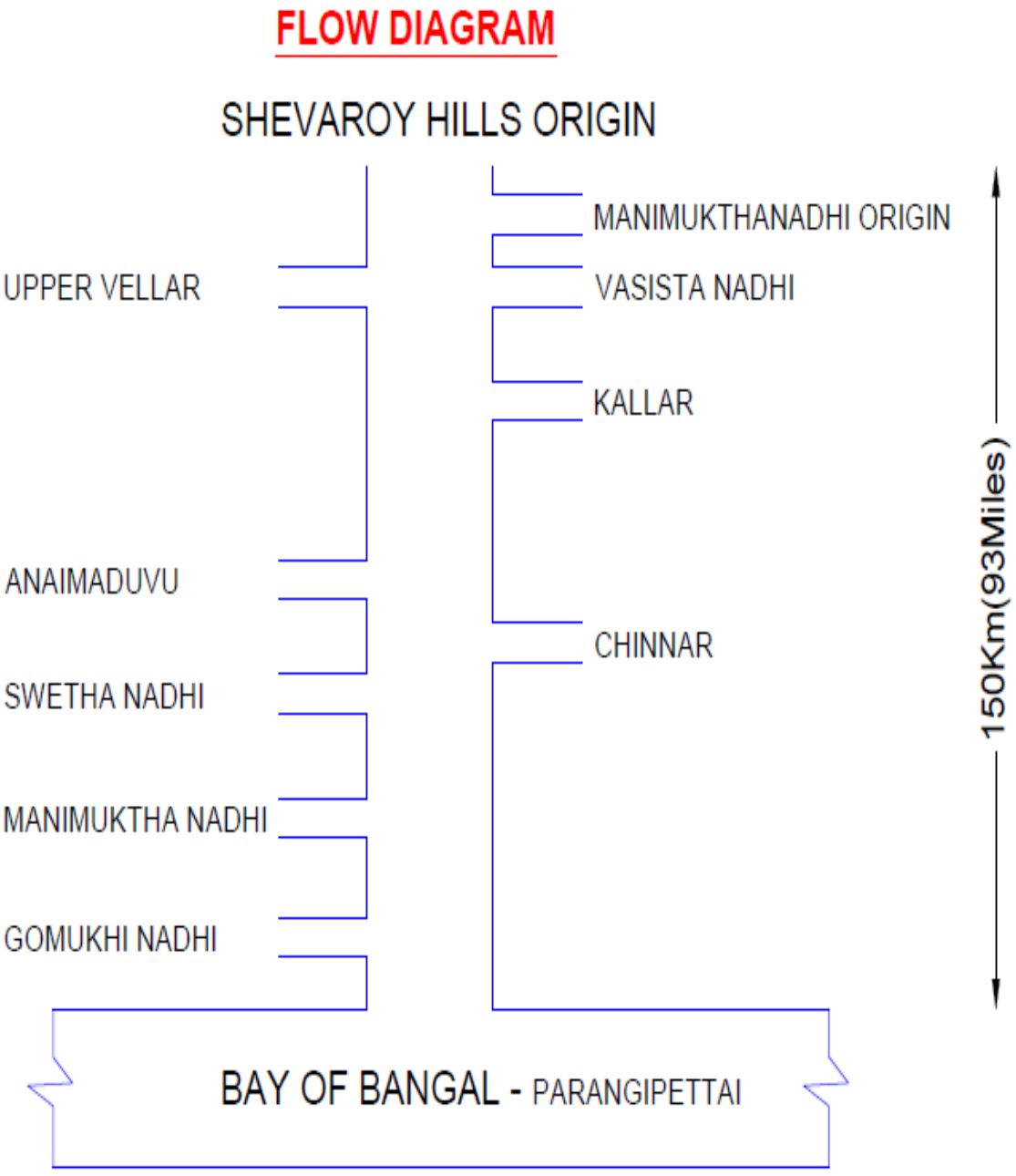
Perambalur Taluk of Perambalur district on the one side and Vridhachalam taluk of Cuddalore district on the other.

Near Peraiyur in the Perambalur taluk, it is joined by Swetanadhi 4 kilometres (2.5 mile) to the west of the Chennai–Trichy National Highway near Tholudur in Cuddalore district. In the reach between the confluence points of Singipuram and Swetanadhi with Vasistanadhi, the tributaries Kallar and Saval Odai join the main river: on the left flank and Chittar, Koraiyar, Manjani Odai and Ellar Odai on the flank join the Vasistanadhi. The drainage area up to the confluence with the Swetanadhi is 1,772 square kilometres (684 sq mile). An area of 10,572 hectares (26,120 acres) is irrigated through 70 tanks and 79 anicuts.

The River Vellar has been flooded in the parts of Cuddalore due to the heavy rainfall in Tamil Nadu in the November and December months

of 2015. Prior to 2015, it flooded two to three times over the past 10 years.

VELLAR RIVER- FLOW DIAGRAM

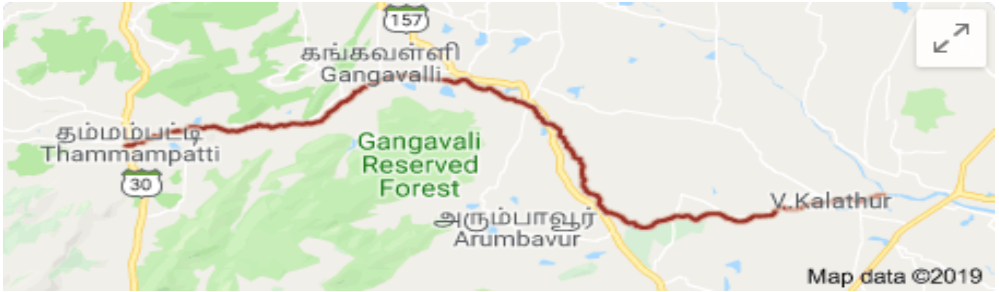


2) Visuvakudi Reservoir

Visvakkudi dam is located in Visvakudi, Tamil Nadu. Visvakkudi dam is contracted across Kallar River. Nestled between Vayalar hills and Semmalai, the reservoir can hold 30.67 million cubic feet of water. The dam is 615 metres long. There will be two sluices and radial shutters will be fixed on the two sluices.

3) Swetha River

Swetha Nadi carries the drainages of Pachaimalai and Kolli Hills. It joins with Vasishta Nadi to form Vellar river and flows into the Bay of Bengal empties near port nova.



b. River wise availability of sand sources

SL.No	River or stream	Total Length of the River in the District	Length of River of District wise availability of sand
1.	**SWETHA RIVER**	9 km	No mineral Potential due to salt content
2.	**MARUTHAIYAR**	35 km	No mineral Potential due to salt content
3.	**VELLAR**	25 km	20 km
4.	**CHINNAR**	25 km	No mineral Potential due to salt content

c. River wise details of existing mining leases of sand and aggregates

SL.No	River or stream	Total Length of the River in the District	Length of River of District wise availability of sand
1.	**SWETHA RIVER**	Nill	Nill
2.	**MARUTHAIYAR**	Nill	Nill
3.	**VELLAR**	Nill	Nill
4.	**CHINNAR**	Nill	Nill

d.DRAINAGE SYSTEM WITH DESCRIPTION OF MAIN RIVERS

- Perambalur district forms parts of Vellar and Cauvery basins.
- Vellar River flows through the northern boundary of the district while Chinnar River draining in the northern part of the district confluences with R.Vellar.
- The southern part of the district falls in the River Cauvery basin with many small streams draining the district area.

14. SALIENT FEATURES OF IMPORTANT RIVERS AND STREAMS

S.NO	Name of the River or Stream	Total Length in the District (in Km)	Place of Origin	Altitude at Origin (m)
1.	**SWETHA RIVER**	9 km	Eastern slope of Pachaimalai hills in Perambalur Taluk and District	
2.	**MARUTHAIYAR**	35 km	Eastern slope of Pachaimalai hills in Perambalur Taluk and District	
3.	**VELLAR**	25 km	Shevaroy Hills of Salem District	1266.00m
4.	**CHINNAR**	25 km	Eastern slope of Pachaimalai hills in Perambalur Taluk and District	

RIVER WISE AVAILABILITY OF SAND OR GRAVEL AGGREGATE RESOURCES

Availability of sand in VellarRiver length of area recommended for mineral concession 20.00 Km (Full Stretch) is 261 million metric tonne.

SL. No	River or stream	Portion of the river or stream recommended for mineral concession	Length of area recommended for mineral concession (in Km)	Average width of area recommended for mineral concession) (in m)	Area recommended for mineral concession (in square meter)	Mineable Mineral Potential (in Million Metric Tonne) (60% of total mineral potential)
1.	**SWETHA RIVER**	-	9 km	**-**	**-**	**-**
2.	**MARUTHA IYAR**	-	35 km	**-**	**-**	**-**
3.	**VELLAR**	Full Stretch	25 km	**250**	**$5.00x10^6$**	**261**
4.	**CHINNAR**	-	25 km	**-**	**-**	**-**

a.Mineral Potential of the district

Bouler in Million Metric Tonne	Bajari in Million Metric Tonne	Sand in Million Metric Tonne	Total Mineable Mineral Potential in Million Metric Tonne
-----	-----	**261 MMT**	**261 MMT**

b.Annual Deposition

Bouler (MT)	Bajari (MT)	Sand in Million Metric Tonne	Total Mineable Mineral Potential in Million Metric Tonne
-----	-----	**7.25 MMT**	**7.25 MMT**

15. CONCLUSION/RECOMMENDATION:

The mining will generate direct and indirect employment during mining operations. In general, there will be no adverse effect on human health as no blasting or handling of toxic material involved in sand mining. All the safety measures will be strictly followed to prevent occupational risk during excavation, loading and transportation. The sand mining operation in the district will be the backbone for infrastructural development besides generate the revenue to the Government. Since the operation is carrying out by the Public Works Department they properly identify the aggradation area over the river bed in the district It will be useful to maintain the hydrogeological cross section of the river to carry the maximum flood discharge.

The Perambalur District is one of the largest urban agglomerations in the state. The detailed scientific study reveals that the Rivers in Perambalur carrying sand sediments whenever there is sufficient flows along its entire length in the District. This cumulative sediments have resulted in shoal formation and reduce the carrying capacity of flood nearly 41,000 cusecs. The properly managed sand mining activities are recommended in Vellar River. Hence, it is concluded that, the permission of sand quarries in the potential areas of river in the District will be beneficial for infrastructural development of the state of Tamil Nadu.

Executive Engineer,PWD, WRD Mining & Monitoring Division, Trichy	**Assistant Director Geology and Mining, Perambalur**	**District Collector Perambalur**