



Preparation of contouring, hill shade and slope map of erode district by using QGIS

M.Rathipraba¹, K.Puhazhenth², K.Preethi³, Mr.V.Sampath Kumar⁴,Mr.S.Manoj⁵

rathi248praba@gmail.com¹, puhazhenthikarunanithi@gmail.com²,
preethikannan146@gmail.com³, anbusampathcivil@gmail.com⁴, yesmanoj89@gmail.com⁵
UG Scholars^{1,2,3}, Assistant Professor^{4,5}

Department of Civil Engineering
Kongu Engineering College (Autonomous), Perundurai-638060.

Abstract- Digital terrain attributes derived from digital elevation model (DEM) such as elevation, slope, hill shade, contour and other aspect are widely used to determine the influence of topography on different environmental and human processes. Contour map is mainly used for locating suitable area for providing check dams and any other construction. The advent of publicly available DEM data has provided a cheaper, low-cost alternative to traditional field data collection and survey. Handling, processing, and visualization of such data on an open-source software will provide researchers and specialists a better and faster way of generating digital terrain maps and creating input data for other analyses. This paper demonstrates the methodology of combining the use DEM and other functionality of QGIS to develop terrain maps for Erode district.

I. INTRODUCTION

A **Geographic Information System (GIS)** is a system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data. The acronym GIS is sometimes used for geographic information science (Geosciences) to refer to the academic discipline that studies geographic information systems and is a large domain within the broader academic discipline of geoinformatics. What goes beyond a GIS is a spatial data infrastructure, a concept that has no such restrictive boundaries. GIS is a broad term that can refer to a number of different technologies, processes, and methods. It is attached to many operations and has many applications related to engineering, planning, management, transport/logistics, insurance, telecommunications, and business. For that

reason, GIS and location intelligence applications can be the foundation for many location-enabled services that rely on analysis and visualization.

QGIS functions as geographic information system (GIS) software, allowing users to analyze and edit spatial information, in addition to composing and exporting graphical maps. QGIS supports both raster and vector layers; vector data is stored as either point, line, or polygon features. Multiple formats of raster images are supported and the software can geo reference images. QGIS supports shape files, coverage's, personal geo databases, dxf, MapInfo, Post GIS, and other formats. Web services, including Web Map Service and Web Feature Service, are also supported to allow use of data from external sources.

QGIS integrates with other open-source GIS packages, including PostGIS, GRASS GIS, and Map Server. Plugins written in Python or C++ extend QGIS's capabilities. Plugins can geocode using the Google Geocoding API, perform geoprocessing functions, which are similar to the standard tools found in ArcGIS, and interface with PostgreSQL/ PostGIS, Spatialite and MySQL databases.

The benefits of taking GIS approach to coastal management, might include:

1. The ability to model, test, and compare alternative scenarios-before the proposed strategy is imposed on the real world.
2. The ability to handle much larger data bases and to integrate and synthesize data –leading to a more holistic and coordinated management strategies.
3. Enhanced capacity for data exchange

II. GETTING STARTED WITH QGIS

To see the system requirements for QGIS, installation options, and methods to organize the QGIS Desktop software. Users will get to know about the QGIS Interface, they will learn how to customize the software. On completion of this chapter QGIS will be successfully installed on Windows operating system and will be ready to perform tasks. This short tutorial has the objective to follow you during the installation, update and the configuration of QGIS.

QGIS runs on almost all versions of windows operating systems, starting from windows XP. It needs the following minimum configurations to run the QGIS

Desktop software. Like many other open source projects, QGIS offers you a choice between a stable release version and the cutting-edge developer version, also called master. QGIS master will contain the latest and greatest developments, but be warned that on some days, it might not work as reliably as you are used to. QGIS 2.8 Long Term Release (LTR) version is currently used.

2.1 Why QGIS?

QGIS is an open source cross platform desktop GIS software which runs on Windows, Linux and Mac operating systems. As it is Opensource it is free, No initial fee, no recurring fee, no caution deposit, nothing. Free here refers to the liberty or freedom to work with the software and customize it according to our needs. This liberty is available with QGIS and moreover it is constantly developing, because anyone can add new features and improve on existing ones, QGIS never stagnates. The development of a new tool can happen as quickly as you need it to.

2.2 INSTALLING QGIS ON WINDOWS – STANDALONE INSTALLER

On Windows, we have two different options to install QGIS: standalone installer and OSGeo4W installer. The standalone installer is one large download (approximately of 285 MB), which contains a QGIS release and the Geographic Resources Analysis Support System (GRASS) GIS in one package. For your convenience we have already downloaded a copy of QGIS 2.8.6 LTR version and is available in C:\student\Ex1\Softwares\qgis folder. Based on your system configuration select the appropriate versions i.e 32 bit or 64 bit.

2.3 INSTALLING QGIS ON WINDOWS – OSGEO4W INSTALLER

QGIS can also be installed through OSGeo4W installer, for which a high speed internet connection is mandatory. It is very small and flexible installation tool that makes it possible to download and install QGIS and many more OSGeo tools with all their dependencies. osgeo4w-setup.exe is an application to help you install applications on windows. Some of the same applications included here.

Select the appropriate downloads based on your operating system available via OSGeo4w. The OSGeo4w tool includes the ability to manage upgrades, install additional libraries and ensure compatability between mulitple applications

The main advantage of this over the standalone installer is that it makes updating QGIS and its dependencies very easy. You can always have access to both the current release and the developer version.

Open the internet web browser and use the following address <http://trac.osgeo.org/osgeo4w>.

2. Using the Add vector Layer button, Browse to C:\Student\Ex 10\ Vector folder and add the erode_bndry
3. Remove the fill colour for the Erode_bndry shape file, once done right click on the shape file and select zoom to layer extent, so that the SRTM data for Erode is clearly visible.
4. From the Raster Menu, click on Extraction and click on Clipper tool to open the clipper window
5. For Input raster make sure that SRTM is selected, For output File click on Select button and browse to C:/student/Ex 10/Raster folder and name it as Erode_SRTM and click on save button
6. Make sure that No data is set to 0 and for clipping mode select mask layer and select the Erode_Bndry shape file from the drop down menu
7. Load into canvas when finished option has to be enabled
8. Click on OK to run the tool, once complete select necessary options and close the clipper window
9. switch off and remove the SRTM layer to visualize the Clipped SRTM portion for Erode .

III.TERRAIN ANALYSIS

A common task in raster processing is clipping a raster with a polygon. This task is well covered by the Clipper tool located in Raster | Extraction | Clipper. This tool supports clipping to a specified extent or clipping using a polygon mask layer, as follows:

1. Start QGIS Desktop, From the project menu select open and browse to C:/student/Ex 10/ folder, select the Ex_Analysis and click on Open

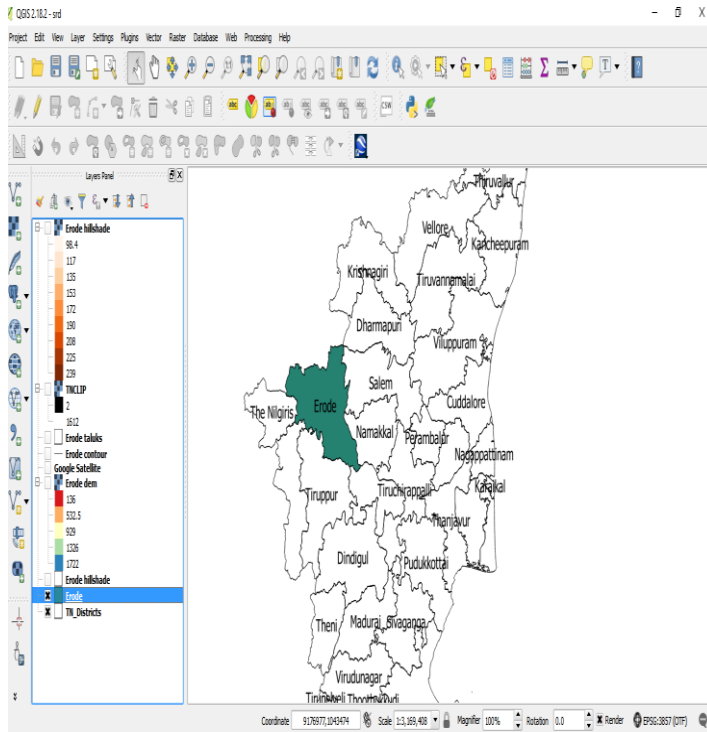


Fig.1 Clipping Erode district from TNCLIP

2. For Render type select Singleband pseudocolor, set the color interpolation to Linear and color band to spectral
3. Set the Mode to Equal interval and assign the Classes to 5 and under load min/max origin, select Min/Max. Click on Load then click on classify
4. Leave all the other options to default and click on OK to see the changes.

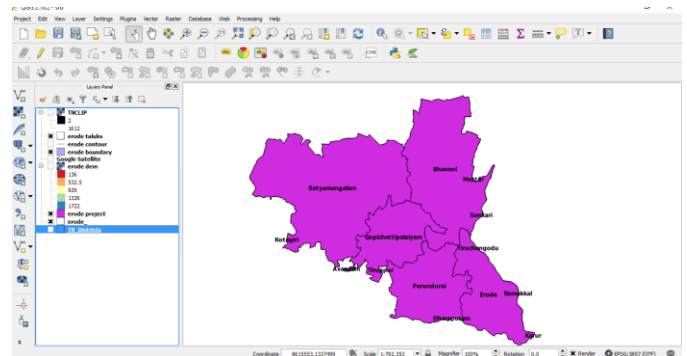


Fig.2 SRTM_DEM shows the layer of Erode district with taluk

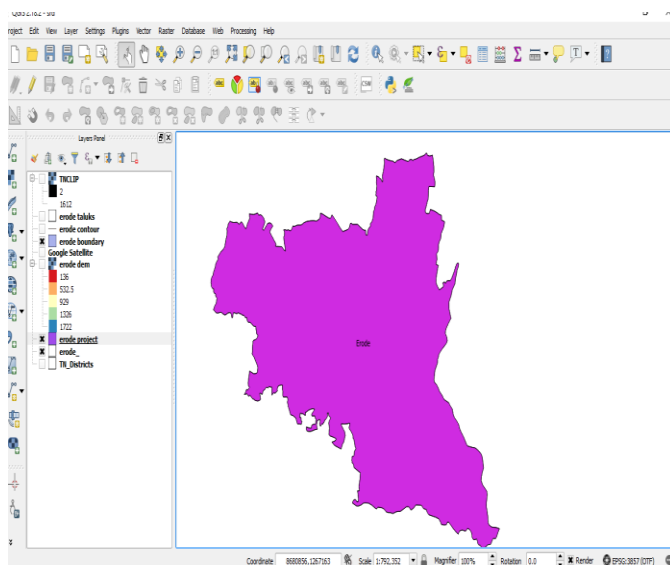


Fig.2 Clipping Erode district separately from raster data

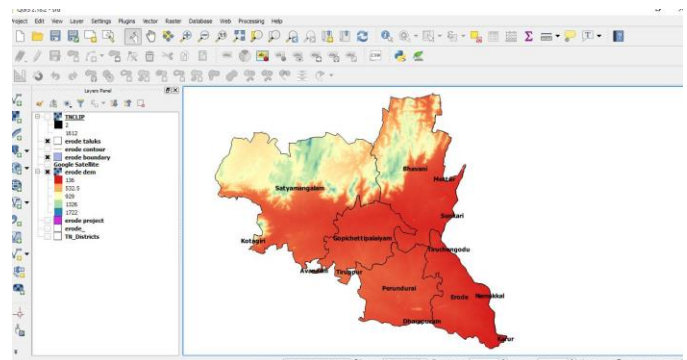


Fig.3 SRTM_DEM shows the minimum and maximum load bearing capacity

3.1 SYMBOLISING RASTER

1. Access to the layer properties of the Erode_SRTM dem layer and click on the styles tab

3.2 ANALYZING ELEVATION / TERRAIN DATA

1. Raster terrain analysis can be used to calculate the slope, aspect, hillshade, ruggedness index, and relief from elevation rasters. These tools are available through the Raster | Terrain analysis

plugin, which comes with QGIS by default, but we have to enable it in the Plugin Manager.

The Terrain analysis includes the following tools:

2. Slope: This tool calculates the slope angle for each cell in degrees (based on the first order derivative estimation)
3. Aspect: This tool calculates the exposition (in degrees counter-clockwise, starting with 0 for north)
4. Hillshade: This tool creates a basic hillshade raster with lighted areas and shadows.
5. Relief: This tool creates a shaded relief map with varying colors for different elevation ranges.
6. Ruggedness Index: This tool calculates the ruggedness index for each cell by summarizing the elevation changes within a 3 x 3 cell grid.

3.3 SLOPE

Slope identifies the steepest downhill slope for a location on a surface. Slope is calculated for each triangle in Tin's and for each cell in rasters. For a TIN, this is the maximum rate of change in elevation across each triangle. For rasters, it is the maximum rate of change in elevation over each cell and its eight neighbors.

The Slope command takes an input surface raster and calculates an output raster containing the slope at each cell. Lower the slope value, the flatter the terrain; the higher the slope value, the steeper the terrain. The output slope raster can be calculated as percent slope or degree of slope.

1. Click on the Raster menu and under Terrain Analysis click on the Slope tool
2. For Elevation layer make sure that Erode_SRTM is selected
3. For output layer click on the browse button and move to C:\Student\Ex 10\Raster folder and name it as slope and click on save
4. Make sure that Output format is set to GeoTiff and Z factor to 1.0. Enable —Add result to the project option and click on the OK button to run the tool

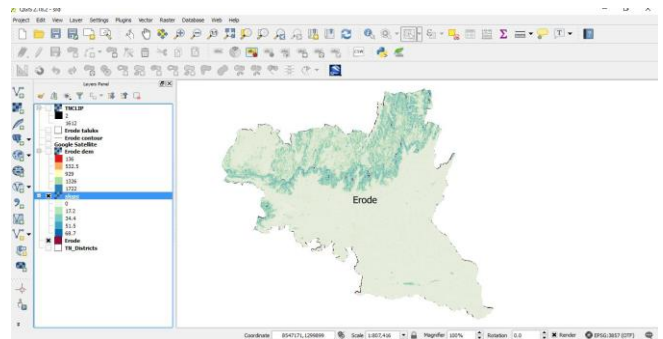


Fig.5 Map of Erode district

3.4 CREATING ASPECT

1. Access to the terrain analysis toolset and select the Aspect, to open the Aspect window
2. For Elevation layer Select Erode_SRTM and save the output layers as aspect in C:\Student\Ex 10\ Raster folder
3. All other options are default, click on OK to run and check the output
4. Access to the layer properties of aspect layer and define the any colour
5. Use Min/Max values and complete the output using the skills that you have acquired very recently

3.5 SHADE RELIEF / HILL SHADE

Hillshading is a technique used to create a realistic view of terrain by creating a three-dimensional surface from a two-dimensional display of it.

Hillshading creates a hypothetical illumination of a surface by setting a position for a light source and calculating an illumination value for each cell based on the cell's relative orientation to the light, or based on the slope and aspect of the cell.

Hillshade computes surface illumination as values from 0 to 255 based on a given compass direction to the sun (azimuth) and a certain altitude above the horizon (altitude).

Hillshades are often used to produce maps that are visually appealing. Used as a background, Hillshades provide a relief over which you can draw raster data or vector data.

1. Similar to chapter 10.7 use the Terrain analysis tool and select the Hillshade tool
2. Elevation layer must be set to Erode _SRTM, Set the output layer to C:\Student\Ex 10\ Raster folder
3. Name the output as hillshade, Leave all other options to default and click on OK to run and visualize the output
4. Access to the layer properties of hillshade layer, select the Transparency tab and set to 65% and to have an pleasing look.

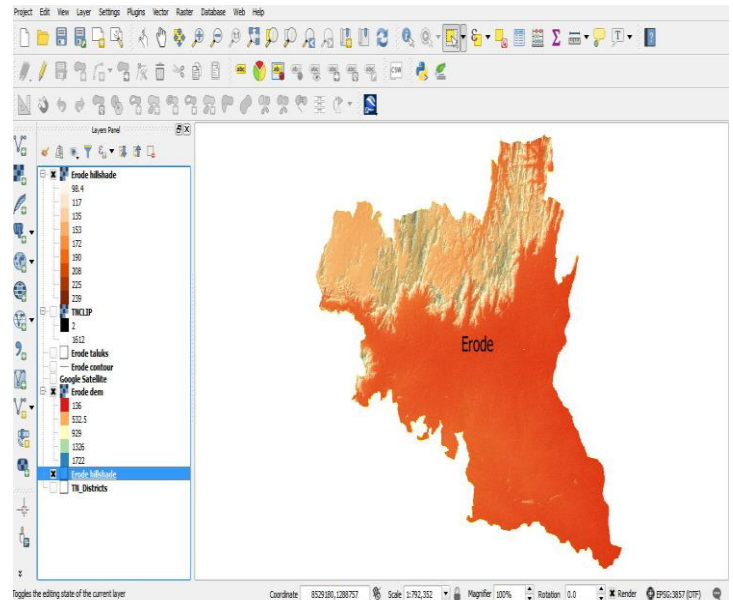


Fig.6 Hill shade map of Erode district

3.6 GENERATING CONTOURS:

Contours are lines that connect points of equal value (such as elevation, temperature, precipitation, pollution, or atmospheric pressure). The distribution of the lines shows how values change across a surface. Where there is little change in a value, the lines are spaced farther apart. Where the values rise or fall rapidly, the lines are closer together.

By following the line of a particular contour, you can identify which locations have the same value. By looking at the spacing of adjacent contours, you can gain a general impression of the gradation of values.

The example below shows an input elevation grid and the output contour map. The areas where the contours are closer together in

indicate the steeper locations. They correspond with the areas of higher elevation (in white on the input elevation grid).

- From Raster menu, hover the mouse cursor to Extraction tool set and select Contour tools to open the contour window
- In the contour window, For Input file (raster) select Erode_SRTM from the drop down menu
- For the Output directory for contour lines (shape file), click on select and browse to C:\student\practical\Ex 10\vector folder and for file name type cntrs_50
- For Interval between contour lines assign 50 and check the Attribute name and leave the name as default i.e ELEV
- Set the option for Load into canvas when finished, Once done click on OK button to run the contour function
- Close the contour window to view the newly created contours, drag and drop the contours_50 to the Top in the Table of contents
- Using the skills that you have learned change the colour of the contour to some pleasing colour
- Display the Labels for contours using the ELEV field
- Once done, switch off the cntrs_50 layer and Save the QGIS

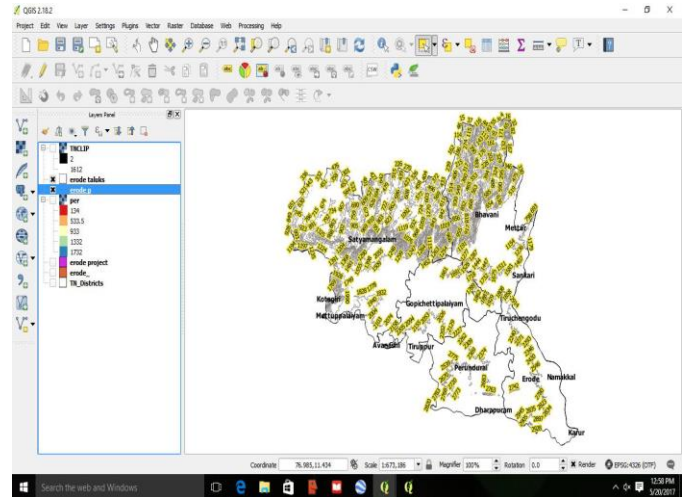


Fig.7 Contour map of Erode district

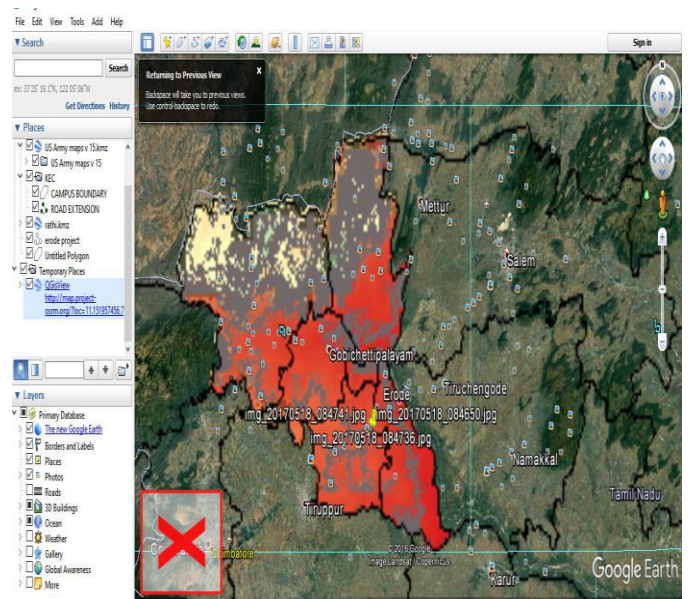


Fig.8 Satellite image of Erode district

IV. RESULT ANALYSIS

This project can be successfully analyzed and its out are shown in Figure 9, Figure 10 and Figure 11 and its shows the accurate result of contours, hill shade, slope and cartography map of erode district.

Project will give accurate contours, slope and hill shade of Erode district by using the QGIS software. It will give perfect area of slope and hill shade area of the given district, it will very much used for topographical analyzer to prepare the topographical map and also for the site selection for dams and check dams. Cartography of QGIS will give the proper way of presenting map.

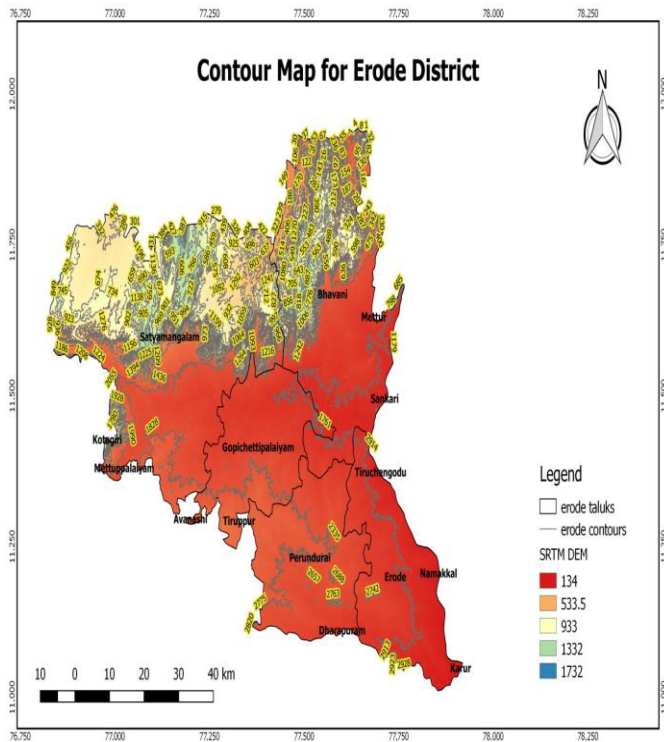


Fig.9 Contour Map of Erode District Final Output of Cartographical

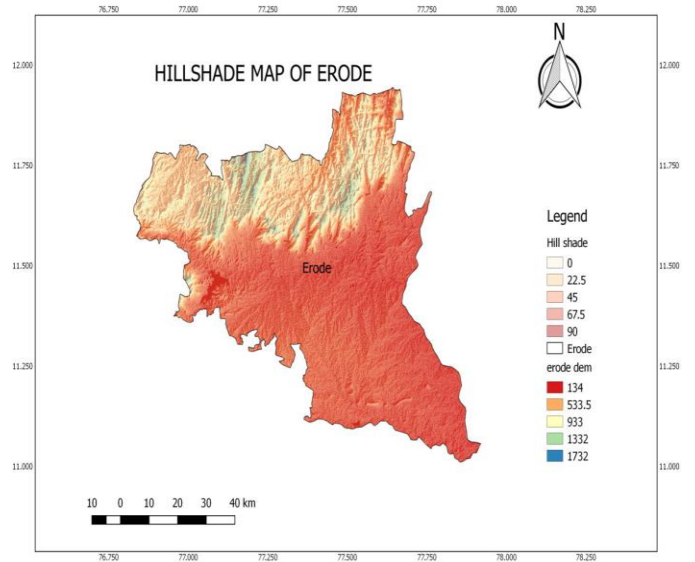


Fig.10 Final output of cartographical hill shade map of Erode district

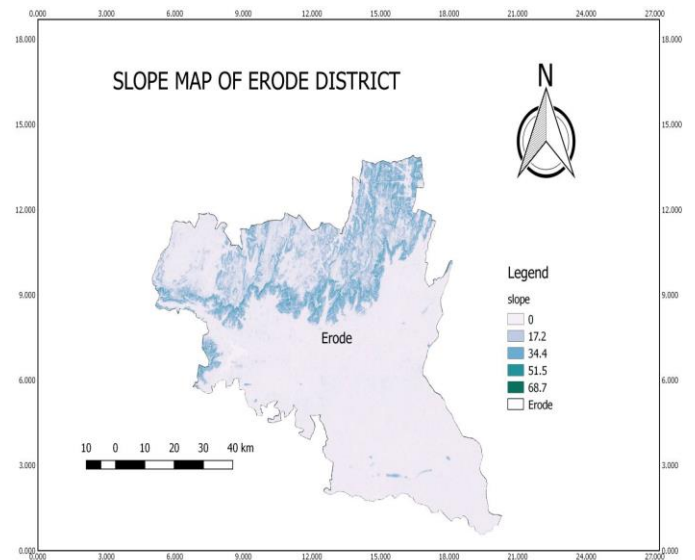


Fig.11 Final output of Cartographical Map of Erode district

V.CONCLUSION

Now I finally conclude that this QGIS software not only gives the accurate results of slope ,contour and hill shade of terrain analysis, it will also gives the

accurate result of watershed declination, integrating bhuvan, hotspot and vector analysis, GEO referencing and google interrogation.

REFERENCES

- [1] Basist A, Bell GD, Meentemeyer V (1994) Statistical relationships between topography and precipitation patterns.
- [2] Behrens T, Zhu A-X, Schmidt K, Scholten T (2010) Multi-scale digital terrain analysis and feature selection for digital soil mapping.
- [3] Alkhasawneh MS, Ngah UK, Tay LT et al (2013) Determination of important geographic factors for landslide mapping analysis using MLP network.
- [4] Hjerdt KN, McDonnell JJ, Seibert J, Rodhe A (2004) A new topographic index to quantify downslope controls on local drainage.
- [5] Li Z, Zhu Q, Gold C (2005) Digital terrain modeling: principles and methodology. CRC Press, New York .