

# GENERATION OF FLOOD MODEL AND IDENTIFICATION SUITABLE SITES FOR ARTIFICIAL RECHARGE STRUCTURES

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**Abstract** - In recent years humans have endured increasing number of natural disasters, of which flood is the greatest and most common throughout the world. Flood plains are thickly populated because of their economic significance. The present study area is Paravanar river basin. This river basin is affected by flood frequently during north-east monsoon periods (Sept-Dec). In order to avoid excess flow of water they can be stored during this time and utilized when in need. So generating a model in Paravanar river basin to know the intensity of flood using SNAP software tools. Landsat 8 satellite images are collected and various thematic maps are generated. In order to manage the flood water, by referring the flood model and thematic maps suitable sites for artificial recharge structures will be done. The thematic maps are overlaid by Weighted Index Overlay Analysis method. Using this method suitable sites for constructing Artificial recharge structure are determined.

**Key Words:** flood model, soil, geology, geomorphology, DEM, LULC, drainage, slope, rainfall and water level maps, Artificial recharge.

## 1. INTRODUCTION

Flood is an overflow of water that immerse land that is usually dry. Flooding may occur as an over flow of water from water body such as river, lake or ocean. Flood is caused under the influence of both natural and anthropogenic factors which vary from place to place. Flood is a perpetual natural hazards in the flood plains of monsoon Asia where, 80% of annual precipitation is received in the four wet months from June to September. Flooding is as a result of complex interaction between rainfall and surface processes. India is the one of the most prone countries of the world. Approximately 25% death occurs due to drowning in floods internationally.

Floods are probably the most happening, widespread, disastrous and frequent natural hazards of the world. Continuous occurrence of high intensity rainfall for a few days is the primary factor contributing to the extreme floods. Floods occurring from excessive rainfall within a short duration of time and consequent high river discharge damage crops and infrastructures. They also

result in settling of the reservoirs and hence limit the capacity of existing dams to control floods.

### 1.1 Flood Effects

The primary effects of flooding include loss of life and damage to buildings and other structures like bridges, sewerage systems, roadway sand canals. Floods also frequently damage power transmission and sometimes power generation, which then has indirect effects caused by the loss of power. This includes lack of drinking water treatment and water supply, which may result in loss of drinking water or severe water contamination. It may also cause the lack of sewage disposal facilities. Lack of clean water combined with human sewage in the flood waters raises the risk of waterborne disease which include typhoid, giardia, cryptosporidium, cholera and many other diseases depending upon the location of the flood. Damage to roads and transport infrastructure may make it difficult to provide aid to those affected or to provide emergency health treatment. Flood waters typically immerse farm land, and the land becomes unworkable without planting and harvesting that can lead to shortages of food both for humans and farm animals. Entire harvests for a country can be reduced in extreme flood circumstances. Some tree species may not live prolonged flooding of their root systems.

### 1.2 Artificial Recharge Structure

The effectiveness of recharge structures in enhancing the recharge process has been evaluated for different recharge structures, namely, check dam and percolation pond with percolation wells, individually as well as in a combined manner. These structures have been constructed and monitored for their effectiveness through field pilot scale studies in a watershed in Tamil Nadu. The effectiveness was assessed in terms of increase in groundwater table, improvement in the quality of groundwater and the percentage of recharged quantity in terms of water storage created by the recharge structures using analysis of water-level fluctuations in observation wells and mass balance approach.

### 1.3 Role of Remote Sensing and GIS

Space and Air based observations of earth provide a unique view point for monitoring and assessing the floods and other disasters. The traditional floods mapping and studies were based on traditional surveys and historical flood records. In this regard, space technology has made consequential contribution in every aspect of flood disaster management such as preparedness, prevention and relief. The Indian and other global remote sensing satellite are being used for obtaining the information about flooded areas and flood damage assessment.

A geographic Information System (GIS) is a computer system capable of assembling, storing and manipulating, analysing and displaying geographically referenced information. This system consists both data identified based on their locations, graphic and non-graphic data. Geographic Information System (GIS) is used in this study to create various maps, data analysis and for creating site suitability maps.

### 1.4 Need for the Study

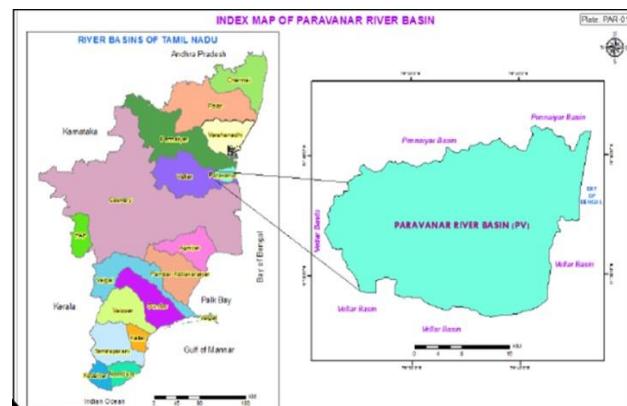
Continuous occurrence of high intensity rainfall for a few days is the primary factor contributing to the extreme floods. Drainage problems also occurs simultaneously if floods are prolonged and the outfalls of major drainage arteries are blocked. One of the major reasons for the floods is the massive indiscriminate deforestation, which leads to large amounts of topsoil coming loose in the rains. Thus, the soil, instead of absorbing the rainfall, flows down into the river and in turn causes the riverbeds and its tributaries to rise. In order to avoid excess flow of water they can be stored during this time and utilized when in need. So to collect the excess water artificial recharge structures are constructed. Site selection for soil and water conservation structures is done.

## 2. STUDY AREA

Paravanar River basin which is a leaf shaped river basin and second smallest river basin of Tamil Nadu lies within the Cuddalore District of Tamil Nadu. The basin falls in the survey of India Toposheet Nos.: 58M / 6, 58M / 7, 58M / 10 & 14 and 58M / 11 in scale 1:50,000 lying in between the latitude 11°18' to 11°45' North and longitude 79°18' to 79°45' East. Paravanar Basin is bounded on the North by Pennaiyar river basin, in the South and West by Vellar river basin and on the East by Bay of Bengal. The Geographical extent of Paravanar basin is 872.34 sq km.

The upper part of the basin is drained by the river Paravanar and the lower part of the basin drained by the Uppanar. Based on this, two sub basins were delineated.

The Paravanar sub basin is 435.016 sq.km and the Uppanar basin is 437.325 sq.km totalling to 872.34 sq.km for the basin as a whole. The index map of the Paravanar basin was shown in the fig 1.



**Figure-1:** Index map of the Paravanar river basin

### 2.1 Data Collection

Remote sensing and GIS techniques offer a wide range of possibilities in the study of flood and its effect. The unique capabilities of satellite-based sensors in providing a wide spectrum of information available through the electromagnetic spectrum in repetitive and synoptic coverage over in accessible and larger areas in frequent intervals made the remote sensing technology.

- Landsat 8 data set for the year 2015 and 2016 which is collected from USGS Earth Explorer website shown in fig 2.
- Sentinel 1 data set for the year 2015 and 2016 which is collected from ASF Alaska satellite facility shown in fig 3.
- Data used for creating thematic maps like geomorphology, geology, soil, land use, digital elevation model, drainage from Institute of Water Studies.
- Non spatial data used for this study are in the form of tabulate type data and the thematic maps created using this data are rainfall and water level.

### 2.2 Data Used

Satellite imagery LANDSAT 8 data for the year 2015, 2016 were used for the study which is given in the table 1.

**Table -1:** Satellite data description

S.no	Satellite data	Acquisition date
1	Landsat 8	24.06.2015
2	Landsat 8	18.01.2016
3	Sentinel 1	28.05.2015
4	Sentinel 1	24.11.2015

## 2.3 Software Used

In this study, ARCGIS 10.4 version software is used. This software is user friendly and it is freely downloaded from the internet. By using this software image processing and map generation are carried out.

**ArcGIS 10.4** version is a geographic information system (GIS) useful for creating and using maps compiling geographic data. It also helps for analyzing mapped information sharing and discovering geographic information using maps and geographic information in a range of applications and managing geographic information in a database. This software is also capable of conversion of data from one format to another format. So that, major works for this study is done by using this software.

**ENVI 4.8 version:** ENVI (Environmental for Visualizing Images) is a software application used to process and analyze geospatial imagery. It is commonly used by remote sensing professionals and image analysis. ENVI is the flawless software for the visualization, analysis and presentation of all types of digital imagery. ENVI having complete image processing package includes advanced spectral tools, geometric correction tools, terrain analysis, Radar analysis etc.

**SNAP:** A Snap (Sentinel Application Platform) is a general architecture for all sentinel toolboxes developed by European Space Agency (ESA). SNAP is specially developed software for processing the sentinel data. The SNAP architecture is complete for Earth observation processing and analysis due to the following technological innovations: Extensibility, Portability, Modular rich client platform, Generic EO Data abstraction, Tiled memory management, and a Graph processing framework.

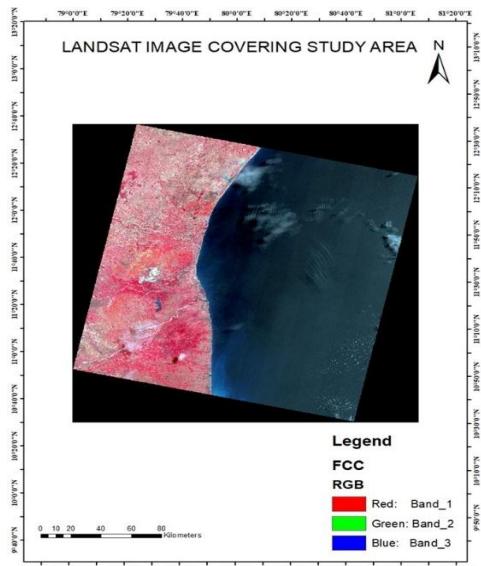


Figure-2: Landsat 8 image covering the study area

## 3. METHODOLOGY

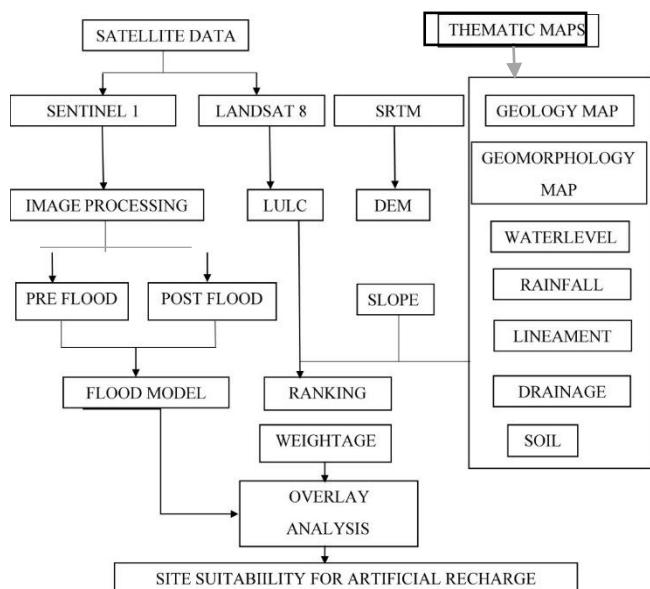


Figure -3: Flowchart for Methodology

### 3.1 Selection of Data sets

The data set consist 2015, 2016 satellite images captured by LANDSAT 8. Different time period of data is downloaded to avoid the cloud cover images.

### 3.2 Study Area Extraction

The study area is extracted from the collected satellite image. False colour composite was generated using different band combination using ArcGIS 10.4 version software.

### 3.3 Classification Technique

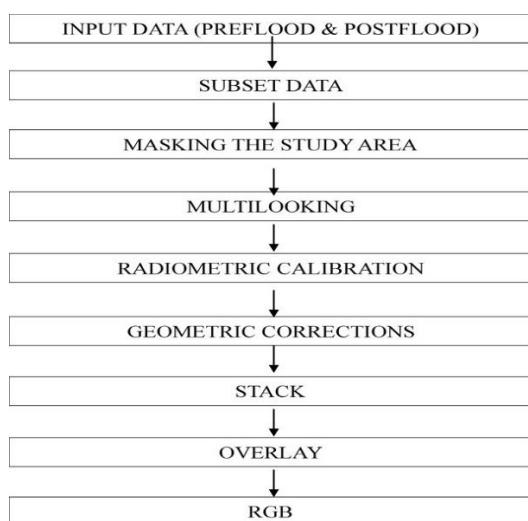
The aim of the classification process is to categorize all pixels in a digital image into one of several land cover classes or "themes". This classified data may then be used to produce thematic maps of the land cover present in an image. Normally, multispectral data are used to perform the classification and to be sure the spectral pattern present within the data for each pixel is used as the numerical basis for categorization (Lilli sand and Kiefer, 1994). The objective of image classification is to identify and depict as a unique grey level (or colour), the features occurring in an image in terms of the object. There are numerous classification algorithms which can be divided into supervised classification, unsupervised classification and hierarchical approaches. Among these classification, supervised classification gives best result

and overall percentage. This is the common algorithm used by many GIS specialist to prepare LULC maps.

### 3.4 Preparation of Thematic map

The thematic maps are created using two types of data they are spatial and non-spatial data. Spatial data used for this study are IRS P6 LISS III FCC LISS IV 2014 and the thematic maps created using this data are geomorphology, geology, soil, drainage, land use, digital elevation model. Non spatial data used for this study are in the form of tabulate type data and the thematic maps created using this data are rainfall and water level.

### 3.5 Process on SNAP



**Figure -4:** Flow chart of SNAP process

### 3.6 3D Flood model on ArcGIS

After creating flood map in SNAP software the file was inserted in ARCGIS to create 3D flood model of the study area. The 3D flood model was created in Arc Scene and exported as a flood model map in ArcMap.

### 3.7 Ranking

Ranking was the arrangement of values from higher to lower. The values will be useful to identify the ground water availability. Each thematic layer will be segregated and each is assigned with the values. The higher value will be fixed based on the availability of ground water availability (more water). The lower value will have less water availability (lesser water). Likewise all the ranking values are assigned. The geology, geomorphology, land use, drainage are assigned considering the features available which has higher capacity to hold water. Other data are assigned based on

water potential. Ranking can be done from values 1 to 10 and it is inputted in ArcGIS. Thus all the ranking for all layers are created.

### 3.8 Weightage

The weightage means the preference of values given to thematic layers. Weightage are mentioned by the values. The value varies from 1 to 9. Each weightage will be assigned from the higher to lower value based on the availability of water. Thus the ground water potential zones map are created.

### 3.9 Analysis

The rankings maps are created for all the thematic layers. The vector format of layers is converted to raster format (different colour combination). For this, ArcGIS was used and the conversion tool is used. Likewise all the ranking maps will be created. Then all the layers are overlaid using the overlay analysis tool.

### 3.10 Site Suitability of Artificial Recharge

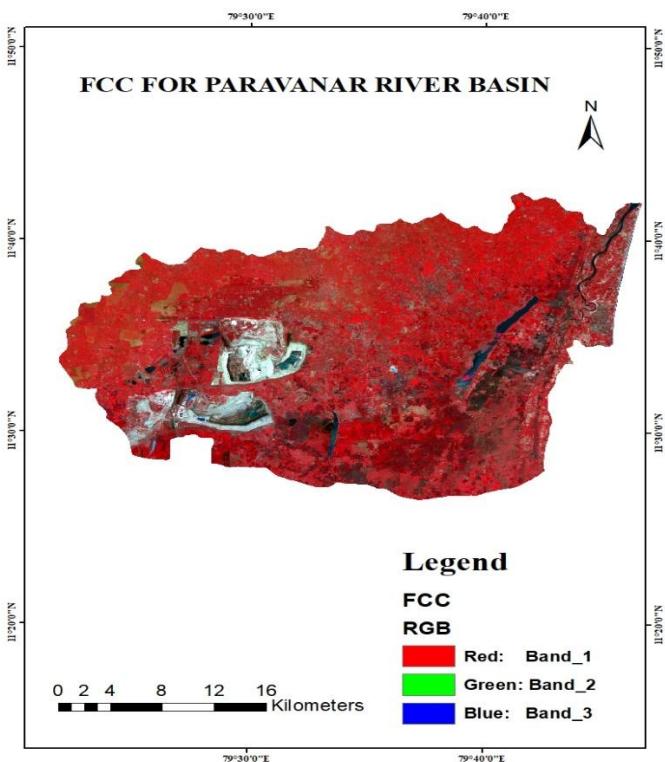
By overlaying the various thematic maps like geology, geomorphology, soil, DEM, slope, drainage, water level, rainfall and LULC suitable site for artificial structures will be created.

## 4. RESULTS AND DISCUSSION

These maps were digitized, edited, analyzed and overlaid for getting zones suitable for different artificial recharge techniques.

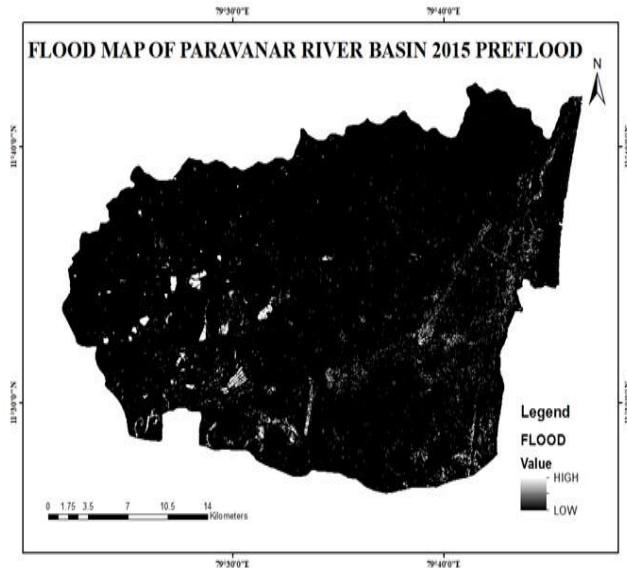
### 4.1 Study Area Extraction

The study area is extracted from the collected satellite image. False colour composite was generated using different band combination using ArcGIS 10.4 version software.



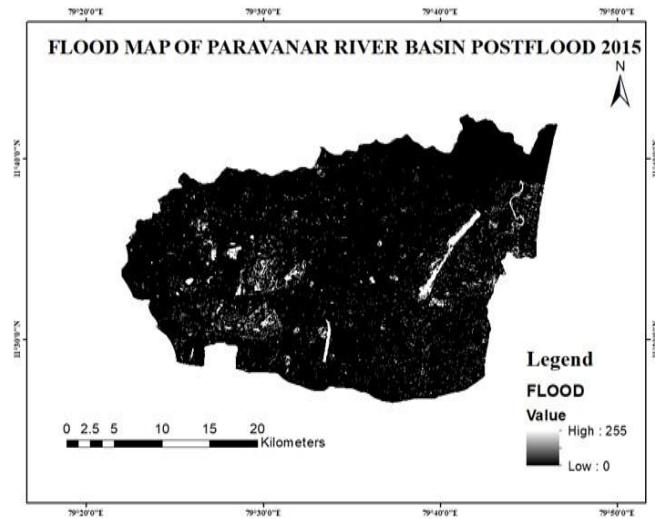
**Figure -5:** Landsat 8 satellite image of the study area

#### 4.2 Flood Assessment of the Paravanar river basin



**Figure -6:** Flood map of the Paravanar basin (Pre-flood)

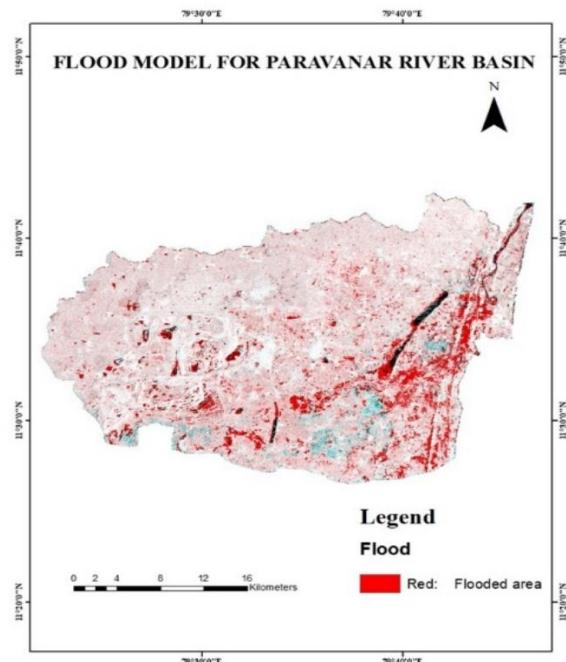
Figure 6 represents flood assessment map of the Paravanar river basin generated from SNAP software (Pre-flood).



**Figure -7:** Flood map of the Paravanar basin (Post-flood)

Figure 7 represents flood assessment map of the Paravanar river basin generated from SNAP software (Post-flood)

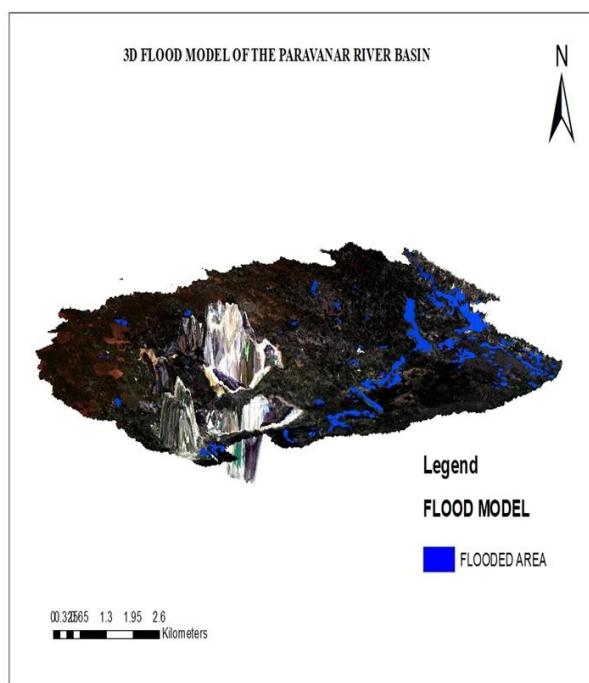
#### 4.3 Flood Model



**Figure-8:** Flood model created in SNAP software

Figure 8 represents flood model of the Paravanar river basin created in SNAP software by using pre-flood and post-flood sentinel data of the study area.

#### 4.4 3D Flood Model



**Figure-9:** 3D Flood model of the Paravanar river basin  
Figure 9 represents the 3D flood model of the Paravanar river basin generated from Arc Map.

#### 4.5 Geology map

Geology is the science which deals with the physical characteristics of the earth. A geological map is a map made to show geological features. The source of the map derived from District resource map of Geology by Geological survey of India. The obtained data was imported in ARCGIS and geology map for study area was created and shown in fig 11. a.

#### 4.6 Geomorphology map

Geomorphology is the study of physical features, origin and development of landforms. The source of map derived from satellite data of IRS P6 III March 2008. This data was imported in ARCGIS and the Geomorphology map for the study area was created and shown in fig 11. b.

#### 4.7 Soil map

The source of the map derived from soil atlas prepared by the Agricultural University Coimbatore. This data was imported in ARCGIS and the different soil types was arrived and the map was created and shown in fig 11.c

#### 4.8 Land Use

The land cover is the natural layer which includes features like water bodies, forest and so on while land use is modified natural environment comprising parameter like crop lands, dry crop, hills, tanks, river, barren land, scrub land, shrub land, swamp etc., These parameters either directly or indirectly influence the ground water. The satellite image of the Paravanar basin obtained from LANDSAT. The features are digitized in ArcGIS and the different land use areas were created and shown in fig 11.l

#### 4.9 Digital Elevation Model

Slope of an area refers to the natural gradient in that locality, which one of the important parameters as far ground water prospect is concerned. If the slope is too steep then the water run off quickly and does not infiltrate the ground easily. If the slope is too slow low then the water stagnates and the condition is suitable for penetration easily and hence ground water improves. The obtained data was imported in ArcGIS and the slope elevation model map for study area was created shown in fig 11.d.

#### 4.10 Drainage map

Drainage is the movement of water and drainage system is the pattern formed by the drainage in an area which includes streams, lakes and rivers thus forming an important part in ground water analysis, the features are digitized in ArcGIS using toposheets of scale 1:50000 and the map was created shown in fig 11.e.

#### 4.11 Rainfall map

Thematic contour map is created for annual using rainfall data. The rainfall data was collected from the year 1971-2016. Rainfall data is segregated according to the average of all the years for the corresponding monsoon season shown in fig 11.g.

#### 4.12 Water level map

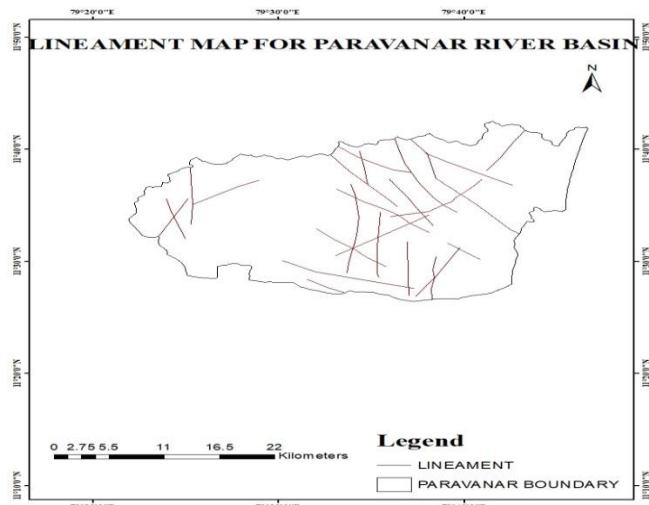
Thematic contour map is created for water level data. The data was collected for the year 2016 shown in fig 11.h.

#### 4.13 Slope map

Slope class map of the study area was generated from SRTM DEM data shown in fig 11.i

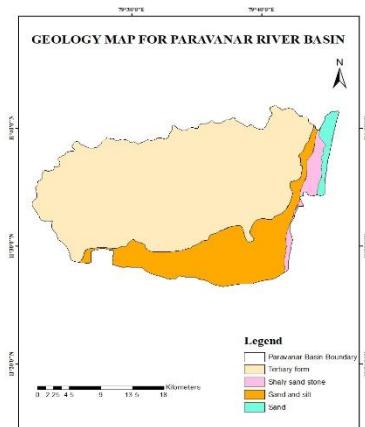
#### 4.14 Lineament map

A Lineament is a linear feature in a landscape which is an expression of an underlying geological structure such as a fault. Lineaments are often evident in geological or topographic maps and can appear obvious on aerial or satellite photographs. This map was derived from satellite data of IRS P6 III March 2008. This data was imported in ARCGIS and the lineament for the study area was created shown in fig 10

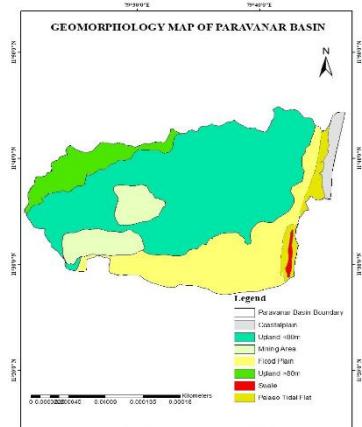


**Figure-10:** Lineament map of the Paravanar river basin

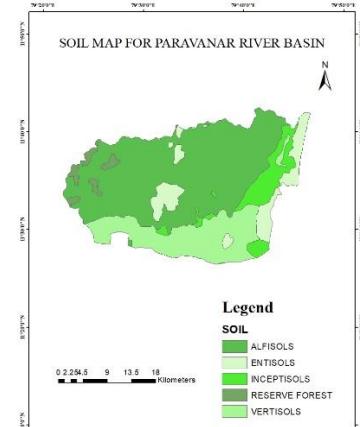
a)



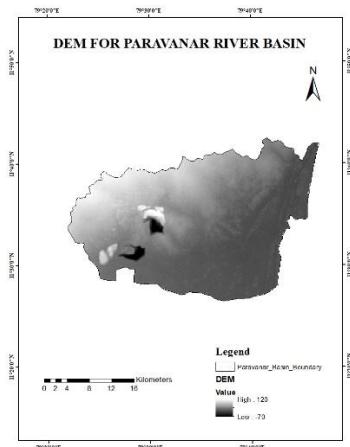
b)



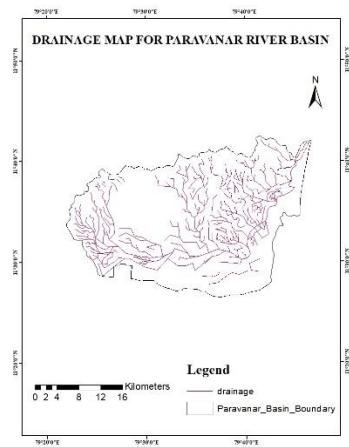
c)



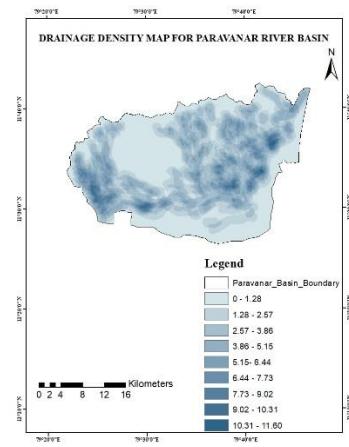
d)



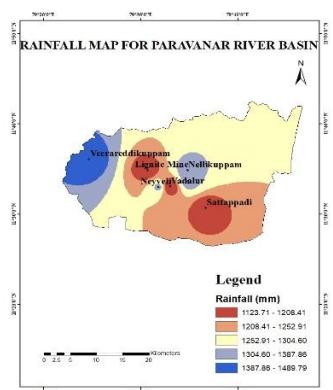
e)



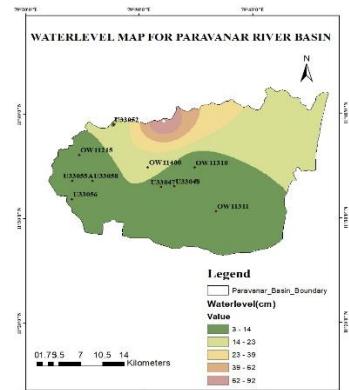
f)



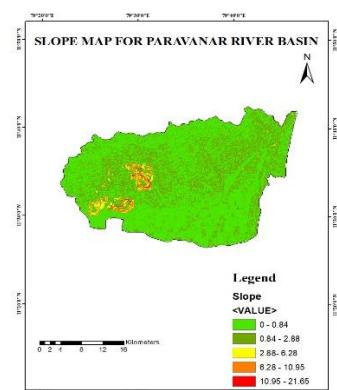
g)



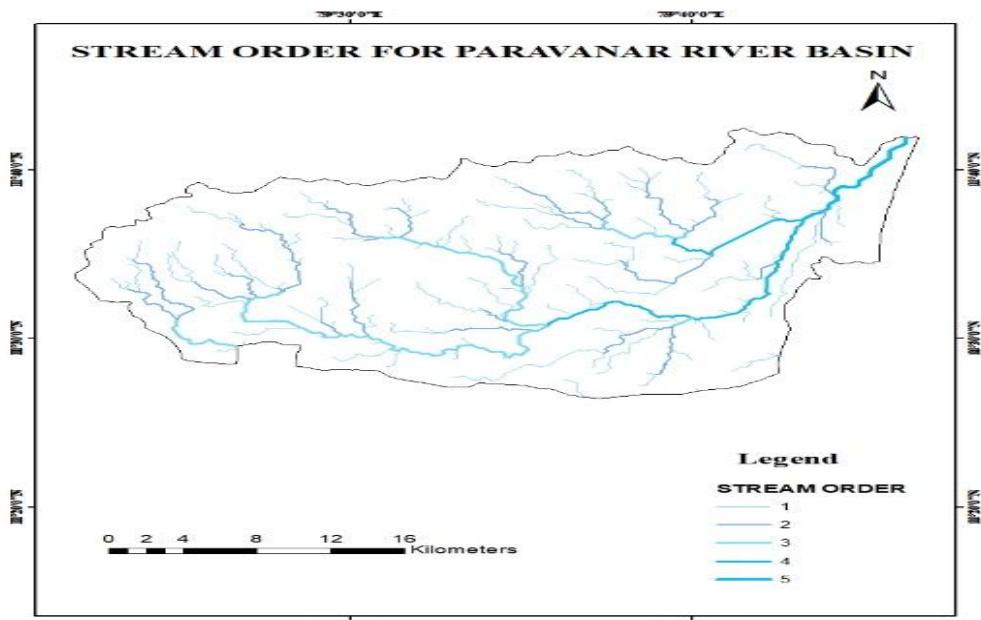
h)



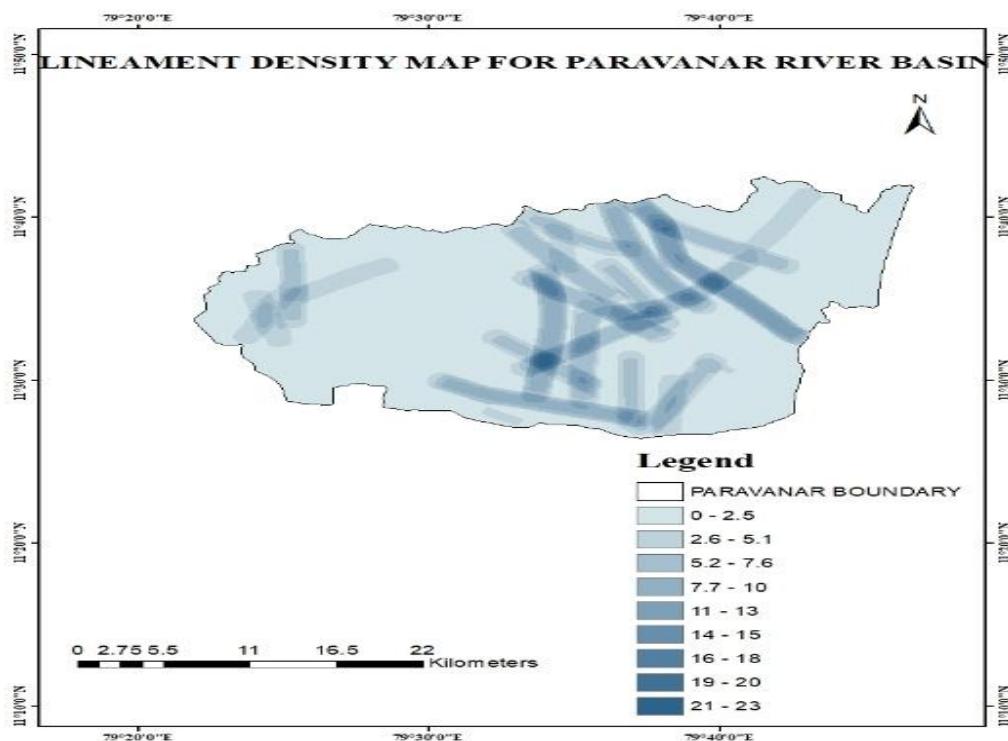
i)



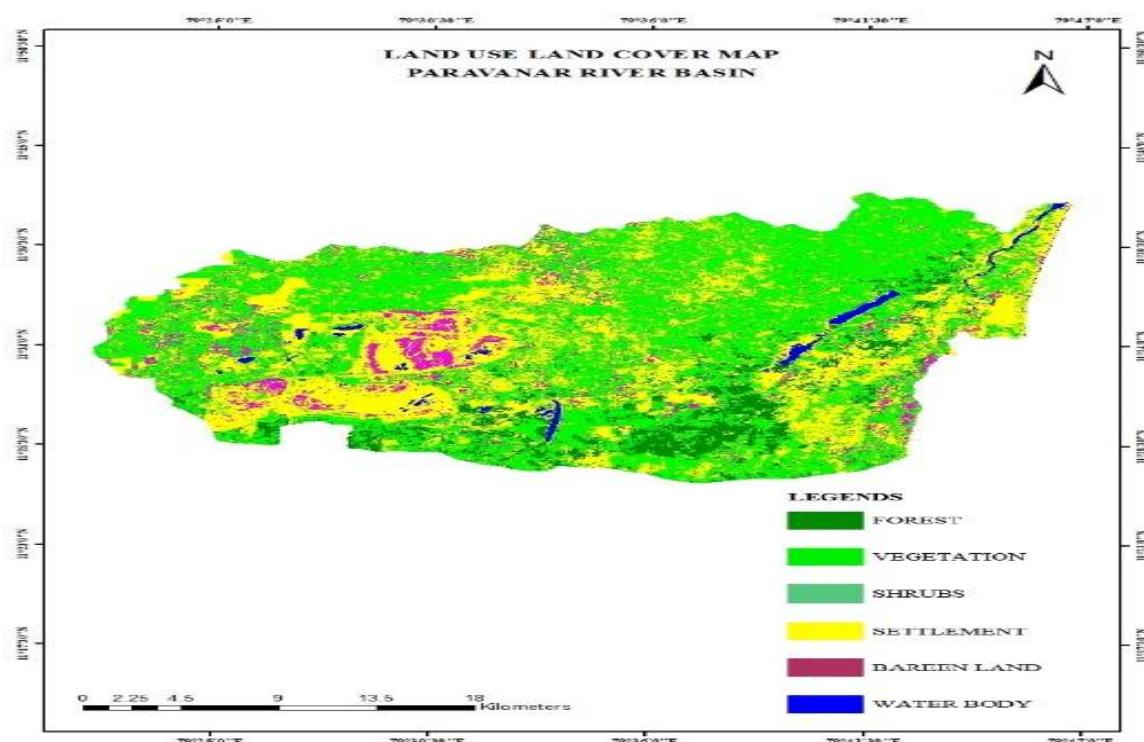
j)



k)



l)



**Figure -11:** Spatial map of a) Geology b) Geomorphology c) Soil d) DEM e) Drainage f) Drainage Density g) Rainfall h) Water level i) Soil j) Stream Order k) Lineament Density l) LULC

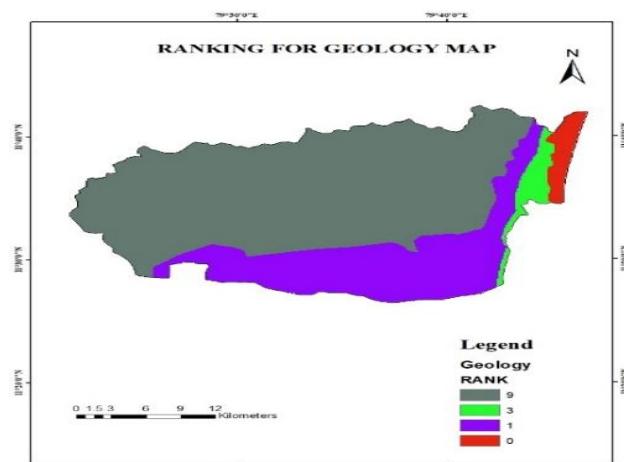
Figure 11.1 represents the land use land cover map of study area Paravanar river basin with various classes such as vegetation, shrubs, settlement, barren land, forest and waterbody. The statistical analysis of land use land cover map for Paravanar basin was given in the table 2

**Table -2 Statistical analysis of Land Use Land Cover map**

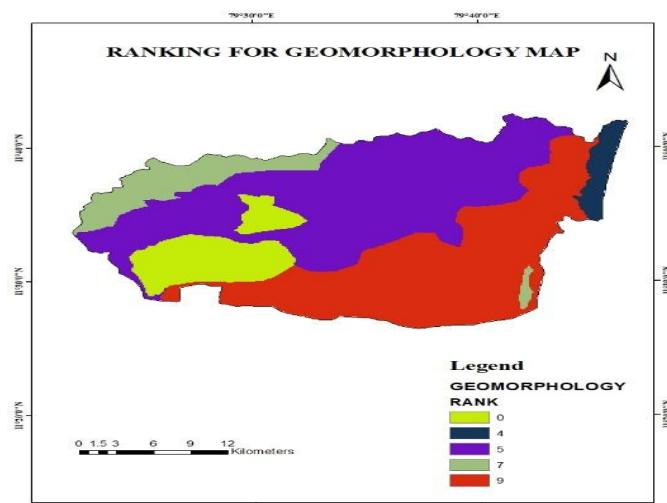
S.NO	FEATURES	AREA(Sq.km)
1	Forest	69.06
2	Vegetation	426.15
3	Shrubs	6.50
4	Settlement	312.52
5	Barren land	46.86
6	Water body	11.56

#### 4.15 Ranking

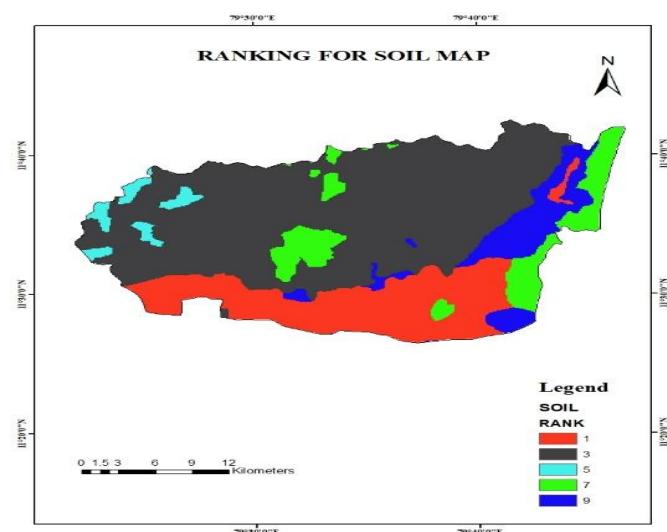
Ranking was the arrangement of values from higher to lower. The values will be useful to identify the ground water availability. Each thematic layer will be segregated and each is assigned with the values. The higher value will be fixed based on the availability of ground water availability (more water). The lower value will have less water availability (lesser water). Likewise all the ranking values are assigned. The geology, geomorphology, land use, drainage are assigned considering the features available which has higher capacity to hold water. Other data are assigned based on water potential. Ranking can be done from values 1 to 10 and it is inputted in ArcGIS. Thus all the ranking for all layers are created. The ranking maps are shown in fig 12,13,14,15,16,17,18,19 and 20.



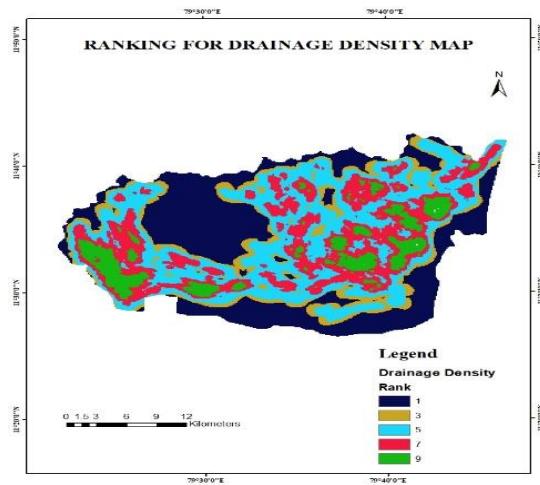
**Figure-12:** Ranking for Geology Map



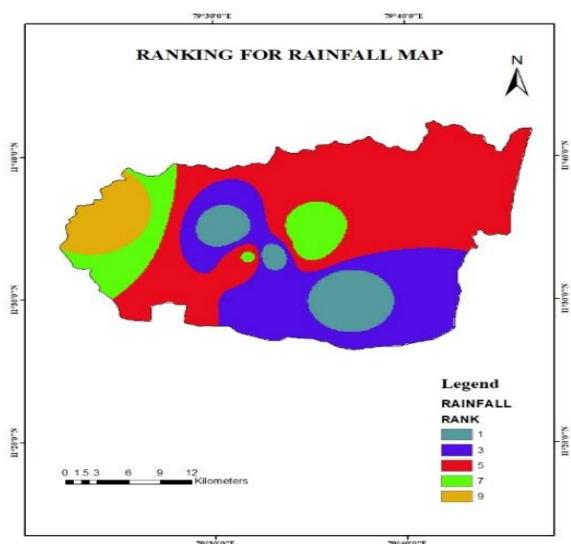
**Figure-13:** Ranking for Geomorphology Map



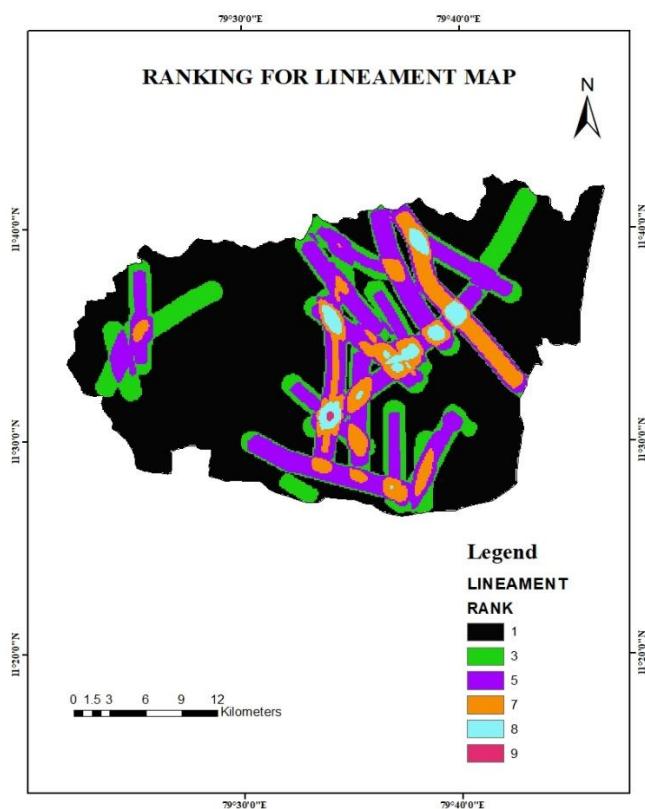
**Figure-14:** Ranking for Soil Map



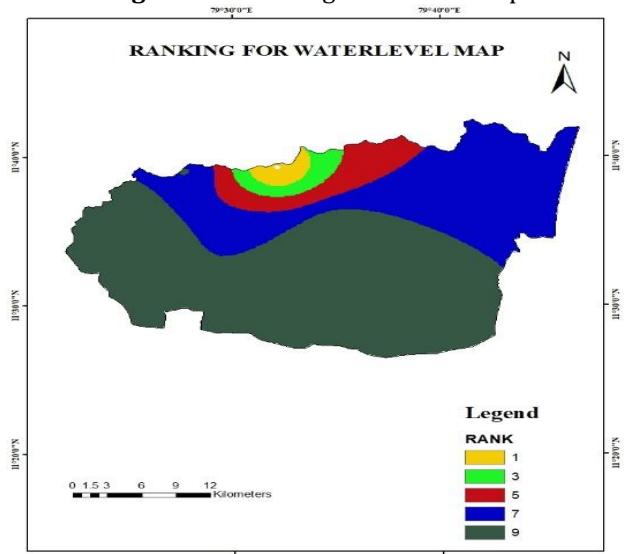
**Figure-15:** Ranking for Drainage Density Map



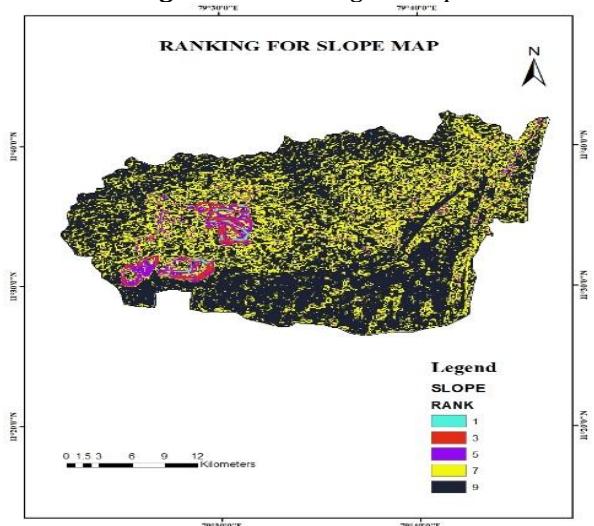
**Figure-16:** Ranking for Rainfall Map



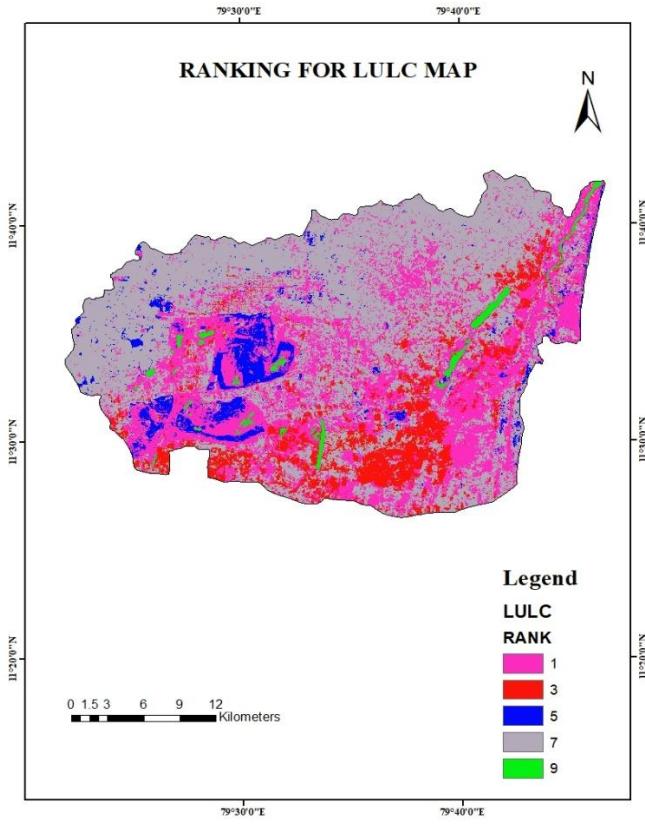
**Figure-19:** Ranking for Lineament Map



**Figure-17:** Ranking for Map



**Figure-18:** Ranking for Slope Map



**Figure-20:** Ranking for LULC Map

**Table- 3: Score Suitability Scale Score Value Suitability**

<b>SCORE VALUE</b>	<b>SUITABILITY</b>
0	Constraint Area
1	Most Unsuitable
2	Extremely Unsuitable
3	Highly Unsuitable
4	Mostly Unsuitable
5	Somewhat Unsuitable
6	Somewhat Suitable
7	Mostly Suitable
8	Highly Suitable
9	Extremely Suitable

**Table -4: Criteria to select the suitable site for Artificial Recharge structure**

<b>Thematic maps</b>	<b>Weight Assigned</b>	<b>Feature classes</b>	<b>Rank Assigned</b>
Geology	20	Shaly Sandstone	9
		Sand and Silt	1
		Silt and Clay	3
		Sand	0
Geomorphology	5	Swale	7
		Upland < 80m	5
		Flood plain	9
		Paleo Tidal Flat	9
		Coastal plain	4
		Upland > 80m	7
		Mining Area	0

Soil	15	Alfisols	3
		Entisols	7
		Inceptisols	9
		Vertisols	1
		Reserve Forest	5
Waterlevel	8	3-14	1
		14-23	3
		23-39	5
		39-62	7

		62-92	9
Rainfall	8	1123.71-1208.41(mm)	1
		1208.41-1252.91	3
		1252.91-1304.60	5
		1304.60-1387.86	7
		1387.86-1489.79	9
Slope	12	0-0.84	9
		0.84-2.88	7
		2.88-6.28	5
		6.28-10.95	3
		10.95-21.65	1
Lineament density	18	0-2	1
		2-5	3
		5-9	5
		9-14	7
		14-22	9
LULC	5	Vegetation	7
		Water Bodies	9
		Barren land	5
		Forest	3
		Settlement	1
		Dense Vegetation	7
Drainage Density	9	0-2.3	1
		2.32-4.64	3
		4.64-6.96	5
		6.96-9.28	7
		9.28-11.603	9

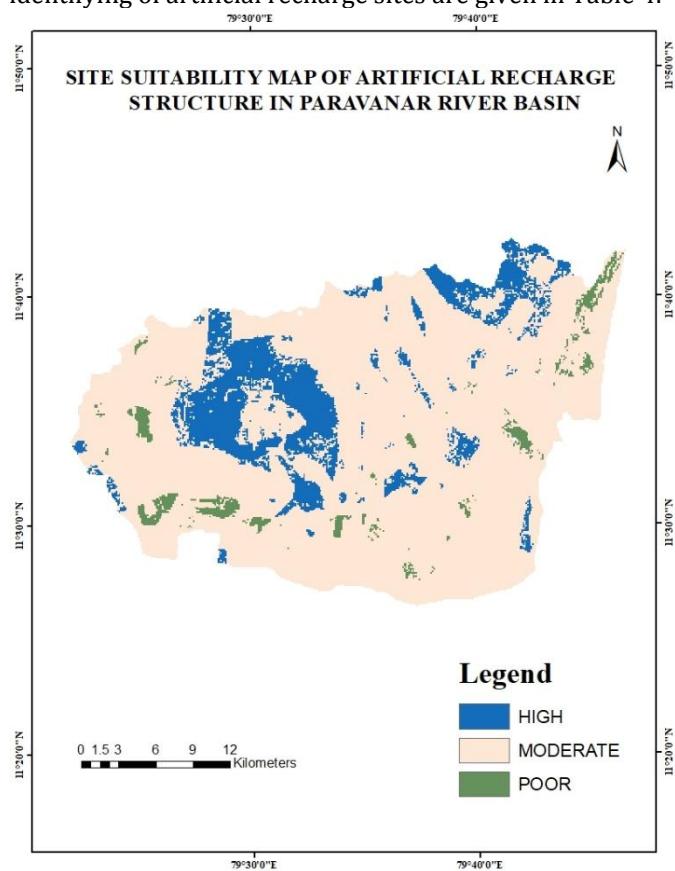
#### 4.16 Assignment of Weightages and Ranking

Weighted Index Overlay Analysis (WIOA) in spatial analysis is a simple and straight forward method for combined analysis of multi-class layers. In WIOA, the individual thematic layers and also their classes are assigned weights on the basis of their relative contribution towards the output. There is no typical scale for a simple weighted overlay method. The determination of the weights of each class is an important part in the integrated analysis. The assignment of appropriate weights controls the value of the input in the weighted overlay analysis.

The sites for the artificial recharge structure are also controlled by various factors. Each factor considered is assigned a weight depending on its influence on the storage and transmission of groundwater. Geology and Geomorphology of the area play a prominent role in groundwater recharging.

The deep water level is given is given the highest weightage because it provides space for the recharge.

Land use influence over recharge is assigned less weight. As the role of soil depends on various factors in recharge, it is given lower weight. In the study, artificial recharge sites are identified based on integration of the thematic layers in the GIS environment. The area which is categorized as excellent for an artificial recharge zone possess high storability, deep water table and good holding capacity for constructing an artificial recharge structure. Nine thematic which includes geology, geomorphology, lineament density, land use/land cover, soil, slope, rainfall, ground water level and drainage density are used to identify artificial recharge zones. Various thematic maps are reclassified on the basis of weighted assigned and brought into the spatial analysis tool for integration. The different units in each theme is assigned a knowledge-based hierarchy of ranking from 0-9. Score Suitability Scale Score Value Suitability are shown in the table 3. The weight influence for identifying of artificial recharge sites and weightage ranks for identifying of artificial recharge sites are given in Table 4.



**Figure-21:** Site suitability map of Artificial Recharge Structure in Paravanar river basin

Fig 21 represents suitable site for constructing Artificial Recharge structure.

#### 4.17 Artificial Recharge Structure

Artificial recharge involves accelerating the natural movement of surface water into underground formations. Recharge can be either direct or indirect. In direct recharge, water is injected into an aquifer via injection wells. The injected water is treated to confirm that it does not clog the area around the injection well. Indirect recharge involves spreading surface water on land so that the water infiltrates through the unsaturated zone, the above the water table, down to the aquifer. Techniques for spreading water include over-irrigation, creating basins, using construction methods, or making artificial changes to natural conditions such as modifying a stream channel. Artificial recharge techniques normally contribute to increase the sustainable yield in areas where over-development has depleted the aquifer, and conserving the excess surface water for future requirements. Therefore, this study intended at information generation for facilitating recharge zone site selections using integrated geospatial techniques. This was coupled with the consideration of hydro-geological factors for potential recharge site assessment and generating spatial information on suitability of potential recharge locations.

#### 4.18 Selection of sites for Artificial Recharge Structures:

In order to enhance the ground water condition, particularly the quality of both drinking as well as irrigation wells in the recharge structure, required recharge is essential. In case the natural recharge is not enough, it has to be met through artificial recharge. Many a times the sites for constructing recharge structures are selected according to administrative grounds. As a result proper recharge doesn't take place leading to wastage of money. To identify the location for constructing artificial recharge structures, each hydro geomorphic unit is evaluated for its recharge potential. The tentative locations for their construction are suggested. The prioritization of the hydro geomorphic units with respect to taking up for construction activity on different priorities is made.

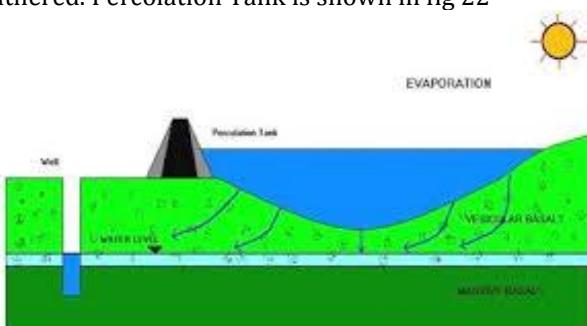
#### 4.19 Types of recharge structures:

The following types of recharge structures are considered for suggesting in each hydro geomorphic unit

- Percolation Tank (PT)
- Check Dam (CD)
- Nala Bund (NB).

#### 4.19.1 Percolation Tank

These are the most frequent structures in India as a measure to recharge the ground water reservoir both in alluvial as well as hard rock formations. The effectiveness and feasibility of these structures is more in hard rock formation where the rocks are highly fractured and weathered. Percolation Tank is shown in fig 22



**Figure -22:** Percolation Tank

#### 4.19.2 Check Dam

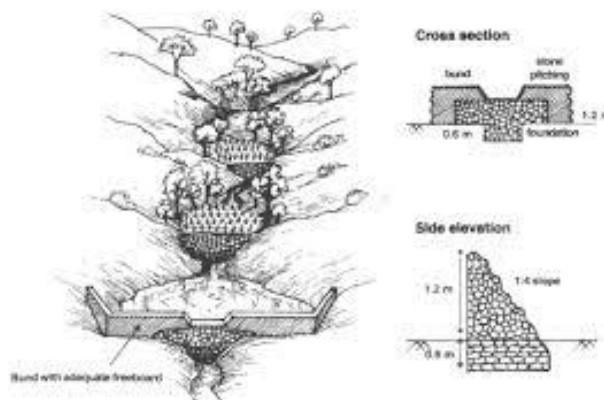
Check dams are constructed across small streams having gentle slope and are practical both in hard rock as well as alluvial formation. The site selected for check dam should have enough thickness of permeable bed or weathered formation to make easy recharge of stored water within short span of time. The water stored in these structures is mostly constricted to stream course and the height is normally less than 2 m. These are designed according to stream width and excess water is allowed to flow over the wall. In order to avoid cleaning from excess run off, water cushions are provided at down streamside. To tackle the maximum run off in the stream, series of such check dams can be constructed to have recharge on regional scale. Check dam is shown in fig 23.



**Figure -23:** Check Dam

#### 4.19.3 Nala Bund

Nala bund is generally a small earthen dam, with a cut off core wall of brick work, through cement bund/plugs are now prevalent in fig 24.



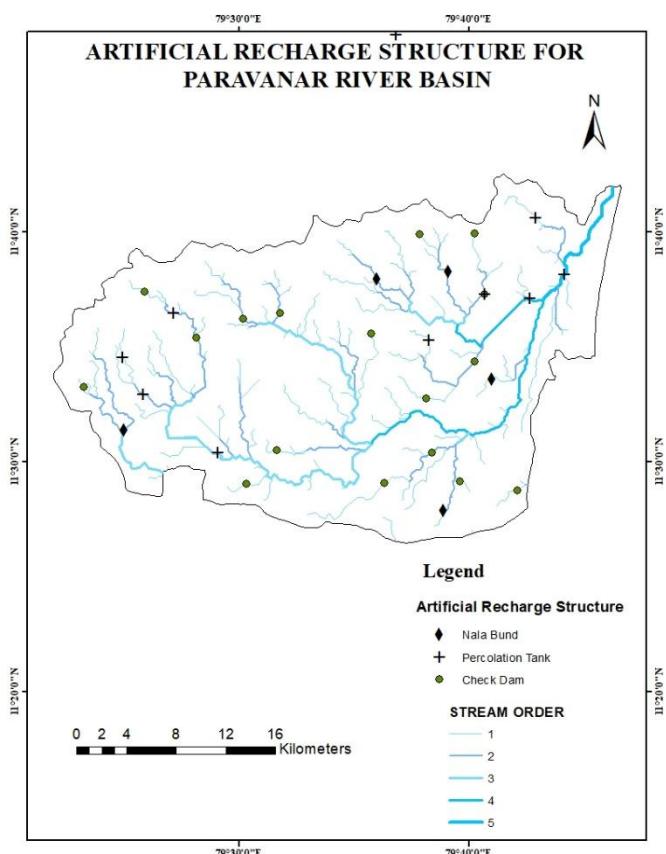
**Figure -24:** Nala Bund

**Criteria for site selection:** In general, the locations for recharge structures are identified about 200-300 m upstream of the dwellings. They are located mainly on 1st to 3rd order streams and at the most up to the initial stages of 4th order stream. No recharge structure is located on major streams .The locations of the recharge structures are shown with the respective symbols indicated in the classification system. The criteria for selection of locations for various recharge structures are given below.

**Check Dam:** On the 1st and 2nd order streams along the foot hill zones and the areas with 0-5% slope.

**Percolation Tank:** On the 1st to 3rd order streams located in the plains and valleys having sufficient weathered zone / loose material / fractures.

**Nala Bund:** On the 1st to 4th order streams flowing through the plains and valleys where acquisition of land for inundation of large areas is not possible. In this case, small amount of water will be stored in the river bed for some time which increases recharge.



**Figure -25:** Artificial Recharge Structure in Paravanar river basin

Fig 25 represents the Artificial structures to be built in the Paravanar river basin.

## 5. CONCLUSIONS

In the present study the collection of satellite data for generation of the flood model and identification of suitable site for artificial recharge. The study area was extracted from the satellite image. Thematic maps like soil, geology, geomorphology, DEM, LULC, drainage density, slope, rainfall, lineament and water level maps are generated. Flood model was generated using the two data which represents the pre-flood and post-flood in SNAP software. The thematic map which was generated are given ranks according to their influence in constructing Artificial recharge structure in suitable site. These thematic maps are then overlaid using Weighted Index Overlay Analysis (WIOA) method. The assignment of appropriate weights controls the value of the input in the weighted overlay analysis. Finally, the thematic maps are overlaid and suitable site for constructing Artificial recharge structure is determined.

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