



SCRUTINIZATION OF DRAINAGE PATTERN USING ArcGIS FOR THANJAVUR DELTA

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ABSTRACT

Water is a precious natural resource and at the same time complex to manage. Hence the drainage basin management approach has emerged as a holistic and an integral way of research. Drainage Basin is not simply the hydrological unit but also socio-political and ecological entity which plays a crucial role in determining food, social and economical security and provides life support services to rural people. In this study a standard methodology is proposed to determine drainage pattern using integration of RS & GIS technique. The composite map is generated using ArcGIS tools. The criteria for selecting drainage basin size also depend on the objectives of the development and terrain slope.

Conservation of natural resources is essential to sustain any developmental activity. The global climatic conditions as well as the land mass locality are varying in an irregular manner. Hence for the development of land and water

resources and to arrest land degradation process to preserve environment and ecological balance. In order to achieve this plan, require scientific knowledge of soils, surface water, ground water and land cover have been generated as a multi-spectral and social economic data in a GIS for the sustainable development of land and water resources. The use of suggested methodology is demonstrated for a selected study area in Thanjavur delta and rural area around it of Tamil Nadu state. This watershed management information in the form of digitized map will be useful for effective identification of spatial variations in land and water resources.

Key words: Drainage basin, Socio-economic, Delta region, Drainage pattern, Spatial data, Land variation, Digitized map, ArcGIS.

INTRODUCTION:

Water is the most essential element to life on Earth. Water on earth



moves continually through the water cycle of evaporation and transpiration, condensation, precipitation and run off usually reaching the sea. Approximately 70% of the fresh water used by humans goes to agriculture. However, some observers have estimated that by 2025 more than half of the world population will be facing water based vulnerability. A report stated that “there is enough water for everyone but the access to it is hampered by mismanagement and corruption”. Hence the emergence of watershed management is needed.

The term watershed refers to the geographic boundaries of a particular water body, its ecosystem and the land that drains to it. A watershed also includes groundwater aquifers that discharge from streams, wetlands, ponds and lakes. The goal of watershed management is to plan and work towards an environmentally and economically healthy watershed for the benefit of the biotic community. Watershed management essentially relates to soil and water conservation in the watershed, which means proper use of land and the protection of land from all deterioration. The watershed management data arrived through RS & GIS will be effective, since the results will be more accurate and in the form of digitized thematic map. These days, remote

sensing specialist and hydrologists confirm that remote sensing data & GIS are only used rudimentarily in their daily routine. For this reason it is important to demonstrate the value of remote sensing data and GIS technology for drainage pattern mapping. The fast emerging spatial information technology remote sensing and GIS have effective tools to overcome most of the problems of land and water resources planning and management rather than conventional methods of data process ^[1]. The analysis of the drainage basin is aimed to accurate data of measurable features of stream network of the drainage basin ^[2]. The main goal of this study is to map drainage pattern based on terrain, hydrological & geological parameters employing multi criteria approach. [3] proposed a system, this fully automatic vehicle is equipped by micro controller, motor driving mechanism and battery. The power stored in the battery is used to drive the DC motor that causes the movement to AGV.

STUDY AREA:

Thanjavur, formerly Tanjore, is a city in the south Indian state of Tamil Nadu. The city is an important agricultural centre located in the Cauvery Delta and is known as the "Rice bowl of Tamil Nadu". Thanjavur is located at 10.7870° N,



79.1378° E ^[3]. The district forms part of Cauvery river basin and Vennar and Vettar sub basins. The Kollidam River forms the northern boundary and flow from west to east. The Grand Anaicut is located at the western boundary, at this point

Cauvery splits into Cauvery and Vennar. A regulator at Thirukkatupalli splits Cauvery into Cauvery and Kodamurti rivers. At Thenperumbur anaicut Vennar splits into Vennar and Vettar.

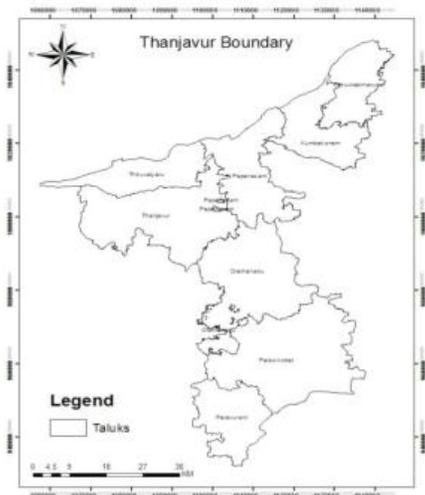


Fig.1

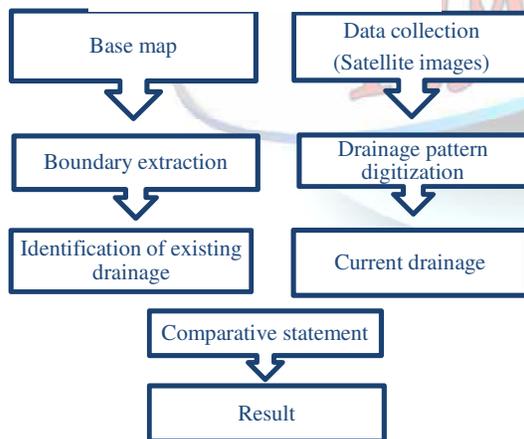


Fig.2



METHODOLOGY:

The methodology adopted for the study is given below (fig.2). The toposheets in a scale of 1:250,000 and satellite image that cover the study area was collected. The sources of spatial and non spatial data are utilised for this study. By assimilating the toposheets and satellite image the basemap was prepared with displaying all geographic features. With the help of this base map using ArcGIS software the boundary of Thanjavur district was extracted. In drainage pattern analysis, using point pattern the discharge level of drainage basin is plotted^[4].

Based on discharge the drainage basins are classified into different levels. It has been considered that the discharge in Level 1- greater than 15m , Level 2- 5 to 10m , Level 3 – less than 5m. By considering the analysed pattern the thematic map of drainage basins for Thanjavur has been arrived using ArcGIS.

RESULTS & DISCUSSION:

DRAINAGE PATTERN:

The river Cauvery and its tributaries are the most remarkable features of Thanjavur district. The river flows from Karnataka State and passes through Dharmapuri, Salem, Erode, Thiruchirappalli, Thanjavur, Thiruvarur and Nagapattinam districts covering a distance of about

770 km draining an area about 72.800 sq.km in all. After Grand Anaicut, the Cauvery divides into numerous branches and covers the whole delta with a vast network of irrigation channels. The main branches of the Cauvery are the Vennar, Kodamurutiyar and the Arasalar and these again branch out into smaller rivers. The Vennar gives off two branches called Vadavar and Vettar in Thanjavur taluk. The Vadavar flows through Thanjavur and Papanasam taluks. The Vettar flows through Papanasam, and enters into Thiruvarur district. Still further down, the Vennar supplies two more branches namely, the Pandavayar and the Vellayar, flowing through Mannargudi taluk of Nagapattinam district. Muniyar and its branches, Adappar and Hari-Chandramathi, are distributaries of the Koraiyar flowing through Tiruchirappalli^[5].

There are altogether 36 main rivers covering a distance of 1600 Kilometres. There are 29,881 channels, totalling 24,000 kilometres in length, serving the delta below the Grand Anaicut^[6].

These are the major eight taluks in thanjavur district which covers the area in the boundary are tabulated below:

S. NO	NAME OF TALUKS	AREA (km)	AREA IN
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			PERCENTAGE
1.	Thiruvidadaimarudur	248.8457	7.3%
2.	Kumbakonam	290.1281	8.5%
3.	Papanasam	381.8115	11.2%
4.	Thiruvaiyaru	272.5098	8.01%
5.	Thanjavur	609.8383	17.9%
6.	Orathanadu	585.3602	17.2%
7.	Pattukottai	725.7605	21.3%
8.	Peravurani	286.8858	8.4%

Using the spatial data the mapping of drainage pattern based on the considered level with help of ArcGIS are shown below:

Cauvery and its tributaries crossing Thanjavur

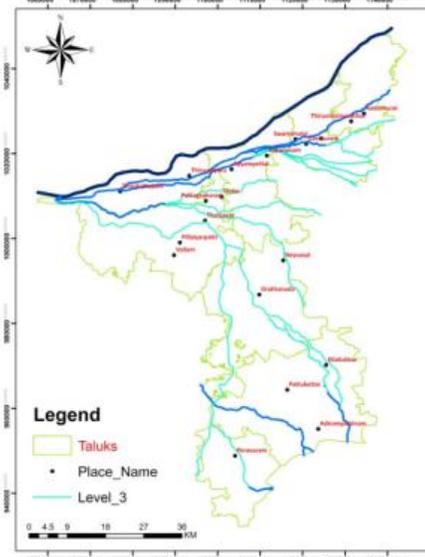


Fig.3

Based on discharge the drainage basin is classified into three levels.

(1) Level 1 comprises of major river basin greater than 150m.

(2) Level 2 comprises of minor river basin 50 to 100m.

(3) Level 3 comprises of small streams & canals less than 50m.

From this the distance of river basin flow through thanjavur district according to levels are tabulated below:

S.NO	BASED ON DISCHARGE LEVEL	DISTANCE (m)
1.	Level - 1	98502.6021
2.	Level - 2	279401.1421
3.	Level - 3	464397.0471

CONCLUSION:

The Cauvery, is the major river which passes through Thanjavur delta. It divides into several branches and gives water to all the regions of Thanjavur district. Based on the width of the river we divided it into three categories as level 1, level2 and level 3 for the work of mapping aided by ArcGIS. It is the software which is usually used to arrive a thematic results in a digitized



form. The results will be more accurate.

Hence the analysis of drainage pattern has been done with this software and the rivers are plotted by point pattern analysis. As a result the length of the rivers along the level 1, level 2, level 3 are 98502.6021m, 279401.1421m, 464397.0471m respectively. These data are arrived as a thematic map which will be helpful for future reference in prediction of spatial variations in water and land resources.

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