



Automated Mapping of Water Bodies from Resourcesat-2 Awifs Image Using Automated Algorithm, Nalgonda District, Telangana State, India.

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Abstract

In the recent past lot of research is taken place on surface water features. The surface water includes lakes, ponds, rivers, streams and other exposed inland water bodies. The function of rainfall amounts, intensity of rainfall etc. over season / year are the variation in spatial extent of these features. Remote sensing providing lot of data and extracting lot of information over the changes from time to time. Nowadays the role of satellite image process is widely used in extraction of water bodies. Different researchers are using various methods to delineate water bodies from different satellite imagery varying in characteristics like spatial, spectral, and temporal. In FCC water bodies appear as different hues depending on their physical characteristics such as depth of water (bottom reflection), turbidity, etc. Water appears dark due to which absorbs all infrared radiations which helps in easy contrast distinction between water and land in near-infrared band. Our present area of interest includes an automatic approach to capture the water body from a Resourcesat-2 AWiFS (Advanced Wide-Field Sensor) imagery using a Automated Algorithm for extraction of surface water bodies model. The dynamics of surface water bodies in Study on geospatial analysis of the extraction of water feature sheets for the month of January month 2018 of the study area. Geospatial database on water bodies information has been created from the Resourcesat-2 AWiFS image. By using bands of 1.55- 1.70 μm (SWIR), 0.77-0.86 μm (NIR), 0.62-0.68 μm (Red) and 0.52-0.59 μm (Green) for the estimation of the water spread area. The Water spread area (WSA) calculated for each is 37231 ha [1] and [2].

Keywords: Surface Water Bodies, feature extraction, Water Spread Area, Water body, Remote Sensing and G.I.S.

1. Introduction

The synoptic and repetitive information provided by orbital sensors is integrated with in situ data for development and management of water resources. Remote sensing data has been used in many applications related to water resources such as surface water body mapping. One of the most simple applications is inventorying surface water bodies. Water is the most abundant and inexhaustible renewable resource. On this earth although water is very plentiful, yet is very valuable. It covers 70% of the surface of water in the form of ocean, rivers, lakes etc., out of which only 3% contributes to fresh water. Out of 3%, 2% is present as polar ice caps and only a fraction of 1%, of it is potable (used for drinking). 90% of the water contributes to agricultural lands in India. By the expanding development and increasing population are cause of increase the demands for water. Two-thirds of the world people would be agonizing from acute water shortage, which would be estimation that by 2024.

India has a land area of 328 million hectares, of which 150 million hectares is under cultivation. About one third of the cultivated area has irrigation facility. To meet the food demands of the rising population of the country, more areas have to come under cultivation and irrigation in the near future, before the population can be stabi-

lized by man made efforts. Some of the parameters amenable to remote sensing are the extent of water spread and its seasonal fluctuations, volume of water, etc. the capacity of surface water bodies like ponds and dams are reduced due to silting because of soil erosion. Remote sensing can be used to find out the extent of **soil erosion** and the consequent sediment load on to the tanks/dams. In remotely sensed data sets which has a accurate identification and delineation of water facilitates a typical spectral response.

The Nagarjuna Sagar Project is one major irrigation project and three medium irrigation projects such as A. Madha Reddy project, Musi project and Dindi projects are present in Nalgonda district.

The gneisses, granites, schists and intrusives are being the Archaean crystalline rocks, which exists 90% of the study area. The southern part of the study area having Quartzites, limestones and shales are exists 9% in the Cuddapah and Kurnool system of consolidated metasedimentary rocks. Alluvial sands, clay, of unconsolidated deposits exists as isolated and narrow patches along the stream and major rivers occupying around 1% of the study area[3].

2. Materials and Methods

Telangana state is geographically located in semi-arid region and has predominantly hot and dry climate. Monsoon starts in the month of June and lasts until September. After bifurcation of Andhra Pradesh the newly formed 29th state of Telangana is located in the southern peninsula of India is spread over a geographical area of 2,449.79 km² (945.87 sq mi) and is the 12th largest State in terms of both area and population. The study area Nalgonda district with its headquarters at Nalgonda is one of the 31 districts of Telangana state. The district lies between 17°09'60.00" N 79°29'59.99" E forms a part of major basin of Krishna river and is covered by Survey of India toposheet nos. E44M, E44S, E44N, E44T (56K, 56L, 56O and 56P). The average annual precipitation of normal rainfall 751.0 mm, Average rainfall 670.2 mm..[3]. The location of the area of study is depicts in Figure 1.

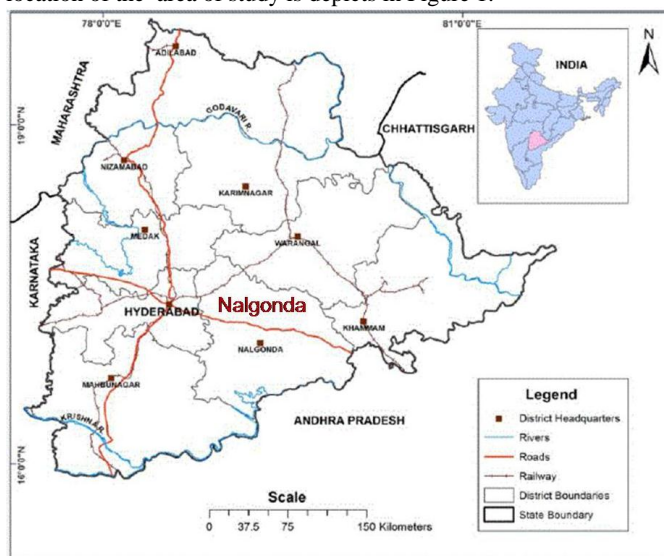


Fig. 1: Location map of the study area

We, launched a major task of mapping surface water bodies at national level through development of automatic feature extraction techniques using data sets. It provides integrated view of water spread dynamics for more 12,500 water features in the country. The mapping, monitoring of dynamics of surface water bodies were acquire by satellite sensors through outline and lively wrapping of earth surface at frequent intervals. Mapping, monitoring and inventory of water features over wide areas by Satellite data is a reputed proficiency for creation of dynamic databases. The aim of present study is automatic delineation of water bodies.

The dendritic to sub-dendritic and rectangular are the drainage pattern in the study area [3]. The overall methodology for the extraction of the water features were illustrated by Figure 2.

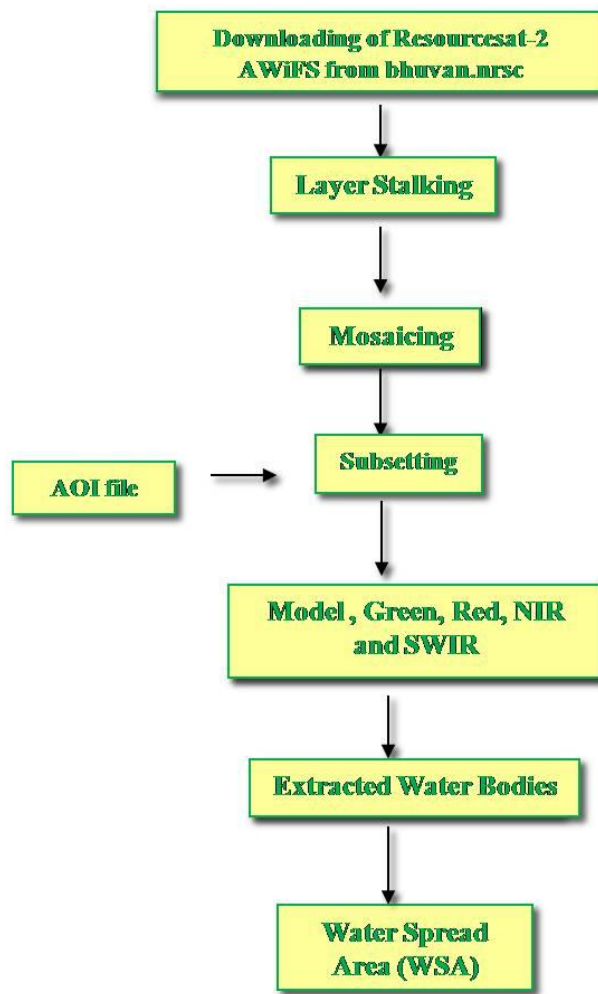


Figure 2: Overview of Methodology

2.1. Data used for study

The main source of satellite data for monitoring variations in water spread are through the missions of Resourcesat-2, RISAT – 1 of Indian Remote Sensing (IRS).

An integrated use of Resourcesat-2 AWiFS, LISS III (optical data) and RISAT-1 MRS, CRS (microwave data) has generated water bodies data. For this process automated algorithms have been developed & made operational in Integrated Multi Mission Ground Segment for Earth Observation (IMGEOS) in near real time [4]. Various sensors are used in extracting the satellite data, they are listed in the tables 1 and 2.

Table: 1

Satellite-Sensor	Spatial Resolution	Repetivity
Resourcesat-2 AWiFS	56 M	5 Days
Resourcesat-2LiSS III	23 m	24 Days

2.2. Water Bodies Information System

Water Bodies Information System (WBIS) is developed using web technologies like Vue JS, Leaflet and eCharts for data visualization and map elements. Raster data is automatically pooled from time-series water layers into a PostGIS enabled Postgres database. Java script and REST APIs are provided using node.js. and Cassandra for generating the statistics of an individual water body, regional (River Basin, River Sub-basin, State, District) Mapnik was used as rendering Engine [4]. Process of Water bodies information system (WBIS) are shown in Figure 3

Table: 2

Year	Month	Source of Satellite Data
2016	Dec, 2016	Resourcesat -2 AWiFS

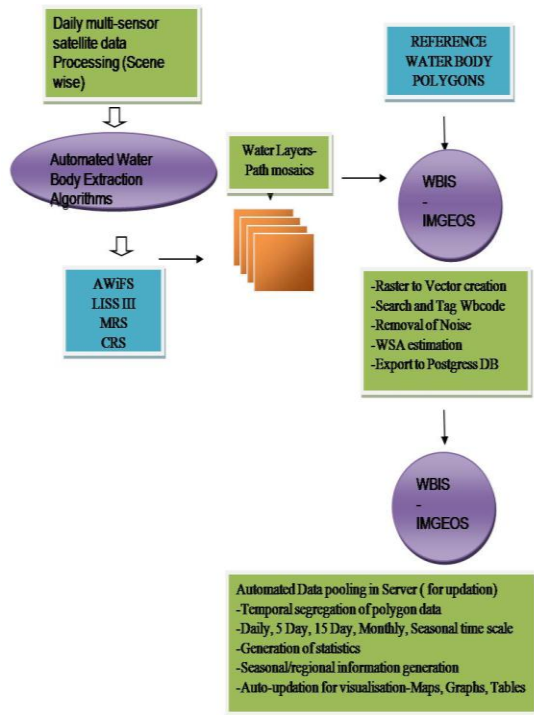


Figure 3: Process flow chart of Water Bodies Information System

3. Results and Discussions

The results acquired from the analysis of spatial temporal satellite attained water bodies information of Nalgonda district, model framework for the extraction of surface water bodies from the Resourcesat-2 image of Nalgonda district of Telangana state. The study is made from the satellite acquired water body area with the help of figures. Water body layers procured from Resourcesat-2-AWiFS through the model for extraction of water body information for Nalgonda district. The analysis is focused on the surface water bodies [2].

3.1. Sub setting of study Area For Water extraction

The area of interest was subset by using a study area shape file to Resourcesat- 2LiSS III 23 m 24 Days clip the need of area by discussing in the methodology section. Figure 4 depicting Nalgonda district boundary layer of area of interest.



Figure 4 : District boundary layer of area of interest.

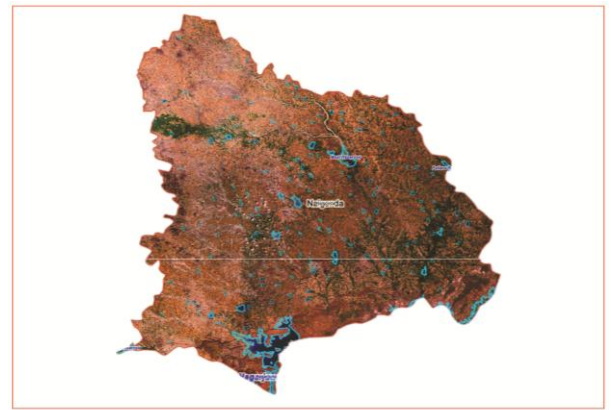


Figure 5 : Subsetting of area of interest

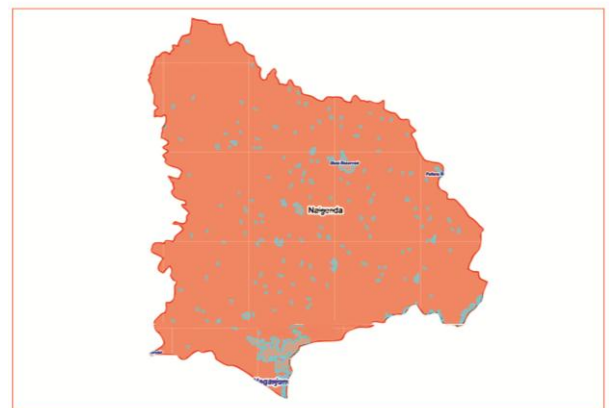


Figure 6 : Extraction of water layer from Satellite image

3.2 Extraction of Water bodies from Satellite Image

Extraction of water features from the Resourcesat-2 image for using the model shown in methodology. The Figure 5 shows that the extracted water bodies layer for the Nalgonda district of Telangana state.

The water spread is the single water features as illustrated in Figures 5 and 6. Application of the new model the total water spread area of the study area is 3723 ha. Pixel wise analysis has made for the identification of water and non water features with the analysis of model [5].

4. Conclusions

In the extraction of surface water features, analysis and information with the G.I.S. application and the remote sensing mechanism are very serviceable. The water spread area is analyzed in January month 2018. During this by size as observed from satellite data and aggregated WBA in single class was derived by satellite derived total WBA etc. The total water spread area of Nalgonda district is 37231 ha. Total number of water bodies in the study area is 1376. The total net irrigated of study area is 2,97,796 ha. in the total geographical area of 1424000 ha. Of this net channelised area 192350 ha. was irrigated by groundwater whereas 92337 ha. mainly irrigation accounts by surface water. The availability of irrigation sources and climatic conditions are being the main source of agriculture operation. The Godavari basin covers about half of northern Telangana state and remaining half of southern part is covered by Krishna basin. There are about 1,036 TMC of water in Godavari basin and 554 TMC of utilizable surface water resources in Krishna basin are there in the state, whereas availability of water as per records does not exceed 150 TMC in both the basins. This indicates the under utilization of river water sources in Telangana state though geographically about 70% of Telangana land is suitable for irrigation.

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