

Varahanadhi Basin

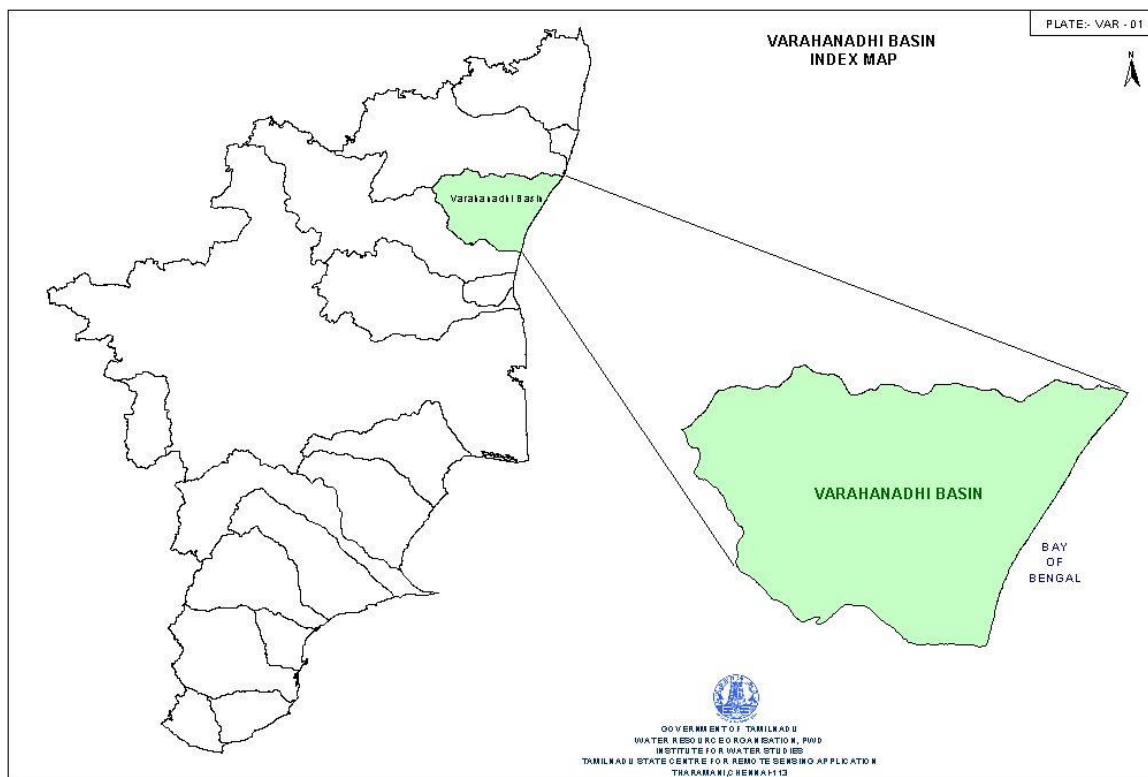
Introduction

There are 34 river basins in Tamilnadu including ParambikulamAliyar. For hydrological studies and water resources planning purposes they are grouped into 17 river basins. Varahanadhi river basin is one among them. The water demand for domestic, irrigation, industries, livestock, power generation and other uses is governed by socio-economic and agricultural factors present and future population size, income level, urbanization, markets, facilities, remunerative prices, cropping patterns, etc. An analysis of the water balance and a water utilisation& allocation plan for different competing water users form the core of a river basin plan.

Water resource planning which is people oriented and resource based requires extensive data on Rainfall, Geology, Soil, Geomorphology, Hydrogeology, Hydrology, Climatology, Water quality, Environment, Socio-economic, Health, Agricultural, Population, Livestock, Industries, etc. Data availability on the above accounts is discussed below:

Location and extent of Varahanadhi Basin

The Varahanadhi basin is one of the 17 major river basins and is located in the Villupuram, Thiruvannamalai, Kancheepuram and Cuddalore districts of Tamil Nadu and Pondicherry state of union territory. The total area of the basin is 4498.5 sq.km. The Varahanadhi basin is surrounded by Bay of Bengal in the east. Palar basin in the north and Ponnaiyar basin in the south and west. The basin is situated between north latitude $11^{\circ} 50' 00''$ to $12^{\circ} 28' 00''$ and east longitude $79^{\circ} 08' 00''$ to $80^{\circ} 10' 00''$. The index map of the Varahanadhi river basin is shown in Fig.1.



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Fig.1 Index map of VarahanadhiRiver Basin

There are 24 blocks in this basin of which 7 blocks are covered in full and the remaining blocks are partly covered. The details of blocks, taluks and districts are furnished in Table-1.

Table-1: List of Blocks, Taluks and Districts covered in the Varahanadhi basin

Sl. No.	District	Taluk	Blocks	
1	Kancheepuram	1. Madhuranthagam 2. Cheyyar	1. Maduranthagam 2. Acharapakkam 3. Chitamur 4. Lathur	Part Part Part Part
2	Villupuram	3. Villupuram 4. Vanur 5. Tinidivanam 6. Gingee 7. Thirukoilur	5. Kandamangalam 6. Vikravandi 7. Kanai 8. Koliyanur 9. Vanur 10. Olakkur 11. Mylam 12. Marakkanam 13. Gingee 14. Melmalayanur 15. Vallam 16. Mugaliyur	Part Full Part Part Full Full Full Full Full Part Full Full Part
3	Thiruvannamalai	8. Polur 9. Thiruvannamalai 10. Vandavasi	17. Kalasapakkam 18. Chetpet 19. Thuringapuram 20. Kilpennathur 21. Pernamallur 22. Tellar 23. Vandavasi	Part Part Part Part Part Part Part
4	Cuddalore	11. Cuddalore	24. Cuddalore	Part

The administrative boundary map of Varahanadhi river basin is shown in Fig.2.

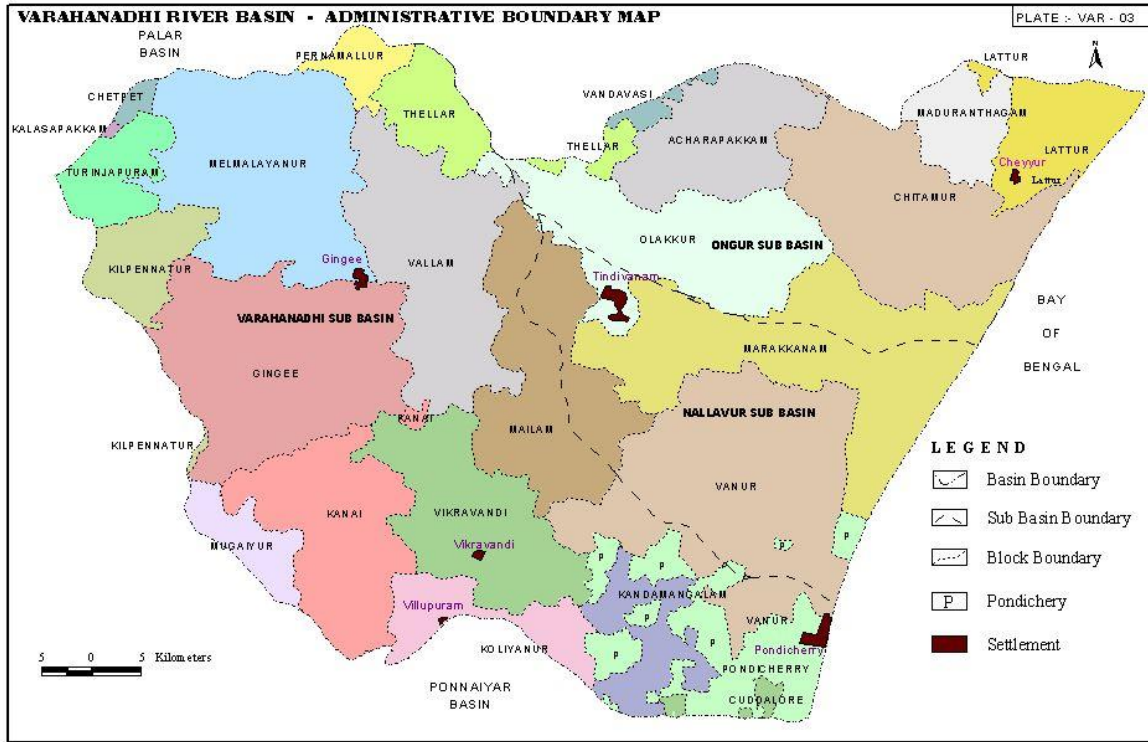


Fig.2 Administrative boundary map of Varahanadhi River Basin

The important towns located in the basin are Gingee, Tindivanam, Mailam, Olakkur, Marakkanam, Melmalayanur, Vanur, Pondicherry (Union Territory) etc. The towns and villages are well connected with district roads and highways and National highways. The NH 45 is passing through Tindivanam town.

The base map of Varahanadhi river basin is shown in Fig.3.

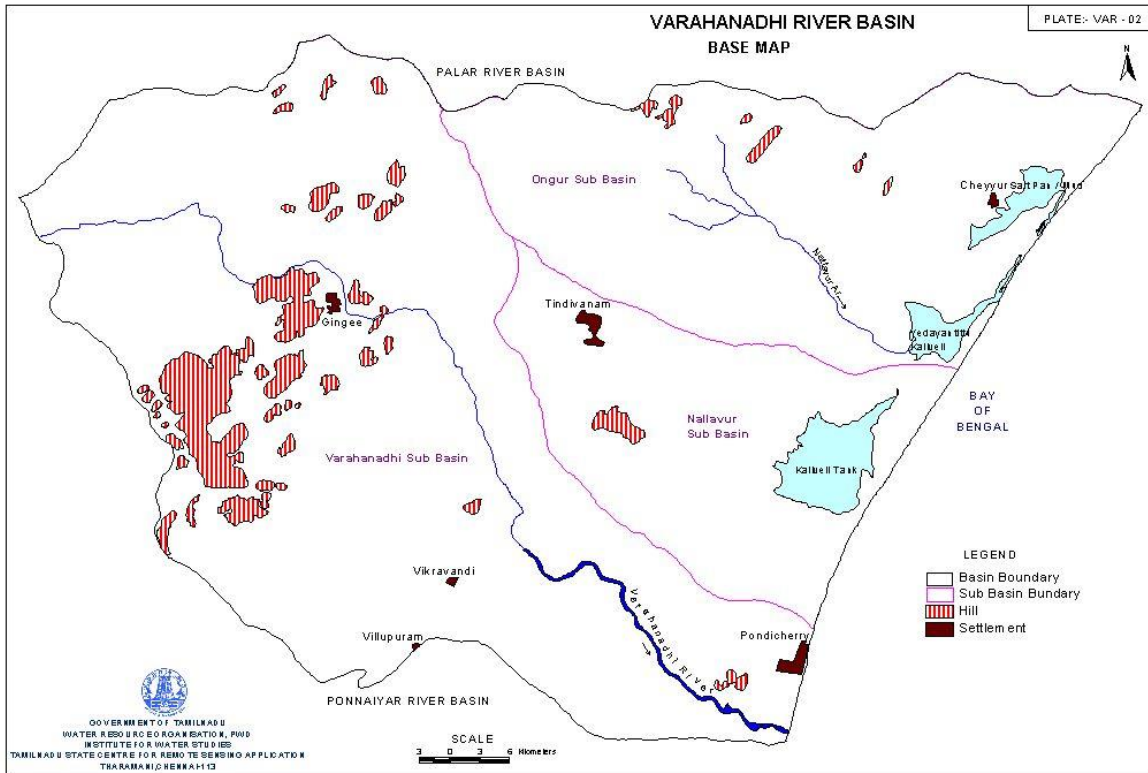


Fig.3 Base map of Varahanadhi River Basin

The Varahanadhi river originates in the northwestern part of Pakkammalai hills at an elevation of 566 m above MSL. There are several hillocks at an elevation of 350 m above MSL and are noticed in the west, central and northwest and southwest part of the basin. Such hillocks are ▲Pakkammalai 566 m, ▲Duraiammansonaimalai 542 m, ▲Suralimalai 496 m, ▲Purasonaimalai 485 m, ▲Konamalai 456 m, ▲Singidikolattumalai 431 m and ▲Periyamalai 397 m. The famous Gingeekottai or Gingee fort is located in the Singidikolothumalai hills hence it takes the name of Gingee hills. Almost the entire area is a plain terrain and the elevation ranges from 10 m to 100m above MSL. The general slope of the basin is towards east and southeast direction.

The Kaluveli swamp is a major swampy area lying in the eastern part of the basin at the tail end and covers an area of 1800 ha. along the seacoast extending from Marakkanam to Pondichery State border. The surplus water of Kaluveli swamp finds its way to feed Yedayanthittu Kaluveli tank where Ongur river confluences near Marakkanam. Finally Ongur river confluences with Bay of Bengal. The Kaluveli swamp flows in the northeast direction. Two salt factories are located along the coast, one at Marakkanam and another at Yedayantittu.

Drainage

The three individual rivers such as Varahanadhi, Ongur and Nallavur had separate catchment areas and flow separately and confluence separately i.e. the Varahanadhi river confluence with Bay of Bengal, the Ongur river flows into Yedayantittu Kaluveli tank and the Nallavur river joins the Kaluveli swamp. For Water Resources Assessment water balance and water planning are done by integrating all the three rivers under Varahanadhi river basin.

Varahanadhi sub basin

The main river Varahanadhi originates in the western slopes/past of Gingee Taluk. It has two arms, i.e. left arm and right arm. The right arm originates from Pakkammalai hills and left arm originates from Melmalayanur. They join together near Thenpalai village and forms the main river Varahanadhi and flows in an easterly direction. The first tributary called Annamangalam surplus course joins the main river near Melcheri. Then the river takes a turn towards south in the eastern past of Singaram village near Gingee and then flows again towards east. The second tributary called "Nariyarodai" joins Varahanadhi river near Uranithangal Village.

Near Vallam village the main Varahanadhi river takes a turn towards the south. The third tributary called Tondiar joins near Vidur. The Vidur reservoir across Varahanadhi is situated just below the confluence of this tributary in Tindivanam taluk.

After Vidur reservoir, the river turns towards southeast and enters into Villupuram Taluk. In this reach the fourth tributary called Pambaiyar joins the main river near Radhapuram village in Villupuram taluk. From there, the river runs east upto Kodukkur and southeast in Tamilnadu and Pondichery states alternately. In this reach, the fifth tributary called Pambai channel joins Varahanadhi river near Sankarakkudi in Villupuram Taluk just 3 kms. above its confluence Bay of Bengal a little south of Pondichery state. The total length of Varahanadhi river is about 78.50 kms.

Nallavur River (Or Kondamur River) Sub Basin

Nallavur Ar is another river that flows in between Varahanadhi and Ongur sub basins. At the starting point it has two arms. The right arm originates from the surplus course of Sinnur Tank which receives the surplus water from upper tanks. Similarly the left arm originates from the surplus water of Tindivanam tank which also received the surplus water from upper tanks. The two arms join together and form a river near Karanavur village at about 4 kms. south of Tindivanam town and turns towards south.

Another drainage course, i.e., surplus from more than 10 tanks east of Mailam town join on the right hand side of the river at about 4 kms. southeast of Sittamur village. After this, the river traverses in the eastern direction in between Arovapakkam and Kondamur.

At north of Kondamur, another drainage course, receiving water from a number of tanks in the upper reaches, joins the main river. This main river is called Nallavur Ar or Kondamur Ar. Below this a number of drainage courses join at the right side of this river before it empties into Kaluveli swamp. The surplus water of Kaluveli swamp finds its way to feed Yedayantittu Kaluveli tank (where Ongur river also enters) near Marakkanam before confluencing with the Bay of Bengal. The length of this river is about 25 kms.

Ongur sub basin

Ongur river originates in Tindivanam taluk of Villupuram district. In the initial reach it has two arms. The right arm originates from the surplus course of Vairapuram tank which is fed by number of upper tanks and empties into Saram Eri (tank). In addition to that, the drainage course to Saram Eri is also receiving water from number of tanks on either side. The surplus course of Saram Eri called Saram river or Saram Odai flows towards the northeastern direction.

Similarly the left arm called Nariyar Odai or Murungai Odai originates from surplus course of Olakkur Melpadi Eri which is fed by surplus water of number of tanks. It joins the Saram Odai about 3 Kms. west of Ongur village. From this point the river is called Ongur river.

After this, a local stream Nedungal Ar joins Ongur river on its left side. Nedungal stream originates from the surplus course of Kalathur and Kilthivakkam tank which receiving

surplus water from a number of tanks in Maduranthagam Taluk of Kancheepuram District. It joins Ongurriver near Veliyambakkam village of Maduranthagam Taluk. The total length of this stream is about 6 kms. Then the river flows towards the southeast until it falls into the Yedayantittu Kaluveli tank and the surplus water joins the Bay of Bengal. The length of Ongurriver from its origin till its confluence with the sea is about 43 kms.

Kaluveli Swamp

The Kaluveli swamp is a large lagoon having triangular shape. It is near the seashore along the eastern border of the Marakkanam taluk of Villupuram district. It is bounded by Marakkanam to Pondicherry road on the eastern side, and by the Brahmadesam- Kiliyanur road on the western side and by Olinthiyapattu to Pudnpatthu road on the south. The water spread area is about 71.48 sq.km and links with Yedayanthittu swamp or Kodhadu swamp on the north by a tidal creek of about 8 kms in length which in turn opens into the sea at about 9.7 km north of Marakkanam. This large swamp is full of water during rainy season and remains dry for the greater part of the year and is partly covered by kar grass and partly by ordinary grass. When it is dry, it presents an appearance of arid waste with patches of salt efflorescence. Because of high tides, seawater enters into this swampy area and therefore reclamation efforts taken earlier have proved futile and did not yield expected results. For several years the problems of reclaiming the waste area has been under consideration and hence there is a need for formulating a technically feasible and economically viable proposal to reclaim this swamp so that it can function as an effective drainage called to the adjoining lands by storing their surplus flow during monsoon years. This swampy area may be suitable for fish culture or prawn culture.

Tributaries

It has the following six main tributaries.

- i)** Annamangalam: It joins the main river near Melcheri about 6 km downstream from origin and is the first tributary of the river.
- ii)** Nariyan: It is second tributary and joins the main river near Uranithangal village about 15 km downstream from origin and is about 13 km long.
- iii)** Tondiar: It joins the main river from left side at 41 km from the origin and is 31.78 km long
- iv)** Pambai: It joins the main river near Chinnabara Samuthavam in Villupuram taluk about 63 km from origin and is about 87 km long.
- v)** Pambaiyar: It joins the main river near Radhapuram village in Villupuram Taluk about 47 km from origin and is about 23.81 km long
- vi)** Chellangi Odai: It is sixth and the last tributary that joins the river near Sankarakudi in Villupuram taluk just 3 km above its confluence with the sea. It joins at about 75.5 km from origin and is about 16 km long.

The drainage map of the Varahanadhi river basin is shown in Fig.4.

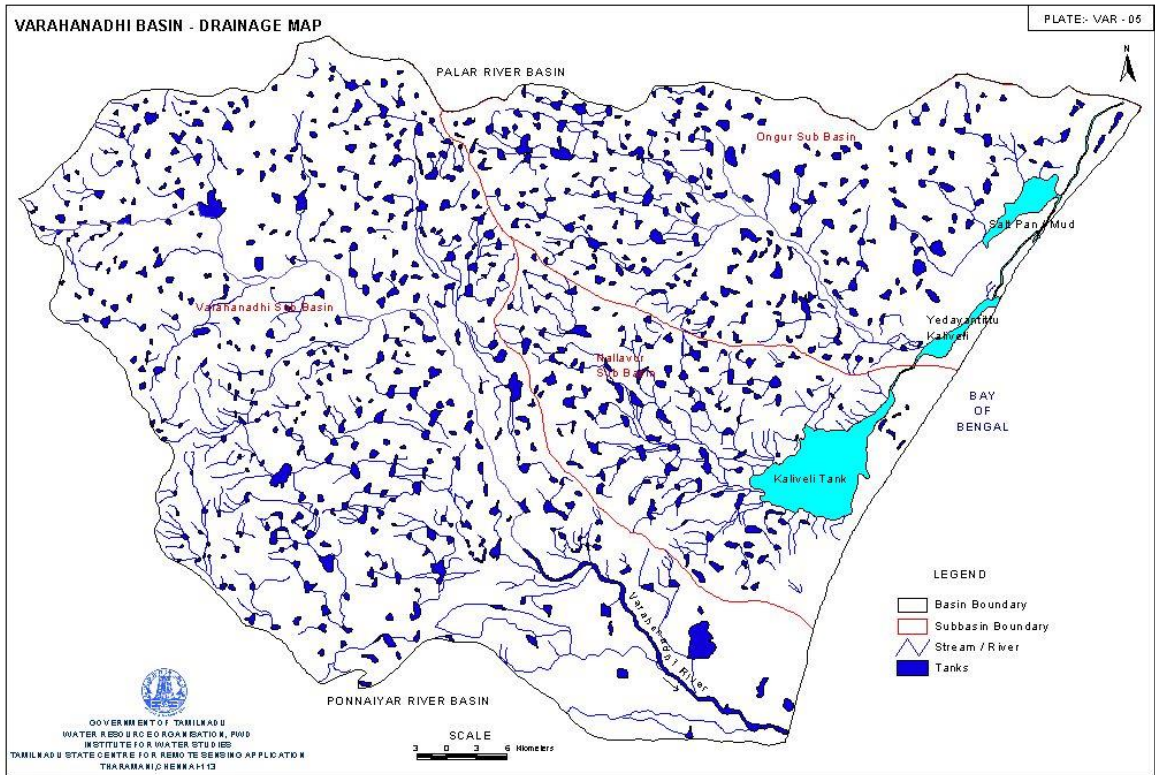


Fig.4 Drainage map of Varahanadhi River Basin

Geology

The Varahanadhi basin consists of hard crystalline rock masses of Archaean age for the most part of the area(84%) on the western portion and sedimentary rocks of Upper Gondwana, Cretaceous, Tertiary and Quaternary age on the eastern portion (16%).

In the east and south eastern portion of Gingee town, granites occur as masses and they are grey, porphyritic to non-porphyritic probably- represent anatectic granite, developed within the migmatite complex. Pink granites and the associated granites are predominantly developed in the western portion of the study area. The general foliation trend of these rocks vary from NNE to NE with dip SSE to SE direction at an angle varying from 55° to 80°. The geology map of Varahanadhi river basin is shown in Fig.5.

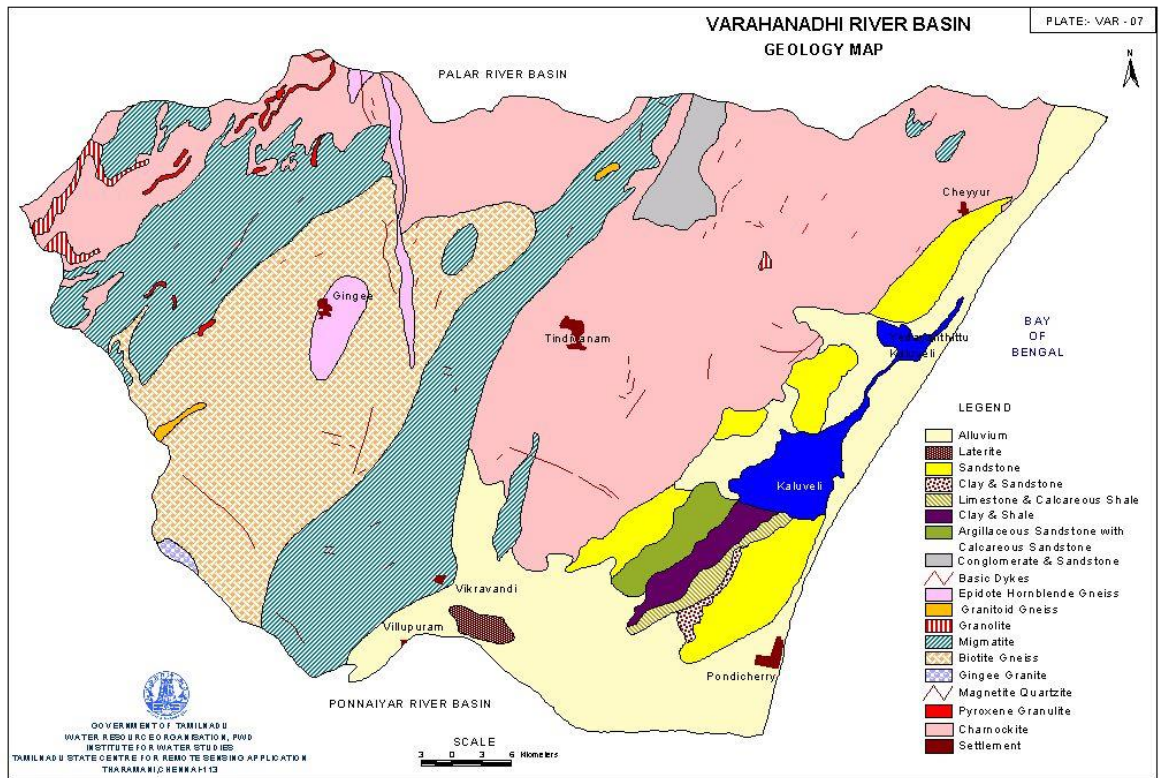


Fig.5 Geology map of Varahanadhi River Basin

The geomorphological landforms identified in Varahanadhi river basinis shown in Fig.6.

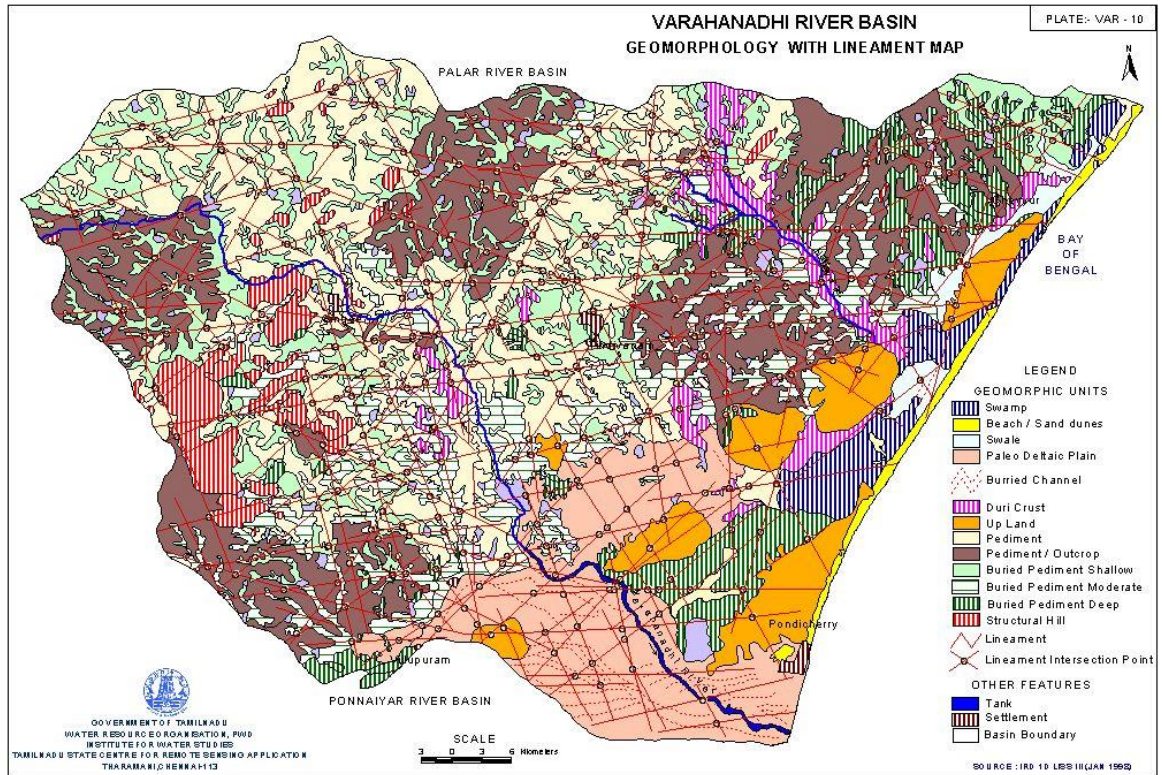


Fig.6 Geomorphology with lineament map of Varahanadhi River Basin

Land Use

The land use map of Varahanadhi river basin and the detailed landuse classification in Varahanadhi basin is given in Fig.7 and Table-2 respectively.

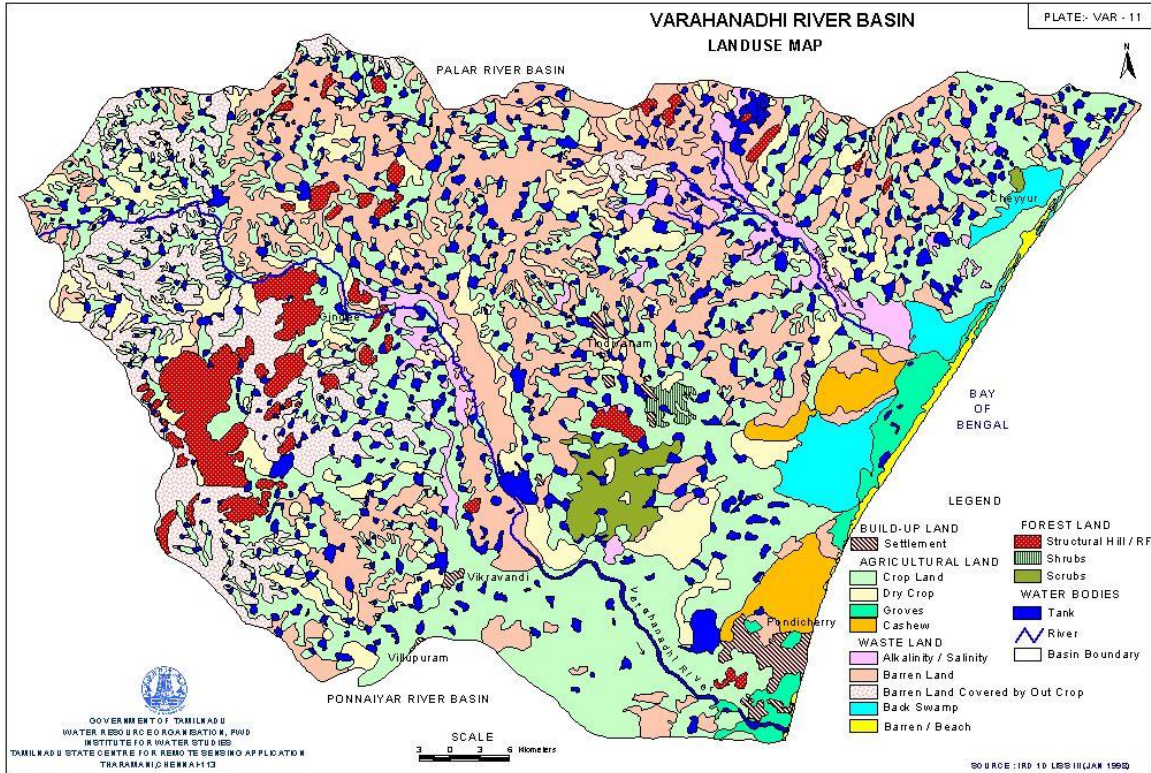


Fig.7 Landuse map of Varahanadhi River Basin

Table-2 :Landuse Classification – Varahanadhi Basin

Sl. No.	Landuse Category		Area IN SQ.KM.	Percentage %
	Ist Level	IInd Level		
1	Built up Land	Settlement	42.74	0.903
2	Crop Land Dry Land	Paddy, Sugarcane	1687.48	35.649
		Groundnut, Cholam, Pulses, etc.	434.48	9.179
		Groves	76.21	1.610
		Cashew Plantation	94.50	1.996
3	Forest Land	Shrubs	11.37	0.240
		Scrubs	67.27	1.421
		Structural hill	189.50	4.003
4	Waste Land	Alkalinity / Salinity	135.51	2.863
		Barren (Outcrop)	382.53	8.081
		Barren land (Beach)	23.24	0.491
5	Water Bodies	Barren land	1092.45	23.079
		Back swamps	118.04	2.494
		Tanks	378.28	7.991

Total Geographical Area	4733.60	100
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The major soils types found this river basin is Inceptisols, Alfisol, Entisol and Vertisol. Due to different stage of weathering of parent material, the above soil types are met with in combination.

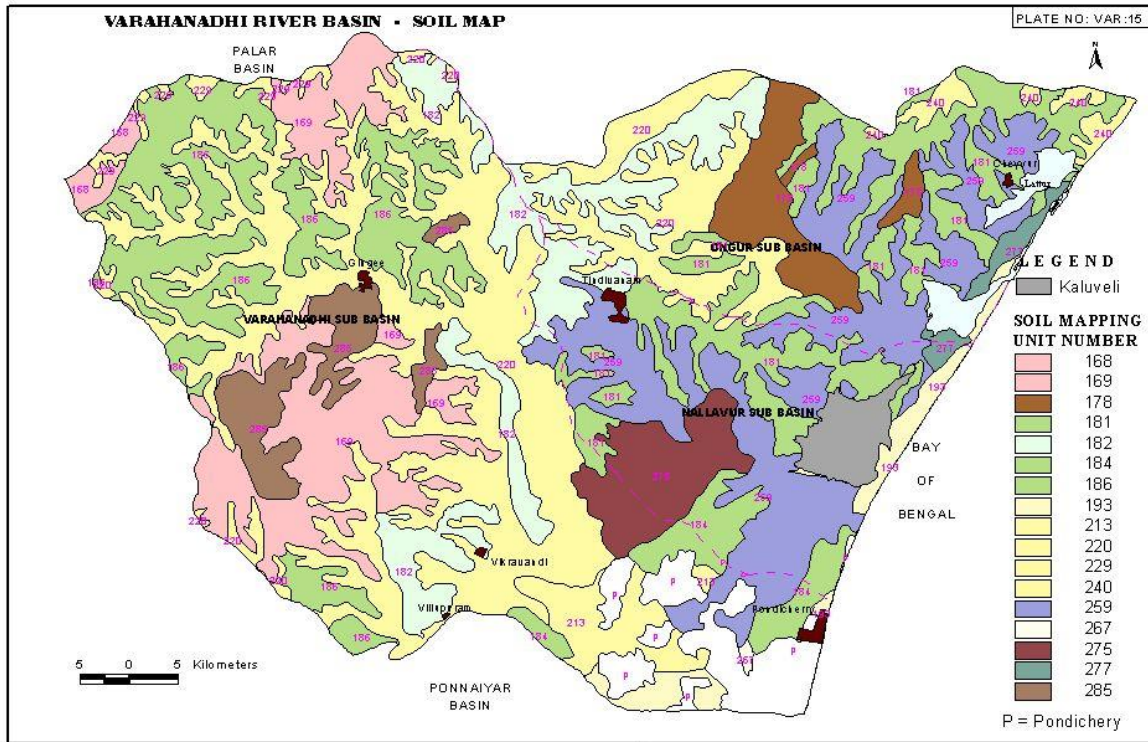
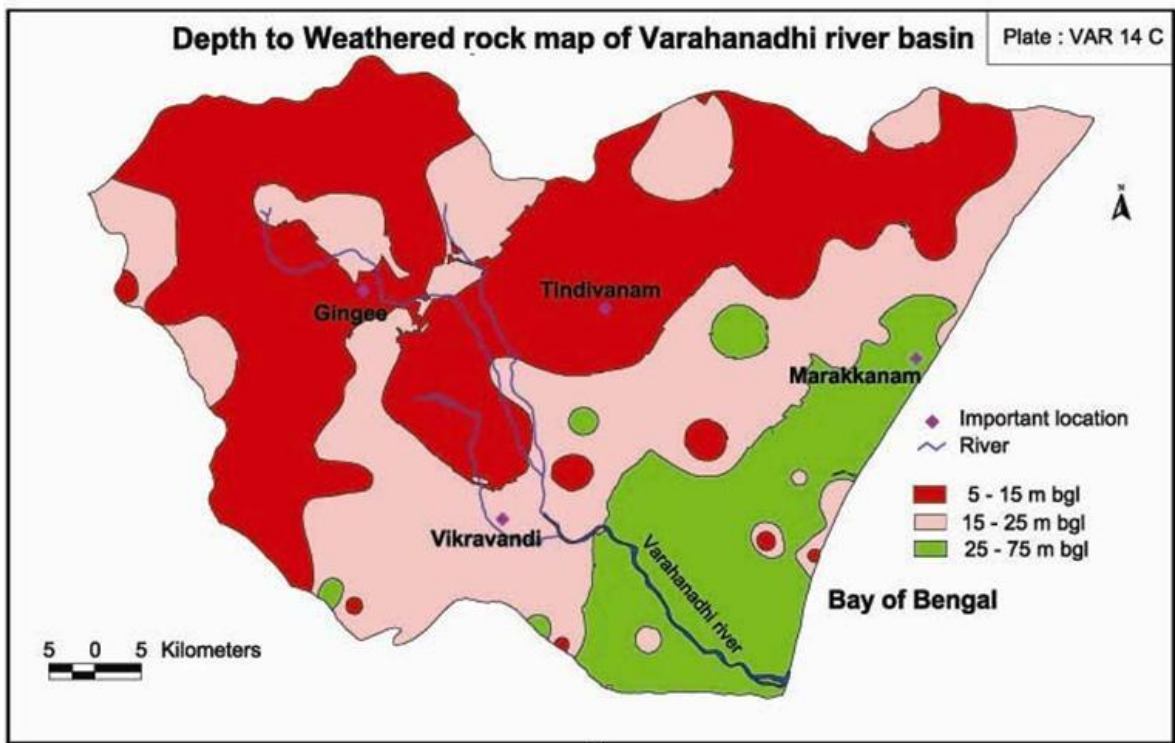


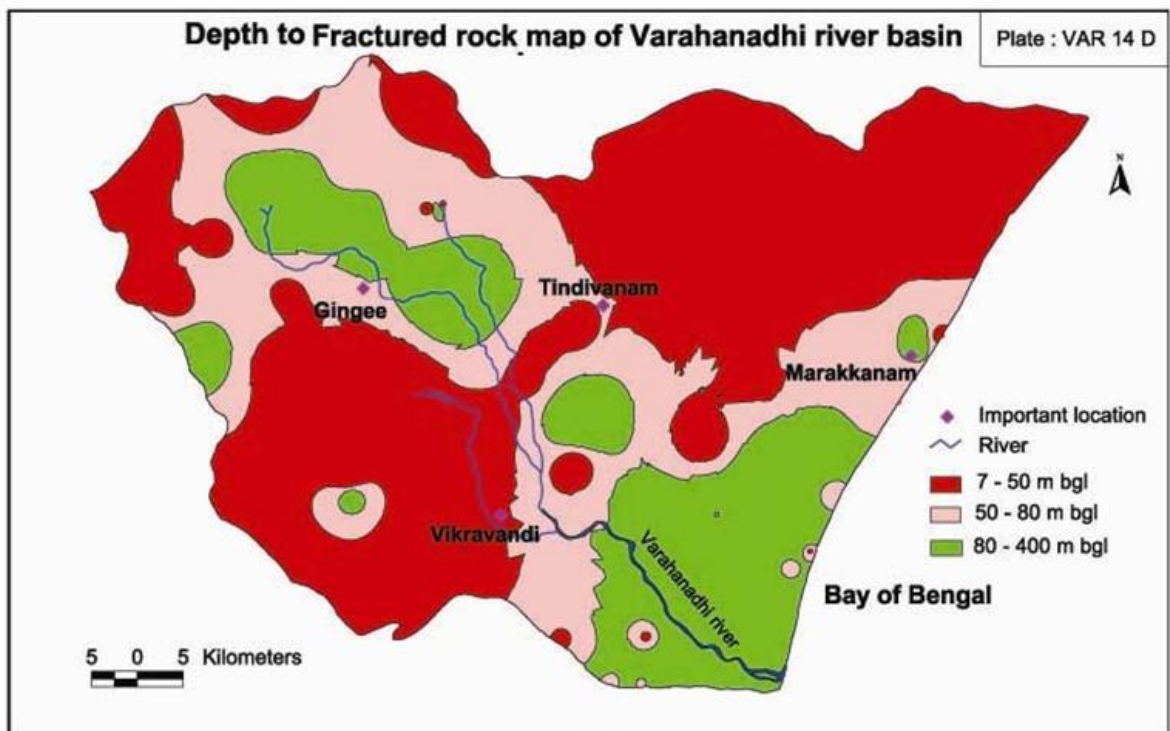
Fig.8 Soil map of Varahanadhi River Basin

The pictorial representation of the depth to bottom of weathered rock of this basin is shown in Fig.9.



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Fig.9 Depth to Weathered rock map of Varahanadhi River Basin
 State of depth to bottom of fractured rock of this basin is shown in Fig.10.



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Fig.10 Depth to fractured rock map of Varahanadhi River Basin

Demographic details

The sub basin wise population is given in Table-4.

Table-4: The Urban and Rural Population as per census 2001 (in Million)

Sl. No.	Name of the Sub basin	Urban Population	Rural Population	Total Population
1	Nallavur	0.077	0.244	0.321
2	Ongur	0.044	0.368	0.412
3	Varahanadhi	0.127	0.950	1.077
TOTAL		0.248	1.562	1.810

HYDROMETEOROLOGICAL CHARACTERISTICS

There are 15 non-recording raingauge stations in the basin of which 5 stations are maintained by Public Works Department-WRO and 10 stations maintained by Revenue Department.

Maximum, minimum and average rainfall

Vanur received the minimum annual rainfall of **113.22** mm (1996-97) and **Pondicherry** received the maximum annual rainfall of **2262.2** mm (**2015-16**). Average annual rainfall varies from **911.96** mm at **Thiruvannamalai** to **1349.55** mm at **Cuddalore**.

The Annual dependable rainfall of Varahanadhi river basin is given in Table-5

Table-5: Annual Dependable Rainfall

Sl. No.	Raingauge Stations	25%	50%	75%	90%
1	Nallavur	190.21	146.55	116.41	76.41
2	Ongur	307.35	239.59	195.35	151.64
3	Varahanadhi	658.45	501.61	390.35	304.02

The weather station considered for Varahanadhi River basin is **Kiladayalam** maintained by PWD, WRO (SG & SWRDC). The climatological values of this river basin are given in Table-6.

Table-6 :Climatological Parameters

S. No	Climatological Parameter	Kiladayalam
1	Average monthly temperature max. / min. in. ° Celsius	31.08 / 25.17
2	Average mean temperature in ° Celsius	28.13° Celsius
3	Average relative humidity in %	75.59

4	Average wind velocity in km/hour	3.16
5	Average pan evaporation in mm / month	171.83
6	Average Sunshine hours / day	5.93

The monthly average Eto in mm for the climatological station estimated using Penman-monteith Method from 1991 to 2003 are given in Table-7.

Table-7: Monthly average Eto in mm from 1991 to 2003

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average (Daily)	4.65	5.67	6.51	7.26	7.33	6.54	6.15	6.42	5.52	4.37	3.87	4.03
ETo (Monthly)	110	118	156	166	180	172	163	160	157	117	95	99

Surface water data

Presently there are two Gauge & Discharge sites in the Varahanadhi basin. Public Works Department maintains both the sites, one gauging station is at Vidur Reservoir across Varahanadhi river and another site is across Ongur River at Arasanur anicut. The analysis of flow particulars of Vidur reservoir for 41 years (1962-2003) reveals that there was no surplus flow in 12 years. In nine years, the quantity is in between 100 to 500 Mcum. During seven years, the surplus quantity is in between 50 to 100 Mcum. In thirteen years, the quantity is less than 50 Mcum. The analysis further reveals that the 50% dependable surplus is 10.94 Mcum, for 75% & 90% dependability it is Nil.

The raingauge stations considered for analysis are given in Table-8.

Table-8: Raingauge stations considered for analysis

S. No.	Name of subbasins	Subbasin area (sq.km.)	Raingauge stations
1	Varahanadhi	2550	Gingee, Kilnatchipattu, Thiruvannamalai, Pondicherry, Vidur Dam, Villupuram, Thirukovilur, Thirukoilur Anicut, Vanamadevi Anicut, Cuddalore, Panruti
2	Ongur	1096	Vandavasi
3	Nallavur	853	Marakkanam, Vanur, Tindivanam
Total		4499	

Surface Water Potential

Monthly Runoff Simulation Model (MRS) assesses the surface water potential for 75% dependable yield for southwest, northeast and non monsoon periods and is given in Table-9.

Table-9: 75% Dependable Surface Water Potential for the Varahanadhi River Basin

Sl. No.	Name of Sub basin	75% Dependable Surface Water Potential in Mcum			
		SW	NE	NM	Annual

1.	Varahanadhi	152.25	221.54	16.56	390.35
2.	Ongur	104.74	69.78	20.83	195.35
3.	Nallavur	25.63	88.13	2.65	116.41
Total		282.62	379.45	40.04	702.11
South West Monsoon Potential		282.62 (or) 283 Mcum			
North East Monsoon Potential		379.45 (or) 379 Mcum			
Non Monsoon Potential		40.04 (or) 40 Mcum			
Annual Potential		702.11 (or) 702 Mcum			

Surface Water Potential of Varahanadhi Basin is **702 Mcum**.

The Existing Surface Water Supply Systems

Vidur reservoir is the only reservoir in the Varahanadhi basin. It is situated near Vidur village in Tindivanam taluk of Villupuram District; it lies in Latitude 12°5'N and Longitude 79°35'E and 800m below the confluence point of Sanakarabarani river and Thondiar. The reservoir was constructed during the year 1958-59. Below the reservoir, the river is called Varahanadhi. The command area under this reservoir, nearly 69% of them fall within the boundary of Tamil Nadu state and remaining 31% lies in the Union Territory of Pondicherry. The command area in Tamil Nadu is about 890.33 ha and about 404.69 ha in Pondicherry. The total catchment area is 1298 sq.km. The waterspread area at FRL is 7.98 sq.km and capacity at FRL is 17.13 Mcum. There are two numbers of river sluices of size 1.52 x 1.83m each. An ayacut of 1295.02 ha is benefited by this reservoir.

Reservoir Sedimentation

Gauging Division of PWD conducted sedimentation surveys in Vidur reservoir during 1981, 1986 and 1991. As per the latest survey conducted in 1991,

Capacity at the time of formation (1959)	= 17.13 Mcum
Capacity as per III rd survey (1991)	= 15.63 Mcum
Storage loss	= 1.50 Mcum
Loss of Capacity	= 8.75%
Average rate of silting per year	= 0.046 Mcum
Annual storage loss percentage	= 0.27
Average annual sedimentation/sq.km of drainage area	= 0.000036Mcum/sq.km

Anicuts

There are 42 anicuts in different locations in the basin, including Vadalur regulator. Table-10 gives the number of anicuts in important rivers.

Table-10: Number of Anicuts in important rivers

Sl. No.	Name of the river	No. of Anicuts
1.	Varahanadhi	9
2.	Ongur	6
3.	Nallavur	5

Tanks

There are about 1421 tanks in the basin. Out of the above, 131 are system tanks with a registered ayacut of 13,021 ha and 1290 are non-system tanks with a registered ayacut of 34,257 ha. The ayacuts benefited by the tanks of the basin comes out to 47,278 ha. The total capacity of all tanks is 275.5 Mcum. Due to problems of tank siltation, poor water scheduling and water losses, water availability at field level is poor. Conjunctive use of tank and well water can improve the overall performance of irrigation systems. At present the overall efficiency of tank irrigation system is very low and it ranges from 30 to 40%. These tanks are mainly used to irrigate paddy fields during the late monsoon to early dry season from September to December.

Inter Basin Transfer of Water

There is no inter basin transfer of water from this basin. But there is inter basin transfer of water from adjoining Ponnaiyar to Varahanadhi basin for domestic water supply of 4 Mcum per annum.

The irrigation map of Varahanadhi river basin is shown in Fig.11.

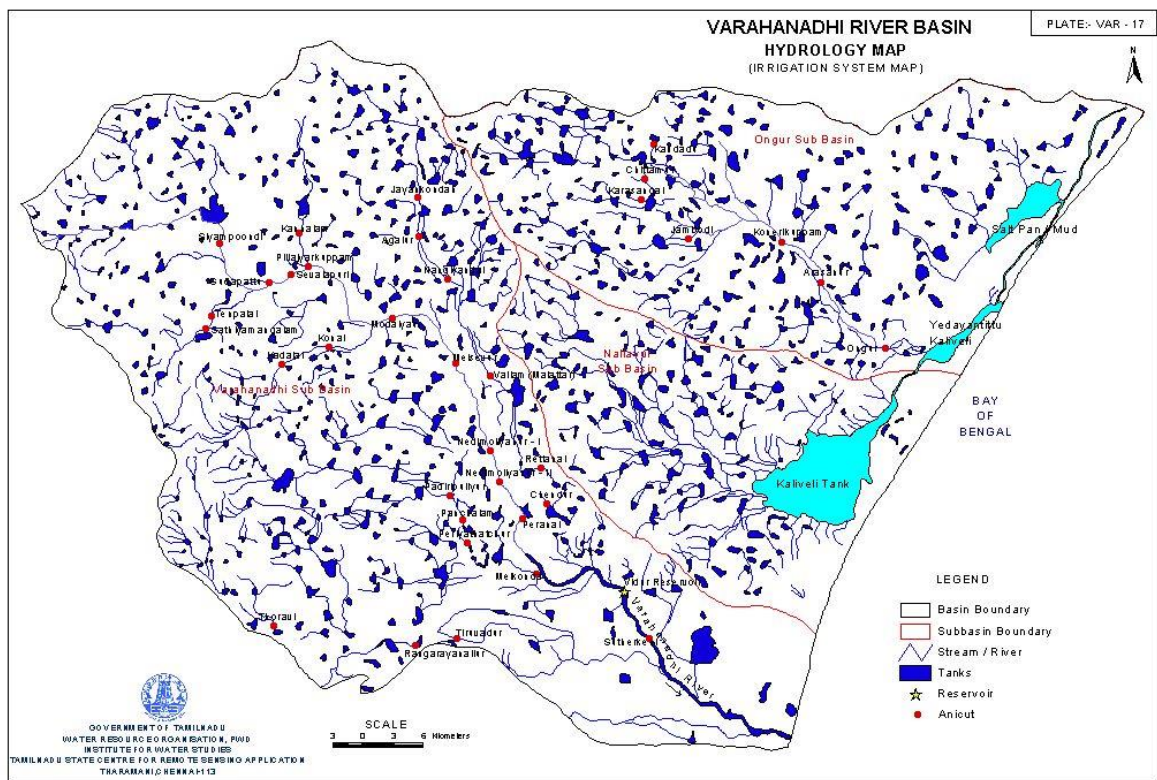


Fig.11 Irrigation System map of Varahanadhi River Basin

Occurrence of groundwater in the three sub basins of Varahanadhi river basin

i) Nallavur sub basin

Nallavur sub basin originates from Tindivanam tank and encompasses an area of about 853 sq km. The predominant soil types found in this river basin is Entisol and Vertisol. There are three observation wells in this sub basin. The winter water level varies from 4.20 to 4.50 m and the summer water table ranges from 4.90 to 5.80 m below ground level.

ii) Ongur sub basin

The area of this sub basin is 1096 sq km. Most of the area is occupied by Inceptisols, Alfisol type soils. There are fifteen observation wells in the sub basin. The winter water level varies from 3.60 to 3.90 m and the summer water level varies from 4.60 m to 6.00m

iii) Varahanadhi sub basin

The sub basin has an area extent of 2550 sq km. There are nineteen observation wells in this sub basin. The winter water level varies from 5.20 to 5.60 m and the summer water level ranges from 6.30 to 7.60 m.

Ground water potential in the study area

The total available groundwater potential as on March 2013 is worked out as 1368.12 Mcum and is shown in Table 11.

Table 11-Ground Water Potential Calculation as Mar 2013

Name of District covered	Area covered in %	Net water available	Ground water potential District wise
Cuddalore	0.25	128495.06	321.23765
Kanchipuram	17.73	105447.62	18695.86303
Thiruvannamalai	11.40	111687.47	12732.37158
Villupuram	70.62	148771	105062.0802

Total 136811.5525 Ha.m
1368.115525 M.cum

PRESENT AND FUTURE WATER DEMANDS

The growth rate to be used for the water planning procedure is as follows.

<u>Population Sector</u>	<u>Annual Growth rates</u>
Urban	0.020 (2 % per year)
Rural	0.013 (1.3 % per year)

Domestic Water Demand

Table-13 shows projected population and projected domestic water demand for Varahanadhi River basin.

Year		Population	Demand	Total	Total
			MLD	MLD	MCM
2011	Municipality	266033	23.94	101.47	37.04
	T.Panchayat	176268	12.34		

	Urban Total	442301	36.28		
	Rural	1629699	65.19		
2017	Municipality	299596	26.96	111.30	40.62
	T.Panchayat	198506	13.90		
	Urban Total	498102	40.86		
	Rural	1761019	70.44		
2020	Municipality	317934	28.61	116.58	42.55
	T.Panchayat	210657	14.75		
	Urban Total	528591	43.36		
	Rural	1830596	73.22		
2030	Municipality	387560	34.88	136.18	49.70
	T.Panchayat	256789	17.98		
	Urban Total	644349	52.86		
	Rural	2082988	83.32		
2040	Municipality	472433	42.52	159.24	58.12
	T.Panchayat	313025	21.91		
	Urban Total	785458	64.43		
	Rural	2370180	94.81		
2050	Municipality	575894	51.83	186.42	68.04
	T.Panchayat	381575	26.71		
	Urban Total	957469	78.54		
	Rural	2696968	107.88		

Live stock Water Demand

Livestock population of Varahanadhi basin are given in Table-17.

Sl. No.	Name	Standard Norms in lpcd	Demand 2017	Demand 2020	Demand 2030	Demand 2040	Demand 2050
1	Cattle	225	44.95	45.52	47.47	49.5	51.62
2	Buffalo	225	4.04	3.53	2.26	1.45	0.93
3	Bovine	100	23.29	23.29	23.29	23.29	23.29
4	Sheep	5	0.29	0.29	0.29	0.29	0.29

5	Goats	5	0.54	0.58	0.72	0.9	1.12
6	Ovine	110	18.5	18.5	18.5	18.5	18.5
7	Horses & Ponies	100	0.009	0.009	0.009	0.009	0.009
8	Donkeys	25	0.033	0.033	0.033	0.033	0.033
9	Pigs	206	2.73	2.37	1.49	0.93	0.59
10	Dogs	20	0.439	0.439	0.439	0.439	0.439
11	Rabbits	10	0.012	0.012	0.012	0.012	0.012
12	Poultry	0.05	0	0	0	0	0
13	Duck	10	0.147	0.147	0.147	0.147	0.147
14	other birds	10	0	0	0	0	0
	Total		94.98	94.573	94.513	95.353	96.833

Industrial Water Demand

At present in the Varahanadhi basin there are 41 numbers of Large and Medium Industries and 2729 numbers of Small Scale Industries. The norms for water requirement as per the recommendations of industries department is 2500 cum / day for large and medium industries and 2.5 cum / day for small scale industries. For forecasting the water demand of Industries for future years, a simple arithmetic increase of 8% per annum over the present requirement has been adopted.

The annual water demand for the Industries during the planning periods are given in Table-19.

TABLE 19 WATER DEMAND CALCULATION FOR SMALL, MEDIUM AND LARGE INDUSTRIES BASED ON INDUSTRY CENSUS AS TAKEN FROM IWS

Sl. No.	Type of industry	Average Rate of Water consumption as given in IWS m ³ /day	2005		2017		2020		2030		2040		2050	
			No. of industry as per IWS	Water Demand	No. of industry	Water Demand	No. of industry	Water Demand	No. of industry	Water Demand	No. of industry	Water Demand	No. of industry	Water Demand
1	Small scale industry	2.5	2729	2.49	6872	6.27	8657	7.9	18689	17.05	40349	36.82	87111	79.49
2	Medium & large scale industry	2500	41	37.41	103	93.99	130	118.63	281	256.41	606	552.98	1309	1194.46
	Total Demand in M.Cum			39.9		100.26		126.53		273.46		589.8		1273.95

Presently, there is no power plant in this basin. As such, the requirement of water for power generation purposes is taken as nil in this basin. The National Thermal Power Corporation (NTPC) of India is contemplating to set up a Thermal plant at Cheyyur.

Fisheries

Fishermen residing in the villages along the coastal area of Villupuram and Kancheepuram districts undertake activities such as fishing, seaweed, coral reefs and firewood collection and diving for collection of chunks.

The districtwise marine fishermen population, marine fish production and inland fish production are given in Table- 20, 21 and 22 respectively.

Table-20: Districtwise Marine fisherman population

District	1998	1999	2000	2001
Villupuram	23000	22300	14923	15752
Kancheepuram (including Thiruvallur)	73000	72400	67612	71368

(Source: Director of Fisheries, Chennai – 6)

Table-21: Districtwise Marine Fish Production in tonnes

District	1998-1999	1999-2000	2000-2001	2001-2002
Villupuram	6255	6015	7474	7515
Kancheepuram	12081	11617	13944	13982

(Source: Director of Fisheries, Chennai – 6)

Table-22: Districtwise Inland Fish Production in tonnes

District	2000-2001	2001-2002
Villupuram	4786	1127
Kancheepuram	8221	9334
Thiruvannamalai	4933	399

(Source: Director of Fisheries, Chennai – 6)

WATER BALANCING

Water balancing for Varahanadhi river basin at 75% dependability which includes water potential, demand and deficit for the projected years are given in Table-23.

Table-23: Water Balancing for Varahanadhi River Basin at 75% dependability

Sl. No	Name of the basin	Area of the basin (in Sq.Km)	No. of Sub basins	Year	Demand of water in various sectors (MCM)						Water availability (MCM)					Surplus / Deficit in Mcum
					Irrigation	Domestics	Industries	Live stock	Others	Total	Surface water potential	Ground water potential	Quantity of recycled water from Sewage	Quant ity of water from desilti ng	Total	
1	Varaha nadhi	4499.00	3	2017	1250.750	40.62	100.260	94.980	0.000	1391.634	428.000	1256.000	3.650	3.090	1690.740	299.11
				2020	1250.750	42.55	126.53	94.57	0.00	1419.83	428.000	1256.000	3.650		1687.65	267.82
				2030	1250.750	49.70	273.46	94.51	0.00	1573.91	428.000	1256.000	3.650		1687.65	113.74
				2040	1250.750	58.12	589.80	95.35	0.00	1898.67	428.000	1256.000	3.650		1687.65	-211.02
				2050	1250.750	68.04	1273.95	96.83	0.00	2592.74	428.000	1256.000	3.650		1687.65	-905.09

Inter basin transfer quantity for drinking purpose of about 4 Mcum of water is taken into account from Ponnaiyar basin to Varahanadhi basin.

In 2005, at 75% dependability, there will be no unmet demand for the domestic sector. All the three sub basins namely Varahanadhi, Ongur and Nallavur are deficient in meeting the water requirements for irrigation. There will not be any unmet demand for domestic, livestock and industries in Ongur and Nallavur subbasins. There will not be any unmet demand for domestic and livestock in Varahanadhi subbasin. The Ongur sub basin is water deficit in 2005.