International Journal of Advanced Multidisciplinary Research (IJAMR)
ISSN: 2393-8870
www.ijarm.com
Volume 3, Issue 6 -2016

Research Article

SOI: http://s-o-i.org/1.15/ijarm-2016-3-6-14

SOIL MAPPING OF AREA ADJACENT TO BARGI DAM USING GEOGRAPHICAL INFORMATION SYSTEM (GIS)

Rohit Kumar Singh[1], Rakesh Grover[2] and Shailza Verma[3]

[1]M.E.(Geotech) Scholar, Jabalpur Engineering College, Gokalpur, Jabalpur (M.P.)
Email Id :- *singhrohitkumar1989@gmail.com*
[2]Associate Prof.,Dept. Of Civil Engineering, Jabalpur Engineering College, Gokalpur, Jabalpur (M.P.)
Email Id :- *rakesh.grover11@gmail.com*
[3]Assistant Prof., Dept. Of Civil Engineering, Jabalpur Engineering College, Gokalpur, Jabalpur (M.P.)
Email Id :- *verma_shailza@yahoo.co.in*

KEYWORDS

Geo-referencing[1],
Data Aquisition[2],
Arcgis[3],
Coordinates[4]

ABSTRACT

This study aims to use the satellite data and Geographic Information System (GIS) to produce the soil map and use the spatial analysis technique to assess the soil capability .The soils adjacent to Bargi dam (RANI AVANTI BAI SAGAR PARIYOJANA) are chosen for this application. A geographical information system (GIS)) consists of three major components: a model employing a similarity representation of soils, a set of inference techniques for deriving the similarity representation, and use of the similarity representation .The similarity representation allows the soil landscape to be considered as a continuum ,and thereby overcomes the generalization of soils in conventional soil mapping. The set of inference techniques is based on the soil factor equation and the soil–landscape model. The soil–landscape concept contends that if one knows the relationships between each soil and its nature for an area, then one is able to infer what soil might be at each location on the landscape by assessing the soil conditions at that point., soil conditions over an area are characterized using ARCGIS or remote sensing techniques. The relationships between soils and their formative geo-tech conditions are extracted from local soil experts or from field of artificial intelligence techniques. The characterized geo-tech conditions are then combined with the extracted relationships to derive a similarity representation of soils over an area . Soil information products derived through ARCGIS are of high quality in terms of both level of spatial detail and degree of attribute accuracy .In addition ,the scheme shows promise for improving the efficiency of soil survey and subsequent updates through reducing time and costs of conducting a survey. However, the degree of success of the ARCGIS highly depends on the availability and quality of geo-technical data, and the quality of knowledge on soil characteristics.

INTRODUCTION

One of the key pieces of information required in civil engineering projects and infrastructure studies is geotechnical data. All structures are supported on the ground; therefore, they transfer their weight and other external loads to the soil layers underneath them. They are also affected by different phenomena that occur within the underlying ground, e.g., earthquakes, settlement and groundwater. Due to this interaction between the structure and the soil, the properties of the soil should to be known to design or analyze the structure .The application of geotechnical data is not limited to structures and civil engineering. Geotechnical data is widely used in other disciplines, including infrastructure, environmental and risk analysis. Geotechnical data are increasingly used in these studies, where more sophisticated and realistic analyses are utilized that rely on accurate input parameters. One of the factors that limit even more widespread adoption of geotechnical data is relatively antiquated methods that are used to manage and disseminate the data. This issue is identified by practitioners in various design and research projects. The main motivation for the research presented in this dissertation is to improve upon these methods and explore solutions that can be used to facilitate access and usability of geotechnical data.

In recent years thematic mapping has undergone a revolution as the result of advances in geographic information science and remote sensing. For soil mapping archived data is often sufficient and this is available at low cost. ARCGIS[3] is a geographic information system (GIS) for working with maps and geographic information. It is used for: creating and using maps; compiling geographic data; 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. The system provides an infrastructure for making maps and geographic information available throughout an organization, across a community, and openly on the Web. ArcGIS includes the following Windows desktop software:

ArcReader, which allows one to view and query maps created with the other ArcGIS products; ArcGIS for Desktop, which is licensed under three functionality levels ArcGIS for Desktop Basic (formerly known as ArcView), which allows one to view spatial data, create layered maps, and perform basic spatial analysis ;ArcGIS for Desktop Standard (formerly known as ArcEditor), which in addition to the functionality of ArcView, includes more advanced tools for manipulation of shape files and geodatabases; ArcGIS for Desktop Advanced (formerly known as ArcInfo), which includes capabilities for data manipulation, editing, and analysis. It decreases the cost, reduce the time and increase the detailed information gathered for soil survey. Most GIS projects require geo-referencing1 some raster data. *Geo-referencing1* is the process of assigning real-world coordinates to each pixel of the raster. Many times these coordinates are obtained by doing field surveys - collecting coordinates with a GPS device for few easily identifiable features in the image or map. In some cases, where you are looking to digitize scanned maps, you can obtain the coordinates[4] from the markings on the map image itself. Using these sample coordinates or GCPs (Ground Control Points), the image is warped and made to fit within the chosen coordinate system.

METHODOLOGY

Soil Mapping tries to overcome some of the drawbacks of the traditional soil maps that are often only focused on delineating soil-classes i.e. soil types. Such traditional soil maps do not provide information for modeling the dynamics of soil conditions and are inflexible to quantitative studies on the functionality of soils. The map of the area was registered into the Arcgis 9.1 software via the steps of scanning, import, creation of coordinate system and geo-referencing. The next step was the digitization of the various spatial features soil sampling sites and contour lines. Contour lines information is used to understand study area, these maps were integrated into the software for further analysis and presentation of results. Soil maps provide descriptions of spatial and temporal attributes of soil and landscape. Soil mapping has traditionally involved the development of an understanding of soil forming processes which is then applied to predict the location of classes of soil types and the likely range of within-class variation of soil properties. Recently, there has been a growing realisation among many soil scientists that spatially extensive and available environmental data layers can be effectively utilized to represent various components of soil forming factors and processes with a view to improving soil mapping. . Traditional soil survey has always had problems with the collection of representative soil data, cost implications in soil mapping, how to spatially represent soil properties in a soil map, and efficient delivery of accurate soil information, among others. These problems have hampered access to, and wide application of, accurate soil information. Collection of soil data is one of the age-old limiting factors in soil mapping because it involves time consuming, costly, cumbersome, and (sometimes) less accurate methods. The traditional methods that have been applied in soil data collection include: field methods (such as Munsell colour chart, soil texture by feel, visual inspection, samplers, direct measurement with field equipment such as infiltrometer, tensiometer, moisture probes, etc); laboratory methods for tests on soil samples collected from the field (such as physical, chemical, and biological equipments and reagents);

and archived soil data (maps, reports, and published articles). Soil scientists are now turning a new page in soil data collection. Technologies which were initially used in other disciplines are finding their way into soil science to improve data collection and analysis. Designing Map Layouts Displaying data so that you can analyze spatial patterns on a computer screen is one thing; printing out a map for other people to look at is another. Arc Map thinks of these as distinct functions and makes available as series of tools for designing may play outs that you don't need until you are ready to print.

Layout View > Layout View Ō or Ō Click the "Layout View" button at the bottom of them app display When you open Arc Map, you are in "Data View" and use the "Tools" toolbar to navigate your map. When you switch to the "Layout View", you have access to a different range of tools and use the "Layout" toolbar to navigate. In Layout View, you get a much better idea of how your map will look when it is printed.

Goal of Soil Survey

⇩

Soil Mapping

Assessment of Effects

Data Acquisition[2] & Data Processing

⇩

Acquire Existing Soil Information (eg : legacy soil data)

Acquire GIS- Maps (geology,vegetation ,terrain ,land-use ,etc)

Proxy Soil Map

⇩

Preliminary overview of the region, rough soil inventory

Delineation of the main soil classes

Investigation of Soil Profiles

⇩

Choice of typical sites, application of soil classification for profiles

Soil measurements for profiles

Soil-Map

⇩

Assessment Report

Soil map, legend, soil data

Arc Map will automatically place a border ("neat line") around your map. You can change this by right clicking on it and going to "Properties." Click on the "Frame" tab. From here you can choose a different style or color frame (to get rid of it altogether, choose "no color" from the color selector). You can also change the background color and add a shadow (to add a shadow, you'll need to change the X and Y offset to something other than 0).

To make your map larger or smaller on the page, you can use the zoom tools on the Tools tool bar or on the Layout toolbar. The Layout toolbar also includes a pan tool that you can use to move your whole layout. To move just your map (and not the whole page) ,use the pan tool in the Tools toolbar. The fixed zoom tools in the Layout toolbar work like the ones on the Tools bar. The "Zoom to whole page" button is especially useful.

One of the biggest differences in Layout View is that many more options in the "Insert" menu become active. These options allow you to add elements—including a title, legend, north arrow, scale bar, and image—to your layout. Each of these will be separate objects in your layout that can be moved and resized through their Properties. You won't see any of them if you switch back to Data View since they are meant to clarify printed maps, not help you interpret your map on the screen. You can add text in the Layout View, but you are better off trying to label features from the Data View, using the label or text tools. ArcGIS for Desktop consists of several integrated applications, including Arc Map, Arc Catalog, Arc Toolbox, Arc Scene, Arc Globe, and ArcGIS Pro. Arc Catalog is the data management application, used to browse datasets and files on one's computer, database, or other sources. In addition to showing what data is available, Arc Catalog also allows users to preview the data on a map. Arc Catalog also provides the ability to view and manage metadata for spatial datasets. Arc Map is the application used to view, edit and query geospatial data, and create maps.

The Arc Map interface has two main sections, including a table of contents on the left and the data frame(s) which display the map. Items in the table of contents correspond with layers on the map. Arc Toolbox contains geo processing, data conversion, and analysis tools, along with much of the functionality in ArcInfo. It is also possible to use batch processing with Arc Toolbox, for frequently repeated tasks.

The ArcGIS Pro application was added to ArcGIS for Desktop in 2015. It had the combined capabilities of the other integrated applications and was built as a fully software application.

CONCLUSION

A soil map has been produced to store and develop an interactive geo-refrencing. The fundamental conceptual elements of creating this SOIL MAPS has been solved designed and developed using ARCGIS. These maps are used to analyze land suitability for the growth and production of some of the selected crops in the study area. Also, Arc Reader control has been customized and this will assist geo-tech engineers to identify all current and future land mapping units (or soil series) which are suitable for the town planning. Soil maps which have the potential of visual impression and special variation of soil properties have been created. These maps delineated one suitability rating from the other using color coding system. It is user friendly, fast and precise. However, the precision of the mapping depends on reliability and accuracy of soil properties such as swelling pressure, grain size analysis, liquid limit, plastic limit, compaction test which are used in this study. The land suitability analysis could have been improved if soil maps are used. The methodology and deliverables of this thesis will allow the future projects to utilize guidelines to manage the soil nature & quality while managing development in the region.

REFERENCES

1. Kotoda, K., Wakamatsu, K., and Oya, M., "Mapping Liquefaction Potential based on Geo morphological land classification," in Proceedings of Ninth World Conference on Earthquake Engineering, August 2-9, (1988), Tokyo-Kyoto, JAPAN (Vol. III).
2. David, M.(1977). Geo-statistical ore reserve estimation. Amsterdam: Elsevier
3. Amadi A.N. and Olasehinde P. I., "Application of Re- mote Sensing Techniques in Hydro-geological Mapping of parts of Bosso Area, Minna, North-Central Nigeria," International Journal of the Physical Sciences, Vol. 5, No. 9, (2010), pp. 1465-1474
4. Sethi M., Bundela D. S, Lal K. and Kamra S.K., "Remote Sensing and Geographic Information System for Appraisal of Salt-Affected Soils in India," Journal of Environmental Quality, Vol. 39, No. 1, (2010), pp. 5-15. http://dx.doi.org/10.2134/jeq2009.0032

5. "ArcGIS 9.1 Now Available" *(Press release). ESRI. (2005-05-25). Archived from* 'the original '*on (2006-05-27).*

6. Schmugge, Kustas W.P., Ritchie J.C., Jackson T.J. and Rango A., "Remote Sensing in Hydrology," Advances in Water Resources, Vol. 25, No. 8-12, (2002), pp. 1367- 1385

7. Forkuo, E. K (2008), digital Terrain Modelling in a GIS Environment. The International Archives of the Photogrammetry , Remote Sensing and Spatial Information Sciences". Vol. XXXVII, Part B2, pp 1023-1028.

8. Jayasinghe P. K. S. C. T., and Machida, T (2008), web-based Online Consulting System with Crop-Land Suiability Identification, Agricultural Information Research, 17(1), pp 13-19

Access this Article in Online	
	Website: **www.ijarm.com**
	Subject: **Soil Science**
Quick Response Code	

<u>How to cite this article:</u>
Rohit Kumar Singh, Rakesh Grover and Shailza Verma. (2016). Soil mapping of area adjacent to Bargi Dam using Geographical Information System (GIS). Int. J. Adv. Multidiscip. Res. 3(6): 122-126.