

## Study of water quality parameters for interlinking of Thamirabarani and Vaigai river basin, South Tamil Nadu, India

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### Abstract

Water availability is becoming dearer and dearer day by day in Tamil Nadu due to monsoon vagaries and increasing population propulsion. The spatial and temporal variations in the rainfall over Tamil Nadu has led to denotation of water 'surplus' and water scarce river basins in the state. This project is an attempt for possibility studies and finding parameters for interlinking the rivers in Tamil Nadu state aims at transferring water from water 'surplus' to the water scarce basins. The study was carried out from January 2018 to December 2020 at regular intervals. This aims the prevailing reductionist concept of 'surplus' flows in some river basins irrespective of its diverse ecological needs and of its diversion to water scarce regions. The project touches on the fact that though the interlinking proposal has been made to reduce the water scarcity in the rain scarce areas of western and southern parts of Tamil Nadu, the choice of this gigantic project as the appropriate mechanism to achieve the goal is questioned. The project is focused on the justifiability of the assumption of an arithmetic expansion in irrigated land as the only possible solution towards maintaining Tamil Nadu food security. Based on the above observations, it identifies the need for a totally transparent techno-economic and environmental feasibility study and comparison with other possible options, before the interlinking project is given final approval. Using Remote Sensing and Geographic Information System the various parameters such as Soil, Geology, Geomorphology, Land use, Slope, Rainfall, Drainage, Basin, Relief were analyzed. All relevant data the transfer of equitable water could be distributed there by the water scarcity for drinking and irrigation purposes could resolve by linking various water channels.

### Keywords

Parallelepiped, Minimum Distance, Mahalanobis Distance, Maximum Likelihood, Spectral Angle Mapper, Spectral Information Divergence, Binary Encoding, Neural Net, ISO data and K-means

### 1.1.Introduction

Water is one of the most significant natural resources. It is a godsend that water constitutes more than three fourths of the area of the earth and hence, it is selected, properly, as 'watery planet' or 'blue planet'. Overall water resources of the earth, the un-utilizable division for more than 99%. In fact, reasonably, a trivial amount of less than 0.4%, including 0.3% of utilizable groundwater and even less proportion surface

waters, is available for direct consumption [1]. Thus, the serviceable surface waters comprise a very scanty proportion in the entire global water resources. Appropriate planning is essential for sensible exploitation of this precious commodity for striking an appropriate balance between demand and availability, and availability and utilization at the worldwide, provincial and local levels for the sustainability of their ecosystems.

## 1.2. Study Area

Thamirabarani River is 130 kilometers in length and the Thamirabarani basin is situated between latitudes 8.21°N and 9.13°N and between 77.10°E longitudes. The forty meters deep Vanatheertham waterfalls are located near the origin of the Thamirabarani River. The river is feed by its tributaries as well as by monsoons. The Thamirabarani has several tributaries, which join at different points during its course. The tributaries Peyar, Ullar, Karamaniar and Pamba join near the Papanasam Reservoir. A major tributary of Thamirabarani is the Servalar River, which joins at a distance of 22 kilometers from its origin. The Manimuthar River, which originates in the Agathimalai Ranges and joins Thamirabarani near Ambasamudram. Gadana River joins at a distance of 43 kilometres from its origin. The Pachaiyar River joins near Gopalsamudram. Chittar River flows for seventy-three kilometers before joining this River. The river flows for 125 kilometers out of which 75 kilometers are in the Tirunelveli district. The Vaigai is a river in Madurai, Tamil Nadu state of southern India. The major tributaries of the river Vaigai are, Suruliyaru, Mullaiyaaru, Varaganadi, Manajalaru and Kridhumaal. Vaippar is a river in the state of Tamil Nadu. It originates from the hills bordering the state of Kerala and runs through Teni and Virudhunagar districts before entering the Gulf of Mannar. Gunnar is a river flowing in the Virudhunagar and Tirunelveli districts of the state of Tamil Nadu. The sanctuary area is within the 15 m (49 ft.) high embankments of the community irrigation tank. The total length of the embankment is 4.010km and detailed study was made from January 2018 to December 2020.

## 2.0 Methodology

The Methodology provides the framework for the interlinking of two rivers with the aid of Remote Sensing and GIS that has been followed in this project shown in figure 1. The several tributaries should consider while planning about the interlinking of rivers, the main factor should analyzed in this area are shortest way, Land use and Land cover structures, Relief and Distance, Flow and Current of water, Dams, Canals, Slopes and so on. The planning and development is important stage in this project before enter in to the action the various parameters related to environment and social factor should investigate [2]. The various parameter scrutinized in this project are Land use, Land cover, Relief, Drainage, Geology, Geomorphology, Rainfall and River Basins. The four

possibility should consider while study about interlinking of rivers they are Dam to River, Canals to Pond, Canal to River, River to River. The multi-layer analysis introduced in this project for analysis several parameter data in the GIS environment, possible area should estimate from the level of classification [3]. The several calculation also considered in this analysis for better finding of possibilities, they are Rainfall estimation, Slope of the Basin, Relief of the Basin, Distance and length of the river and tributaries [4].

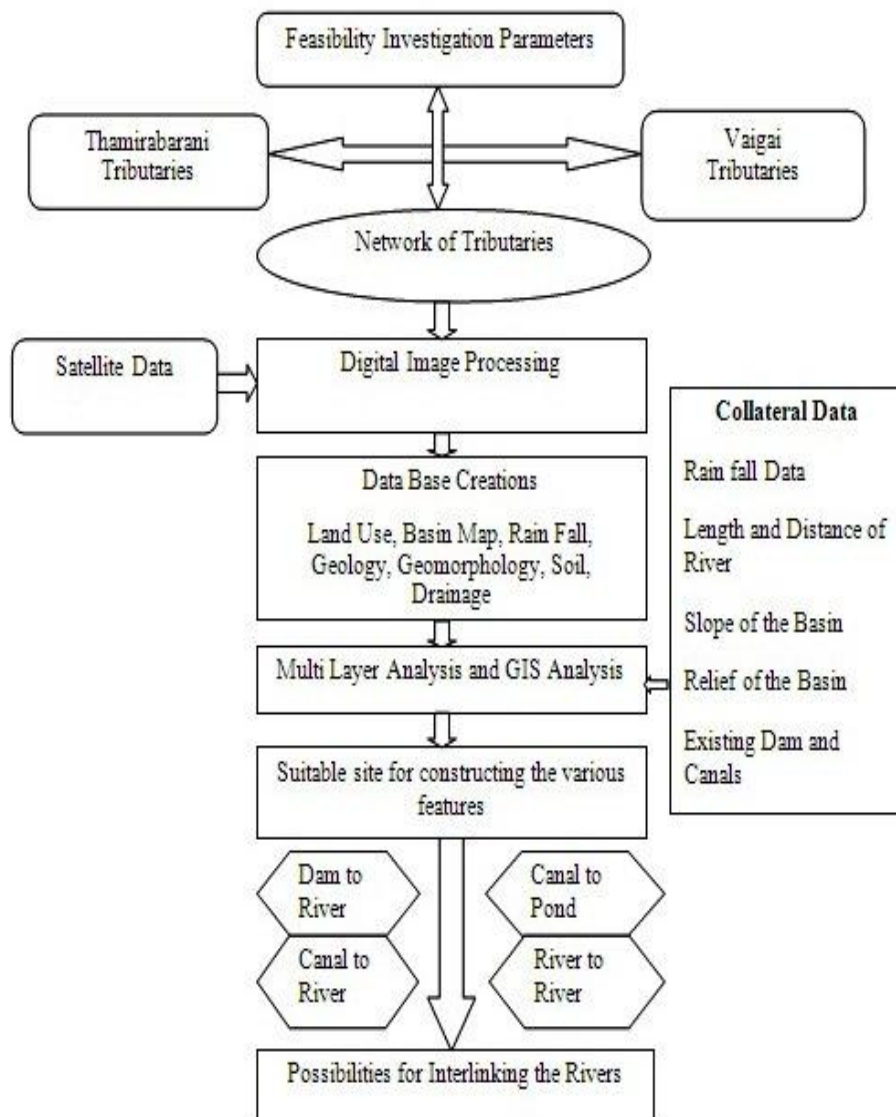


Figure 1: Frame Work for the Interlinking of two Rivers

## 2.1. Thamirabarani River Basin and Sub Basin

The Thamirabarani River consists of 5 River basins and 45 Sub basins [5]. The table 1 shows the detailed element of Thamirabarani River basin and sub basins

**Table 1:** Thamirabarani River Basin and Sub Basin

S.NO	NAME OF RIVER BASIN	AREA IN HECTARES	NO.	NAME OF THE SUB BASINS	AREA IN HECTARES
1.	Vaippar Basin	72881.98	1	Vasudevavallur I	25971.73
			2	SankaranKoil II	7476.14
			3	SankaranKoil III	6218.72
			4	Thiruvankadam part	29810.02
			5	Jamin Devarkulam	3405.37
2.	Chithar Minor Basin	235593.8	1.	Vasudevavallur II	28314.15
			2.	Karuppanathi	31777.79
			3.	Naduvakurichi I	2393.20
			4.	Naduvakurichi II	4064.11
			5.	Marukalankulam	5252.10
			6.	Uthumalai	2462.16
			7.	Melanelithanallur I	5576.53
			8.	Melanelithanallur II	11063.25
			9.	Senkottai	18734.39
			10.	Tenkasi	21022.38
			11.	Hanumanathi	7596.73
			12.	Chithar I	6020.70
			13.	Chithar II	19486.02
			14.	Kelapavoor	11358.34
			15.	Alankulam	10681.06
			16.	Manur I	23608.29
			17.	Mela-ilanthakulam	1215.90
			18.	Kodikurichi	316.99
			19.	Thiruvankadam part	10970.58
			20.	Sankarankovil I	5097.28

			21.	Sankarankovil II	8581.85
3.	Thambaraparani Minor Basin	241865.75	1.	Manur II	24655.42
			2.	Ambasamudram	73474.69
			3.	Cheranmadevi	20625.23
			4.	Devanallur	36567.88
			5.	Palayamkottai	26711.53
			6.	Thambaraparani	23650.09
			7.	Kadayam	19987.89
			8.	Pappakudi	16193.01
4.	Nambiar Minor Basin	87258.61	1.	Thirukurinkudi	10489.86
			2.	Therkku Nanguneri	15830.74
			3.	Valliyur	7051.45
			4.	Perunkudi	19644.20
			5.	Nambiar IV	11959.08
			6.	Nambiar V	12666.63
			7.	Radhapuram	9616.65
5.	Karamanar Minor Basin	44707.87	1.	Karamanar I	8003.47
			2.	Karamanar II	10548.77
			3.	Karamanar III	11569.73
			4.	Thisaiyanvilai	14585.90
<b>Total Area</b>		<b>682308.00</b>			<b>682308.00</b>

## 2.2. Vaigai River Basin and Sub Basin

The Vaigai River consists of 4 River basins and 12 Sub basins. The table 2 shows the detailed element of Vaigai river basin and sub basins

**Table 2:** Vaigai River Basin and Sub Basin

S.NO	NAME OF RIVER BASIN	AREA IN HECTARES	NO.	NAME OF THE SUB BASINS	AREA IN HECTARES
1.	Vaigai	4,64,051	1.	Suruliyar	1,15,496
			2.	Thalaivaigai	45,894
			3.	Periyakulam	36,830
			4.	Andipatti	21,958

			5.	Cholavandhan	1,68,000
			6.	Uppar	37,021
			7.	Manjalar	38,852
2.	Gunnar	1,56,044	1.	Therkar	62,668
			2.	Goundanadhi	93,376
3.	Vaippar	27,712	1.	Arjunanadhi	23,969
4.	Pambar	28,878	1.	Thirumanimuthar	23,969
			2.	Upper Palar	4,909
<b>Total Area</b>		<b>6,76,685</b>			<b>6,76,685</b>

### 2.3. Rainfall data Rainfall Data

The rainfall varies according to the season of the area. These are majorly classified into four seasons such as winter, hot weather period, southwest monsoon and northeast monsoon [6]. Table 3 and 4 show the rainfall data for Tirunelveli and Madurai respectively.

**Table 3:** Rainfall Data for Tirunelveli District

SEASONS	PERIOD	RAINFALL in mm	PERCENTAGE
Winter	Jan. & Feb.	79.18	9%
Hot Weather period	Mar. to May	172.39	19.6%
Southwest Monsoon	June. to Sep	147.98	16.8%
Northeast Monsoon	Oct. to Dec.	480.23	54.6%
<b>Total</b>		<b>879.78</b>	<b>100.00</b>

**Table 4:** Rainfall Data for Madurai District

SEASONS	PERIOD	RAINFALL in mm	PERCENTAGE
Winter	Jan. & Feb.	52.3	6.1
Hot Weather period	Mar. to May	171.0	19.7
Southwest Monsoon	Jun. to Sep.	242.3	27.9
Northeast Monsoon	Oct. to Dec.	401.9	46.3
<b>Total</b>		<b>867.5</b>	<b>100.00</b>

### 3.0 Results

#### 3.1. Pictorial Representation of Parameters

The various parameter such Land use, Rainfall, Drainage, Geology, Geomorphology and Soil map of Thamirabarani and Vaigai river is shown in figures 2 to 14 were generate with the help of Remote Sensing and Geographical Information System analysis. The various image processing technique used in this analysis such as parallelepiped, Minimum Distance, Mahalanobis Distance, Maximum Likelihood, Spectral Angle Mapper, Spectral Information Divergence, Binary Encoding, Neural Net, ISO data and K-means with the help of ENVI and ERDAS image processing software [7]. These factor should consider for the initial process for interlinking thamirbarani and vaigai rivers, these clearly shows the rain fall data, drainage possibilities and existing, land coverage details, structure and features of earth surface

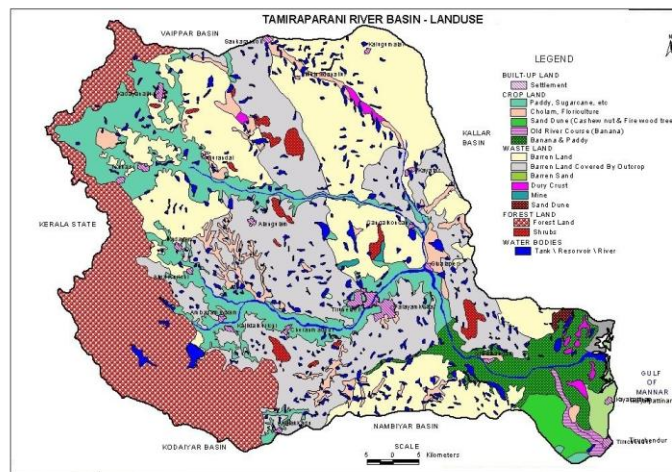


Figure 2: Thamirabarani Land Use Map

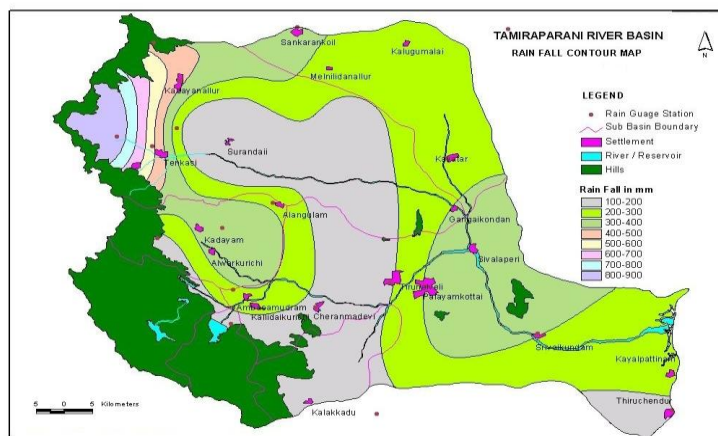


Figure 3: Thamirabarani Rainfall

Map

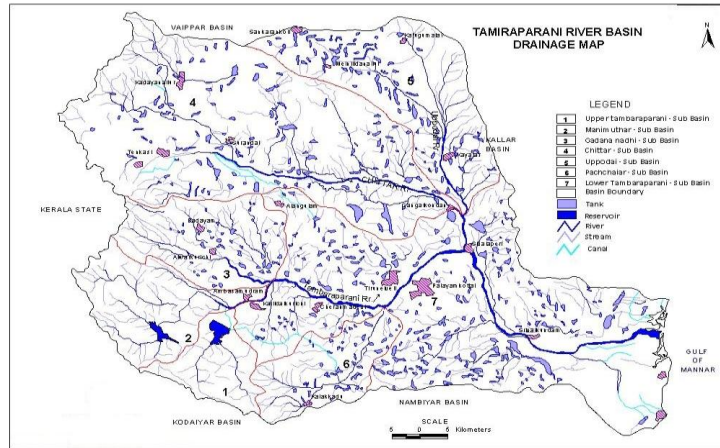


Figure 4: Thamirabarani Drainage

Map

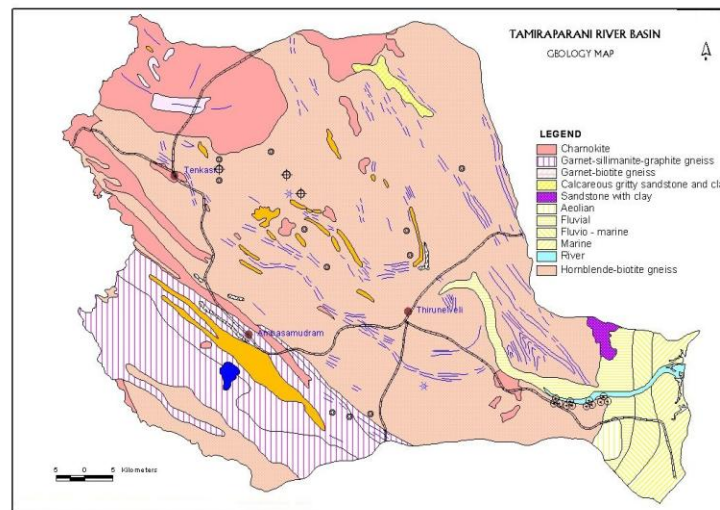


Figure 5: Thamirabarani Geology Map

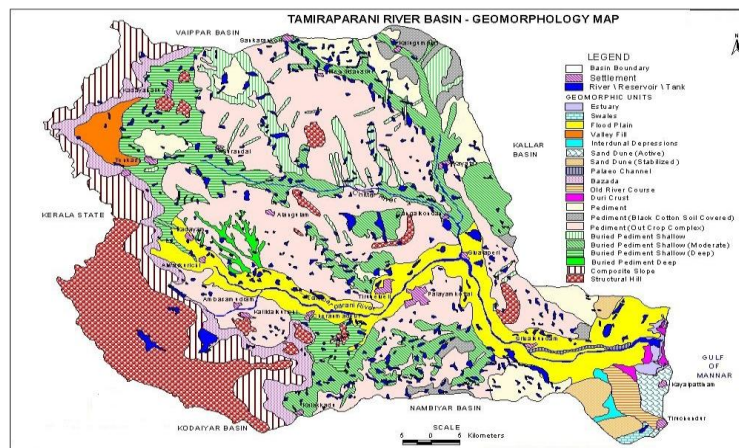


Figure 6: Thamirabarani Geomorphology



Map

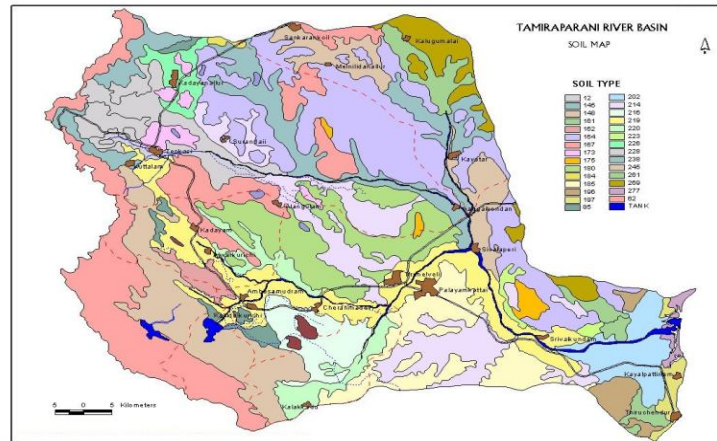


Figure 7: Thamirabarani Soil

Map

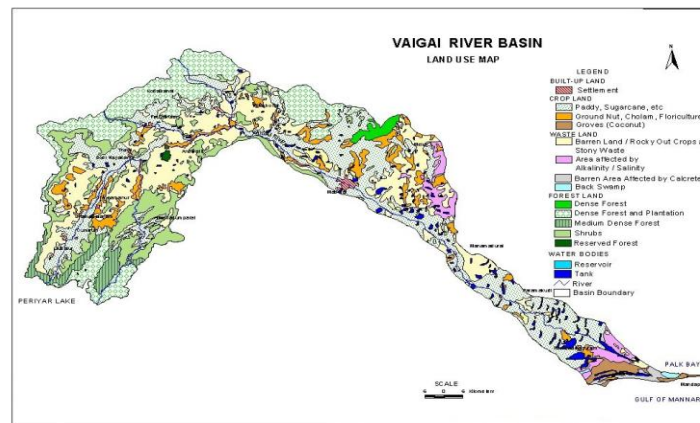


Figure 8: Vaigai Landuse

Map

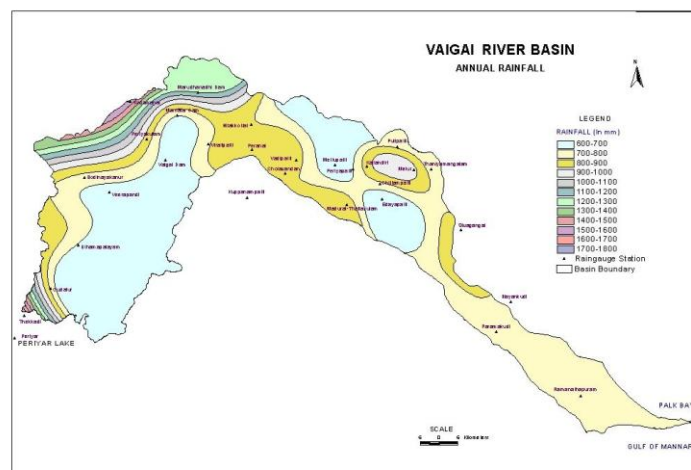


Figure 9: Vaigai Rainfall Map

Map



Figure 10: Vaigai Drainage

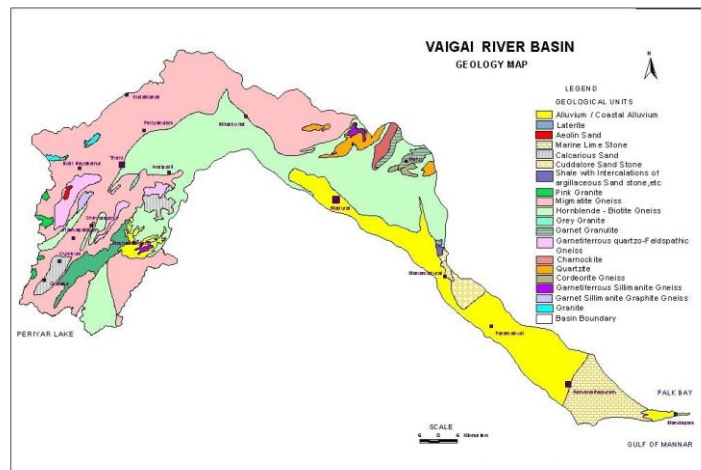


Figure 11: Vaigai Geology

Map

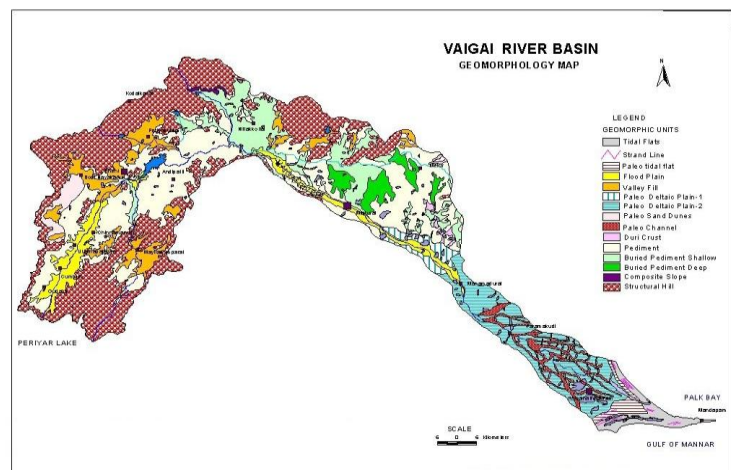


Figure 12: Vaigai Geomorphology

Map

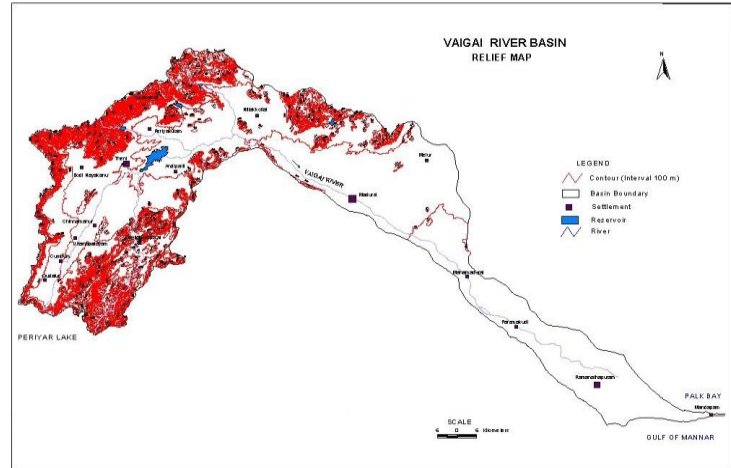


Figure 13: Vaigai Relief

Map

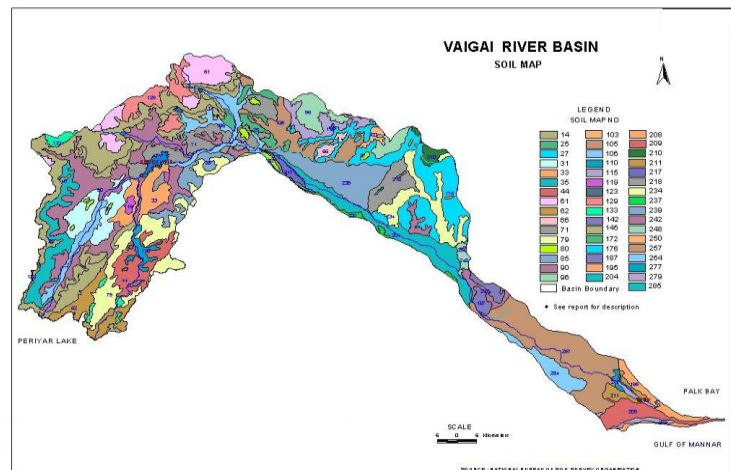


Figure 14: Vaigai Relief

Map

#### 4.0 Conclusion

This project provides information at a provincial level about the various possibilities and parameters for interlinking of Thamirabarani River and Vaigai River. The study shows the environmental and social factor are majorly supporting for achieving interlinking of rivers. The Thamirabarani and Vaigai Rivers origin and settling area present inside the Tamilnadu, so there is no possibility of confliction among the states. While interlinking these rivers unquestionably the total south Tamilnadu water scarcity will be reduced, majorly the following districts Dindigul, Theni, Tuticorin, Sivanganga, Madurai, Virudhunagar, Ramanathapuram, Tirunelveli and Kanyakumari will get benefit and possibility of increase the water storage

capacity for the irrigation and drinking purpose. In other hand interlinking of themirabarani and Vaigai Rivers helps to control the floods in south Tamilnadu and the surplus water flow may be used for diverse purpose such as Agriculture, Irrigation, Electric power generation and so on

## 5.0 References

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