Land Degradation: A review Paper

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Abstract

This article **provides** a review **toward land** degradation **mistreatment** Remote Sensing and Geographical **system** (GIS). Land degradation **could be a method during which the worth** of the biophysical **atmosphere** is **littered with a mix** of human-induced processes acting upon the land. This remote sensing and GIS technique **is employed** on **varied** parameters on the bases of areas **like rough** region, hill slopes and **watercourse** banks. Land degradation is slow and continual deterioration **method principally iatrogenic** by human activities and equally catalysed by few natural parameters **additionally**. U**ntil** they grew in their full strength it couldn't be seen by naked eyes, its tropical identification takes **many** years **whereas** its consequences **typically** remain forever. **Rough** regions **are a lot of** prostrated **to the present** land degradation and **is** a caricature to witness its **world** consequence. **During this** review **several** papers **are** studied on analysis of land degradation. **Two** major case studies **are conferred** below **that** shows the techniques **accustomed** analyse this land degradation **method** by **mistreatment** remote sensing and GIS.

Introduction

Human Landscapes **are are**as of Earth's terrestrial surface **wherever** direct human alteration of ecological patterns and **vital** and **in progress** processes **that are** directed toward the services that are **wants** of human populations for food, shelter and **different** resources etc. Their development is **littered with** the over-use of natural landscapes **within the** past **like** overgrazing, frequent fires, or excessive depletion of forests. A literature review done **that** is highlight **however** GIS **will offer sensible** integration of geographic **spatial** structures (habitation, soils, and **watercourse** drainage) to past and current relationships between the **atmosphere** and human systems.

The major **drawback that India** faces **additionally** to **the present issue** is Land degradation. Land degradation **is that the** major consequences of direct interference of human activities **within the phenomenon**. Land degradation **could be a world** issue; **as a result of** it's **rife** in **each** community.

It not **solely iatrogenic** by manmade machineries or activities **it's additionally thanks to the character** in itself and **additionally** by animals **however the main** contribution is by **folks**. These land degradation **are created** by humans by **for his or her temperature**. This study **space** in recent times welcomes **Brobdingnagian** increase in population **moreover** as tourists in equal measures **that** indirectly promote **a rising** urbanization.

Remote sensing addresses the **terribly would like** of the hour, **prime** soil removal **generally** is found to be **AN** act of **mental object** amongst cultivators. Remote sensing offers **each** scientific and **applied math answer which might** replace some **historically disbursed** failure methodologies **that** has been counted **to help** cultivation alone and conventionally rains that entire region for cultivation by deteriorating it. Digital Elevation Model (DEM) was **accustomed determine varied** land uses **that** acted as indicators of land degradation and agricultural land use intensity **within the 3** physiographic regions [1].Land degradation **is that the** "temporary or permanent reduction **within the** productive **capability** of a land as a **results of** human action". The processes of land degradation have **expose** a worrisome threat to food security at a time of continuous **increment particularly** in developing countries. At present, **regarding twenty** million km² of land worldwide **ar littered with** reduced productivity **thanks to** land degradation. **Regarding twenty one** per cent of the **tillable space** even show signs of **sturdy** and extreme degradation; these **are** "largely, and **for many sensible functions** irreversibly, destroyed" [14]. Soil **erosion** by wind and water **is that the** most damaging and widespread **kind of** land degradation and accounts for **regarding eighty three percent** of **the world** degraded land. As much as **fifty six** per cent of the degraded land is **littered with** water erosion alone. In India, **the issues** of land degradation **are rife** in **several** forms. About 146.8 million **HA space** is **affected by varied styles of** land degradation. This includes **ninety three**.7 million **HA** due **to** water erosion, 9.5 million **HA due to** wind erosion and **fourteen**.3 million **HA due to** water logging/flooding [15]. **In step with three**, **India** loses **regarding** 5334 million tonnes of soil annually **due to varied** reasons.

In recent years, as **a part of atmosphere** and land degradation assessment policy for **property** agriculture and development, **erosion** has **more and {more**} being recognized as a hazard **that** is more serious in mountain areas [17]. **Natural resources on the market** for agriculture **are** shrinking in **India**. Most of the soils in rain fed regions **are** at the verge of degradation having low cropping intensity, **comparatively** low organic matter **standing**, poor soil physical health, low fertility, etc. [18]. Soil **erosion could be a** major **method** of land degradation and **is mostly related to** agricultural practices **that results in** decline in soil fertility and a series of negative environmental impacts and has become a threat to **property** agricultural production and water quality in **several** countries.

2. Literature Review

Singhanhalli-Bogur **small** watershed **is extremely littered with** water erosion **thanks to** high rates of deforestation and unsustainable land use practices **that** have **intense thanks to** poor socio-economic **standing** of inhabitants. **Additionally**, the **sociology during this space** is **characterized** by high **economic condition**, **fast increment** and high illiteracy rates [5]. **Space** has undergone **many** changes in forest/land use as results **of** human influence **inflicting** degradation of soil resources.Analysis of **spatial** variations of Agricultural Land Use Intensity and Land Degradation **in numerous**Physiographic Regions. **the most** objective of this case study on **spatial** variations **and therefore the** relationship between land degradation and agricultural land use intensity was **to see spatial** variations **and therefore the** relationship between land degradation and agricultural land use intensity in **wooded** areas, hill slopes and **watercourse** banks. This was **exhausted** Nyakach District **gift** in **African nation**.
Agricultural land use intensity was highest **on** the **watercourse** banks and lowest in **wooded** areas.

The findings imply that land degradation **is in remission** by **aggravating** agricultural land use **on** the **water course** banks and steep slopes of Nyakach District **moreover** as **different** regions of **the globe**. However, **true** in **wooded** areas remains **a lot of advanced** and **needs more** investigation. This analysis was done by **the employment** of Digital Elevation Model (DEM) **to spot varied** land uses **that** acted as indicators of land degradation and agricultural land use intensity **within the 3** physiographic regions [6].Impacts of Digital Elevation Model in Land Degradation Assessment. **During this** case study the assessment of land degradation by **mistreatment** Remote sensing and Geographical **system** (GIS) in Munnar and its **locality**, **that could be a rough** region. Munnar is **decorated** by its **lovely** chain of mountains. Most **downfalls** is received by this region and its watershed is controlled by its dense trees **however thanks to** the recent unhealthy agricultural practices and urbanization the torrent **finally ends up** with water erosion **that** eventually contributed to **the quantity** of recent landslides it encountered and recorded. The recent time cultivators **don't seem to be** giving thought on the changes **they create** to the agricultural practices **that cause the highest** soil characteristic changes **henceforward** land degradation assessment here is **disbursed** considering parameters like land use/land **cowl** changes, **hydrographic** and **geography** parameters.

The landuse/land **cowl** changes imply that there **are varied** irregularities and most of the changes occur in medium slope **space**. Through weighted overlay analysis the land degradation assessment **result's** obtained[11].Cartosat I stereo-pair was used here **to get** Digital Elevation Model (DEM) with **spatial** resolution of **ten** meter.

This DEM was generated **mistreatment AN** Imagine photogrammetric tool in ERDAS Imagine **fifteen and therefore the** DEM was subsetted **mistreatment** the boundary of study **space**. The clear that **during this** case study Digital Elevation Model (DEM) technique was used for analysing and **supported** it land degradation was detected. Here remote sensing and GIS plays **a crucial** role to analyse land degradation **supported** the layouts of the previous maps/images. Here remote sensing and GIS **provides higher** results than a general survey.

3. METHODOLOGY

3.1. Exploration of DEM

A digital elevation model (DEM) **may be a** digital model or 3D **illustration** of a terrain's surface **unremarkably** for a planet (including Earth), moon, or asteroid created from **piece of land** elevation **knowledge**.

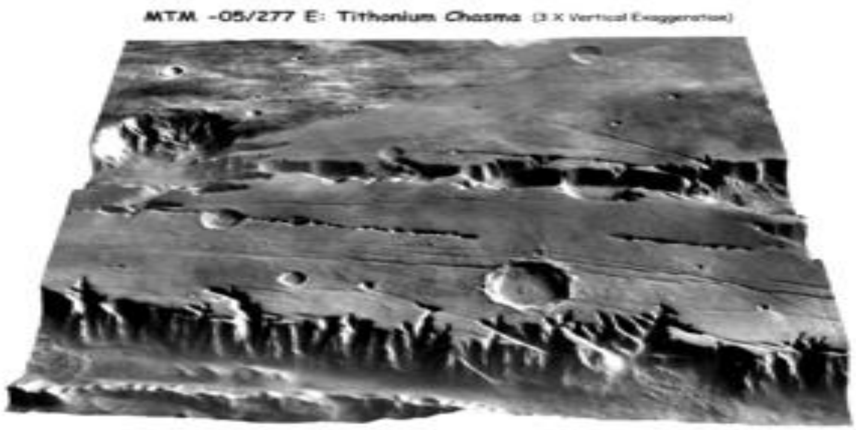

Figure 6.3D rendering of a DEM of Tithonium Chasma onMars

DEM **is commonly** used as a generic term for DSMs (digital surface model) and DTMs(digital **piece of land** model), **solely** representing height **data with none more** definition **regarding** the surface. **Different** definitions equalise the terms DEM and DTM, or **outline** the DEM as a **set** of the DTM, **that additionally** represents **different** morphological **part**. There **are** definitions **that** equalise the terms DEM and DSM.[7] On **the net** definitions **may be** found **that outline** DEM as **a frequently** spaced GRID and a DTM as a three-dimensional model (TIN). Most of **the info suppliers** (USGS, ERSDAC, CGIAR, and Spot Image) use the term DEM as a generic term for DSMs and DTMs. All datasets **that square measure** captured with satellites, airplanes or **different** flying platforms **square measure** originally DSMs (like SRTM or the ASTER GDEM). **It's potential** to **work out** a DTM from high resolution DSM datasets with **complicated** algorithms (Li et al., 2005). **Within the** following the term DEM **is employed** as a generic term for DSMs and DTMs.

A digital elevation model (DEM) **may be a** digital file consisting of **piece of land** elevations for ground positions at **often** spaced horizontal intervals. Its uses **vary** from scientific, commercial, industrial, and operational to military applications. DEM **is employed** primarily as **associate** input or as **knowledge supply** itself in studies **on** the fields of climate impact studies, water management, **geologic** &hydrological modelling, geographic **data** technology, **geophysics** & landscape analysis, mapping **functions**, programs.

3.1.1. Varieties of DEM

DEM **may be diagrammatic** as a **formation** (a grid of squares, **additionally called** a height map **once** representing elevation) or as a vector-based triangular irregular network (TIN). The TIN DEM dataset **is additionally said** as a primary (measured) DEM, whereas the **formation** DEM is **said** as a secondary (computed) DEM. The DEM **may well be non inheritable** through techniques **like** photogrammetric, lidar, IfSAR, land **mensuration**, etc. (Li et al. 2005).

DEMs **square measure unremarkably engineeredmistreatment knowledge** collected **mistreatment** remote sensing techniques; **however they will even beengineered** from land **mensuration**. DEMs **square measure** used **usually** in geographic **data** systems, and **square measure the foremost** common basis for digitally **made** relief maps. **whereas** a DSM **is also helpful**for landscape modelling, **town** modelling and **visualisation** applications, a DTM **is commonly needed** for flood or **drain** modelling, land-use studies, **geologic** applications, and **different** applications.

3.2. Making a Digital Elevation Model (DEM):

3.2.1Basic ideas

a.Geographics map

Topographic **may be a kind of** map **characterized** by large-scale detail and quantitative **illustration** of relief, **sometimes mistreatment** contour lines in **trendy** mapping. **It's a close** graphic **illustration** of cultural & natural **options** on **the bottom**.

b. Contour line

An **isometric** connects a series of points of equal elevation **as an instance** relief on a map. **As an example**, **various** contour lines that **square measure on the brink of each other** show **unsmooth** or mountainous terrain; **once way** apart, theyindicate a gentler slope.

c. Scanning

Scanning **may be a method** of **changing** any paper-based material (in this case, paper **based mostly geographics** map) into a digital format that **is sometimes** integrated into the GIS **information**.

d. Georeferencing

Georeferencing refers to **the** **method** of **distribution** map coordinates to **picture knowledge**. **Knowledge** that **square** **measure** already georeferenced **may** **be** used as reference in georeferencing.

e. Digitizing

Digitizing **may be a method** of **changing spacial options** (point, line & polygon) from a paper-based **supply**into a digital **type** by tracing. **this could** be done **employing a** digitizing **pill** or by on-screen digitizing.

f. Interpolation

Interpolation **may be a method** of **distribution** values to unknown points by **mistreatment** values from **sometimes** scattered set of **known** points. **it's** a procedure **wont to** predict cell values for locations that lack sampled points.

3.2.2. A flow diagram in creating a DEM

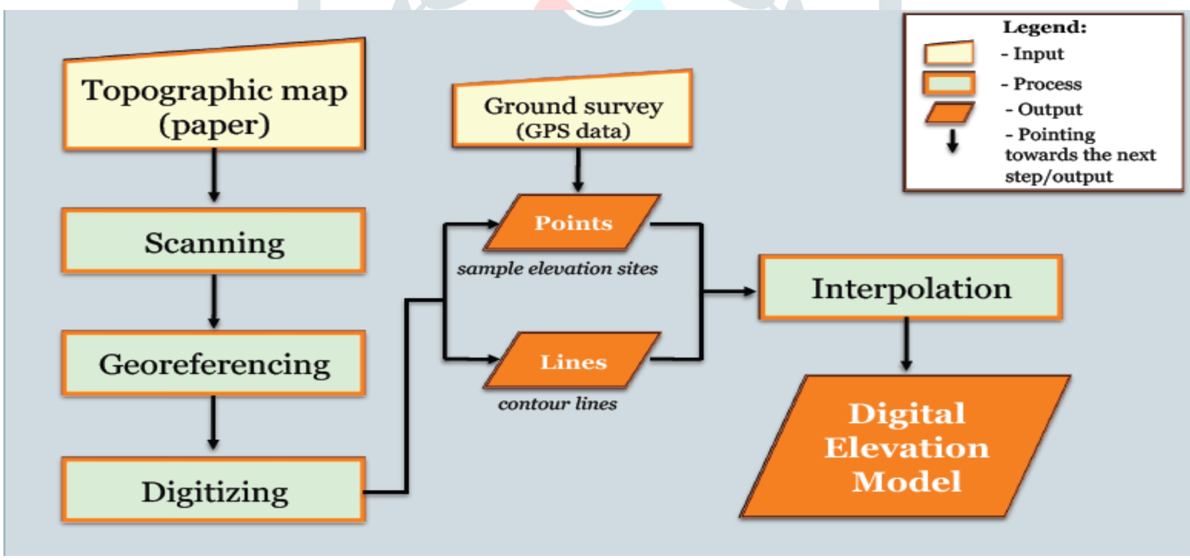

Figure 7.A flow diagram in creating a DEM

1. Scanning

Prior to on-screen digitizing, paper map shave to be integrated into the GIS **information** by **changing** them into digital format. **The method** of such conversion **is thought** as scanning. Through scanning, map **options together with** texts and symbols **square measure mechanically** captured as individual cells or pixels and **an automatic** image is **made**.

These **options** in **formation** format **square measure** then"vectorised" through tracing or on-screen digitizing. Generally, **so as to own a decent supply** image **within the** digitizing **method**, a scanner **must** have **a decent** resolution and, **betting on** the underlying purpose, **giant** enough to accommodate **the entire** map sheet being scanned.

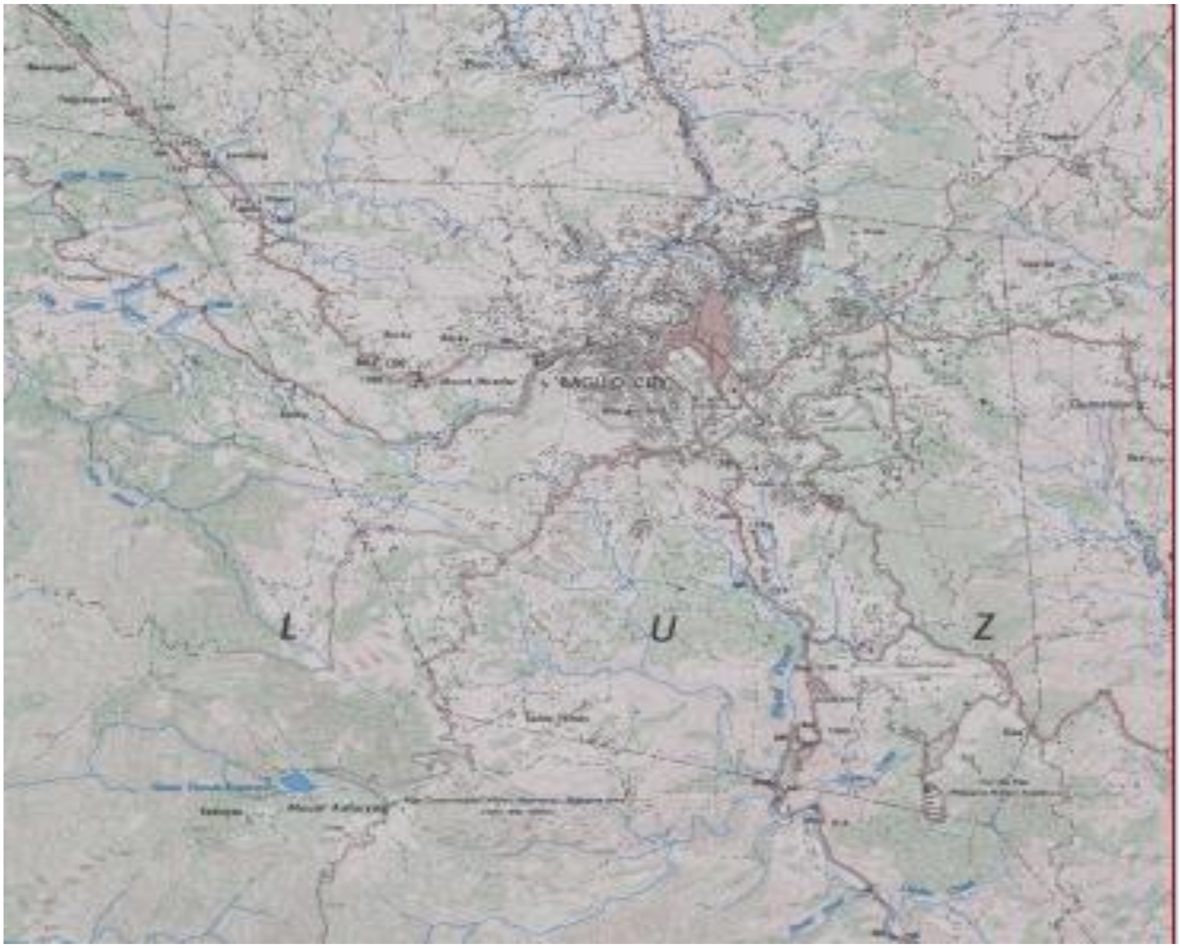

Figure 8.Scanned topographic map (.jpg)

2. Georeferencing

In this presentation, georeferencing was **tired** ArcGIS **package**. The road map that is in **form** file format & already georefenced was used as a reference feature. **45** (45) **communication system** points were collected.

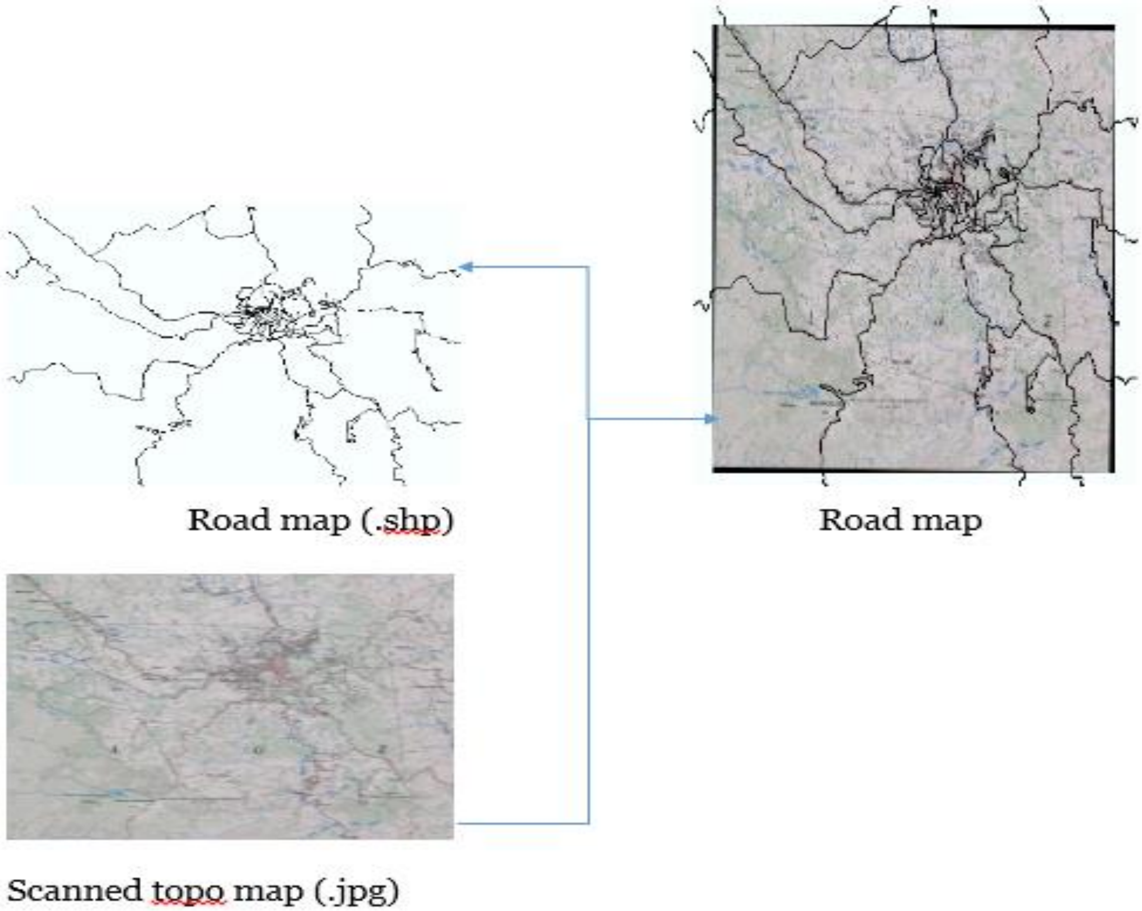
Road map (.shp)
Road map
Scanned topo map (.jpg)

Figure 9.Georeferencing

3. Digitizing

In this presentation, **solely a little** of the georeferenced **geographics** map was **designated** & digitized. **The chosen space is termed** "area of interest" or "aoi".

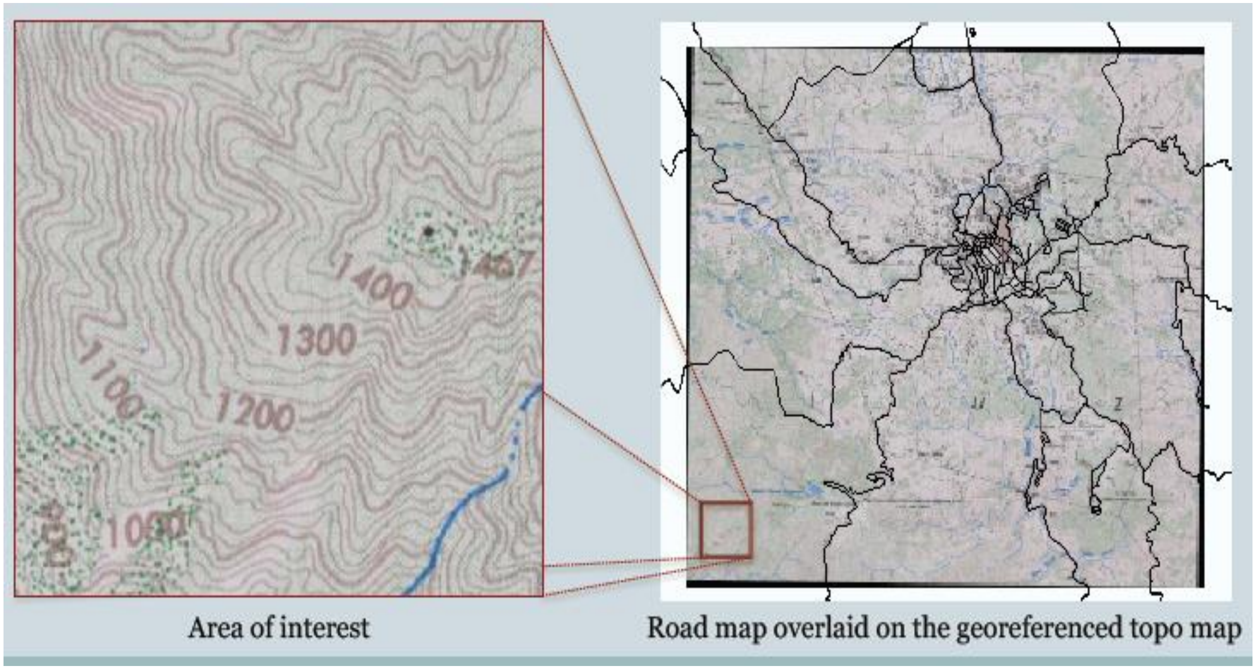

Figure 10.Digitizing

3.1. Digitizing (Lines)

In order **to own** a **additional elaborated** DEM output, digitizing the contours at 20m interval **may be a smart possibility**. Lower contour interval denotes a **additional elaborated geographics** map or DEM. However, **during this** presentation; a contour interval of100m was used. Thus, **solely** the contour lines at 100minterval (i.e. 900, 1000, 1100, etc.) were digitized. Digitizing was done **mistreatment** ArcGIS **package**.

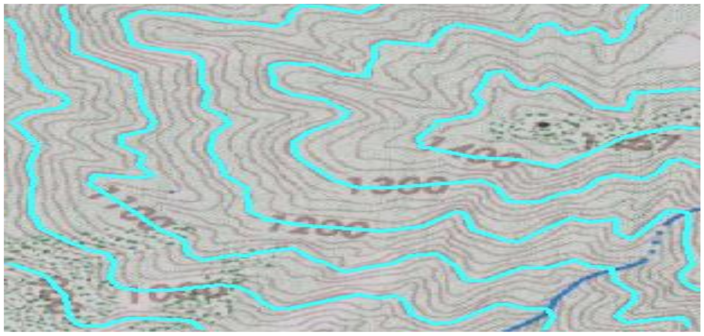

Figure 12.Digitized contour lines

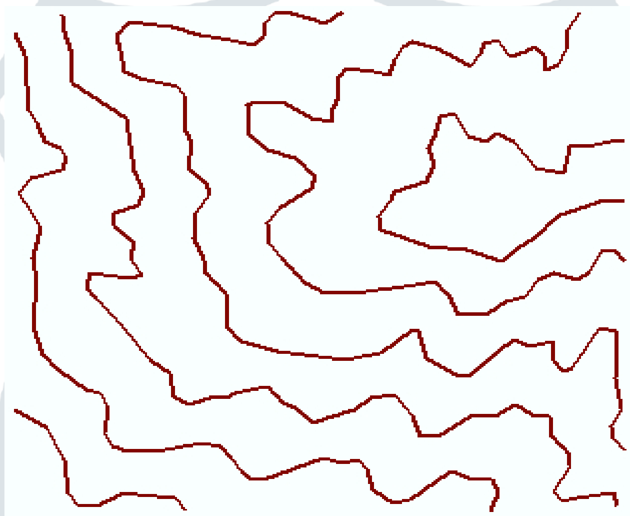

Figure 11.On-screen digitizing

3.2. Digitizing (Points)

In this presentation, digitizing was done **mistreatment** ArcGIS **package** (on-screen digitizing).Alternatively, as shown in slide no.5, sample **purpose** scan **even be** collected from ground survey **mistreatment** GPS. The **additional** sample points collected & used, the **additional correct** the output **are** in representing the earth's surface.

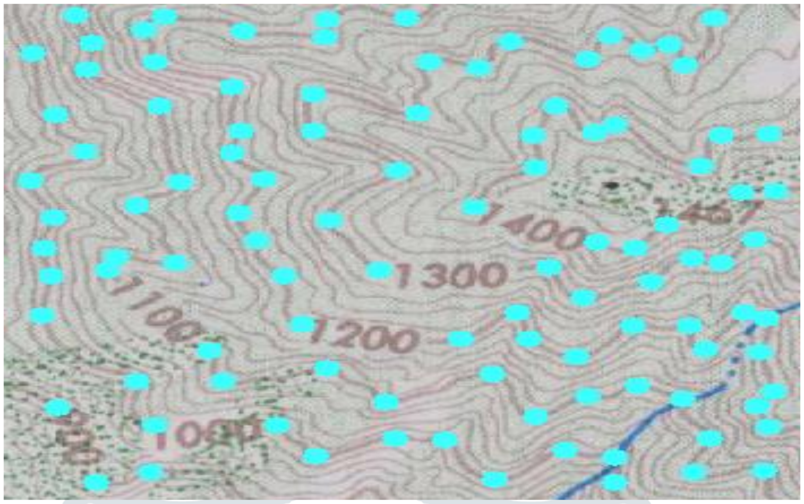

Figure 13.On-screen digitizing

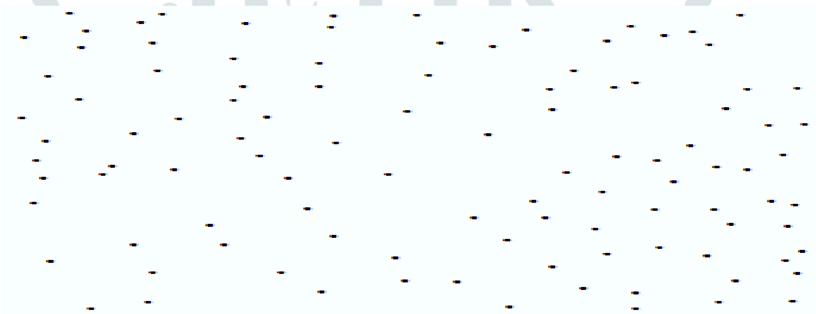

Figure 14.Digitized sample points

4. Interpolation (using contour lines)

The "Topo to Raster" interpolation **technique may be** accessed from the "Spatial Analyst Tools" of ArcGIS **below** "Interpolation". The digitized contour lines were used as input. This **technique permits the utilization**or analyst to interpolate the digitized contour lines **on to** generate a surface map or DEM. **within the** "Topo to Raster" window; one **will** specify the "field" containing the values to be **utilized in** the interpolation **method**. The output cell size **can even** be **outlined**.

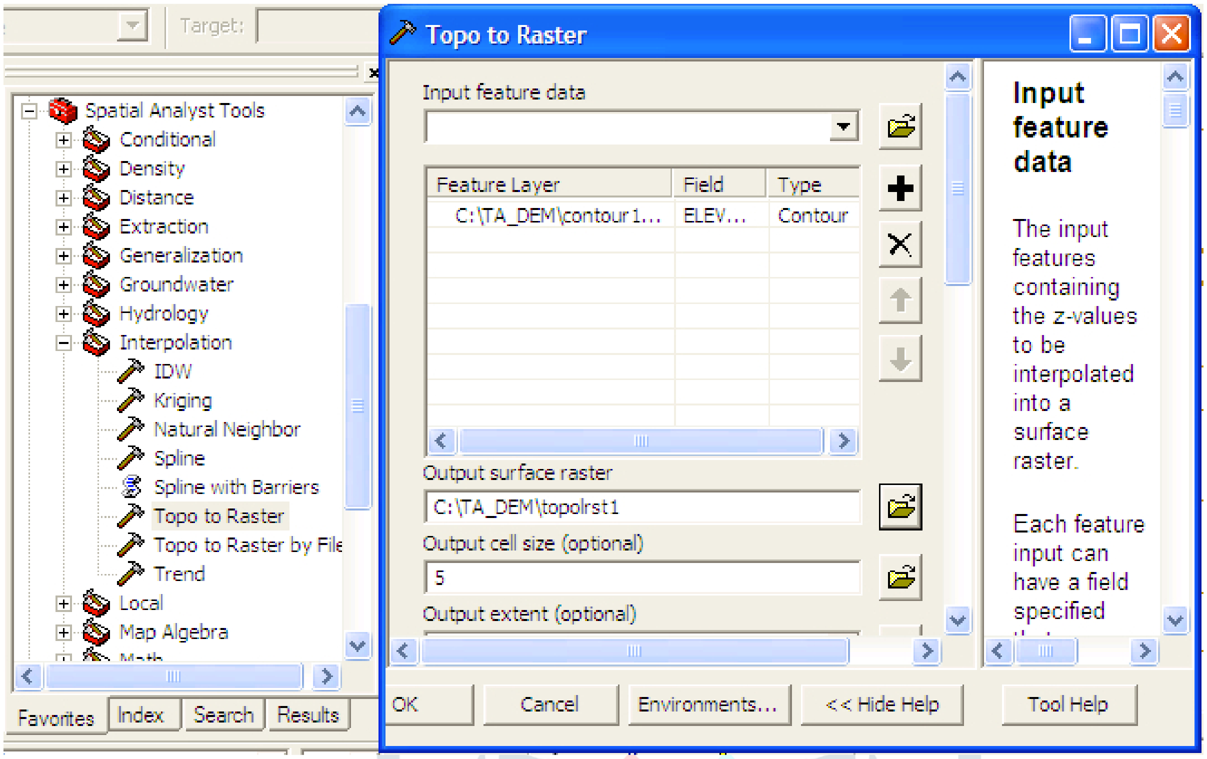

Figure 15.Screen shot of the "Topo to Raster" interpolation method

5. Interpolation (using contour lines)

The DEM of the aoi generated **mistreatment** the "Topo to Raster" interpolation **technique** is **bestowed** below. A **spacial** resolution of 5m was **assigned throughout** the interpolation **method**. The "Topo to Raster" **technique** imposes constraints that **guarantee** a hydrologically correct digitalelevation model that:

• Contains a connected **drain** structure; &

• Correctly represents ridges &streams from input contour **knowledge**.

It uses **associate unvarying** finite **distinction** interpolation technique that optimizes the **machine potency** of **native** interpolation **while** **not** losing the surface continuity **of world** interpolation. **It had been** specifically designed **to figure showing intelligence** with contour inputs.

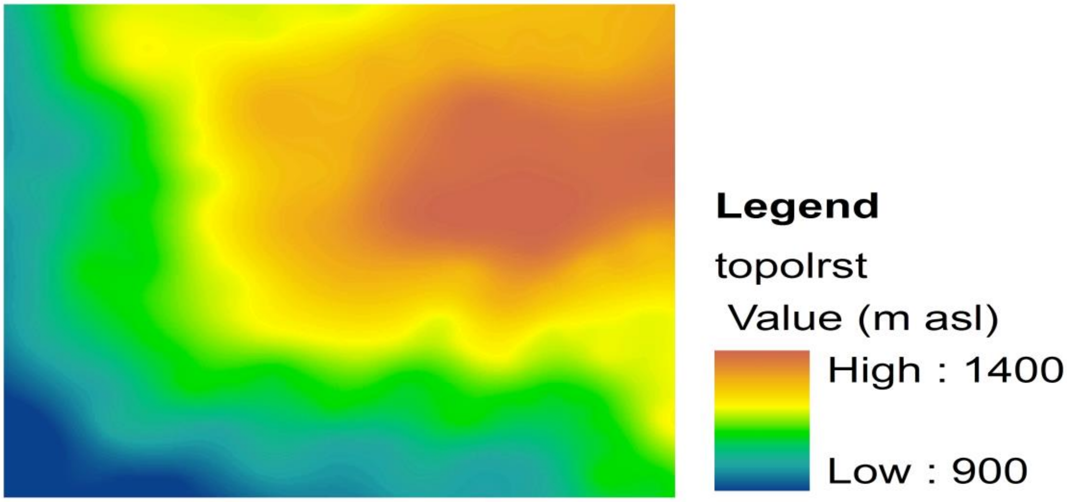

Figure 16.Digital Elevation Model (output of the "Topo to Raster" method)

5.1. Interpolation (using sample points)

Some of **the foremost** common interpolation **strategies embrace** Inverse Distance Weighted (IDW) interpolation, Spline, & Kriging. These **square measure** all **accessible** in ArcGIS **package**.

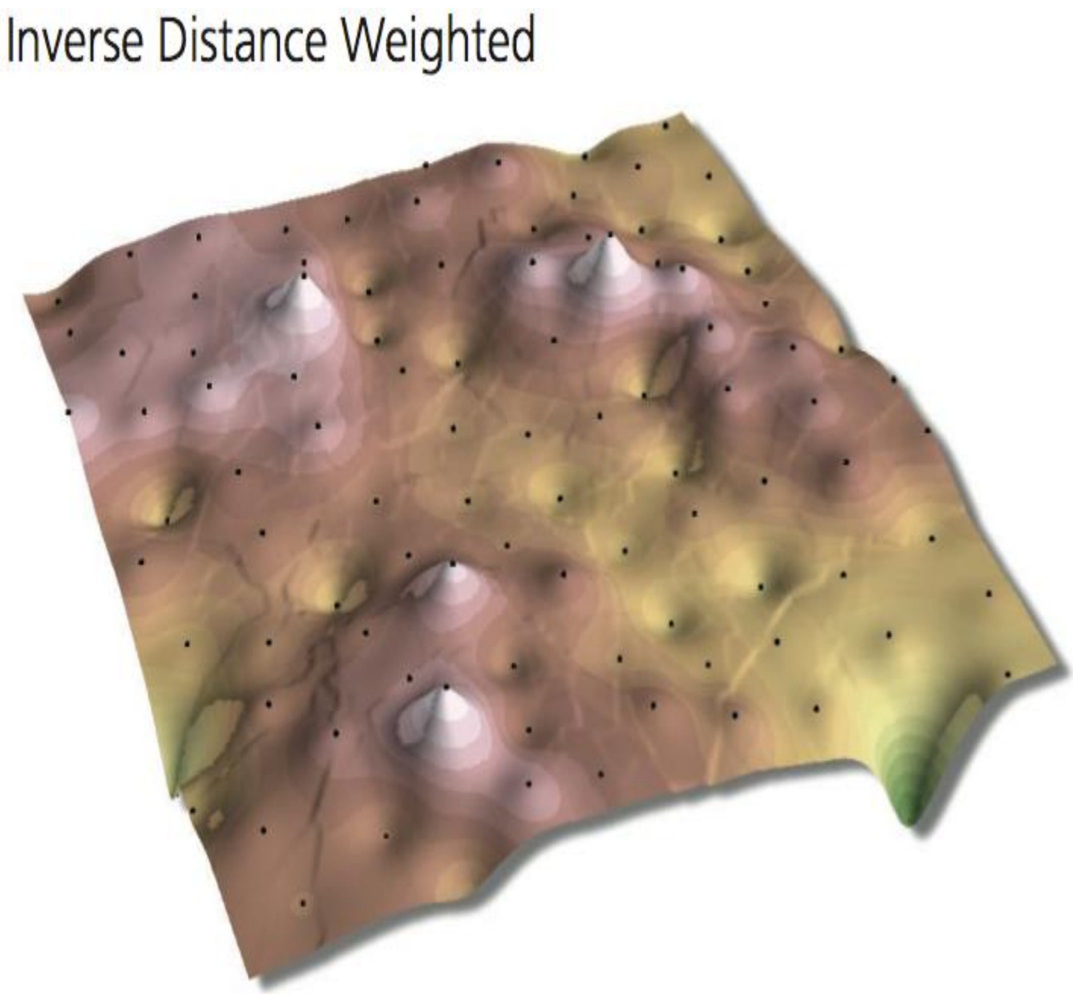

Figure 17.Interpolation using sample points

3.3. Techniques Used For Analysing Land Degradation

Analysis was accomplished by **the utilization** of GIS package **known as** ILWIS(Integrated Land and Water **data** System). ILWIS was **wont to** run **easy** filter operations on already existing map. This was **in deep trouble the various** areas **during this** study. In modelling Digital Elevation Models (DEMs) were created from the **map**areas **mistreatment** the technique **known as** interpolation. For accuracy **functions**, the grid size, scale **and determination** were taken **under consideration**. In **map knowledge**, **the common** grid size **is set** by the length of the contour lines. A map with **the best** length of contour lines was chosen as a blue print for **the remainder** of the areas. The study areas were **designated** and their grid sizes extracted from the larger map. The grid sizes were **thus** chosen as **associate** estimate. The grid resolution was given by **the subsequent** formula: $p = \frac{A}{2.\Sigma l}$

Where A **is that the** total size of the study **space** and Σl **is that the** total **additive** length of all digitized contours.

Creating a DTM in ILWIS **concerned**

1. Digitizing contour lines from existing **geographics** maps and **afterwards**
2. Interpolation between the contour lines **to get** a rasterized surface of topography.

The contours were digitized from a **section** map **that** contained coordinate **knowledge**. **Thanks to** lack of **correct** digitized maps for analysis, **the method of making correct** DEMs **concerned the utilization** of Golden **package** Didger **that** provides a **simple** approach to digitizing the **geographics** maps. Once Didger is **put in and began**, **a replacement** project was started **and also the** image map **foreign**. The **foreign** image map was vectorized. The **package analyzed** the map and created **polygonal shape** lines **that** represent the contour lines shown on the **geographics** map.

ILWIS tools were then used on digitized topo maps **to boost**, filter and **measure the info**. **During this** step the slopes in **every** of the maps were calculated **to search out** out the coverage of high altitude **piece of land and the way** they **have an effect on** land use. The slopes and aspects were calculated from the DEMs at **every pelmistreatment** the gradient of the slope. The filters Dfdx and Dfdy **square measure** gradient filters **within the**X and Y coordinates **severally** that yield the altitude **variations** in these directions on a **pel** by **pel** basis.[6] **scheming** the slope **may be a ballroom dancing** process: **1st the 2** filtered maps for the gradient in X and Y direction were calculated and **wont to get** slopes. The map slopes were created **mistreatment** the formula shown below.

Slope = ((hyp(Dx,Dy))/50) x **one hundred**

CONCLUSION

Analysing land degradation by GIS and remote sensing **method need** monitored. Monitored **is finished so as** to **reach** a **report** with the adequate **facilitate** provided by GIS and remote sensing. This **method** of land degradation **needs an extended method** of observation; **as a result of** this land degradation **method may be a** slow **method however** it takes **an extended** time to be accepted to human eye. **The method needs an extended period of your time and might** be **determined** by remote sensing and GIS. **The foremost often** technique is DEM for **perceptive** this land degradation.

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