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# Watershed Management for Namakkal District Using GIS

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***Abstract :*** The Eastern Ghats of southern Tamil Nadu is composed of prominent delta valley of the river Cauvery. Being a perennial river, Cauvery extends its sub-watershed across the paths of Salem and Namakkal. It is evident to measure and put forward the pavement of this river across the study area. This paper uses the images of LISS 3, SRTEM; constructive and destructive analyses are further carried out with the above images. This basin area of sub-peninsular extends over different morphological area of the delta valley. The study is coupled with the information delivered by the survey of India toposheets. The morphometric and anatomical analysis is carried out by employing ArcGIS 9.1 software platform. Various theoretical and visual aspects of the basin are analyzed and interpreted, especially the remarkable hindrance due to astounding influence of geology, geo-morphology and tectonics of the basin. The results are discussed in this paper. Digital Elevation Model for the study area is prepared using ERDAS IMAGINE 9.1.

***Keywords :*** Digital Elevation Model, LISS 3, GIS, Stream order

## 1. INTRODUCTION

In order to sustain life, water is an extremely important element. Water is the most essential substance on earth. For healthy upward growth of farm stock and crops, water plays a key role. Water gets contaminated when in contact with chemicals and other impure substances. There have been thousands of deaths which are mainly due to disease causing germs which spread by polluted supply of water. Water can be collected through many ways. The main sources of collecting water are surface water, bores and wells, artesian bores, rock holes and its catchment areas, springs, excavated dams etc..

Watershed management is the geographical area where water glides into a body of water which can be a stream, lake, river or even an ocean. Water usually drifts from the runoffs of storm water and rainfall. If there are naturally elevated areas, then a watershed gets separated from another watershed. Regarding wild land watershed management, Satterlund and Adams [1] discussed about the possibilities of harvesting and passing of excess rain water in a proper manner. Further, they also discussed about watershed management in detail. Farrington et al.[2] has discussed about the management of excess water effectively in stakeholder and panchayati raj, this further explains in detail about the need and development of watershed management in relevant areas. Natural resource management is still an arena of conflict whereas few stakeholders and environmental activists are implementing this methodology at a successful rate which is in detail explained by Meenakshi Ahluwalia [3]. Pari Baumann [4] discussed about the constraints and challenges of implementing watershed management in Panchayat level. Yet natural resource management remains an arena of conflict, while certain stakeholders have benefited from soil and moisture conservation activities and the enclosure of commons, others especially common people have suffered for their livelihood. [5].

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## A. Study area

In the district of Namakkal, taluk of Tiruchengodu the Indian village Andipalayam is located. Andipalayam exactly lies in the border of Salem and Namakkal districts. The elevation level of the study area is 271 meters above sea level.

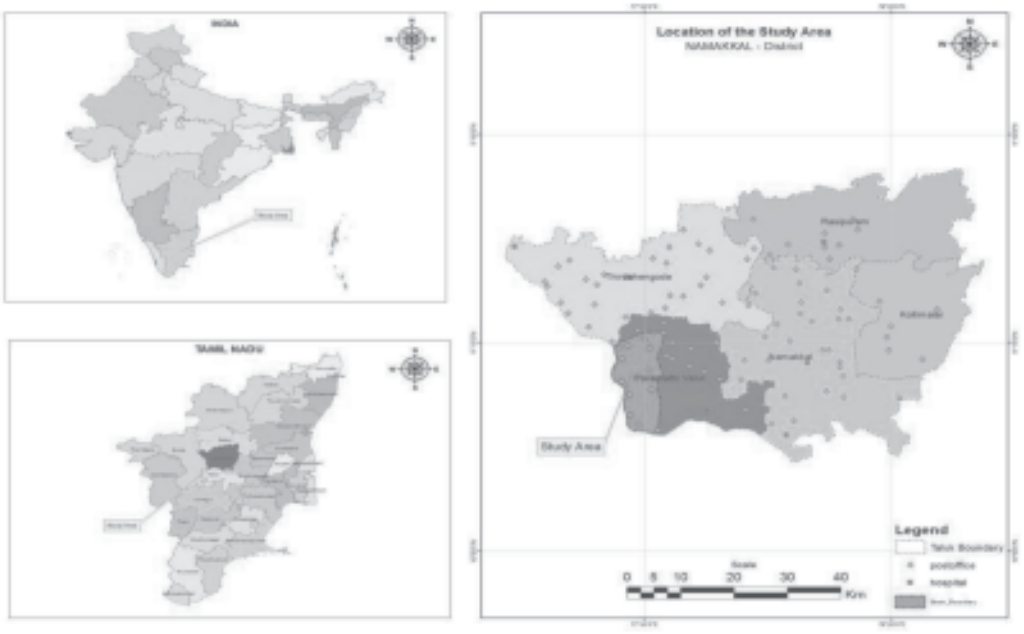


**Fig. 1. Study area**

## B. Data Used

The data used in this paper is LISS III image (Fig 2.). It is a multispectral image and it has four spectral bands: three in visible and near infrared and one in SWIR regions. It covers the area of 141 × 141km.


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**Fig. 2. Data Used: LISS III image.**

### C. Methodology

The data has been taken from the survey of India and the study area is clipped. After geo-referencing the Digitized Elevation Model (DEM) is created. The flow diagram for the methodology used is as given in Fig 3.

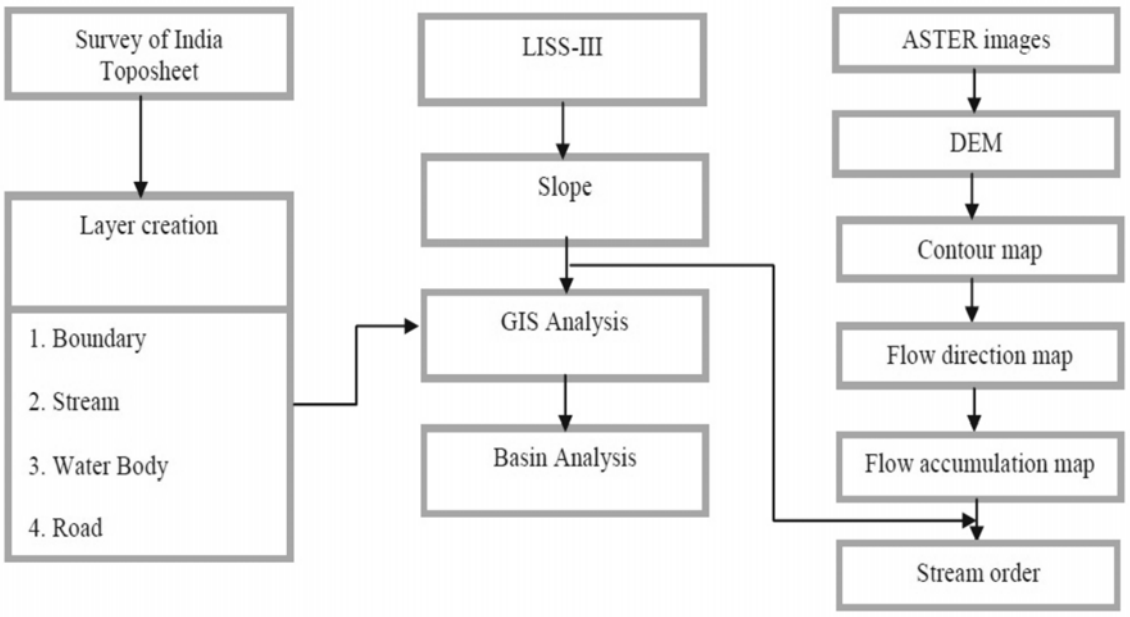


**Fig 3. Flow diagram of methodology**

## 2. SCOPE

At the early stages watershed management is to be designed with the geographic areas and other constraints before the implementation phase. A well designed watershed management should describe about the management efforts and environmental hazard. It deals with the hydrologic recycle which in turn deals with flow of subsurface water, air, ground water and land. It also provides re-habitation of the water resource. It should provide re-habitation and health whenever water gets degraded. A lot of constraint such as economic, bio-physical, social factors, urbanization and industrialization influence the development of watershed management.

## 3. OBJECTIVE

Maintaining the hydro-sphere cycle, exchange of water, irrigation are the significant aspect of water-shed management. Therefore minimizing the damage and finding the optimal solution without compromising the quality of living is the goal of this paper. The key objectives include the following: Improvising the soil quality and raising the productivity ratio, maintaining the clean water supply for living, construction of storage facility, making the substantial growth over domestic water supply, hydropower generation, and preparation to sustain the life during flood, landslide and droughts condition to a higher extent, maximizing the water productivity per area mainly in rural areas, diminishing the money spend over water per area of land by the farmers.

## 4. DEM

Digital elevation model (DEM) is a most popular tool in Arc water facility, which has its application much into watershed delineation process. Hydrologic and environmental analyses are the scope of watershed delineation. DEM provides facility to calculate standardized datasets such as climatic change, geographic location, coverage of land, soil properties and so on. ArcGIS enables a consistent and reliable way to club the datasets of water-shed management with help of streams and river based networks. Further it can detect the flow upon elevated areas with detecting distance of flow path and by sorting the streams. This can continuously combine the geological data with temporal data via various resources the scope is extended to field data and mobile GIS.

## 5. CONTOUR MAP

Map exhibits the land surface structure, surface and configuration by contour lines. The slope, terrace are represented through relative spacing up of lines so closely. Contour lines can be illustrated for contour map. The steepness of the slope can be determined with the contour map. Contour map is as shown in the Fig 4.

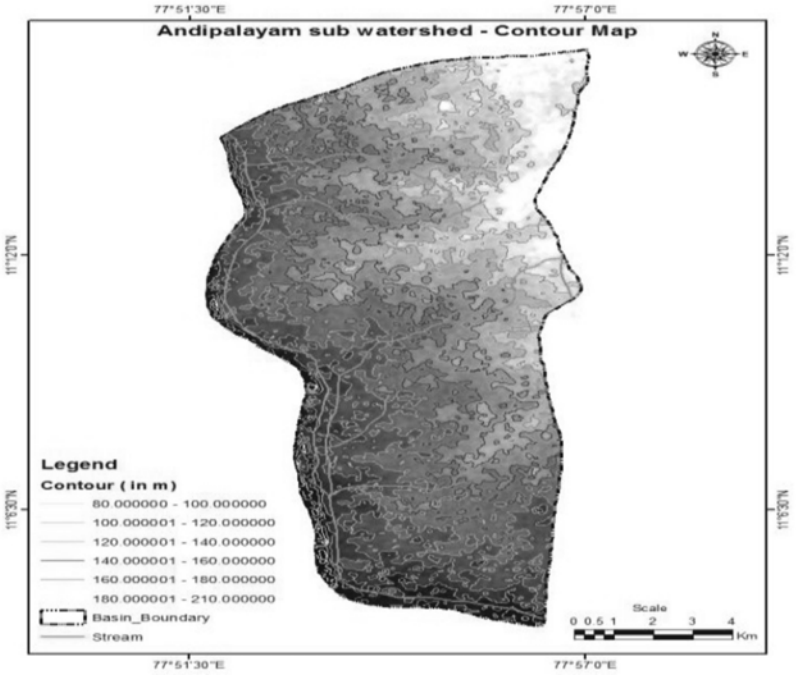


**Fig. 4. Contour map.**

## 6. FLOW ACCUMULATION MAP

Various water-shed are spatially defined by the characteristic of geomorphic drainage. Initially the flow path of each and every cell, on the landscape grid is formulated. Flow accumulation helps in generating the drainage network by the flow direction of the cell. Flow Accumulation map is shown in Fig 5.

## 7. SLOPE MAP

This refers to the direction is to degree of a slope in a terrain. This is shown with hues (*i.e.*) the difference of red, orange, yellow colors. Slope map is shown in Fig 6.

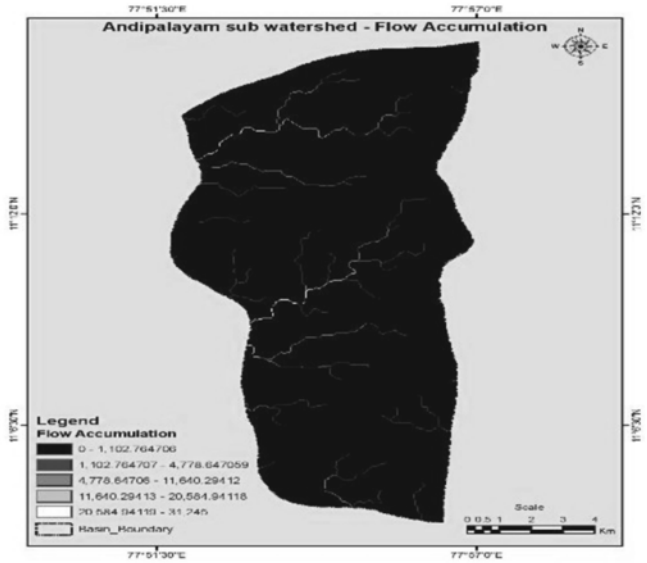


**Fig. 5. Flow Accumulation Map.**

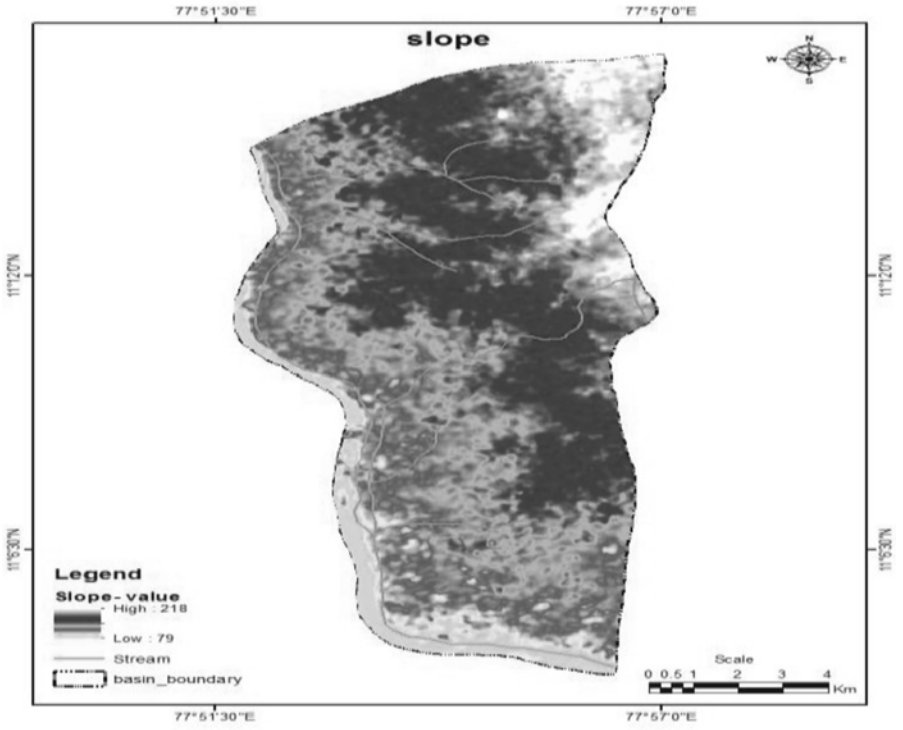


**Fig. 6. Slope Map.**

## 8. FLOW DIRECTION MAP

Flow direction operation determines in which direction the water flows naturally. Flow direction map is shown in the Fig 7.

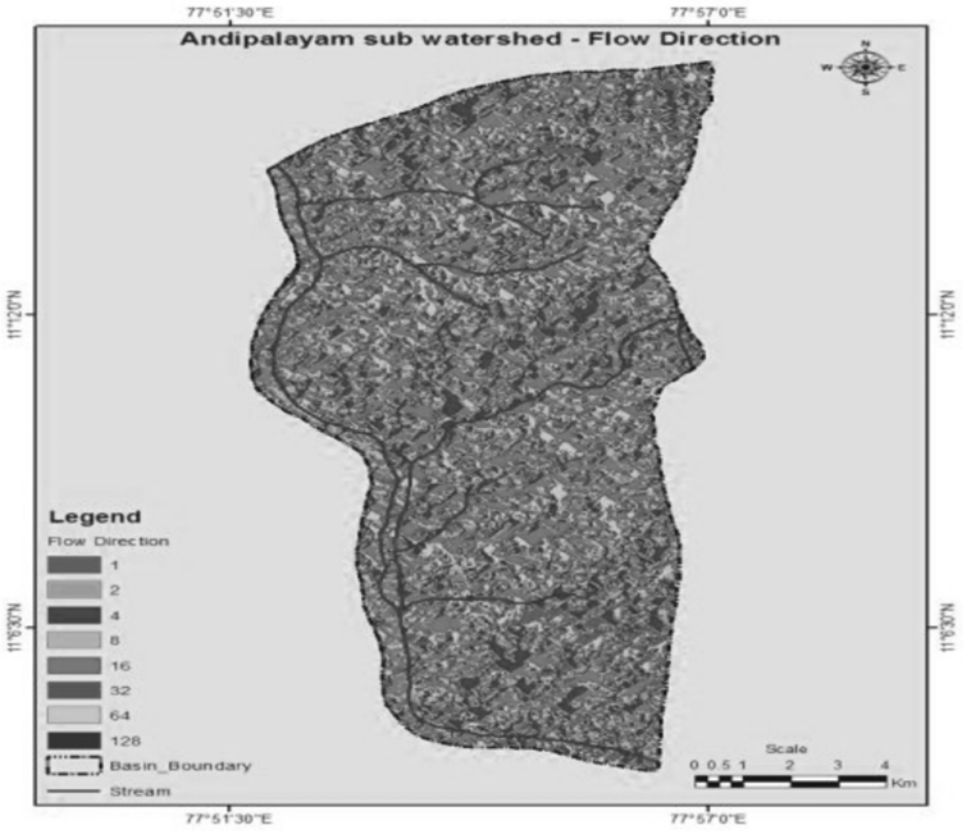


**Fig. 7. Flow Direction Map.**

## 9. RESULTS AND DISCUSSION

In Namakkal district, Andipalayam area is selected and for this area slope, contour map, flow accumulation, flow direction, digitized elevation model is being established. These things will enable us in finding the altitude and peaks. Even stream order is being found out. The magnitude of stream order increases based on tributaries.

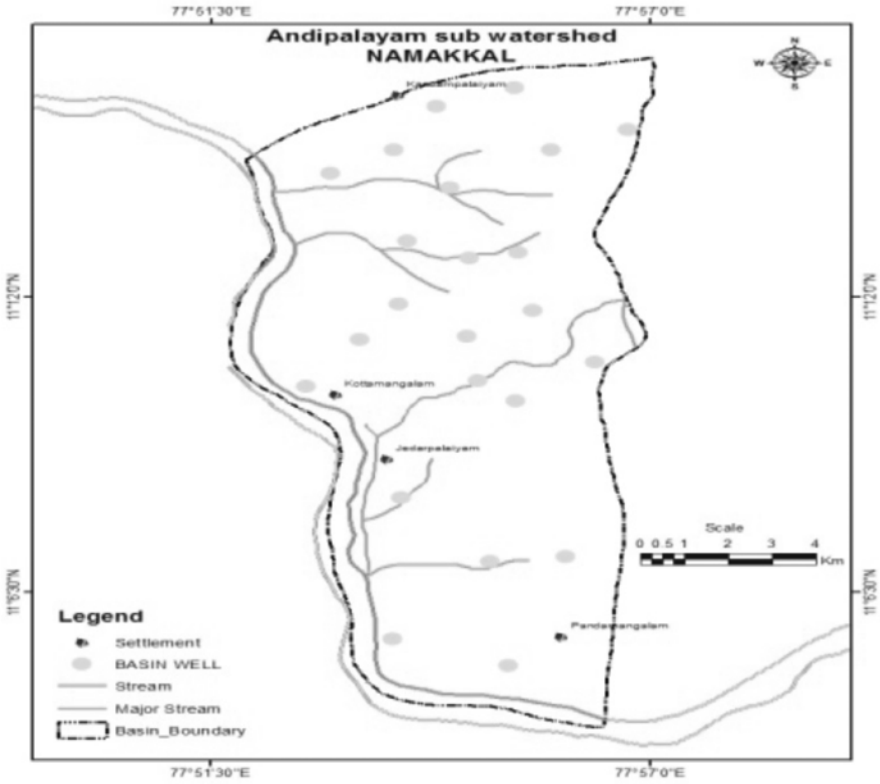


**Fig. 8. Basin Map**

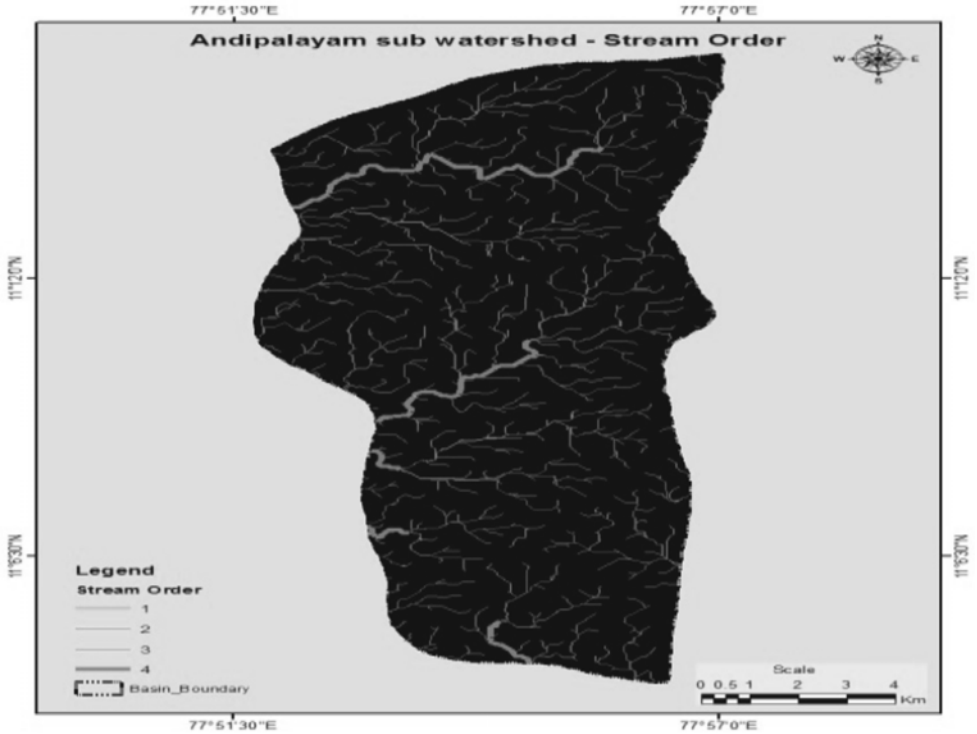


**Fig. 9. Stream Order.**

## 10. CONCLUSION

The paper describes about the assessment of natural resources in Namakkal district's watershed Management. The ideal constituent of a watershed are land, water, forest and its acquaintances, which have been studied in detail to assess their present circumstances and predict their future condition. Traditional methods for the assessment and conservation of highly technical and updated tools like ERDAS and GIS. These results are useful for communicators and ecology programmers. Also this view is suitable for other areas and related problems and it can be adopted by planners and managers for easy decision making. The rich experience in collaborative IWM particularly in participatory action research provide the knowledge base in climatic changes thereby achieving appropriate management of fragile ecosystem using structural and non - structural measures.

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