Assessment Of Krishna River Soil Sediment Using Geospatial Technology

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ABSTRACT
The present study was done by the assessment of soil sediments quality which is carried out in Krishna River, Vijayawada, Andhra Pradesh. The soil sediments quality study was assessed during three months. Considerable amount of data was generated between various parameters done by Geographical Information System 10.5 version software. Maps of soil sediments prospects zones are prepared from the toposheets, serves as efficient tools for detailed surface based geological survey. Arc-GIS software is usedassess the quality of soil sediments in Krishna River. This assessment will help in order to develop good soil sediments quality region successfully. Environmental changes taking place in the Krishna River soil sediments should be recorded with the help of Geographical Information System and Satellite base map must be used as basic input parameters for Environmental mapping and recording of Krishna River soil sediments environment.
Keywords: Base Map, Environmental Sustainability, GIS.

Introduction: The Krishna River is the fourth-biggest river in terms of soil sediments in flows and river basin area in India, after the Ganga, Godavari and Brahmaputra. The river is almost 1,288 kilometers (800 m) long. The river is also called Krishna veni. The Krishna Basin extends over Andhra Pradesh, Maharashtra and Karnataka having a total area of 2,58,948 Sq.km which is nearly 8% of the total geographical area of the country. The basin has a maximum length and width of about 701 km and 672 km and lies between73°17’ to 81°9’ east longitudes and 13°10’ to 19°22’ north latitudes. It is bounded by Balaghat range on the north, by the Eastern Ghats on the south and the east and by the Western Ghats, the west. The Krishna River rises from the Western Ghats

near Jor village of Satara district of Maharashtra an altitude of 1,337m just north of Mahabaleshwar.

Topography the Study Area of Vijayawada:
Vijayawada is the second largest commercial city of Andhra Pradesh, within an area of 61.88 km^2. The city municipal limits has a population of 1,048,240 Location of Vijayawada in Andhra Pradesh. Coordinates 16°31′8.50″N and 80°37′17.38″E
The City Vijayawada today: Total Area: 2,168,000 sq.km.Population: 1,476,931

Males: 7,43,267
Females: 7,33,664
Literacy: 81.24%

Soil sediments supply coverage: 77%
Access to comprehensive sewage scheme: 20%
One of every five house holds doest not have access to latrine facility.

POLLUTION:
The Krishna River Soil sediments are due to the rapid development of urban activities and the river basin population has increased to 80 million enhancing pollution load many folds into the river. Adequate average and minimum continuous environmental flows to the sea are not taking place in most of the years constricting salt export and leading to formation of saline and alkaline soils in the lower reaches of the river basin. High alkalinity soil sediments is discharged from the ash dump areas of many coal fired power stations into the river which further increases the alkalinity of the river soil sediments whose soil sediments is naturally of high alkalinity since the river basin is draining vast areas of basalt rock formations.

OBJECTIVES:
1. Preparation of thematic maps using Survey of India toposheet and satellite imagery.
2. Collection of Krishna River soil sediments samples in different locations.
3. Testing the quality of soil sediments samples in different locations by different physical chemical properties.
4. Collection of Attribute data from the surface soil sediments.
5. To conduct GIS mapping of physiochemical data obtained from the Krishna riversoil sediments analysis by using GIS Software.

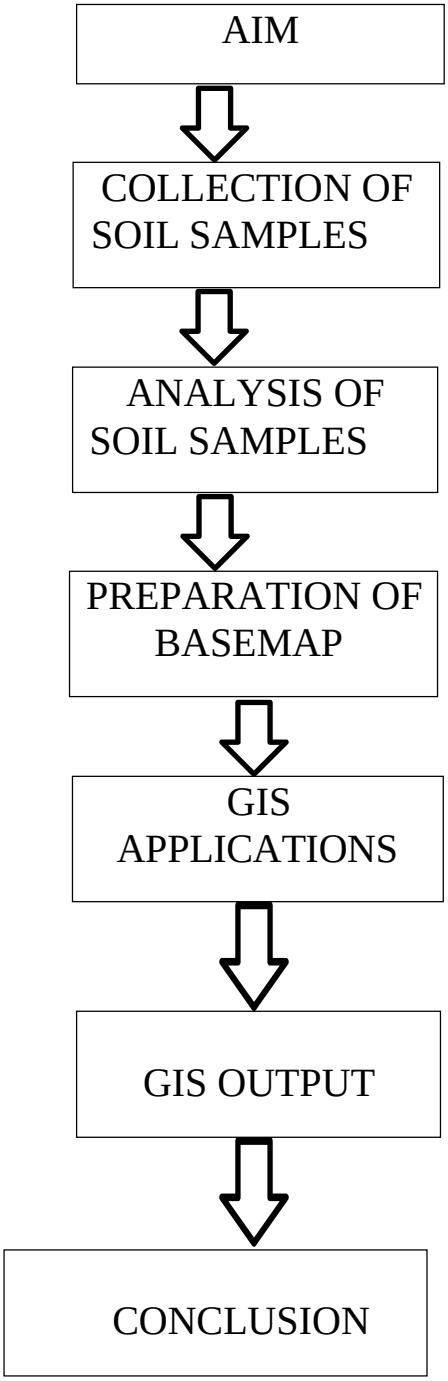
SCOPE: The scope is to recommend a standard of good practices in the collecting soil samples, testingand Analyzing the Krishna river soil sediments. The main goal of the guidelines are:
- To Provide a general understanding in testing the soil sediments samples of the krishna river(Tests : pH, Alkalinity, Chloride, Hardness, TDS, TS).
- To Provide a consistent for the Analysis of soil sediments samples of the krishna river.

COLLECTION OF SOIL SEDIMENTS SAMPLES:

- **Location** : Krishna River, Vijayawada.
- **Number of Samples** : 10

- **Tests to be conducted** : p^H, Alkalinity, Hardness, Total Dissolved Solids (TDS), Total Solids (TS), Chlorides.

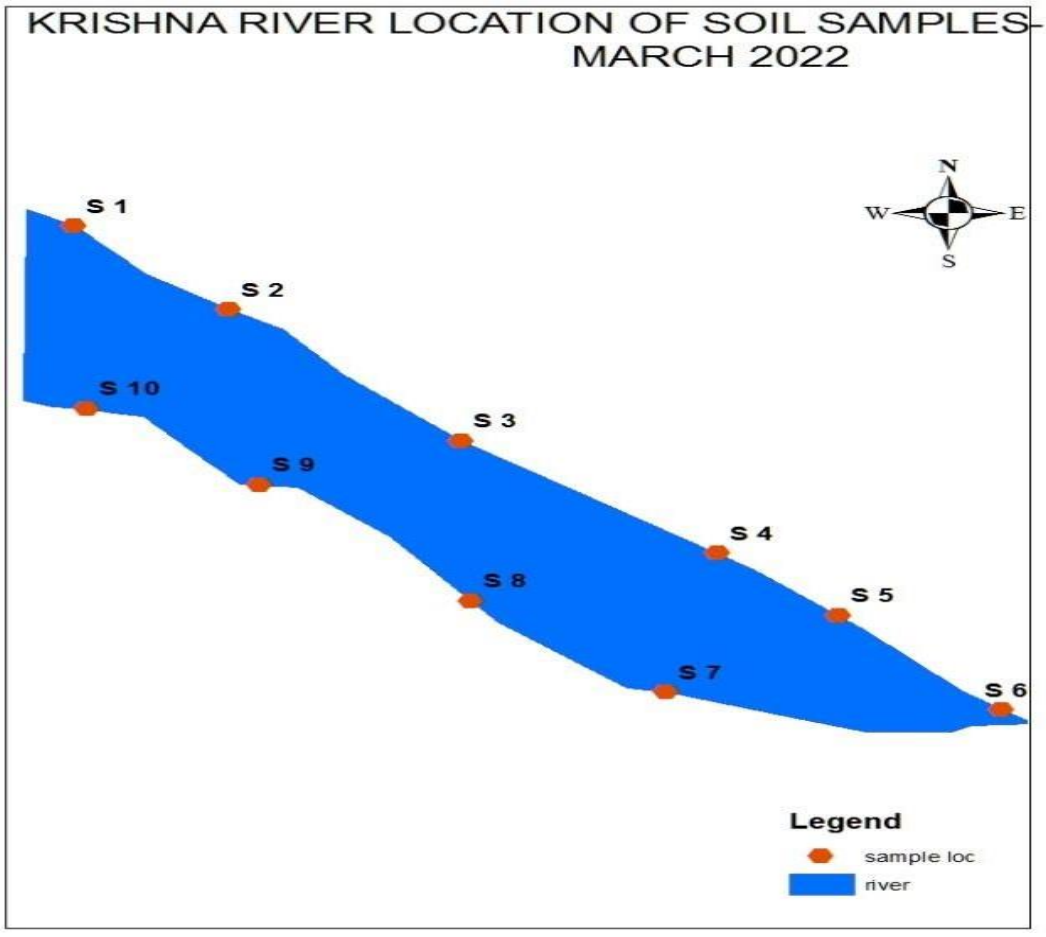
METHODOLOGY:

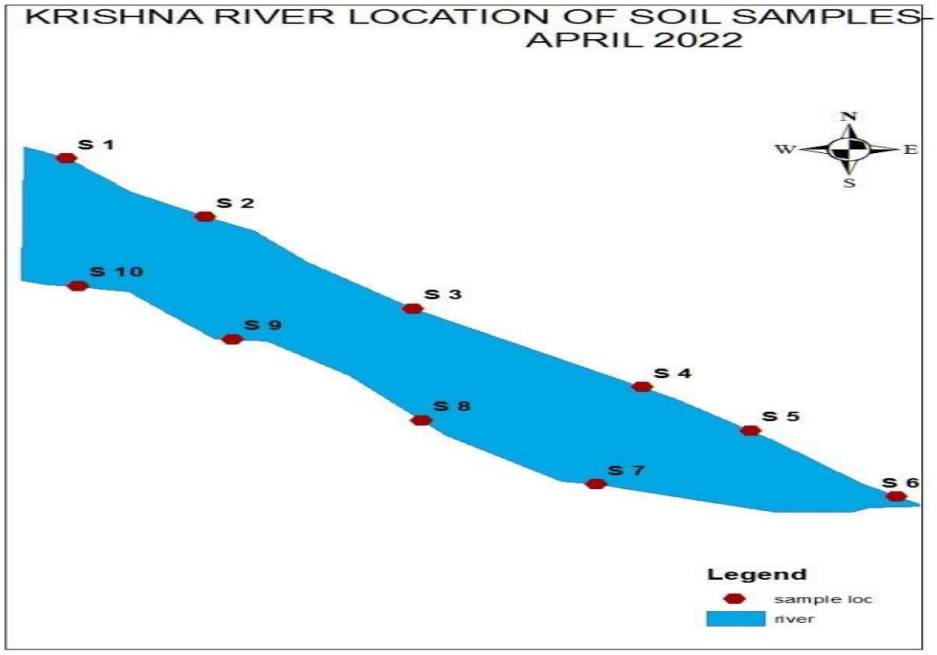


Data Structures:

In GIS the Data Structure is of Two types.

- **Raster Data Structure:** It is the cellular organization of spatial data. The Simplestraster data structure consists of an array of grid cells.
- Simple Raster Array
- Hierarchical Raster structures.
- **Vector Data Structure:** Vector representation is mainly based on the three Maingeographical entities points, lines and polygon.
- Whole polygon structure
- Dual independent map encoding file structure.
- Arc-node structure.
- Relational structure.
- Digital line graphs.




KRISHNA RIVER LOCATION OF SOIL SAMPLES-
APRIL 2022
N
W
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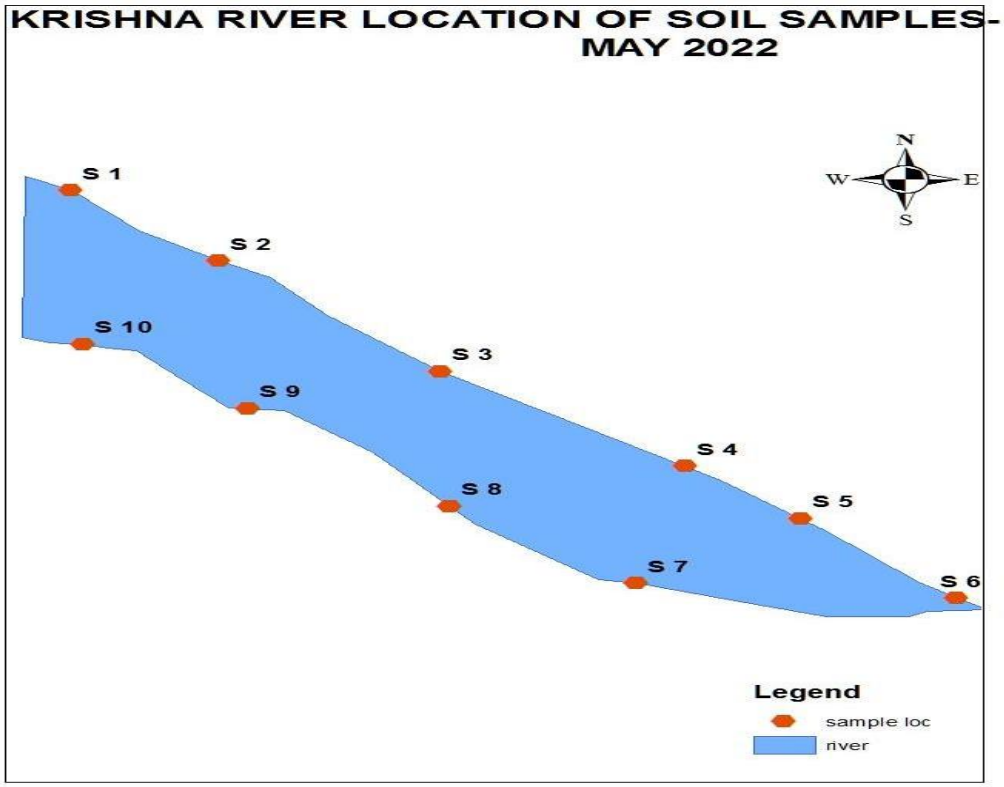
S 1
S 2
S 10
S 3
S 9
S 4
S 8
S 5
S 7
S 6
Legend
sample loc
river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S 8
S 5
S 7
S 6
Legend
sample loc
river

ANALYSIS OF SOIL SEDIMENTS SAMPLES:

Parametric Analysis: The parametric analysis carried out to assess the surface soil sediments quality are the physico-chemical parameters of the soil test: p^H, Alkalinity, Hardness, Total Dissolved Solids (TDS), Total Solids (TS) and Chlorides.

Table 1.0 Methods Used for Soil Sediments Analysis.

Test Conducted	Units	Principle of the Method
p^H		Digital p^H meter
Alkalinity	mg/1	Titration with N/10 HCl, Phenolphthalein and Methyl orangeindicators, Sample soil sediments.
Hardness	mg/l	Titration with standand EDTA using Eriochrome black T indicator& 1 ml of Ammonia buffer Solution
Total Dissolved Solids	mg/1	Filtration and Evaporation
Total Solids	mg/l	Evaporation
Chlorides	mg/l	Titration with standard Silver nitrate solution using 1ml of Potassium chromate indicator

The Laboratory experiments done for the Krishna River Soil sediment Analysis are shown with the following values:

March Month- 2022, Table 1.1

S.NO	p^H	Alkalinity mg/l	TDS mg/l	Chlorides mg/l	TS mg/l	Hardness mg/l
S 1	8.2	185	421	99	460	220
S 2	7.2	199	445	84	473	254
S 3	8.1	184	398	106	461	178
S 4	7.7	188	356	98	497	168
S 5	7.5	147	308	103	473	146
S 6	8.2	141	352	188	397	132
S 7	8.1	198	365	122	477	176
S 8	7.7	185	376	160	483	118
S 9	8.2	193	412	129	470	150
S 10	8.5	`173	362	103	470	178

April Month-2022, Table 1.2

S.NO	pH	Alkalinity mg/l	TDS mg/l	Chlorides mg/l	TS mg/l	Hardness mg/l
S 1	7.4	132	394	142	460	199
S 2	7.7	146	388	142	373	244
S 3	7.2	162	342	156	441	199
S 4	7.8	168	356	162	343	198
S 5	7.4	188	408	152	373	152
S 6	8.2	144	322	188	397	192
S 7	8.1	160	365	122	377	196
S 8	7.6	185	346	170	483	248
S 9	7.9	130	412	139	370	250
S 10	7.1	178	370	115	410	278

May Month -2022, Table 1.3

S.NO	pH	Alkalinity mg/l	TDS mg/l	Chlorides mg/l	TS mg/l	Hardnessmg/l
S 1	8.4	152	380	132	420	204
S 2	7.6	166	496	152	368	244
S 3	7.2	162	360	146	412	234
S 4	7.8	168	482	172	397	238
S 5	7.4	188	310	142	344	132
S 6	8.2	116	252	198	302	192
S 7	8.1	120	312	112	386	196
S 8	8.5	194	356	160	490	258
S 9	8	140	402	119	310	210
S 10	7.4	198	350	105	490	268

For the above tables, all units are mg/l, expect for p^H

GIS APPLICATIONS

GIS is a computer based information system used to digitally represent and analyze the geographic features present on the Earth‘s surface. It is an organized collection of computer hardware, software, data and personnel designed to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information. GIS Components are the integration of the basic components, which are very essential to complete GIS tasks.

People: are the most important component of a GIS. People must develop the procedures and define the tasks of the GIS data. The results are dependent on the availability and accuracy of data. HardwareProcessing speed, ease of working and output of a GIS is Hardware dependent. Software this includes not only the actual GIS software, but also various databases, drawing,

and statistics, Imaging or other software.

Procedures: Analysis requires well-defined, consistent methods to produce correct and reproducible results.

Analyzing Data: A GIS should have the capability to answer questions regarding the interaction of spatial relationships between multiple data sets.

Displaying Data: There must be tools for visualizing the geographic features.

DIGITIZATION OF TOPOSHEET:

AIM: Creating a new shape file in the Arc Map

First of all shape files are nothing but the layers that you create for your convenience using the Arc Catalog which is another profile or sub grade of this Arc Map itself.

You are able to create the following layer types in Arc MAP. They are poly lines, points, polygons. Poly lines are generally used for the streams, Roads, Embankment trench lines for observing landslides, points will be for the towns for Ground control points that you may be observing during the survey such as the bench mark and all, polygon features will be used for the closed body survey type namely forests, entire town plan, water body etc. Now I will show you how to create those shapefiles which you are going to work on the Raster files. First of all you need to choose the map that exists in the computer. We choose Krishna District Toposheet folder in the D drive by the project name for the GIS Maps. For that we have to choose the Add Data button which appears in the tool barside with a black plus mark sign in the yellow coloured rhombus. That will show one window throughwhich you can add shape files as well as the Raster features into the Arc MAP. Let me include the raster form first of all then the creation of the shape files later for this existing Raster image form. Now click on the Krishna district Raster image and click on the add but to that is appearing in the window shown below. You can also observe the Add data button to the top in the above figure as mentioned it earlier already. After adding Map, it will open up in the Arc MAP software. Now how to create the shape files is the very next duty we should perform. Go to the Arc Catalog Icon and press on it. Arc Catalog icons have a yellow coloured icon which will appear like the yellow colored desk with a blue blanket in a shelf that is opened from it. Later it will show one window which is most commonly your explorer window in the computer. Click in the folder for the option new in which you will be allowed to create. The shape file as a point, polyline, polygon shape files.

Clip the.img format image: Clipping of the image means simply trimming the unnecessary side borders of the image except the area that is within the coordinates you entered. Clipping can be of many types, not only rectangular or square. You can also clip an image in the desired closed polygon shape that you want. But all will follow the common procedure i.e., clipping the image in.img. Format with the Arc Tool box window tools.

Import the image only into the Arc Map:

Go to the Arc Tool Box window which is the Red coloured icon next to the Arc Catalog icon the Toolbar. Click on it and it will be displayed in the same window after clicking it .It has many tools. But our operation is dealing with the Raster image format but not spatial image format and all. So find the Raster editing tool in that Tool window. Path for the clipping of the image is Arc Tool Box>Data Management tools>Raster>Raster processing>clip. Click on the clip and it will open the window again. In which you have to give the .tiff format of the image that you want to clip, img format of the image you want to clip and also you should be verifying the path clearly for the clipped image saving. It will most probably save the clipped image in the folder where the .img file is existing. Other wise you can a so give the path where you want to save

the clipped file for I hope you get this one with no doubt. You can clearly observe and show the coordinates that are entered by you after choosing the .img image that has to be clipped in the Arc MAP. I have rectified my error to 0.0001, so I have the accurate coordinates being displayed there. If you have an error then basing on that error it will display coordinates but not the exact. Just clickon Ok and the clipped image is saved in the address that is mentioned in the output Raster Dataset in the above window displayed. Automatically clipped images will be imported into your existing Arc MAP window. You can verify whether it is clipped or not. This window suggests the process of the image being clipped. Final step digitization of the image: For the Digitization of the image import the clipped image, shape files created into the Existing Arc map working window. Now after the adding data i.e., shape files and the.img format clipped image, we have to start the editing. Make the editor toolbox appear in the window that you are working in that editor toolbox will be as follows.

Press Editor>start editing. All the Icons in it will be highlighted. Choose the pencil tool as displayed above and always select the shape file on which you are working. Suppose if it is roads, select the feature as the roads in the scroll menu that is provided at the end.

Use the pan tool to move to the sides when you are working with the editing.

To have the edits up to mark you should press F2 function key for one time or you should select save edits in the editor scroll in the editing toolbar. Every time when you save editing, stop the edit by clicking on stop editing and be able to view your work progress in Digitization. By switching off the Raster image in the layers.

A point shape file is used to represent a place or thing that by its nature doesn't have area or length, such as a mountain peak or a lighting strike, point features have pointgeometry. Click on Edit in the shape file but to that is appearing to you in the above window. Another window will open and it will appear as follows. Here you have to do some simple steps and that is mentioning the map for which you have created these shape files.

Now press on the select button to choose the coordinate system type. Choose the projection and press the add icon that window. Now go to the import button and click on it. Now browser for the Map which you have added to the Arc MAP for the working in your computer path in that window and choose that map by browsing through the Import window and set that Map as the parent for the shape file which you have created, I am working with Krishna district. We should browse to the folder where you want to create the shape file and right so I have to put it in the Import via Browsing and add that detail to every shape file which I have created for the Krishna district. The same step will continue for every shape file which you have created in the Arc Catalog menu.

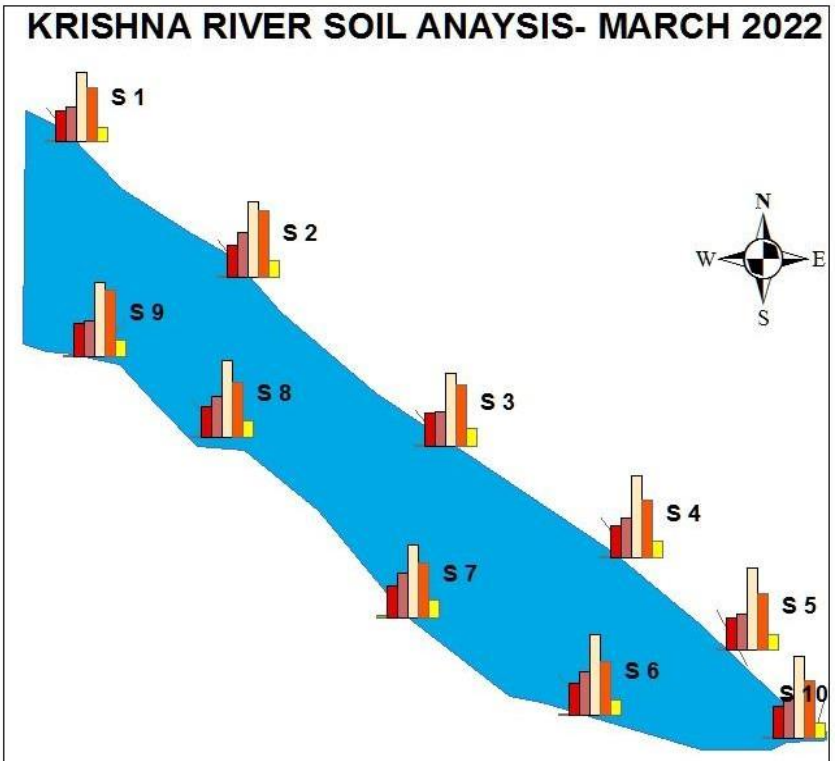
Now shape files will be created using this process and they will be stored in a place where you browsed and created via Arc Catalog. Don't forget where you have created the shape files because that will become a panicify you forget and we have to create the imagine. But this is one way of creating shape files and there is also another way known as the feature class and Database creation method. Both will have more or less the same functionally so I prefer this one to follow rather than that method. After you choose the projection type for the shape file and the Raster image you imported then they obey the curvature properties basing on the grid coordinate system that you chose, and every measurement on the feature you draw using the editor will be measured basing on the coordinate system that you allot to the image and the shape files. I intend in creating the shape files Soil sediment locations, River in the folder Krishna district Workout in my computer, but when giving the image on which you are working out as source for the shape file you created make sure that the image is in the img form but not the

.bmp, jpeg .tif form. If you did not know how to rectify the image and make it ready for the

shape file let me help by mentioning them also in the Geo-image rectification.

You should know how to enter the coordinate for the entire tiff image you chose. Especially four coordinate points must be given at the square border of the toposheet for the rectification of the image. So with this DIGITIZATION we can be able to know the amount of the river area to be cropped for the laying of the new shape files or we can simple develop some new point locations in the existing survey plan to reduce the volume and also make the places vary from one place to the other easily in a convincible manner. Hence we successfully completed the task of DIGITIZATION of the Raster image that is Toposheet.

OUTPUT: The following are the output maps after analyzing the samples of Krishna River Soil.



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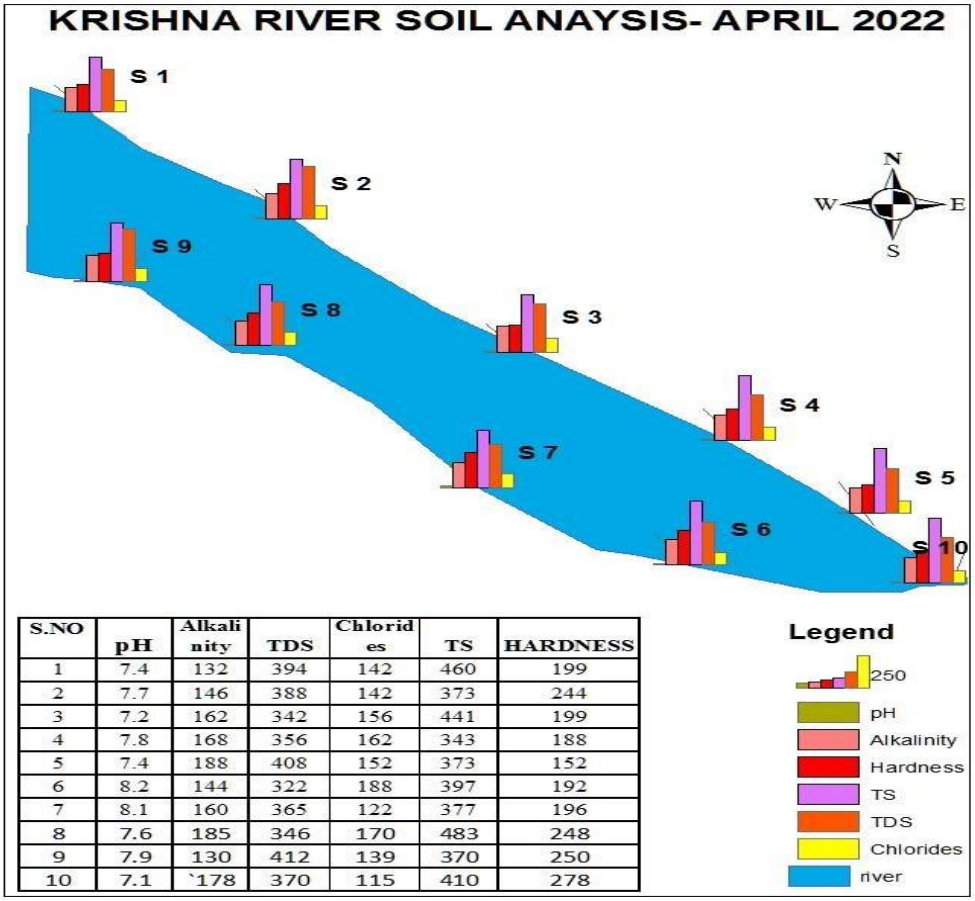

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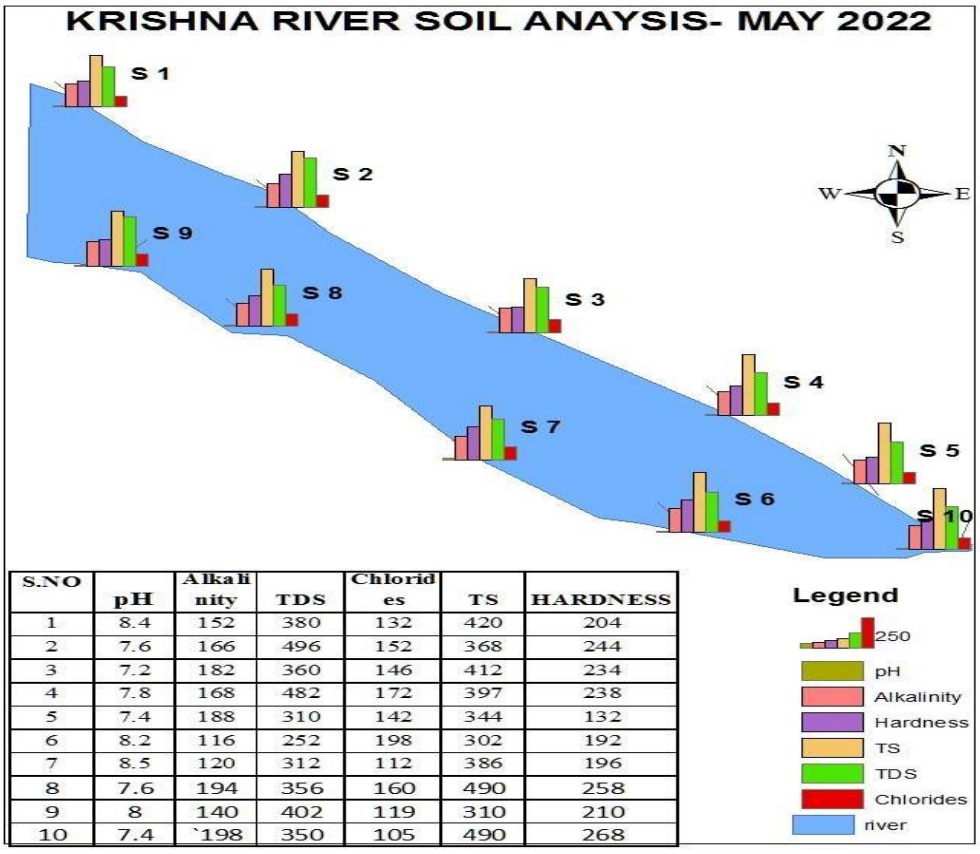

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9	8	140	402	119	310	210
10	7.4	`198	350	105	490	268

CONCLUSIONS:

The Environmental changes taking place in Krishna River Soil sediments is due to the rapid development of urban activities in nearby locations can be detected easier with GIS and Satellite based maps and GIS is very much useful for easy explanation of the results. This study of Krishna river soil sediments Analysis has shown that the use of GIS is very useful tool for the assessment of soil sediments quality. Geospatial Technology plays a vital role in decision making for policy makers to promote environmental protection by integrating Krishna River soil sediments quality data of various months with spatial information for making maps to be used as future reference in and around the study area. The Surface soil sediments of the Krishna River constantly monitoring must be done, to identify the changes any. The spatial distribution maps of pH, TDS, TS, Hardness, Chlorides showsthat these parameters are within the permissible limit in the study area.

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