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Use of High Resolution Remote Sensing Data and GIS Techniques for Monitoring Of 'U' Shaped Wetland At G.B. Nagar District, Uttar Pradesh

Kshama Rai[1], Abhishek Kumar Yadav[2], Amit Verma[3]

1Remote Sensing Applications Centre, Uttar Pradesh
Sector-G, Jankipuram, Kursi Road, Lucknow
2Research Scholar, Deptt. of Geography, Jiwaji University, Gwaliar, M.P.
3M.Tech Student, Suresh Gyan Vihar University, Jagatpura, Jaipur, Rajasthan.
*Corresponding author email id: raikshama2012@gmail.com

ABSTRACT:
In developing countries of the world, the ever increasing population and to fulfill its need for housing and other economic activities almost urban fringe are getting encroached and our surrounding environment and natural wetlands, water bodies and other biological cycles are depleting. In recent years high resolution satellite imageries and Geographical Information System (GIS) coupled with Global Positioning System (GPS) is vital tool for mapping and monitoring of our natural resources and provide us lucid and effective means of information on present and past status due to synoptic coverage of satellites. This paper present results on monitoring of 'U' shaped wetland at Gautambuddha Nagar district of Uttar Pradesh using Survey of India Topographical Map surveyed in 1971, Cartsat-1 (2.5m Res.) plus IRS-P6 LISS-IV Mx (5.8 m multispectral) fused data product acquired in 2008 and Cadastral Map Sheets on 1:4,000. The result shows that in 1971 the wetland total geographical area based on Survey of India Topographical Map (SOI) was 61.12 hectare, whereas based on interpretation of Cartsat-1 (2.5m Res.) plus IRS-P6 LISS-IV Mx (5.8 m) satellite imagery of 2008, it was calculated as 40.52 hectare in GIS domain. This has been decreased to -20.60 hectare in a span of 37 years.

Key words: Wetland, Carosat plus IRS-P6 Merged Satellite Imagery, GIS, GPS Techniques.

INTRODUCTION

Wetlands are considered the world's most productive environments and rich ecosystems that provide refuge to high concentration of fauna and flora. Wetlands can be thought of as "biological supermarkets". Wetlands serve as transitional environment between land and water and represent a signigicant part of the district and state natural resources. (Karr 1995, Montgomery and others 1995; Angermeirer and Schlosser 1995; Montgomery and others 1995; Reeves and others 1995; Ebersole & others 1997, has been expressed that numbers of efferts has been made to protect and maintain the wetland area and its environment but wetland and waterbodies evidence shows declining the area and natural eco system of wetlands. As a consequence, wetlands are among the most degraded of all ecosystems, which needs to be protected to stop the accelerated decline of wetlands populations. Wetlands are not isolated spaces but on the contrary it has dynamic, complex habitats with biotic and a biotic connections all around. In recent years, there is an increased public awareness of the values and benefits of wetlands to society. Now people have begun to recognize what is lost when wetlands are destroyed, efforts are made to restrore lost wetlands or to create new ones. Restoration and creation of wetlands can help maintain a quality of wetlands and their surroundings ecosystems and at the same time accommodate the human need for development. Consequently, there is an urgent need to monitor current status of wetlands and come up with possible management alternative for their recovery. The Ramsar convention is the Central element of wetland policy. The Ramsar convention on wetlands 'a UNESCO-based inter-government treaty on wetlands adopted in the Iranian city of Ramsar in 1971 provides brand charancterization and framework for protecting wetland areas from further, exploration and resulted in several conservation plans, policy documents and protection efforts. In 2010, Hon'ble Supreme Court of India constituted a separate body as National Green Tribunal (NGT), to protect and solve the issue and litigations related to detrimental of our environmental balance and natural resources.

According to Ministry of Environment and Forests, India has 67,429 major wetlands covering an area of around 4.1 million hectare out of these 2175 are natural and 65,254 are manmade. Wetland in India excluding rivers accounts for 18.4% of the country's geographical area of which 70% is under paddy cultivation. In state of Uttar Pradesh the total numbers of natural lakes, reservoir, tanks, ponds, waterlogged areas and ox-bow/meanders accounts 1,19,964 based on remote sensing data covers 6, 35,215 hectare. The digital

database created for the study area will be very useful to protect of our natural wetland/ water bodies for decision makers/development authorities for proper land use planning & management.

STUDY AREA:

The study area lies at Chithera-Bhil-Akbarpur and Datawali village of tehsil- Dadri, G.B. Nagar district in western part of Uttar Pradesh along G.T. road. The location of study area is at 77^0 34' 34.704 E longitudes and 28^0 31' 24.208 N latitude. This area comes under National Capital Region (NCR). (Figure-1)

OBJECTIVE:

The broad objective of the study is to prepare temporal wetland map, monitoring and super imposition of cadastral map on wetland using Geographical Information System (GIS) Techniques.

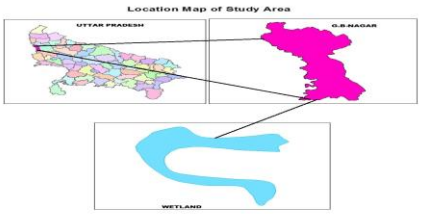
MATERIALS & DATA USED:

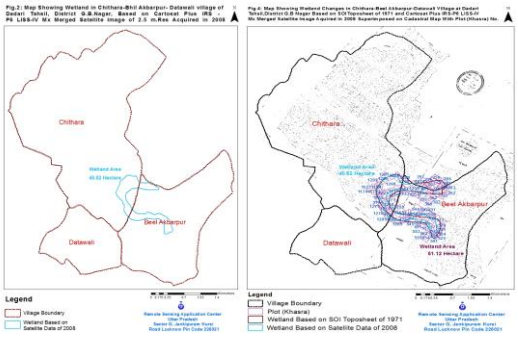
1. Survey of India topographical map Sheet No. 53H/10 on 1:50,000 Scale surveyed in 1971-72 and published in 1979.
2. Cartsat-1 (2.5m Res.) plus IRS-P6 LISS-IV Mx (5.8 m multispectral) fused data product acquired in 2008.
3. Cadastral Map Sheets on 1:4,000 Scales.
4. Village Boundary map of Chithehra-Bhil-Akbarpur & Datavali Village.

METHODOLOGY:

The Procedure followed for identification of wetland, preparing wetland map on 1:50,000 scale and for preparation of wetland change database using remote sensing & GIS techniques is discussed in brief are as under:

At first survey of India topographical map Sheet No.53H/10 on 1:50,000 scales has ben used for identification and demarcation of 'U' shaped Wetland located at Chithehra-Bhil-Akbarpur-Datavali village at Gautambudh Nagar District (Figure-1). The delineated Wetland vector map has been overlaid on cartost-1 (2.5m spatial Resolution) data merged with Resourcesat-1 (5.8m spatial Resolution) fused satellite data product acquired in 2008 to delineate the wetland using Geographical Information System (GIS) software. Further, cadastral map provided by the Bulandshahar Development Authority for wetland and surrounding area was geo-referenced, digitized and attributes coded for each and every Khasra/ plot boundary in surrounding of wetland. The digitized and attributed coded cadastral map was super imposed on wetland map which was prepared based on SOI toposheet and cartosat plus Resourcesat-1 fused data product respectively in Arc-GIS software to know the how many plot numbers are falling within 'U' Shaped wetland area. The final map of the study area has been prepared including the village boundary/satellite based wetland information, toposheet based information and Khasra/plot numbers information.





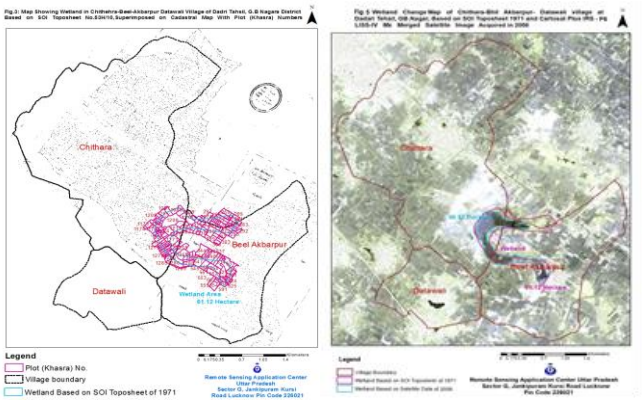


Fig.1 Location Map of Study Area

RESULTS & DISCUSSIONS:

To generate the digital data base for Chithehra-Bhil-Akbarpur-Datavali Village area (Total area-1381.18 hectare) for 'U' Shaped Wetland, a base map at cadastral level as explained above was prepared. The SOI toposheet was used to estimate the area of wetland as on 1971-72 and it was calculated in GIS domain and it was found to be 61.12 hectare (Figure-1). Subsequently, cartosat-1 plus Resourcesat-1 multispectral -5.8 m resolution fused data was used for temporal change detection in 2008. Accordingly, the area of wetland in GIS was estimated as 40.52 hectare (Figure-2). Cadastral map on 1:4,000 scale provided by Bulandshahr Development Authority was scanned and geo-referenced. The same projection parameters (Universal Transverse Mercator (UTM) and World Geodetic System (WGS_84) and Zone_44) were defined for each and every layer. The wetland map based on SOI topographical map was superimposed on cadastral map and it shows that 152 Khasra/plot numbers are falling under wetland area (Figure-3), out of these plots some plots are covered in full while others are in parts only. Similarly the wetland map prepared based on Cartosat-1 plus Resourcesat-1 LISS-IV fused data(Figure-5), was also superimposed on cadastral map(Figure-4), which shows that 104 Khasra/plot numbers are falling under wetland area**,** either fully or partially and some of these are common in both the data sets. The analysis shows that 48 Khasra/plot numbers are merged into some other economic activities.

LIMITATIONS OF STUDY:

I. The scale of SOI toposheet is 1:50,000 and the scale of cadastral map is 1:4,000. Hence, there may be minor inaccuracies due to scale transformation.

II. Similarly, there may be minor inaccuracies due to variation in scale of satellite data used and that of cadastral map.

III. Minor inaccuracies might have been developed in the process of digitization and geo-referencing of Cadastral map as DGPS surveys are not conducted in the present case.

IV. Keeping in view the above limitations, the study conducted although reveals the 1971 and 2008 status of 'U' shaped wetland in the study area. However, there may be inaccuracies regarding the exact numbers of plots or regarding plot numbers falling within the wetland.

CONCLUSION:

Wetlands are now being looked upon as ecosystems with specific ecological chracteristics, functions are values. They are one of the most productive systems of the world and essential life supporting systems, providing a wide arrary of benefits of human mankind. Remote Sensing by virtue of its high resolution/multispectral multitemporal and synotic viewing provides rapid and powerful tool for monitoring wetlands on our earth surface. The study conducted using temporal data of SOI toposheet surveyed in 1971 and satellite data of 2008 has helped in estimating the temporal changes in 'U' shaped

wetland in Chithehra-Bhil-Akbarpur-Datavali village of Dadri tehsil in G.B. Nagar district.

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